

**PRACTICES THAT HELP GRADE 12 LEARNERS TO IMPROVE THEIR  
PERFORMANCE IN PHYSICAL SCIENCE: A CASE OF OMUSATI REGION,  
NAMIBIA**

A THESIS SUBMITTED IN PARTIAL FULFILMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF EDUCATION (SCIENCE EDUCATION)

OF

THE UNIVERSITY OF NAMIBIA

BY

MALAKIA HAIMBANGU

200112805

April 2018

**Main Supervisor:** Dr. M. Chirimbana

## ABSTRACT

In Namibia, Omusati Region is one of the poorly performing regions in Physical Science Grade 12 national examinations (Omusati Regional Advisory Services (ORAS), 2015). Despite the poor performance, there are few schools in this region which have been ranked among the top six performing schools in the country. These schools are located in the same geographic region with other schools with a poor performance record. Therefore, this study investigated practices that could help improve the academic performance of learners in the Physical Science subject. The study employed a QUAL-quant research approach of a concurrent nested design by using a case study for an in-depth investigation. An extreme case sampling strategy was used to draw a sample of two schools from a population of seventeen secondary schools in the region. The four domains: planning and preparation, the classroom observation, instruction and professional responsibilities were used in data collection. Six Physical Science teachers from both schools were part of the study and were observed over five different occasions. Interviews were used to collect data for domain four while domain one, two and three data were collected using a classroom observation. Thirty classroom observations were conducted at both selected schools. Field notes assisted the researcher to come up with mitigation strategies to be employed by School B. Data analysis was done using contingency table analysis on the four domains of Danielson (2007) by studying the relationships and differences between School A and School B. Results from this study showed that the classroom environment (Domain 2) was an important factor that helps learners improve their performance in Physical Science, with fewer efforts from the teachers towards other practices found in three domains including planning and

preparations, instructions and professional responsibilities. Mitigating strategies were suggested to strengthen the classroom environment for School B. These included creating an environment of respect and rapport, establish a culture for learning, manage classroom procedures, managing learner behavior and organising the physical space. To improve on this domain, teachers were advised to empower learners through career fairs, peer tutoring, group discussions while the education officers were recommended to execute the Continuous Professional Development initiatives that focus on improving classroom environment.

## TABLE OF CONTENT

ABSTRACT .....	ii
TABLE OF CONTENT .....	iv
LIST OF TABLES .....	vii
LIST OF FIGURES .....	viii
LIST OF ABBREVIATIONS AND/OR ACRONYMS .....	ix
ACKNOWLEDGEMENTS .....	x
DEDICATIONS .....	xi
DECLARATIONS .....	xii
CHAPTER1: INTRODUCTION .....	1
1.1. Introduction .....	1
1.2. Orientation of the study .....	1
1.3. Statement of the problem .....	3
1.4. Research questions of the study .....	4
1.5. Significance of the study .....	4
1.6. Limitation of the study .....	4
1.7. Delimitations of the study .....	5
1.8. Definition of terms .....	5
1.9. Summary .....	6
CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK .....	7
2.1. Introduction .....	7
2.2. Theoretical framework of the study .....	7
2.3. Teaching and learning environment .....	9
2.4. Teachers' roles and activities .....	11
2.5. Summary .....	16
CHAPTER 3: METHODOLOGY .....	17
3.1. Introduction .....	17
3.2. Research design .....	17
3.3. Population .....	18

3.4. Sample and Sampling Procedures .....	18
3.5. Research Instruments .....	18
3.5.1. Interviews.....	18
3.5.2. Observations .....	19
3.6. Data collection procedures .....	20
3.7. Piloting .....	21
3.8. Consistency and neutrality .....	22
3.9. Data analysis.....	24
3.10. Ethical considerations.....	25
3.11. Summary .....	26
CHAPTER 4: RESULTS AND DISCUSSIONS.....	27
4.1. Introduction .....	27
4.2. Demographic information for teachers.....	27
4.3. Class Sizes.....	28
4.4. Classroom Observation Outcomes .....	29
4.4.1. Domain 1 (Planning and Preparation) .....	29
4.4.2. Domain 2 (Classroom Environment).....	38
4.4.3. Domain 3 (Instruction).....	44
4.5. Interview Outcomes .....	50
4.5.1. Domain 4 (Professional Responsibilities).....	50
4.6. Mitigating strategies .....	79
4.6.1. Creating an environment of respect and rapport.....	80
4.6.2. Establishing a culture for leaning .....	81
4.6.3. Managing classroom procedures .....	81
4.6.4. Managing learner behavior .....	82
4.6.5. Organising the physical space.....	83
4.7. Summary .....	84
CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS .....	85
5.1. Introduction .....	85
5.2. Summary of the study.....	85
5.2.1. Chapter 1: Introduction of the study.....	85

5.2.2. Chapter 2: Theoretical Framework and literature review .....	86
5.2.3. Chapter 3: Methodology .....	86
5.2.4. Chapter 4: Results and Discussions .....	86
5.3. Strengths and shortcomings of the study .....	89
5.4. Limitations of the study .....	89
5.5. Conclusion .....	90
5.6. Recommendations .....	90
5.6.1. Recommendations to the Professional Development Subdivision .....	90
5.6.2. Recommendations to the schools' managements .....	91
5.6.3. Suggestion for further research .....	91
REFERENCES .....	92
APPENDIX 1: Ethical Clearance Certificate .....	100
APPENDIX 2: Permission letter .....	101
APPENDIX 2: Informed Consent for Teachers .....	102
APPENDIX 4: Informed Consent for Principals .....	104
APPENDIX 5: Classroom Observation Instrument .....	105
APPENDIX 6: Interview Instrument .....	113

## LIST OF TABLES

Table 2.1: Four Domains and their components ( <i>adopted from Danielson, 2007</i> ).....	8
Table 4.1: Demographic information for teachers of School A.....	27
Table 4.2: Demographic information for teachers of School B.....	28
Table 4.3: Domain 1 mean scores for teachers from School A and School B.....	35
Table 4.4: Domain 2 mean scores for teachers from School A and School B.....	42
Table 4.5: Domain 3 mean scores for teachers from School A and School B.....	48
Table 4.6: Interview Results for Teacher SA1.....	61
Table 4.7: Interview Results for Teacher SA2.....	62
Table 4.8: Interview Results for Teacher SA3.....	63
Table 4.9: Interview Results for Teacher SB1.....	73
Table 4.10: Interview Results for Teacher SB2.....	74
Table 4.11: Interview Results for Teacher SB3.....	75
Table 4.12: Comparison of School A and School B.....	77

## LIST OF FIGURES

<i>Figure 1: Contingency Table Analysis of Table 4.12</i> .....	78
<i>Figure 2: Haimbangu's Model of Best Practice for Teaching and Learning (adopted from Danielson, 2007)</i> .....	79

## **LIST OF ABBREVIATIONS AND/OR ACRONYMS**

**NIED:** National Institute for Educational Development

**SADC:** Southern African Development Community

**ORAS:** Omusati Regional Advisory Services

**DNEA:** Directorate of National Examination and Assessment

**COI:** Classroom Observation Instrument

**PD:** Professional Development

**CPD:** Continuous Professional Development

**LRC:** Learners' Representative Council

## **ACKNOWLEDGEMENTS**

Prima facie, I am grateful to God for the good health and wellbeing that were necessary to complete this study.

I would like to express my sincere gratitude to my supervisor Dr. Moses Chirimbana for the continuous support in this study, for his patience, motivation, and immense knowledge. His guidance helped me during the time of the study and writing of this thesis. I could not have imagined if things could be easier until he came into the picture.

Besides my supervisor, I would like to thank Dr. Elago, Dr. Miranda & Dr. Kapenda for their insightful comments and encouragement, but also for a direction that made me to have a clear focus with my research.

My sincere thanks also go to Dr. Kandjeo-Marenga who tirelessly shaped my research from scratch to a refined and well focused project.

I thank my colleagues and my friends for support and encouragement. In particular, I am grateful to Ms Haukongo, Ms Kanandjebo and Dr. Eliakim Hamunyela for enlightening me with academic writing skills.

Last but not the least, I would like to thank my family: my wife: Ndahaleumbo, my daughters: Ndapunikwa, Linonge and Munonhemo, my son: Tuhumbata and my nephew: Malakia Jr. for supporting me spiritually throughout this thesis and my life in general.

## **DEDICATIONS**

This thesis is dedicated to my father, Nghilengwa Haimbangu, who died while I was one year old but the legacy he left behind has taught me to overcome hardship. It is also dedicated to my mother, Ndahaleumbo Malwa, who taught me that a good life is not about how you are living today but it is about how you will live tomorrow.

## DECLARATIONS

I, Malakia Haimbangu, hereby declare that this study is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution.

No part of this thesis may be reproduced, stored in any retrieval system, or transmitted in any form, or by means (e.g. electronic, mechanical, photocopying, recording or otherwise) without the prior permission of the author, or the University of Namibia in that behalf.

I, Malakia Haimbangu, grant the University of Namibia the right to reproduce this thesis in whole or in part, in any manner or format, which the University of Namibia may deem fit.

.....

Signature

.....

Date

# **CHAPTER1: INTRODUCTION**

## **1.1. Introduction**

This chapter presents the orientation of the study, statement of the problem, research questions, significance of the study, limitations, delimitations and definitions of terms.

## **1.2. Orientation of the study**

Physical Science forms an integral part of the secondary school curriculum; it aims at increasing the learners' knowledge and understanding of the physical world of which they are part of, so that they can satisfy human needs and how the environment can be used in the sustainable way (National Institute for Educational Development (NIED), (2010)). Therefore, our personal lives are real world contexts for learning Physical science and understanding the impact of Physical science on our lives. Everyone can become engaged in science by way of linking daily personal experiences to Physical Science (NIED, 2010). It can thus be deduced that Physical Science is an important subject at secondary level, but teachers are often faced with difficulties to understand and teach concepts related to this subject (Chavan, 2013). If these concepts which are difficult to understand for the teachers are taught to the learners, it will transfer towards learners incorrectly and it will create many alternative conceptions. In order to teach today's Physical Science concepts, teachers need to understand the subject matter deeply and flexibly in order to help learners create useful cognitive maps, relate one idea to another, and address alternative conceptions (Chavan, 2013). Chavan further added that teachers need to see how ideas connect across fields and to everyday life, how to present

them to the learners for them to understand them effectively and improve their performance. This means, teachers are expected to demonstrate the knowledge of relevant content and a range of pedagogical approaches.

Teachers' roles and activities are seen as the major determinant of learners' performance in Physical Science in schools (Stephen, 2013). The positive and negative behaviours exhibited by teachers determine to a great extent their effectiveness in the classroom, ultimately, the impact they have on learners' achievement (Stronge, 2007). Learners are able to engage in sophisticated scientific practices and learn complex science concepts when provided with strategic scaffolding, where they are fully supported using different activities (Davis, 2013). On average, learners' performance on examinations and concept inventories is increased in active learning classroom (Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt & Wenderoth, 2013). Different schools have different classroom practices that contribute to different performance in Physical Science (Mji & Makgato, 2006).

Generally, Physical Science is one of the subjects in secondary schools of Southern African Development Community (SADC) which learners do not perform well (Kibirige & Hodi, 2013). In SADC, there are, however, some schools where learners perform well in Physical science mainly because of the different teaching standards (Mji & Makgato, 2006). This means, teachers should use different practises while presenting sophisticated scientific practices and complex science concepts to improve academic performance in Physical Science.

In Namibia, for example, learners in the Omusati Region performed below average in 2015 with an average performance of 43.57% (A\*-D symbols) in Physical Science (ORAS, 2015). Yet, a particular school (referred to herein as School A) came in top six best performing schools in Physical Science with 100% (A\*-D symbols) in Namibia (Directorate of National Examination and Assessment (DNEA), 2014). Another school, referred to as School B, only attained 8.21% (A\*-D symbols), which was ranked amongst the last ten schools out of 176 secondary schools in Namibia (DNEA, 2014). It is not known why some schools (e.g. School A) performed well in Physical science while others (e.g. School B) did poorly. This study aims to investigate why some schools perform well while others do not, in order to identify practices that will help Grade 12 learners to improve their performance in Physical Science.

### **1.3. Statement of the problem**

In Namibia, Omusati Region is one of the poorly performing regions in Physical Science (ORAS, 2014). Despite this poor performance, there are some schools from the same region which are ranked among the top six performers in the country. Interestingly, the excellent performing schools are in the same geographic region with those whose performance is poor (ORAS, 2014). Like in other regions, factors contributing to this huge performance discrepancy between the schools have not been investigated. One of the studies carried out so far is an investigation into the knowledge and practice of Learner-centred methods of teaching by Physical Science teachers in the Omusati Region (Awe, 2007) which revealed that Physical Science teachers used few learner-centred methods and practices of teaching in the classroom. The question remains as to

why some schools are performing exceptionally well despite that some of the schools are performing poorly. Therefore, this study has investigated the practices that enable learners to academically perform well in Physical Science, at two schools in Omusati Region.

#### **1.4. Research questions of the study**

1. What are the teachers' roles and classroom practices that contribute to higher performance in Physical Science among secondary schools in Omusati Region?
2. What mitigating strategies need to be put in place to help poor performing schools improve their Grade 12 Physical Science results?

#### **1.5. Significance of the study**

The findings of this study could be significant to Senior Education Officers and Heads of Departments as they could inform them about better teaching practices that they should instill in teachers to improve performance in Physical Science. The findings exist as a source of literature of best practices. These findings may also benefit teachers to take corrective measures when it comes to classroom practices in Physical Science.

#### **1.6. Limitation of the study**

Best practices that positively affect the performance of learners may vary across the schools and educational regions in Namibia. Therefore, documenting such factors would require a comprehensive coverage of such practices across the country. However, such comprehensive coverage would require more time and resources. As a result, this study

only focused on a top performing school and least performing school in Physical Science in the Omusati Region; which are similarly resourced, have similar field of studies and located in the similar surrounding. Hence the findings may not be generalised to the entire country.

### **1.7. Delimitations of the study**

The study was done at two selected secondary schools in the Omusati Region, where one school was the top ranked while the other was a bottom ranked school as per the national examination results.

### **1.8. Definition of terms**

**Learners' performance:** refers to how a learner meets examination standards set out by the examination body (Elger, n.d.). In this study, the term learners' performance should be understood the same way.

**Best practices:** refers to those teachers' and classroom's activities such as variety of assessments, lesson preparation in advance, classroom decoration and motivation of learners, in which successful learning has occurred and has been evaluated as excellent (Spillane, 2011). This should be the same way the term is defined in this study.

**Classroom practices:** refers to all methods used to make learners' learn effectively/ineffectively, using textbooks and worksheets, writing reports, working with objects, discussing in small groups and assessing learners in different ways (Wenglinsky, 2001). The term was understood in this manner in this study.

## **1.9. Summary**

Chapter 1 presented the orientation, statement of the problem, research questions, the significance, limitation and delimitation of the study and definitions of the terms used.

The literature review and the theoretical frame work are presented in the next chapter.

## **CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK**

### **2.1. Introduction**

This chapter presents the literature review and the theoretical framework. The Danielson's theory of Best Practice for Teaching and Learning was used as the theoretical framework of the study. The literature was reviewed with a focus at teaching and learning environment, and teachers' role and activities.

### **2.2. Theoretical framework of the study**

Investigating the best teachers' roles and classroom practices that contribute to higher performance is central to this study. Therefore, the conceptual framework of Danielson Theory of Best Practice for Teaching and Learning, which is grounded in a constructivist view, was adopted (Danielson, 2007). This theory of Best Practices of Danielson is a comprehensive and coherent framework that identifies aspects of a teacher's responsibilities that promote successful learning. Danielson's theory informs this study by using a validated instrument where teachers who receive higher ratings on their evaluation produce greater gains in learner test scores. Danielson (2007) divided the complex activity of teaching into four main domains of teaching responsibilities: planning and preparation, the classroom environment, instruction and professional responsibilities as shown in Table 2.1.

**Table 2.1: Four Domains and their components (adopted from Danielson, 2007)**

<b>Domain</b>	<b>Components</b>
Planning and preparation	<ul style="list-style-type: none"> <li>- Demonstrating knowledge of content and pedagogy</li> <li>- Demonstrating knowledge of learners</li> <li>- Selecting learning objectives</li> <li>- Demonstrating knowledge of resources</li> <li>- Designing coherent instruction</li> <li>- Designing learner assessment</li> </ul>
The classroom environment	<ul style="list-style-type: none"> <li>- Creating an environment of respect and rapport</li> <li>- Establishing a culture for learning</li> <li>- Managing classroom procedures</li> <li>- Managing learners behavior</li> <li>- Organizing physical space</li> </ul>
Instruction	<ul style="list-style-type: none"> <li>- Communicating with learners</li> <li>- Using questioning and discussion</li> <li>- Engaging learners in learning</li> <li>- Using assessment in instruction</li> <li>- Demonstrating flexibility and responsiveness</li> </ul>
Professional responsibilities	<ul style="list-style-type: none"> <li>- Reflection on teaching and learning</li> <li>- Maintaining accurate records</li> <li>- Communicating with families</li> <li>- Participating in a professional community</li> <li>- Growing and developing professionally</li> <li>- Showing professionalism</li> </ul>

Each domain is composed of several components: planning and preparation includes demonstrating knowledge of content and pedagogy; demonstrating knowledge of learners; setting of instructional outcomes; demonstrating knowledge of resources and designing learners' assessment.

The classroom environment domain includes creating an environment of respect and rapport; establishing a culture for learning; managing classroom procedures; managing learners' behaviour and organising physical space. The instruction domain includes communicating with learners; using questioning and discussion techniques, and engaging learners in learning (Danielson, 2007). Finally, the professional responsibilities include reflecting on teaching; maintaining accurate records; communicating with families and showing professionalism. Although Danielson has shown that the effective implementation of these domains can improve results, the strategies used by School A and School B in Physical Science in Omusati Region remain unknown. Therefore, this study used these domains to investigate the teaching and learning environment, and teachers' roles and activities.

### **2.3. Teaching and learning environment**

Miller and Cunningham (2011) argue that class composition (different learners' abilities), number of learners (class size) and classroom management are some of the best practices at schools. Class composition includes the classroom grouping methods such as ability grouping of learners. Smaller classes are associated with learners who are less stressed and are more frequently on task with fewer reported behaviour problems than learners in large classes (Miller & Cunningham, 2011). This means, performance of learners in Physical Science could be affected by how the teachers compose their classes as per the learners' abilities, the number of learners in the class at a specific time and how effective the teachers manage their classrooms.

Kstashuk (2007) alluded to the fact that best structuring of the physical environment is when the teacher considers the best desk arrangement, best classroom decoration and

adding music and movies to the classroom when necessary. The primary role of a teacher is to establish a learning environment where all learners are able to learn and are motivated to learn, an environment that is both challenging and supportive (Callaban, Cannon, Chesick, Mackin, Mandel & Wenning, 2009). Therefore, physical environment of the classroom is very important as it provides the support and an opportunity to learners to learn effectively.

Motivated and encouraged learners can inquire into complex science concepts, problems, and issues effectively with fewer efforts from the teachers who are seen as a powerful determinant of the classroom climate (Hassard & Dias, 2013). Teachers with motivated learners act as facilitators while learners direct their own learning. Learners are eager to learn and they can create a challenging atmosphere that can assist the teacher to explain the subject matter extensively.

Teachers should have the interest in teaching and ability to teach science and hence to improve learners learning. This was supported by Sahin and White (2015) who alluded to the fact that promising high-quality education in science for all learners depends on the teacher's interest in the subject and that promote and support understanding of scientific concepts. Teachers with the interest of teaching Physical Science promote confidence and love of the subject in the learners.

Additionally, learners learn with understanding when the learning takes place in meaningful and familiar situations. As learners explore their familiar environments, they encounter experiences through which they actively construct knowledge and discover new relationships (Charlesworth, 2015). This means, learners master the taught content better when prior knowledge is addressed so that they could relate known to the unknown.

Finally, Aguilar (2010) advocated for a classroom environment that can ignite learning and cultivate caring, for example, the teacher was addressing bullying using human figure named “Carecrow”. A child-size "Carecrow" hangs on one wall of the classroom. Learners have taped messages onto the figure reflecting their commitment to care for each other before the lesson commence and bullying was addressed while caring for one another was sowed effectively. Danielson (2007) contended that classroom composition, class size, physical environment and classroom management fall under the classroom environment domain. The reviewed literature does not explain why schools in the same or with similar classroom environment settings perform differently.

#### **2.4. Teachers’ roles and activities**

Oladejo, Ojebisi, Olosunde and Isola (2011) noted that teachers’ usage of instructional materials complemented the theory of best teachers’ practices. Academic performance in Physical Science is directly influenced by instructional resources; availability of textbooks and/or past papers as learners are well exposed to the content, type of examination questions and answering skills (Oladejo et al., 2011). This suggests that teachers develop their science by using carefully planned, fine-tuned lessons that reflect

an understanding of many different teaching techniques. Teachers apply each technique skilfully to gain the desired intellectual, social, affective or kinaesthetic result (Orlich, Harder, Callahan, Trevisan and Brown, 2012). This means, the teacher's knowledge of resources for classroom use and for extending the teacher's professional skill has to be extensive so that learning could be effective and contribute to the improvement of the learners' academic performance.

Lesson planning and preparation are vital in teaching and learning as quality teaching depends on what is done by the teacher before stepping into the classroom (Callaban et al., 2009). Therefore, through lesson planning and preparation, teachers will be encouraged to take part in scientific literacy development. Since science does not happen only inside the classroom, teachers are expected to plan putting in mind that they are charged with producing informed consumers of science who will be able to make decisions whenever science intersects public policy (Callaban et al., 2009). This means that effective teachers plan as indicated in the components of Danielson's planning and preparation domain for improved academic results in Physical Science.

Additionally, when the content that is being taught does not relate to the inherent goals of the learners, it will be forgotten (Schank, 2015). Thus, the teacher should be an informed and critical observer of science, concerned with developing scientific literacy that will assist learners to effectively grasp scientific knowledge and skills (Callaban et al., 2009). This is also indicated in the demonstrating knowledge component of the planning and preparation domain of Danielson (2007). This means, the effective teacher

coordinate in-depth knowledge of content, learners and resources to design lessons that can improve learners' performance.

Samy (2005) argue that good teachers who execute best practices in the science classroom are enthusiastic, friendly, easy-going, and able to develop a good rapport with learners. Samy also notes that good teachers motivate learners, encourage an open learning environment and also encourage learners' participation and engagement in the learning process. Additionally, several specific characteristics of teacher responsibilities and teacher behaviours that contribute directly to effective teaching are effective implementation of planned instruction, being professional and manage learners' behaviour throughout their lessons (Stronge, 2007).

It is a good practice for a teacher who is in complete charge of the class as discipline is concerned and paying attention to what learners do, what they say and how they say it. In this classroom, teachers may have the gift of instruction, and can inspire through their own knowledge and expertise by facilitating learning, questioning, sharing ideas, helping learners to formulate their ideas and develop their skills (Gunstone, 2012). The teacher encourages learners to participate and makes suggestions about how learners may proceed in an activity (Stronge, 2007). Engaging learners in learning and using questions and discussion techniques is part of Danielson's instructional domain as discussed in this study.

Archer, Childs, Covaciu and De Young (2012) found that effective technology implementation in the classrooms has the potential for performance improvement.

Archer et al. (2012) perceived technology as audio-visual materials that teachers take to classrooms in order to improve on the teaching-learning situations and by so doing bring about permanent and meaningful experience to their learners. For the learners to attain scientific knowledge and skills effectively, teachers are encouraged to advance teaching and learning agenda by using instruction that fully utilise the potential of mass media (Klosterman, Sadler and Brown, 2012). Furthermore, using media in teaching Physical Science makes it more interesting for the learners and increasing their ability to use science outside school (Ekborg, Ottander, Silfver & Simon, 2013). This means teachers should coordinate in-depth knowledge of resources including technology when designing lessons.

Every educator should know that education and technology are inseparable. Thus, it's a rational response to interrogate every new technology for its potential to serve educational aims. Technology can shape what is learned by changing how it is learned (Laurillard, 2013). Therefore, teachers must demonstrate knowledge of 'resources and media' as stipulated in planning and preparation domain, and instructional domain of Danielson.

Concurring with the fore going literature, teaching is basically a reflection process that can be improved by examining its components in an analytical manner (Cooper, 2013). This can be achieved if the teacher demonstrates a capacity to assess, provide feedback and report on learning through record keeping of classroom data (Shaw, 2013). Furthermore, good teachers strive to establish partnerships with parents in order to

support learners learning and this can build a sense of community between home and school (Graham-Clay, n. d.).

On showing professionalism, Sleight and Richer (2004) alluded to the fact that teachers who behave appropriately are more respected and trusted by the learners, which contributes to effective learning. Teachers are urged to be professional by integrating current global issues such as new technology, diverse cultures, religions, languages and lifestyles in a spirit of mutual respect, and open dialogue in personal, work, and community contexts. Pedagogical consideration should also be included by providing opportunities for 'active learning' and humor to encourage pupil engagement, making learning interesting and explaining things clearly (Noor & Hamidon, 2010).

Poor performance in a science classroom may also be attributed to poor monitored academic progress of learners by teachers and inadequate communication from teachers to parents on learners' learning. Teachers should execute the tasks for which they are responsible (Lassibille, 2013). All the aspects discussed above (Sleight & Richer, 2004; Noor & Hamidon, 2010; Lassibille, 2013) are part of professional responsibilities' domain Danielson where teachers are required to reflect on teaching, maintain accurate records, communicate with the families, participate in a professional community, grow and develop professionally, and show professionalism.

## **2.5. Summary**

The study has adopted the conceptual framework of Danielson Theory of Best Practice for Teaching and Learning, which is grounded in a constructivist view. Four domains of Danielson with their components and elements were discussed. The literature was reviewed based on the teaching and learning environment and teachers' roles and activities. Under the teaching and learning environment, class composition, number of learners in the class, structuring of the physical environment and motivation of learners were reviewed. Under the teachers' roles and activities, instructional materials, planning and preparation, learners' participation and engagement, use of technology, teacher-learner feedback, assessing and recording of learners' work, parental involvement and professional responsibilities of teachers were reviewed in this chapter. The methodology used for the study is presented in the next chapter.

## **CHAPTER 3: METHODOLOGY**

### **3.1. Introduction**

This chapter presents the research methodology used. This includes an explanation of the research design, population, sample and sampling procedures, research instruments, data collection procedures, data analysis and research ethics.

### **3.2. Research design**

The study employed a mixed method research approach of QUAL-quant with a concurrent nested design. A mixed method was appropriate because it combined the strengths of, and to compensate for, the limitations of quantitative and qualitative methods (Pluye & Hong, 2014). The concurrent nested design was used on the basis of dominance of the study as a quantitative strand was embedded within a predominantly qualitative study (Castro, Kellison, Boyd & Kopak, 2010). The quantitative method was used to get the teachers' mean score during the observation and tabulate the mean scores to summarise the data per teacher. The same method was used to gather systematic information about school practices and how these schools operate or experience their environments (Gay, Mills & Airasian, 2011). A case study was appropriate for this research because it makes an in-depth investigation of a group of individuals whose behaviours cannot be manipulated (Gay et al., 2011). This case study used mixed method to integrate techniques for collecting and analysing qualitative and quantitative data concurrently.

### **3.3. Population**

The target population included 17 senior secondary schools that offer Physical Science at higher, ordinary or both levels in the Omusati Region.

### **3.4. Sample and Sampling Procedures**

The sample was selected using an extreme case sampling strategy. Extreme case sampling is a type of purposive sampling that is used to focus or identify information-rich cases related to the phenomenon of interest which are either special or unusual by highlighting notable outcomes, failures or successes (Palinkas, Horwitz, Green, Wisdom, Duan & Hoagwood, 2015). Extreme case sampling is suitable because the investigation focused at the best and the worst performance cases (Gay et al., 2011). Extreme Case sampling was used to select participating schools, i.e. School A and School B by taking the top ranked school and bottom ranked school. All Grade 11-12 Physical Science teachers of 2017 at School A and School B who taught at the same grade level in 2016 by default became part of the sample. There were a total of six teachers because each school provided three teachers teaching Physical Science at Grade 11-12 level.

### **3.5. Research Instruments**

#### **3.5.1. Interviews**

Individual in-depth face to face structured interviews with six teachers were used to collect qualitative data. This enabled the researcher to focus on the characteristics such as classroom practices for specific schools (James, 2013). Structured interviews allow all

respondents to be asked the same questions with the same wording and the same sequence. The structured interviews are principally useful in uncovering the narrative behind a participant's experiences that cannot be observed (Doody & Noonan, 2013). In this study, guided interviews were used to collect data about the participating teachers' perceptions on the professional responsibilities domain.

### **3.5.2. Observations**

The observations used were overt non-participant observations. In non-participant observation, the observer simply observes the activities, but does not take part in them. The advantage of overt non-participant observation is that it is much quicker and effective. This is because it is easier for the observer to get into the group and the researcher can be quite open about what they were interested in and why (Abbott, 2009). Therefore, the researcher observed practices as described by Danielson (2007) in planning and preparation domain, the classroom environment domain and instruction domain, to generate explanation and understandings of the practices used by the observed teachers (Hannan, 2006). The observation was conducted using Classroom Observation (COI) and Field Notes.

#### **3.5.2.1. Classroom Observation (COI)**

Thirty classroom observations were conducted at both selected schools. Classroom observations looked at everything happening in the classroom during teaching and learning. Six teachers in total were observed from both schools and each teacher was observed five times. Observations were recorded in the Classroom Observation

Instrument (COI) which is based on the three first domains of Danielson, which are planning and preparation, classroom environment and instructions domains.

### **3.5.2.2. Field notes**

Field notes are widely recommended in qualitative research as a means of documenting needed contextual information (Philippi & Lauderdale, 2017). This study used field notes to record the practices which were not covered by the COI and the administered interview but were necessary to be recorded because they may enhance and aid the understanding of the practices used. Some of the aspects the field notes looked at were the learners' behavior during changing of classes, going to the lesson after break and during afternoon study time.

### **3.6. Data collection procedures**

Permission was obtained from the Permanent Secretary of the Ministry of Education, Arts and Culture through the Regional Directorate Offices of Education, Omusati Region. With the permission letter from the mentioned offices, the researcher sought permission from schools through the offices of principals. The aim of the study was explained. Appointments were made thus a convenient time table was set for interviews and classroom observations.

Six Physical Science teachers (three teachers from School A and three from School B) were regarded as participants. School A was mostly the one topping the regional academic performance ranking while School B was the one mostly at the bottom of the ranking. The researcher spent a week at School A and the following week at School B to

conduct interviews and observations. For each teacher, five lessons of Physical Science at Grade 11-12 were observed.

The COI with critical attributes was used to rate teachers in all the components of the first three domains (see Appendix 5). Critical attributes is the process of identifying the level of the teacher in each component of the four domains. A tick was used to select the attributes that fit the observed traits of the teacher. A space for comments was provided at the right side of the COI to consolidate the observation against the attributes. Furthermore, the rate was selected depending on the attribute of that rate and the observed outcome of the teacher. Finally, each teacher was interviewed once during their free time. Interviews were conducted after every teacher was observed twice. Other vital information that the researcher took while carrying out the research were noted in the field notes.

### **3.7. Piloting**

A usual procedure for testing the quality of an interview protocol and for identifying potential researcher biases, is the pilot study. In this phase, the investigators tested their proposed methods to see if the planned procedures perform as envisioned by the researcher (Chenail, 2011). The pilot study was done at School Z which has moderate characteristics as School A and B. Moderate characteristics mean School Z was in the middle of the academic performance ranking between School A and School B. It was seen that School Z may have some teachers who can perform similar to teachers of School A and School B.

After piloting, the COI was found fit to collect the intended data; however, some questions which were supposed to address some elements in the interview schedule were removed since the researcher was unable to obtain enough data in the intended data collection timeframe. The removed elements were: Learner completion of assignments and non-instructional records in Component 4b, information about the instructional program and information about individual learners in Component 4c, and advocacy in Component 4f.

### **3.8. Consistency and neutrality**

Qualitative researchers incorporate methodological strategies to ensure the consistency, trustworthiness and neutrality of the findings (Noble & Smith, 2015). Firstly, the researcher accounted for personal biases which might have influenced the findings. For example, one question on professional responsibilities, ‘How the confidentiality is maintained in the subject and the school at large?’ was likely to result into a Social Desirability bias if it was focused on the respondent. This bias involves respondents answering questions in a way that they lead to being accepted and liked (Sarniak, 2015). Sarniak further alluded that regardless of the research format, some people might report inaccurately on sensitive or personal topics to present themselves in the best possible light. Therefore, the bias was minimised by questioning indirectly about how confidentiality was maintained in the subject and the school at large. This allowed respondents to project their feelings onto others and still provided honest, representative answers.

Secondly, the researcher established a comparison case, seeking out similarities and differences across accounts to ensure that different perspectives were represented (Noble & Smith, 2015). Consistency was maintained when the study was carried out at two selected schools to minimise biases by comparing the teachers' roles and classroom practices. The conclusion was made from analysed data from both schools to ensure trustworthiness.

Thirdly, consistency could be maintained in qualitative research when data triangulation was employed (Noble & Smith, 2015). Noble and Smith further explained data triangulation as a research which used different methods and perspectives to help produce a more comprehensive set of findings. Thus, the concurrent nested method was used so that the embedded quantitative approach ensured consistency when each teacher was observed five times and the overall mean score calculated, for the teachers to be rated correctly.

Finally, acknowledging biases in sampling and ongoing critical reflection of methods to ensure sufficient depth and relevance of data collection and analysis may minimise biases (Noble & Smith, 2015). In this study, interview questions on mitigating strategies were set and piloted. After piloting, the researcher found that responses from teachers might be affected by biases. Teachers tried their best to respond positively even on things they don't practise. Therefore, the researcher withdrew the questions on mitigation strategies and rather used the findings from the field notes since the researcher was more neutral in recording what transpired on the ground.

### **3.9. Data analysis**

Qualitative data was analysed in such a way that the themes, which are domains, components and elements were analysed to identify the best practices (Taylor-Powell & Renner, 2003; Danielson, 2007). Firstly, the researcher understood the critical attributes in the COI by reading and re-reading them. The COI, which covered the first three domains, was crafted in the form of a rubric with a scale of 1 to 4, where 1 is *satisfactory*, 2 is *basic*, 3 is *proficient* and 4 is *distinguished*. The domains were spread into components and each component was spread up into elements that were divided into attributes with scores from 1 to 4 as in the conceptual framework of Danielson Theory of Best Practice for Teaching and Learning. The COI was analysed employing the methods of quantitative approach as tables and measures of the central tendency were used to determine the teachers' overall scores.

The mean score of each domain was calculated from the total score of its components and the mean score for the teacher was determined from the total score of all three domains. The mean was used as it was the best choice for summarising the central tendency of rated items.

Secondly, the same method was used to analyse the Domain 4 data from the interview. The teachers' responses were rated according to the critical attributes of Danielson (2007) and the mean scores were determined as per the components and elements of the domain.

Thirdly, the scores of school A were compared to the scores of School B using a contingency table analysis to investigate the similarities and differences of practices at these two schools. The contingency table analyses the statistical relationship between two or more variables which may be numerical values, qualitative descriptions, or a combination of the two (Helweg & Seidl, n. d.). The table allows the researcher to see at a glance the relationship or variance where the differences between columns are displayed using letters, or cell comparisons, which use color or arrows to identify a cell in a table that stands out in some way (Helweg & Seidl, n. d.). The contingency table was used in the same way in this study. Finally, the researcher interprets the findings by identifying the relationships and differences in rows of the table to explain the findings on the best practices as recommended by Taylor-Powell and Renner (2003).

### **3.10. Ethical considerations**

Ethical clearance was obtained from the University of Namibia Research and Publications Office to carry out this study. Participants were requested to sign consent form (Appendix 3) and were informed that they were allowed to withdraw anytime. Each participant was given a pseudonym to ensure utmost confidentiality (David & Resnik, 2011). The raw data was kept in a locked file cabinet and electronic information was kept in the password protected computer for at least five years before it is destroyed permanently.

Observation and interview sheets were incinerated and a secure shredder was used to delete electronic data. Participants were also assured that the information obtained from them be for research purposes only and would be treated with utmost confidentiality.

Interviews were planned to be audio-taped; however, some participants were reluctant to share their opinions because they were concerned about anonymity if they were being audio taped. Participants feared repercussions from unfavorable opinions expressed during the interview. The issue of audio recording was negotiated until the solution was found which was not to audio record the interviews. This was supported by King and Horrocks (2010) who argued that if participants are concerned about the confidentiality and anonymity of their responses, agreement can be reached between the interviewee and interviewer and it is regarded as simply a good research ethics.

### **3.11. Summary**

This chapter outlined how a mixed method approach of concurrent nested design in a form of a case study was employed. A sample of two schools was selected from a population of all senior secondary schools in Omusati Region using Extreme Case Sampling strategy. Three Physical Science teachers from each school were part of the study. The classroom observations, interviews and field notes were used to collect the research data. Piloting, consistency and neutrality were outlined. Data collection procedures including all necessary permissions from relevant authorities were explained. The data analysis methods were explained on how the total mean score for each teacher was composed from every domain score and how the total mean scores were compared in the contingency table to find the answer to research questions. The research ethics were clarified and explained on how they were observed throughout the research.

The results and discussions of the study are presented in the next chapter.

## CHAPTER 4: RESULTS AND DISCUSSIONS

### 4.1. Introduction

In this Chapter, the analysis of the data is presented. The chapter looked at interviews, field notes and classroom observation outcomes. Classroom observation outcomes were presented as the outcomes from Domain 1 (planning and preparation), Domain 2 (classroom environment) and Domain 3 (instruction). Furthermore, the interview outcomes covered Domain 4 (professional responsibilities). Then finally, the mitigation strategies from the field notes are outlined and the summary presented.

### 4.2. Demographic information for teachers

A group of six teachers from two schools (School A and School B) in the Omusati Region were participants of the study. Table 4.1 and 4.2 shows teachers' demographic information based on the number of years of teaching experience.

**Table 4.1: Demographic information for teachers of School A**

<b>Teacher's code</b>	<b>Years of teaching experience</b>
SA1	11
SA2	3
SA3	7

The above shows that two of the three Physical science teachers at School A have been teaching the subject for more than five years.

**Table 4.2: Demographic information for teachers of School B**

<b>Teacher's code</b>	<b>Years of teaching experience</b>
SB1	9
SB2	8
SB3	11

Table 4.3 shows that all three Physical science teachers at School B have been teaching the subject for more than five years.

The years of experience were not part of the research questions but it was only outlined to describe the study group in detail.

### **4.3. Class Sizes**

The class sizes at School A were in the range from 38 to 44 learners in one class while School B has class sizes ranging from 39 to 42 learners. The results have shown that School A and B have large class sizes as affirmed by the Namibian Teacher-Learner ratio of about 25 learners per teacher in secondary schools (Index Mundi, 2007). However, according to Miller and Cunningham (2011), smaller classes are associated with learners who are less stressed and are more frequently on task with fewer reported behaviour problems which at the end boost their academic performance than learners in large classes. Hence, the class size can affect the academic performance in Physical Science. But, the class sizes from school A and School B have a similar trend, which is regarded as large in the Namibian context. Therefore, the difference in academic performance between School A and School B might not be influenced by the size of learners in the class.

#### **4.4. Classroom Observation Outcomes**

The findings were presented as per the Four Domains of Danielson (2007). Domain 1, 2 and 3 were covered by the classroom observation while the Domain 4 was covered by the interview with teachers.

##### **4.4.1. Domain 1 (Planning and Preparation)**

Schools, teachers and lessons involved were assigned codes. School A was represented by code SA and School B with code SB. Teachers were assigned codes that show from which school they teach. For example, Teacher SA1 represents the first teacher from SA and SB2 represents a second teacher from SB. SA1L1 represents the first lesson of the first teacher from School A and SB2L3 represents the third lesson of the second teacher from School B. This study did not focus on individual teachers' scores in each component or element but on the overall mean score of the domain, however, the elements and components were used to establish how the overall mean score in this domain was obtained. It is worth noting that the mean score of the elements was used to get the mean score of the components that helped the researcher to get the overall mean score of the domain.

Teacher SA1 was used to show how teachers were rated in each component that led to the establishment of the overall mean score. SA1 was observed in lesson SA1L1, SA1L2, SA1L3, SA1L4 and SA1L5. In Domain 1, Component 1a (Demonstrating Knowledge of Content and Pedagogy), the teacher was rated at 4 in SA1L1, SA1L2, SA1L3 and SA1L4, which is being distinguished. The attributes for rate 4 in the COI were:

*‘Teacher demonstrated knowledge of the relevant content standards within the grade level and across grade levels, as well as how these standards related to other disciplines. Teacher SA1’s plans demonstrated extensive knowledge of the disciplinary way of reading, writing, and/or thinking within the subject area. Teacher SA1 demonstrated deep understanding of prerequisite learning and relationships among topics and concepts. Teacher’s plans include a range of effective pedagogical approaches suitable to learner learning of the content/skills being taught and anticipate Learner misconceptions’*

In SA1L5, the teacher was rated at 3 and the attributes were:

*‘The teacher demonstrates knowledge of the relevant content standards, within and across grade levels. Teacher SA1 demonstrated knowledge of the disciplinary way of reading, writing, and/or thinking within the subject area. Teacher SA1 demonstrates accurate understanding of prerequisite learning and relationships among topics and concepts. Teacher’s plans reflect a range of effective pedagogical approaches suitable to learners learning of the content/skills being taught’*

In Component 1b (Demonstrating Knowledge of learners), Teacher SA1 was observed five times. In lessons SA1L1, SA1L3 and SA1L5, the teacher was rated at 3 (Proficient) and the attributes were:

*‘The teacher demonstrated an understanding of the active nature of Learner learning and attains information about levels of development for groups of*

*learners. Teacher SA1 purposefully gathered information from several sources about most learners' backgrounds, cultures, prior knowledge, skills, language proficiencies, learning styles, interests, and special needs'*

In the same component for the lessons SA1L2 and SA1L4, the teacher was rated at 2 (Basic). The attributes that represented rate 2 were:

*'The teacher displayed generally accurate knowledge of how learners learn and attained information about levels of development for the class as a whole. Teacher SA1 gathered some knowledge about some learners' backgrounds, cultures, prior knowledge, skills, language proficiencies, learning styles, interests, and special needs'*

Teacher SA1 was rated at 1 (Unsatisfactory) (see Appendix 5) in Component 1c (Selecting Learning Objectives) when observed in lesson SA1L1, SA1L3 and SA1L4.

Rate 1 was attributed to:

*'Learning objectives are not standards based and are unclear, or were stated as activities rather than as Learner learning outcomes, prohibiting a feasible method of assessment. Teacher SA1 did not sequence and align learning objectives to build toward deep understanding and mastery of the standards. Objectives reflect only one type of learning and/or only one discipline'*

Still in Component 1c, SA1L2 and SA1L5, the teacher was rated at 2 (Basic) (see Appendix 5) and the attributes were:

*'learning objectives are partially standards-based, clear, written in the form of learner learning outcomes, aligned to methods of assessment, and/or are only written for the class as a whole. Teacher SA1 demonstrates an attempt to sequence and align some standards-based learning objectives, but did not build toward deep understanding or mastery of the standards. Objectives reflect more than one type of learning, but teacher had made no attempt at coordination of the disciplines'*

In Component 1d (Demonstrating Knowledge of Resources), Teacher SA1 was rated at 2 in lesson SA1L1 and the attributes were:

*'The teacher displays some awareness of resources beyond those provided by the school or district for classroom use and for extending one's professional skill but did not seek to expand this knowledge'*

While in lesson SA1L2 SA1L3, SA1L4 and SA1L5, Teacher SA1 was rated at 1 and the attributes were:

*'The teacher was unaware of resources to assist Learner learning beyond materials provided by the school or district, nor was the teacher aware of resources for expanding one's own professional skill'*

When it comes to Component 1e (Designing Coherent Instruction), SA1L1 for SA1 was rated at 1 and the attributes were:

*'Teacher does not coordinate knowledge of content, learners, and resources to design units and lessons. Learning tasks were not aligned to objectives. Tasks were not cognitively challenging and do not require learners to provide evidence of their reasoning. There is no evidence of scaffolding and differentiation for learners to access the content/skills. The progression of tasks was not coherent and has unrealistic time allocations. Units and lessons did not include grade-appropriate levels of texts and/or other materials and did not represent a cognitive challenge. The lesson or unit did not have a recognizable structure and makes no use of instructional groupings to support the learning objectives'*

While lesson SA1L2 was rated at 2 and the attributes were:

*'Teacher coordinates some knowledge of content, learners, and resources to design units and lessons. Learning tasks are partially aligned to objectives. Tasks were cognitively challenging, designed for the class as a whole, and occasionally require learners to provide evidence of their reasoning. There was some evidence of scaffolding and differentiation for some learners to access the content/skills. The progression of tasks in units and lessons was not always coherent, and some time allocations are unrealistic. Units and lessons include grade-appropriate levels of texts and other materials that represent a moderate cognitive challenge. The lesson or unit had a recognizable structure with some evidence of instructional groupings that partially support the learning objectives'*

In the same component, SA1L3, SA1L4 and SA1L5 were rated at 3 and the attributes were:

*‘Teacher coordinates knowledge of content, learners, and resources to design units and lessons. Learning tasks were aligned to objectives. Tasks were cognitively challenging, designed for groups of learners, and require learners to provide evidence of their reasoning. There was evidence of scaffolding and differentiation for most learners to access the content/skills. The units and lessons were paced appropriately. Units and lessons include grade-appropriate levels of texts and other materials, representing a cognitive challenge. The lesson or unit had a clear structure with intentional and structured use of instructional groupings that support the learning objectives’*

The last component in Domain 1, Component 1f (Designing Learner Assessment) for teacher SA1 was rated 1 in SA1L1, SA1L2, SA1L3 and the attributes were:

*‘The plan for learner assessment was not aligned with the standards-based learning objectives identified for the unit and/or lesson. Assessments contain no criteria or descriptors aligned to learner expectations. Teacher did not select or design formative assessments that measure learner learning and/or growth. Teacher did not use prior assessment results to design units and lessons’*

Both SA1L4 and SA1L5 were rated at 2 and the attributes were:

*‘The plan for learner assessment was partially aligned with the standards-based learning objectives identified for the unit and/or lesson. Assessments did not*

*clearly identify and/or describe learner expectations. Teacher selects or designs formative assessments that measure only part of learner learning or growth. Teacher used prior assessment results to design units and lessons that target the class as a whole’.*

The total scores of all components in the domain were then added together and the sum was divided by the total number of components to get the overall score of the domain.

Furthermore, the total score of all Domain 1 for the five lessons was added together and the sum was divided by the number of lessons to get the overall attribute for teacher SA1.as shown in Table 4. In conclusion, the overall mean score for teacher SA1 in Domain 1 was rated at 2 which means teacher SA1 is rated as basic when it comes to planning and preparation. The same procedures were followed to get the overall attributes of all other teachers (SA2, SA3, SB1, SB2 and SB3) to complete Table 4.3.

**Table 4.3: Domain 1 mean scores for teachers from School A and School B**

Lesson Number	Teacher’s Domain Score					
	SA1 Domain Score	SA2 Domain Score	SA3 Domain Score	SB1 Domain Score	SB2 Domain Score	SB3 Domain Score
L1	2	1	2	1	2	2
L2	2	2	2	2	2	2
L3	2	2	2	2	1	2
L4	2	2	2	2	2	2
L5	2	2	3	1	1	3
Overall Domain Score	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>

Table 4.3 above shows that Teacher SA1 was rated as basic in Domain 1, which is on planning and preparation. Although the teacher’s level of performance was not

unsatisfactory, the teacher was neither proficient in planning nor competent in preparation aspects. The components in Domain 1 outline how the teacher organised the content of what learners were expected to learn, this means, how the teacher designed the instruction. The study had revealed that Teacher SA1 did not demonstrate knowledge of content and pedagogy, knowledge of the learners, select instructional goals, demonstrate knowledge of resources, design coherent instruction, and assess learner learning proficiently.

The findings have shown that Teacher SA2 was rated unsatisfactory in lesson SA2L1 comparing to other lessons. The lower rate in SA2L1 might be caused by the teacher not being comfortable with the observation but later gained confidence. From lesson SA2L2 to lesson SA2L5, Teacher SA2 performed the same as Teacher SA1. The overall domain score and the overall score for Teacher SA2 was the same as for Teacher SA1. Therefore, Teacher SA2 was rated as basic in planning and preparation.

Teacher SA3 was rated in five lessons in Domain 1. The first lessons, SA3L1 to SA3L4, were rated as basic and SA3L5 was proficient. The overall outcome for Teacher SA3 was similar to Teacher SA1 and SA2. The teacher was rated basic in planning and preparation. The study revealed that the teacher fell short of being proficient in planning and preparation.

Teacher SB1 was rated in Domain 1 in all five lessons which were observed. Even though, the teacher was unsatisfactory in lesson SB1L1 and SB1L5 the teacher managed to score an overall domain score with rate 2 (basic) in Domain 1 as other

lessons were rated at basic level. Teacher SB2 was rated basic in planning and preparation domain as an overall score from SB2L1, SB2L2 and SB2L4 which were rated at basic and SB2L3 and SB2L5 rated at unsatisfactory.

The ratings of Teacher SB3 are similar to the level of performance for Teacher SA3 with overall domain score of a basic. Comparing teachers of School A and Teachers of School B, it was shown that they were all rated at 2 in Domain 1, which means they were all not proficient when it comes to planning and preparation. According to Orlich et al. (2012) teachers developed their science by using carefully planned, fine-tuned lessons that reflect an understanding of many different teaching techniques. Teachers apply each technique skilfully to gain the desired intellectual, social, affective, or kinaesthetic result. Orlich and others were supported by Callaban et al. (2009) who alluded to the fact that teachers' preparation was very vital in teaching and learning as quality teaching depends on what was done by the teacher before stepping into the classroom.

Therefore, through planning and preparation, teachers will be encouraged to take part in scientific literacy development. Since science does not happen only inside the classroom, teachers were expected to plan in recognition that they were charged with producing informed consumers of science who would be able to make decisions whenever science intersects public policy (Callaban et al., 2009).

Even though the scholars have indicated the importance of planning and preparation in teaching and learning Physical Science, the study has revealed that School A performs the same as School B, which fell short of proficiency. Despite the same performance in

Domain 1, School A still out performs School B in Physical Science, this was revealed by the national performance rankings. This had shown that there are other best practises, which were not determined yet and not part of Domain 1, that assist learners from School A to perform better than learners from School B in Physical Science.

#### **4.4.2. Domain 2 (Classroom Environment)**

As the case in Domain 1, in Domain 2, Teacher SB2 was used to show how the teachers were rated and how the overall mean score of the domain was established from the mean scores of the components. Hence, Teacher SB2 was observed five times in all domains. Domain 2 has five components, from Component 2a-2e. Lesson SB2L2, SB2L3 and SB2L5 were rated at 2 (Basic) in Component 1a (Creating an Environment of Respect and Rapport). The attributes associated with rate 2 were:

*‘Patterns of classroom interactions, both between the teacher and learners and among learners, were generally appropriate but may reflect occasional inconsistencies, favoritism, and disregard for learners’ ages, cultures, and developmental levels. Learners rarely demonstrate disrespect for one another. Teacher SB2 attempted to respond to disrespectful behavior, with uneven results. The net result of the interactions was neutral: conveying neither warmth nor conflict’*

Still in Component 2a, both lessons SB2L1 and SB2L4 were rated at 1 (Unsatisfactory) and the attributes were:

*'Patterns of classroom interactions, both between the teacher and learners and among learners, were negative, inappropriate, or insensitive to learners' ages, cultural backgrounds, and developmental levels. Interactions were characterized by sarcasm, putdowns, or conflict. Teacher SB2 did not respond to disrespectful behavior'*

In Component 2b (Establishing a culture for learning), teacher's SB2L1, SB2L2, SB2L3, SB2L4 and SB2L5 were all rated at 1 and the attributes were:

*'The classroom culture was characterized by a lack of teacher or Learner commitment to the learning, and/or little or no investment of Learner energy into the task at hand. Learning was not expected to take place or not valued'*

Furthermore, Component 2c (Managing Classroom Procedures) was rated at 1 during lessons SB2L1, SB2L2, SB2L3 and SB2L4 and the attributes were:

*'Much instructional time was lost due to inefficient classroom routines and procedures. There was little or no evidence of the teacher managing instructional groups, transitions, and the handling of materials and supplies. Learners did not appear to know or follow established routines. Volunteers and paraprofessionals had no clear roles'*

Lesson SB2L5 was rated at 2 and its attributes were:

*'Some instructional time was lost due to only partially effective classroom routines and procedures. The teacher's management of instructional groups,*

*transitions, and/or the handling of materials and supplies were inconsistent, leading to disruption of the learning. With regular guidance and prompting, learners followed established routines. With guidance, volunteers and paraprofessionals were able to make a contribution'*

In Component 2d (managing learner behaviour), Teacher SB2 was rated at 1 in lesson SB2L1 and SB2L5 and the attributes were:

*'There was little or no teacher monitoring of Learner behavior. Learners challenge the standards of conduct. Response to learners' misbehavior was repressive, or disrespectful of learner dignity'*

In lesson SB2L2, SB2L3 and SB2L4, Teacher SB2 was rated at 2 and the attributes were:

*'Teacher tries with uneven results, to monitor Learner behavior and respond to Learner misbehavior. There was inconsistent implementation of the standards of conduct'*

Lastly, teacher SB2 was observed in Component 2e (organising physical space) in Domain 2 and was rated 1 in lesson SB2L1, SB2L2, SB2L3 and SB2L4 and the attributes were:

*'The physical environment was unsafe, or many learners did not have access to learning. There was poor alignment between the arrangement of furniture and resources, including computer technology, and the lesson activities'*

In lesson SB2L5, Teacher SB2 was rated at 2 and the attributes were:

*'The classroom was safe, and essential learning was accessible to most learners, the teacher's use of physical resources, including computer technology, was moderately effective. Teacher attempted to modify the physical arrangement to suit learning activities, with partial successes'*

The total scores of all components in Domain 2 were then added together and the sum was divided by the total number of components to get the overall attribute of the domain. Furthermore, the total score of all Domain 2 for the five lessons was added together and the sum was divided by the number of lessons to get the overall score for teacher SB2 as shown in Table 4.4. In conclusion, the overall attribute for teacher SB2 in Domain 2 was rated at 1 which means teacher SB2 was rated as unsatisfactory when it comes to classroom environment. The same procedures were followed to get the overall attributes of all other teachers (SA1, SA2, SA3, SB1 and SB3) to complete Table 4.4.

**Table 4.4: Domain 2 mean scores for teachers from School A and School B**

Lesson Code	Teacher's Domain Score					
	SA1 Domain Score	SA2 Domain Score	SA3 Domain Score	SB1 Domain Score	SB2 Domain Score	SB3 Domain Score
L1	4	3	3	2	1	2
L2	4	4	4	2	1	2
L3	4	4	4	1	1	2
L4	4	4	4	2	1	2
L5	4	4	4	2	2	2
Overall Domain Score	<b>4</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>2</b>

Table 4.4 shows that Teachers SA1, SA2 and SA3 performed extremely well in Domain 2, which was classroom environment as their overall domain scores were distinguished. Teachers SB1, SB2 and SB3 were rated at basic, unsatisfactory and basic respectively. The components in Domain 2 consist of the interactions that occur in all classrooms that are non-instructional (Danielson, 2007). Teacher SB1, SB2 and SB3 did not effectively create an environment of respect and rapport among the learners and with the teacher. Teacher SB1, SB2 and SB3 did not effectively establish a culture for learning. Teacher SB1, SB2 and SB3 did not effectively manage classroom procedures, or manage learners' behaviour. Teacher SB1, SB2 and SB3 did not effectively organise the physical space as it was the case with teachers from School A. Teacher SA1, SA2 and SA3 created an environment of respect and rapport among the learners and with the teacher, established a culture for learning, managed classroom procedures, managed learners' behaviour, and organized the physical space more than proficiently (Danielson, 2007).

This implied that teachers at School A organized their classrooms that allowed all learners to learn effectively. They maximized instructional time and fostered respectful

interactions among and between teachers and learners with sensitivity to learners' cultures and level of development. Learners themselves made a substantive contribution to the effective functioning of the class through self-management of their own learning and of others. Process and tools for learners' independent learning were visible to learners from School A. The findings of this study on the classroom environment concurs with Danielson (2007) and were also supported by Kstashuk (2007) who indicated that best structuring of the physical environment is when the teacher considers the best desk arrangement, best classroom decoration and adding videos to the classroom when necessary. The primary role of a teacher is to establish a learning environment where all learners are able to learn and are motivated to learn, an environment that is both challenging and supportive (Callaban et. al., 2009).

Motivated and encouraged learners can inquire into complex science concepts, problems, and issues effectively with fewer efforts from the teachers who are seen as a powerful determinant of the classroom climate (Hassard & Dias, 2013). Results on Domain 2 concur with Sahin and White (2015) who alluded that promising high-quality education in science for all learners depends on the classroom's environment that promote and support understanding of scientific concepts. Additionally, learners learn with understanding when the learning takes place in meaningful and familiar situations. As learners explore their familiar environments, they encounter experiences through which they actively construct knowledge and discover new relationships (Charlesworth, 2015). Finally, Aguilar (2010) advocated for a classroom environment that could ignite learning and cultivate caring and this could be achieved through the practices that were incorporated in the classroom environment at School A. Therefore, strengthening

Domain 2 (classroom environment) could assist learners to perform well academically in Physical Science.

#### **4.4.3. Domain 3 (Instruction)**

Domain 3 was spread up into five components. Teacher SB3 was used to show how data was analysed in Domain 3. In Component 3a (Communicating with Learners), teacher SB3 was observed five times and was rated at 3 (Proficient) in lesson SB3L1, SB3L2, SB3L4 and SB3L5 and the attributes were:

*'The instructional purpose of the lesson was clearly communicated to learners, including where it was situated within broader learning; directions and procedures were explained clearly. Teacher's explanation of content was well scaffold, clear and accurate, and connects with learners' knowledge and experience. During the explanation of content, the teacher invited learner intellectual engagement. Teacher's spoken and written language was clear and correct. Vocabulary was appropriate to the learners' ages and interests'*

In lesson SB3L3, teacher SB3 was rated at 2 (Basic) and the attributes were:

*'Teacher's attempt to explain the instructional purpose was only partially successful, and/or directions and procedures must be clarified after initial learner confusion. Teacher's explanation of the content may contain minor errors. Teacher's explanation consists of a monologue, with no attempt to the engage learners intellectually. Teacher's spoken language was correct; however,*

*vocabulary was limited, or not fully appropriate to the learners' ages or backgrounds'*

In Component 3b (using questioning and discussion), the teacher was rated at 2 in lesson SB3L1 and SB3L4 and SB3L5 and the attributes were:

*'Teacher's questions/prompts were a combination of low and high quality, some related to the lesson objectives and of moderate cognitive challenge inviting a thoughtful response. Teacher SB3 attempted to engage all learners in the discussion and to encourage them to respond to one another, with uneven results'*

In SB3L2, the teacher was rated at 3 and the attributes were:

*'Most of teacher's questions/prompts were of high quality and support the lesson objectives, with adequate time for learners to respond. A variety or series of questions / prompts were used to challenge learners cognitively, and advance high level thinking and discourse. The teacher creates a genuine discussion among learners, stepping aside when appropriate. Teacher successfully engages all learners in the discussion, employing a range of strategies to ensure that most learners are heard'*

In lesson SB3L3, the teacher was rated at 1 and the attributes were:

*'Teacher's questions/prompts were poorly aligned with lesson outcomes, with low cognitive challenge, single correct responses, and asked in rapid succession. Interaction between teacher and learners was predominantly recitation style, with the teacher mediating all questions and answers. A few learners dominate the discussion'*

In Component 3c (Engaging learners in Learning), lesson SB3L1, SB3L3 and SB3L5 were rated at 2 and the attributes were:

*'The learning tasks or prompts are partially aligned with the instructional outcomes but require only minimal thinking by learners, allowing most learners to be passive or merely compliant. The lesson had a recognizable structure; however the pacing of the lesson may not provide learners the time needed to be intellectually engaged'*

While in lesson SB3L2 and SB3L4, the teacher was rated at 3 and the attributes were:

*'The learning tasks and activities were aligned with the instructional outcomes and were designed to challenge learner thinking, resulting in active intellectual engagement by most learners with important and challenging content, and with teacher scaffolding to support that engagement. The lesson had a clearly defined structure. The pacing of the lesson was appropriate, providing most learners the time needed to be intellectually engaged'*

Furthermore, Component 3d (using assessment in instruction) was rated at 2 in lesson SB3L1, SB3L2 and the attributes were:

*‘Assessment was occasionally used to support instruction, through some monitoring of progress of learning by teacher and learners. The feedback to learners was inaccurate or unspecific, and learners were only partially aware of the assessment criteria used to evaluate their work. Questions / prompts / assessments were not used to diagnose evidence of learning.*

Lessons SB3L3 and SB3L4 were rated at 1 and the attributes were:

*‘There was little or no assessment or monitoring of learner learning; feedback was absent, or of poor quality. There was no attempt to adjust the lesson as a result of assessment. Learners were not aware of the assessment criteria and do not engage in self-assessment’*

While SB3L5 was rated at 3 and the attributes were:

*‘Assessment is regularly used during instruction, through monitoring of progress of learning by teacher and/or learners, resulting in accurate, specific feedback that advances learning. Learners were aware of the assessment criteria. Questions / prompts / assessments were used to diagnose evidence of learning, and adjustment to instruction is made to address learner misunderstandings’*

Lastly, in Component 3e (Demonstrating Flexibility and Responsibility), the teacher was rated at 2 in lesson SB3L1, SB3L2, SB3L3, SB3L4 and SB3L5 and the attributes were:

*‘Teacher attempted to modify the lesson when needed and to respond to learner questions and interests, with moderate success. Teacher accepted responsibility for learner success, but had only a limited repertoire of strategies to draw upon’*

The scores were added together and divided by the number of components to get the overall score of the domain as shown in Table 4.5. Therefore, teacher SB3’s Domain 3 is rated at 2 as an overall mean score.

**Table 4.5: Domain 3 mean scores for teachers from School A and School B**

Lesson Code	Teacher’s Domain Score					
	SA1 Domain Score	SA2 Domain Score	SA3 Domain Score	SB1 Domain Score	SB2 Domain Score	SB3 Domain Score
L1	2	2	2	2	1	2
L2	2	2	2	2	2	3
L3	2	2	2	2	1	2
L4	2	2	2	2	2	2
L5	3	3	3	2	1	2
Overall Domain Score	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>

Table 4.5 shows the teachers’ scores in Domain 3. The components in Domain 3 are what constitute the core of teaching, which was the engagement of learners in learning content. Most of the teachers from School A and School B had an overall mean score of 2. This meant that, most of the teachers from both schools did not communicate clearly and accurately, use questioning and discuss techniques, engage learners in learning, provide feedback to learners, and demonstrate flexibility and responsiveness proficiently

(Danielson, 2007). Teacher SB2's level of performance was unsatisfactory in instruction domain. The poor performance in Domain 2 and 3 made Teacher SB2 to be rated as an unsatisfactory teacher as much of the components were not up to standard.

Although most of the teachers from both schools were all rated at 2 (basic) except one teacher from School B who was rated unsatisfactory; they all did not perform well in instruction domain. Because rate 1 and 2 were close to each other, it made no much difference in standing out from other results. According to Gunstone (2012), it is a good practice for a teacher who is in complete charge of the class and paying attention to what learners do, what they say and how they say it. Gunstone further emphasised that teachers may have the gift of instruction, and can inspire through their own knowledge and expertise by facilitating learning, questioning, sharing ideas, helping learners to formulate their ideas and develop their skills.

Gunstone was supported by Stronge (2007), who stated that the Physical Science teacher encourages learners to participate and makes suggestions about how learners may proceed in a classroom activity. As indicated by Gunstone and Stronge, teachers who perform well in instruction help learners to perform academically well in Physical Science. However, Teachers from School A, which performed outstandingly well than teachers from School B in Physical Science national examinations, were rated alike. The study has revealed that teachers from both schools puts equal efforts as teaching and learning instruction is concerned.

## **4.5. Interview Outcomes**

The components and elements of Domain 4 were spread into questions of the interview. Teachers' responses were compared to the critical attributes from a rubric as designed by Danielson so that their responses could be rated.

### **4.5.1. Domain 4 (Professional Responsibilities)**

An interview was conducted to collect data for Domain 4. This was where the components were essential in the smooth functioning of the classroom that learners and parents rarely see (Danielson, 2007). Five components of Domain 4 were part of the interview. Each teacher was interviewed once during their free time. The rubric is used to determine the level of performance in each component. 1 is Unsatisfactory, 2 is Basic, 3 is Proficient and 4 is Distinguished.

In Component 4a (reflecting on teaching and learning) is where accuracy of reflection and reflection use in future teaching was discussed. The question on accuracy was: "Looking at your previous lesson, was the lesson successful or not? Give a reason for your answer?" Teachers SA1, SA2 and SA3 have indicated that:

*"There was a success for the first part when I covered the topic for yesterday but the second part in which I covered the lesson for today, I don't know yet if it was successful" [SA1]*

*"I think the lesson was successful because learners understood basic competencies as they could relate the subject matter to the real life situation and this was done using oral questions" [SA2]*

*“It was successful, I finished asking learners questions on time and they answered them successfully, and learners were asking questions too” [SA3]*

With this reply, Teacher SA1 was rated at 1 because the teacher profoundly misjudged the success of a lesson as the efforts were not made to measure to see if the instructional outcomes were met (Danielson, 2007). Teacher SA2’s was rated at 2 because the teacher has a general accurate impression of a lesson’s effectiveness and the extent to which instructional outcomes were met. Teacher SA3 response was rated at 2 too as SA2.

On the reflection use in future teaching, the question was: What changes will you propose for your next lesson? Teachers SA1, SA2 and SA3 have said:

*“I will change a bit from a lecture method to involve the learners” [SA1]*

*“I’m proposing more diagrams as compared to more writing for learners to understand better” [SA2]*

*“Time management” [SA3]*

Teacher SA1 has made a general suggestion about how a lesson could be improved another time the lesson is taught. Therefore, SA1 was rated at 2. SA2’s response was rated at 3 because the teacher makes a few specific suggestions of what could be tried another time the lesson is taught (Danielson, 2007). Teacher SA3 was rated at 2 since the teacher has a general suggestion about how a lesson could be improved.

In Component 4b (maintaining accurate records), one element was covered during the interview. The element was ‘learner progress in learning’. The first question was ‘Explain on how you monitor the learners’ individual progress?’ The answers for Teacher SA1, SA2 and SA3 were:

*“I give exercises and walk around tables and see if they have done the work. I also ask individual learners to see if they are on par with others” [SA1]*

*“Through checking their activities or home works, through marking and using oral questions” [SA2]*

*“Classes are full, so learners are not monitored individually” [SA3]*

Teacher SA1 was rated at 1, this was attributed to the fact that the teacher had no system for maintaining information on learner’s progress in learning, or the system was in disarray. SA2’s response was rated at 1 because despite the evidence to the contrary, the teacher said so and this was attributed to non-existence of maintaining learners’ progress. The response for Teacher SA3 was rated at 1 due to the same attribute as for Teacher SA1.

In Component 4c (Communication with families), the component that was discussed was engagement of families in the instructional program. The question on this component was ‘How do you rate (good, moderate or poor) the parental involvement in their children’s’ education?’ ‘What kind of involvement and how often is it done?’ Teachers SA1, SA2 and SA3’s answers were that:

*“It is good, it is only done through parents meetings, book viewing and during disciplinary hearings. Parents meeting are conducted once a term while book viewing is done twice per term” [SA1]*

*“I’m rating it as moderate. Parents of poor performing learners are called for discussion which is done yearly. They also get involved during disciplinary hearings” [SA2]*

*“It is good, book viewing is done once per year but there is also an individual viewing that can be done any time” [SA3]*

Teacher SA1 and SA2’s responses were both rated at 2 because teachers made modest and inconsistently successful attempts to engage families in the instructional program. SA3’s response was rated at 3 because this was attributed to: the teacher made frequent attempts to engage families in the instructional program.

In Component 4d (participating in a professional community), four components were discussed, which were relationship with colleagues, involvement in a culture of professional inquiry, service to the school, and participation in school and district. The question on relationship with colleagues was: ‘How do you rate (good, moderate or poor) the interrelationship/cooperation between Physical Science teachers at the school?’ and Teachers’ responses were:

*“It is good as teachers ask each other and assist each other with no competition” [SA1]*

*“It’s good because we discuss questions of concern, discuss chapters or topics, use same summary notes and plan together” [SA2]*

*“a very strong relationship because we plan together and we discuss subject related matters most often” [SA3]*

Teachers SA1, SA2 and SA3 responses were all rated at 3 because support and cooperation characterize relationships with colleagues.

On the involvement in a culture of professional inquiry, the question was ‘how many subject meetings have been conducted this year at your school?’ Teachers SA1, SA2 and SA3’s response were:

*“None so far but usually it used to be done termly” [SA1]*

*“None” [SA2]*

*“None” [SA3]*

Teachers SA1, SA2 and SA3 were all rated at 1 because the teachers did not attend meetings as yet as an effort to improve practice. When it comes to service to the school, the question was: ‘How many times did you take part in a school function and you name them?’ Teachers SA1, SA2 and SA3 have replied that:

*“I take part most of the times. But I did not attend the debating and athletic inter-house competition this year” [SA1]*

*“Most often as I participate in sport and science fairs” [SA2]*

*“I am a volleyball coach, a member of Entertainment Committee thus I help in Miss SA, Miss Valentine and so forth” [SA3]*

On the basis of the responses above Teacher SA1 was rated at 1 which means the teacher avoided becoming involved in school and Teacher SA2 was rated at 3 because the teacher volunteers to participate in school events. Teacher SA3 was rated at 4 because the teacher volunteers to participate in school events, making a substantial contribution, and assuming leadership role in at least one aspect of school.

On the participation in the district, the question was: ‘Do you participate in circuit/regional projects, e.g.: field trips, science fair and quizzes? How do you rate your participation in these activities as a Physical Science teacher?’ Teachers SA1, SA2 and SA3’s responses were:

*“I participate in Science club, sport and all entertainments and I do it most often” [SA1]*

*“I participate in sport, Science Fair and bazaar, and I do it every time there are these activities” [SA2]*

*“Yes, I do it but only on sport and entertainment. We had only one activity this year though” [SA3]*

All these teachers were rated at 2 because the teachers participate in district projects but not clearly specified on how they do it.

In Component 4e (growing and developing professionally), there are three elements that were covered in the interview such as enhancing of knowledge and content pedagogical skills, receptivity to feedback from colleagues and participation in professional organisations supporting academic inquiry. In the first element, the question was ‘Are there any professional developmental activities done for you in the subject? When and by who?’ Here are the responses of three teachers:

*“There is nothing”* [SA1]

*“No activities, but the school has a CPD (Continuous Professional Development) committee”* [SA2]

*“None, but we have a CPD committee at school”* [SA3]

This element was rated at 1 for all the teachers because Teacher SA1, SA2 and SA3 engage in no professional development activities to enhance knowledge or skill.

In the second element, the question was ‘How do you rate the quality of feedback you receive from your co-workers, Head of Department and the School Principal?’ Teachers SA1, SA2 and SA3’s responses were:

*“The principal is always positive and shows that he appreciates my work but I don’t receive feedback from the co-workers”* [SA1]

*“I receive a good feedback from co-workers and Head of department”* [SA2]

*The feedback from the Head of the Department is very poor but I receive a good feedback from the principal”* [SA3]

In this element, SA1 was rated at 2 because the teacher welcomes feedback from the principal even though not from the colleagues. Teacher SA2’s response was rated at 3 because the feedback is well received from both the co-workers and from the management. SA3’s response was rated at 2 because the teacher accept, but with some reluctance from some members of the management. On the last element, the question was ‘How often do you conduct departmental meetings at your school?’ SA1, SA2 and SA3 gave responses:

*“Three meetings per term”* [SA1]

*“Three meetings per term”* [SA2]

*“Three times per term”* [SA3]

The three meetings per term is at least a good number for a department so this element was rated at 3 because all the teachers participated actively in assisting other educators through departmental meetings.

In Component 4f (Showing Professionalism), four elements were discussed in the interview as integrity and ethical conduct, service to learners, decision making and compliance with school and district regulations. On the integrity and ethical conduct, the

question was ‘How is the aspect of confidentiality (with respect to disciplinary hearings, counseling service and meetings) maintained in the subject and the school at large?’

Teachers SA1, SA2 and SA3 gave the following responses:

*“There is nothing to keep a secret at subject level but some teachers tell learners what was discussed in meetings, which is not supposed to be the case” [SA1]*

*“Everything is kept confidential”[SA2]*

*“Confidentiality is maintained here” [SA3]*

Teacher SA1’s response was rated at 2 because there are some teachers at school that did not act with integrity by revealing information to the third parties. Teacher SA2 and SA3’s responses were both rated at 3 because teachers displayed high standards of honesty, and confidentiality in interaction with colleagues, learners and the public.

On the service to the learners, the question was ‘How are the after-school classes for your specific subject being handled at your school?’ Teachers SA1, SA2 and SA3 gave the following responses:

*“There is no formulae, any teacher who wants to meet learners can meet them any time they wish and it is about meeting the learners that are willing” [SA1]*

*“There is a program that’s tentative, depending on the situation. Dates are divided up with subjects” [SA2]*

*“No program on paper but it is known who to teach when and which class”*

[SA3]

Therefore, this response was rated at 1 because the teacher’s attempts to assist the learners are inconsistent as teachers and learners are not obliged to activities that can assist learners who need assistance more. Teacher SA2 and SA3’s responses were both rated at 2 because teachers’ attempts to serve learners are inconsistent and not in black and white for proper control.

For decision making, the question was ‘Are you involved in decision making related issues at your school when it comes to physical Science?’ Teacher SA1, SA2 and SA3’s responses were:

*“Yes, I advised on which books to be used in Physical Science”* [SA1]

*“Not real”* [SA2]

*“Yes, we are only three Physical Science teachers in the school; therefore, all the happenings in the subject are because of our decisions”* [SA3]

SA1 response was rated at 3 because the teacher maintains the open mind in team or departmental decision-making. Teacher SA2 was rated at 1 as the teacher cannot remember anything on the teacher’s involvement in decision-making. SA3’s response was rated at 2 because teacher takes part in decision-making but it is not specified and sounds too limited.

Finally, the last element which is compliance with school and district regulations, the question was ‘How does the science teachers comply with school and regional regulations?’ SA1, SA2 and SA3’s responses were:

*“I don’t use the regional scheme of work, year plan because I follow my own plan” [SA1]*

*“Very well, I comply with regional year plans, regional examinations and regional timetable” [SA3]*

*“We don’t comply with the year plans from the region, which affects the examination because topics covered might not be the same” [SA3]*

These responses were rated at 1 because the teachers did not comply with the district regulations. SA2’s response was: Teacher SA2 was rated at 3 as the teacher complies fully with the school and district regulations. Finally, Teacher SA3’s response was rated at 1 because the teacher did not comply with the district regulations. The teachers’ responses were summarised in tables. Table 4.6 shows the interview results for Teacher SA1.

**Table 4.6: Interview Results for Teacher SA1**

<b>Component 4</b>	<b>Element</b>				<b>Mean score</b>
<b>A</b>	Accuracy	Use in the future teaching			
	1	2			2
<b>B</b>	Learner progress in learning				
	1				1
<b>C</b>	Engagement of families in the instructional program				
	2				2
<b>D</b>	Relationship with colleagues	Involvement in a culture of professional inquiry	Service to the school	Participation in school and district project	
	3	1	1	2	2
<b>E</b>	Enhancement of content knowledge and pedagogical skill	Receptive to feedback from colleagues	Service to the profession		
	1	2	3		2
<b>F</b>	Integrity and ethical conduct	Service learners to	Decision-making	Compliance with school and district regulation	
	2	1	3	1	2
<b>Total Mean Score</b>					<b>2</b>

Table 4.6 shows the interview results for Teacher SA1 in Domain 4 (Professional Responsibilities). Six components (Component a-f) and some of their elements were covered in the interview questions. The components covered were: reflection on teaching and learning, maintaining accurate records, communicating with families, participating in a professional community, growing and developing professionally, and Showing professionalism as shown in Table 2.1. The mean score for the components was used to determine the overall mean score for Teacher SA1 in Domain 4. The teacher’s level of performance was rated as 2 (basic).

**Table 4.7: Interview Results for Teacher SA2**

<b>Component 4</b>	<b>Element</b>				<b>Mean score</b>
<b>A</b>	Accuracy	Use in the future teaching			
	2	3			3
<b>B</b>	Learner progress in learning				
	1				1
<b>C</b>	Engagement of families in the instructional program				
	2				2
<b>D</b>	Relationship with colleagues	Involvement in a culture of professional inquiry	Service to the school	Participation in school and district project	
	3	1	3	2	2
<b>E</b>	Enhancement of content knowledge and pedagogical skill	Receptive to feedback from colleagues	Service to the profession		
	1	3	2		2
<b>F</b>	Integrity and ethical conduct	Service learners to	Decision-making	Compliance with school and district regulation	
	3	2	1	3	3
<b>Total Mean Score</b>					<b>2</b>

Table 4.7 shows the interview results for Teacher SA2 in Domain 4. The total mean score for Teacher SA2 was 2 which indicated that the teacher’s level of performance in Domain 4 was basic.

**Table 4.8: Interview Results for Teacher SA3**

<b>Component 4</b>	<b>Element</b>				<b>Mean score</b>
<b>A</b>	Accuracy	Use in the future teaching			
	2	2			2
<b>B</b>	Learner progress in learning				
	1				1
<b>C</b>	Engagement of families in the instructional program				
	3				3
<b>D</b>	Relationship with colleagues	Involvement in a culture of professional inquiry	Service to the school	Participation in school and district project	
	3	1	4	2	3
<b>E</b>	Enhancement of content knowledge and pedagogical skill	Receptive to feedback from colleagues	Service to the profession		
	1	2	2		2
<b>F</b>	Integrity and ethical conduct	Service learners to	Decision-making	Compliance with school and district regulation	
	3	2	2	1	2
<b>Total Mean Score</b>					<b>2</b>

Table 4.8 shows the interview results for Teacher SA3 in Domain 4. Teacher SA3 was rated as basic.

Furthermore, teachers from School B were interviewed on Domain 4 (Professional Responsibilities) where six components were discussed. The discussed components were Component 4a (Reflecting on teaching), Component 4b (Maintaining Accurate Records), Component 4c (Communicating with Families), Component 4d (participating in a Professional Community), Component 4e (Growing and Developing Professionally) and Component 4f (Showing Professionalism). Teachers' responses were rated as 1

(Unsatisfactory), 2 (Basic), 3 (Proficient) and 4 (Distinguished) by using critical attributes of Danielson (2007).

In Component 4a, there were two elements, accuracy and use in future teaching. On accuracy, the question was ‘Looking at your previous lesson, was the lesson successful or not successful? Give a reason for your answer’. Teacher SB1, SB2 and SB3’s answers were:

*“It was not successful because learners did not get the competencies as they did not answer the asked questions”* [SB1]

*“I can’t say it was successful because I did not assess properly. Some learners understood while some didn’t understand my questions”* [SB2]

*“It was not successful because most of the learners still don’t understand how current is calculated from the equation of the transformer”* [SB3]

Teacher SB1’s response was rated at 2 because the teacher has a generally accurate impression of a lesson’s effectiveness and extent to which instructional outcomes were met. Teacher SB2’s response was rated at 1 because the teacher did not know whether a lesson was effective or achieved its instructional outcomes. While Teacher SB3’s response was rated at 3 because the teacher made an accurate assessment of a lesson’s effectiveness and the extent to which it achieved its instructional outcomes (Danielson, 2007).

In element ‘use in future teaching’, the question was ‘What changes will you propose in your next lesson?’ and Teacher SB1, SA2 and SA3’s responses were:

*“I’ll use the teaching aid like a plug for the learners to understand better”* [SB1]

*“I’ll give them more practical questions”* [SB2]

*“I’ll give them extra examples and extra activities”* [SB3]

Teacher SB1’s response was rated at 3 because the teacher makes a few specific suggestions of what could be tried another time the lesson is taught. Teacher SB2 and SB3 were rated at 2 because the teachers make general suggestions about how a lesson could be improved.

In Component 4b, one element, learners’ progress in learning was discussed and rated. The question on this element was ‘Explain on how do you monitor the learners’ individual progress?’ Teacher SB1, SB2 and SB3’s responses were:

*“When they do activities, I record their marks so that I can see who attained the objectives and who not”* [SAB1]

*“I usually give them homework, activities to see who perform well and who perform poorly so that I can give them more activities”* [SB2]

*“Starting with participation in the class, completion of activities and see the progress through writing tests”* [SB3]

Teacher SB1's response was rated at 3 because teacher's system for maintaining information on learner progress in learning is fully effective. Teacher SB2 and SB3 were both rated at 2 because the teachers' system of maintaining learner progress in learning was rudimentary and only partially effective.

In Component 4c, the element of engagement of families in the instructional program was discussed and the question on this element was 'How do you rate (good, moderate or poor) the parental involvement in their children's education? Suggest the kind of involvement'. Teacher SB1, SB2 and SB3's responses were:

*"The parental involvement is very poor because parents only come during parents' meetings"* [SB1]

*"It's moderate because parents only come during parents' meetings but there is only one parent who come by own to monitor her child's work"* [SB2]

*"The parental involvement is poor because they only come for parents' meetings"* [SB3]

Teacher SB1, SB2 and SB3 were all rated at 1 because the teachers made no attempt to engage families in the instructional program.

In Component 4d, four elements were discussed and rated accordingly. The question on the first element, Relationship with colleagues, was 'How do you rate the

interrelationship/cooperation between Physical Science teachers at the school?’ Teachers SB1, SB2 and SB3’s responses were:

*“The interrelationship is moderate because we don’t plan together, we don’t do anything together”* [SB1]

*“It is moderate because we don’t plan together but sometimes do share activities for the learners”* [SB2]

*“It’s good because we share activities and tests with other teachers”* [SB3]

Teacher SB1’s response was rated at 1 because teacher’s relationships with colleagues were negative. Teacher SB2 and SB3 were rated at 2 because teachers maintain cordial relationship with colleagues to fulfill duties that the school requires. The question on involvement in a culture of professional inquiry, the question was ‘how many subject meetings have been conducted this year at your school?’ Teachers SB1, SB2 and SB3 were all rated at 1 because the teachers avoided participation in a professional culture of enquiry and their responses were:

*“None”*

On the service to the school, the question was ‘How many times did you take part in a school function and can you name them?’ Teachers SB1, SB2 and SB3’s responses were:

*“I take part most often in Science Club, sport and all entertainment activities”*  
[SB1]

*“I partake in sport, Science Fair and Bazaar because every time there is always these activities” [SB2]*

*“Yes, I do but only in sport and entertainment. We had only one activity this year though” [SB3]*

Teacher SB1, SB2 and SB3’s responses were rated at 2 because the teachers participated in the school events when specifically asked to do so. On the participation in district projects, the question on this element was ‘do you participate in circuit/regional projects e.g.: field trips, science fair and quizzes? How do you rate your participation in these activities as a Physical Science teacher?’ Teachers SB1, SB2, SB3’s responses were:

*“No” [SB1]*

*“I participate with a good participation in Science Fair and quiz” [SB2]*

*“Not yet” [SB3]*

Teacher SB1 and SB3 were rated at 1 because teachers did not participate in circuit and regional projects and Teacher SB2 was rated at 2 because at least the teacher has participated in two activities so far.

In Component 4e, enhancement of content knowledge and pedagogical skill element was part of the interview. The question was ‘Are there any professional development

activities done for you in the subject? When was it contacted and who conducted it?’

Teachers SB1, SB2 and SB3’s responses were:

*“No, there is nothing”* [SB1]

*“None of that nature happens”* [SB2]

*“Not yet”* [SB3]

Teacher SB1, SB2 and SB3’s responses were all rated at 1 because teachers engaged in no professional development activities to enhance knowledge or skill. On the receptivity to feedback from colleagues, the question was ‘How do you rate the quality of feedback you receive from your co-workers, Head of Department and the School principal?’

Teachers SB1, SB2 and SB3’s responses were:

*“The feedback is discouraging from the principal especially when giving activities which are set by someone else”* [SB1]

*“I receive a good quality feedback from Head of department and Subject head”*  
[SB2]

*“It’s helpful but I was only visited once by the Head of department”* [SB3]

Teacher SB1’s response was rated at 1 because the teacher resisted feedback on teaching performance from the supervisor. Teacher SB2 and SB3’s responses were rated at 3 as they were attributed to the fact that teachers welcomed feedback from their supervisors. On the last element, which is service to the profession, the question was ‘How often do

you conduct departmental meetings at your school?’ Teachers SB1, SB2 and SB3’s response were:

*“Three meetings per term”*

This element was rated at 3 because all the teachers participated actively in assisting other educators through departmental meetings.

In Component 4f, the four elements were discussed in the interview and rated according to critical attributes of Danielson (2007). The elements of Component 4f are integrity and ethical conduct, service to learners, decision-making and compliance with school and district regulation. On integrity and ethical conduct, the question was ‘How is the confidentiality (with respect to disciplinary hearings and counseling services) maintained in the subject and the school at large?’ Teachers SB1, SB2 and SB3’s responses were:

*“Confidentiality is respected”* [SB1]

*“Confidentiality is respected”* [SB2]

*“There was one case where confidentiality was compromised by one of the management member”* [SB3]

Teacher SB1 and SB2’s response were rated at 3 as they have indicated that teachers are honest with each other and they display high standard of integrity and confidentiality. Teacher SB3’s response was rated at 2 as some confidential etiquettes were

compromised which showed that the teacher does not trust others as integrity is concerned.

On the service to the learners, the question was ‘How are the after-school remedial classes for your specific subject being handled at your school?’ and Teacher SB1, SB2 and SB3’s responses were:

*“We’ve a timetable, so that every subject has a date when to conduct it”* [SB1]

*“There is a program in place per subject”* [SB2]

*“There is a program but only for junior phase but it is now not honored because of other activities”* [SB3]

Teacher SB1 and SB2’s responses were rated at 2 because these teachers attempted to serve learners in a manner that is inconsistent. On contrary, Teacher SB3’s response was rated at 1 because it shows that teachers are not alert to learners’ needs and that contributes to school practices that result in some learners being ill served by the school. On the decision making, the question that was asked was ‘Are you involved in decision making related issues at your school when it comes to Physical Science?’ Teachers SB1, SB2 and SB3 have replied that:

*“Not real, I don’t”* [SB1]

*“My decisions are taken during meetings”* [SB2]

*“I’m involved in decision making as I’m the one who influenced others to visit the Science laboratory” [SB3]*

SB1’s response was rated at 1 because the teacher did not remember making decisions that are crucial to benefit the learners in the subject while SB2 was rated at 2 because the teacher’s decisions were not specifically determined; they were generally stated and Teacher SB3’s response was rated at 3 because the teacher maintained an open mind in team or departmental decision-making.

Lastly, the element on compliance with school and district regulations, the question was ‘How do the science teachers comply with school and regional regulations?’ and Teacher SB1, SB2 and SB3’s response was:

*“We comply with the regional year plan, regional time table and school internal policy”*

These similar responses were rated at 3 because all teachers comply fully with school and regional regulations.

To that effect, the teachers’ responses were summarised in the tables. Table 4.9 shows the results of Teacher SB1.

**Table 4.9: Interview Results for Teacher SB1**

<b>Component 4</b>	<b>Element</b>				<b>Mean score</b>
<b>A</b>	Accuracy	Use in the future teaching			
	2	3			3
<b>B</b>	Learner progress in learning				
	3				3
<b>C</b>	Engagement of families in the instructional program				
	1				1
<b>D</b>	Relationship with colleagues	Involvement in a culture of professional inquiry	Service to the school	Participation in school and district project	
	1	1	2	1	1
<b>E</b>	Enhancement of content knowledge and pedagogical skill	Receptive to feedback from colleagues	Service to the profession		
	1	1	3		2
<b>F</b>	Integrity and ethical conduct	Service to learners	Decision-making	Compliance with school and district regulation	
	3	2	1	3	2
<b>Total Mean Score</b>					<b>2</b>

Table 4.9 shows the interview results for Teacher SB1 in Domain 4. The total mean score for all six components was found to be basic.

**Table 4.10: Interview Results for Teacher SB2**

<b>Component 4</b>	<b>Element</b>				<b>Mean score</b>
<b>A</b>	Accuracy	Use in the future teaching			
	1	2			2
<b>B</b>	Learner progress in learning				
	1				1
<b>C</b>	Engagement of families in the instructional program				
	2				2
<b>D</b>	Relationship with colleagues	Involvement in a culture of professional inquiry	Service to the school	Participation in school and district project	
	3	1	1	2	2
<b>E</b>	Enhancement of content knowledge and pedagogical skill	Receptive to feedback from colleagues	Service to the profession		
	1	2	3		2
<b>F</b>	Integrity and ethical conduct	Service learners to	Decision-making	Compliance with school and district regulation	
	2	2	2	3	2
<b>Total Mean Score</b>					<b>2</b>

Table 4.10 shows the interview results for Teacher SB2 in Domain 4. The total mean score for all six components was found to be basic.

**Table 4.11: Interview Results for Teacher SB3**

<b>Component 4</b>	<b>Element</b>				<b>Average score</b>
<b>A</b>	Accuracy	Use in the future teaching			
	3	2			3
<b>B</b>	Learner progress in learning				
	2				2
<b>C</b>	Engagement of families in the instructional program				
	1				1
<b>D</b>	Relationship with colleagues	Involvement in a culture of professional inquiry	Service to the school	Participation in school and district project	
	2	1	2	1	2
<b>E</b>	Enhancement of content knowledge and pedagogical skill	Receptive to feedback from colleagues	Service to the profession		
	1	3	3		2
<b>F</b>	Integrity and ethical conduct	Service to learners	Decision-making	Compliance with school and district regulation	
	2	1	3	3	2
<b>Total Average Score</b>					<b>2</b>

Table 4.11 shows the interview results for Teacher SB3 in Domain 4. The total mean score for all six components was found to be basic.

As in Domain 1 and 3, teachers from School A and School B have performed the same in Domain 4, which is ‘professional responsibilities’. Teachers’ professional responsibility components as they appear in Table 2.1 can boost the learners’ academic performance in Physical Science as supported by Cooper (2013) who reveals that teaching is basically a reflection process that can be improved by examining its components in an analytical manner. He was supported by Shaw (2013) who alludes that

this could be achieved if the teacher demonstrated a capacity to assess, provide feedback and report on learning through record keeping of classroom data.

Furthermore, good teachers strive to establish partnerships with parents in order to support learner learning and this can build a sense of community between home and school (Graham-Clay, n. d.). On showing professionalism, Sleight and Richer (2004) alludes that teachers who behave appropriately are more respected and trusted by the learners, which contributes to effective learning.

Teachers are urged to be professional by integrating current global issues such as new technology, diverse cultures, religions, languages and lifestyles in a spirit of mutual respect, and open dialogue in personal, work, and community contexts. Poor performance in a science classroom may also be attributed to when learners' academic progress is poorly monitored and communication from teachers to parents on learners' learning is often perfunctory (Lassibille, 2013).

However, this study had revealed that teachers from School A had the same level of performance with teachers from School B in Domain 4 components and elements. This has shown that there might be other teacher's roles and responsibilities apart from professional responsibilities that are being implemented at School A but not at School B. Although, Teacher SB1, SB2 and SB3 performed similar to SA1, SA2 and SA3 as shown in Tables 4.3, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10 and 4.11 the teachers of School B's level of performance in Domain 2, as shown in Table 4.4, was different from the teachers' level of performance from School A. Table 4.12 summarised the results of all

the domains in the study to see which domain of Danielson was the best practice in Physical Science.

**Table 4.12: Comparison of School A and School B**

Domain	School A (Scores for 3 teachers)			School B (Scores for 3 teachers)		
	SA1	SA2	SA3	SB1	SB2	SB3
Planning and Preparation	2	2	2	2	2	2
Classroom Management	4	4	4	2	1	2
Instruction	2	2	2	2	1	2
Professional Responsibilities	2	2	2	2	2	2

Table 4.12 shows the total mean scores of teachers from School A and School B in all four domains. By using the contingency table analysis of the attributes, the results have shown similar level of performance of all teachers except in Domain 2. The difference between Teacher SB1, SB3 and all teachers from School A is only the poor rating in classroom environment domain while teachers from School A have performed credibly well in that domain.

Therefore, the study revealed, through Figure 1, that effective classroom environment is the best practice and strengthening it can assist learners to perform well academically in Physical Science with fewer efforts from the teachers towards other three domains. This is depicted in Figure 2, where classroom environment is indicated as a critical domain which need planning and preparation, instruction and professional responsibilities as

supportive domains to contribute towards improvement in Physical Science's performance.

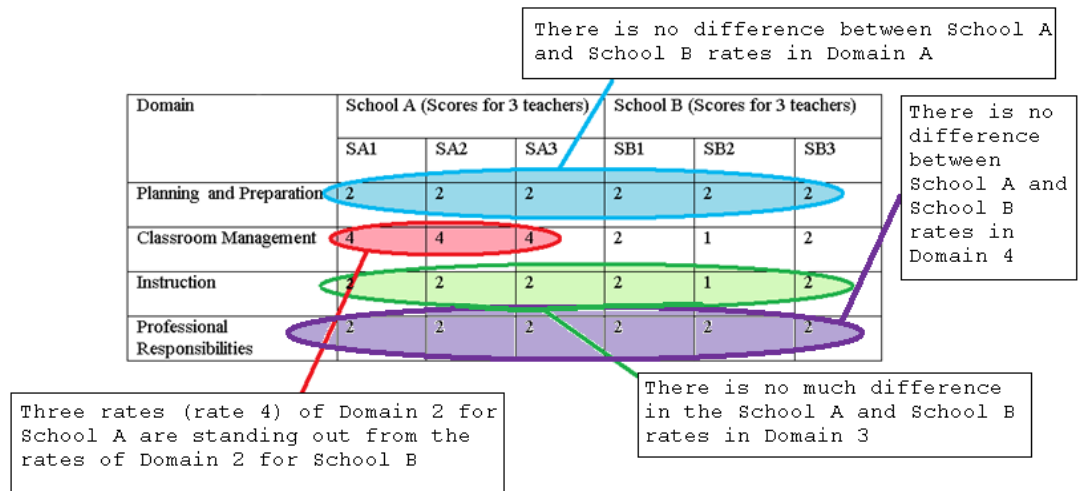


Figure 1: Contingency Table Analysis of Table 4.12

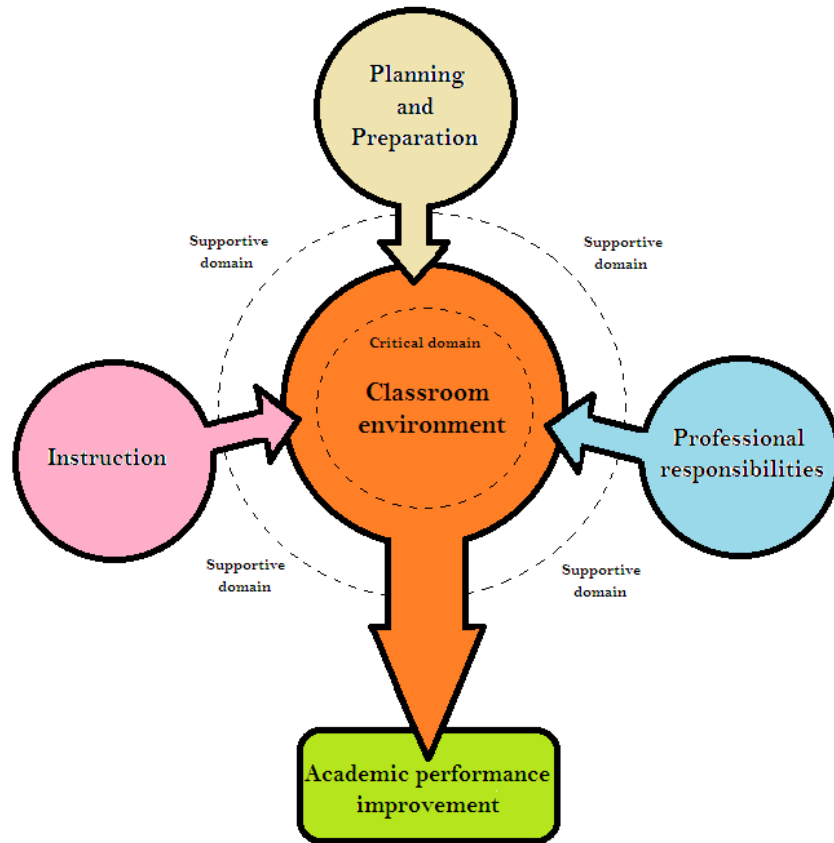


Figure 2: Haimbangu's Model of Best Practice for Teaching and Learning (adopted from Danielson, 2007)

#### 4.6. Mitigating strategies

The researcher spent a week each at School A and School B during the period of collecting data. The researcher took note of learners and teachers' behaviour outside the classroom and recorded all necessary information in the field notes. Field notes were also taken during lessons on the space of the 'comment' on the COI form. These notes were studied, together with all aspects attributed to classroom environment by Danielson (2007), to formulate the mitigation strategies that School B can put in place to improve its learners' performance in Physical Science as far as Domain 2 (classroom environment) is concerned.

#### **4.6.1. Creating an environment of respect and rapport**

Noted statements taken from the field notes on creating an environment of respect and rapport were:

*‘Learners from School A were exercising a high degree of respect towards themselves and the teachers’*

*‘Classrooms for School A were ever clean and tidy while at School B classrooms were always dirty and dusty’*

*‘The school uniforms for the learners from School A are neat. Learners have a responsibility to make sure that their classrooms are clean and tidy’*

*‘Teachers of School A are trying their best to be role models when it comes to time on task’*

Classroom interactions among the teacher and individual learners should be based on respect, reflecting genuine warmth, caring and sensitivity to learners as individuals. Learners should exhibit respect for the teacher and contribute to maintain high levels of civility among members of the class (Danielson, 2007). Respect is good when it starts with a learner. Learners should respect themselves by wearing tidy uniforms properly and making sure that classrooms are cleaned regularly. Learners respect teachers who respect them. Teachers who go to lessons late might make learners lose respect in them and it demoralise learners to work hard.

#### **4.6.2. Establishing a culture for leaning**

With regard to establishing a culture for learning, the field notes had these information:

*'Learners from School A show the characteristics of being highly motivated as there is no afternoon study slot at School A but learners always go to classes to revise their work without being forced which is the contrary to learners from School B'*

*'Teachers at School B were using common subject notes from other regions without clear understanding on how they were crafted'*

The classroom culture should be characterized by a shared belief in the importance of learning. Instructional outcomes, activities and assignments should convey high expectations for all learners. Classroom interactions should extend learning. Learners should assume responsibility for high quality work by initiating improvements, making revisions, adding detail and/or helping peers. High expectations in learning should be internalized by learners (Danielson, 2007). Learners should be motivated occasionally so that they can develop a culture of self directing and self-reliance. Learners should have a good understanding of why they are at school and who they would want to be in the future because teaching learners with no hope will not yield any good results in Physical Science despite the efforts from the teachers.

#### **4.6.3. Managing classroom procedures**

With regard to managing classroom procedures, the field notes had these information:

*‘Learners Representative Council (LRC) members of School A seemed to know their roles and they assisted the teachers to make sure that daily procedures are followed by other learners’*

*‘School B learners wasted much of the instruction time during changing of classes (taking up to 15 minutes) and when they were coming from break. Learners took more than the time allocated in the time table to change from one class to another’*

Instructional time should be maximized due to efficient classroom routines and procedures. Learners should contribute to management of instructional groups, transitions, and/or the handling of materials and supplies. Routines should be well understood and engaged in consistently by learners. Volunteers and paraprofessionals should work independently of the teacher and take initiative (Danielson, 2007). The school should come up with a functional timetable that would guide learners and teachers on what needs to be done, when and how. The time learners take to change classes during rotation should be limited and close attention should be paid to make sure that positive actions are taken against those who will be found guilty.

#### **4.6.4. Managing learner behavior**

With regard to managing learner behaviour, the field notes had these information:

*‘Learners from School B have shown a tendency of standing in front of their classroom doors when they have no teacher to attend to them. This was*

*persistent even when they see a teacher walking by and they are not showing any remorse'*

Learners' behavior should be entirely appropriate during school time. Learners should take an active role in monitoring their own behavior and that of other learners against the standards of conduct. Teachers' monitoring of learners behavior should be subtle and preventative. Teachers' response to learners' misbehaviors should be sensitive to individual learner needs and receives a positive reaction (Danielson, 2007). Learners should be treated with respect to avoid them being rebellious and rude towards teachers. Teachers should come up with a mechanism to control learners' behaviour where good work is rewarded and bad behaviour leads to demotion. For example, Learners who are behaving as required could be awarded badges with points and points could be deducted from those who transgress.

#### **4.6.5. Organising the physical space**

On the establishing a culture for learning, the field notes had these information:

*'Teachers at School B mostly have used a lecture method, where a teacher is always standing in front of the class, reading from notes'*

*'The seating arrangements at School B did not allow teachers to move around and reach every learner as possible'*

The classroom should be safe, and learning should be accessible to all learners including those with special needs. Teachers should make effective use of physical resources,

including computer technology to show complex concepts in the subject. The teacher should ensure that the physical arrangement was appropriate to the learning activities. Learners should contribute to the use or adaptation of a better physical environment to advance learning (Danielson, 2007). Physical Environment should allow the teacher to reach to every learner to maximise classroom control. The classroom setup should not be rigid because each teaching style works better when a suitable seating arrangement is used.

#### **4.7. Summary**

In this chapter, the demographic information for the teachers was highlighted. The classroom sizes of School A and School B were compared and found to be similar. Domain 1-3 results were discussed as they were collected by the COI and Domain 4 results were discussed from the interview. The results for all domains were compared in the contingency table to see the domain that stood out from others between School A and School B. After the best practices that can help learners from School B to perform better in Physical Science were determined then the mitigating strategies were crafted for specifically School B so that the gap between School A and School B can be decreased if not eliminated.

The conclusions and recommendations are presented in the next chapter

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

### **5.1. Introduction**

This chapter presents the summary of the study, the conclusion of the findings and recommendations for the future research. The aim of this study was to investigate practices that help grade 12 learners to improve their performance in Physical Science in Omusati Region. The study adopted a QUAL-quan research method in form of a case study. The discussion of whether the problem was solved by the research was outlined. The study also highlighted the shortcomings, strengths of the study and recommendations on improving the teachers' roles and classroom practices. The main question for the study was "What are the teachers' roles and classroom practices that contribute to higher performance in Physical Science at School A than at School B?" The recommendations were also outlined to give an idea on what measures should be adopted to solve the problem and the inconsistencies, and the suggestions of the possibilities of the further studies were addressed.

### **5.2. Summary of the study**

The study comprised of five chapters such as:

#### **5.2.1. Chapter 1: Introduction of the study**

This chapter provided an overview through the orientation of the study, statement of the problem, research questions, significance of the study, limitations and delimitations of the study as well as the definition of terms used in the study.

### **5.2.2. Chapter 2: Theoretical Framework and literature review**

In this chapter, the theoretical framework and literature review was discussed. The theoretical framework was based on the conceptual framework of Danielson Theory of Best Practice for Teaching and Learning. The literature was reviewed looking at teaching and learning environment, and teachers' role and activities.

### **5.2.3. Chapter 3: Methodology**

This study has employed a mixed method research approach of QUAL-quant with a concurrent nested design. The chapter explained more on research approach, description of the population of the population (Physical Science teachers in Omusati Region teaching Grade 11-12) and sampling strategies (Extreme case sampling) which were adopted. The data were collected using interviews and observations. This chapter also discussed the data collection procedures, piloting, data analysis and research ethics.

### **5.2.4. Chapter 4: Results and Discussions**

The study investigated the practices that help Grade 12 learners to improve their performance in Physical Science in Omusati Region. It has not been known why some schools are consistently kept performing well than others in Physical Science despite similar environment setups and children from similar family background. To unpack this mystery, a study was carried out based on the four domains as per the conceptual framework of Danielson Theory of Best Practice for Teaching and Learning. The four domains have covered most of the roles of the teachers ranging from planning and preparation, classroom environment, instructions, and professional responsibilities. In this chapter, the findings are discussed as per the domains of Danielson (2007). Domain

1 to 3 findings were presented from the classroom observations while Domain 4 findings were generated from interviews which were carried out. The field notes were used to present data on mitigation strategies, School B could employ to improve their performance. This chapter also presented the demographic information of the six teachers who took part in the study and class sizes. By using 4 domains of Danielson, the reviewed literature was used to support, compare and contrast the findings of the study. The following domains were presented:

#### ***5.2.4.1. Domain 1 (Planning and Preparation)***

Although the scholars' findings reviewed have indicated the importance of planning and preparation in teaching and learning Physical Science, results have revealed that School A and B are at the same level when it comes to Domain 1. This is so despite that School A outperforms School B in Physical Science academic performance as revealed by the national performance rankings.

#### ***5.2.4.2. Domain 2 (Classroom environment)***

Results from this study revealed that teachers from School A had created an environment of respect and rapport among the learners and with the teacher, established a culture for learning, managed classroom procedures, managed learners' behavior and organized the physical space more than proficiently than teachers from School B. The study has also revealed that the aspects under Domain 2 are the best practices that assist learners at School A to outperform learners from School B.

#### ***5.2.4.3. Domain 3 (Instruction)***

The scholars' findings, as reviewed, have indicated that teachers who perform well in instruction help learners to perform academically well in Physical Science. However, it was revealed that teachers from both schools do place equal efforts as far as teaching and instruction is concerned even though School A outperforms School B as per the national rankings. Therefore, the aspects under instruction are not one of the best practices that assist learners from School A to outperform learners from School B.

#### ***5.2.4.4. Domain 4 (Professional responsibilities)***

As in Domain 1 and 3, the results revealed that teachers from School A and B had performed equally in Domain 4. This indicated that the aspects under professional responsibilities are not the best practices at School A.

The study has revealed that the level of performance for teachers from School A and School B were the same in terms of planning and preparation, teaching and learning instruction and professional responsibilities, but clearly different in the classroom environment. This has shown that effective classroom environment is the best practice and strengthening it can assist learners to perform well academically in Physical Science with fewer efforts from the teachers towards components and elements in other three domains. Classroom sizes of School A and School B were also found to be similar despite the variance in academic performance in Physical Science.

Furthermore, mitigating strategies required to boost improvement in Physical Science results were highlighted. These strategies included creating an environment of respect

and rapport, establishing a culture for learning, managing classroom procedures, managing learner behaviour and organising the physical space as adopted from Domain 2 (Classroom environment) of Danielson.

Additionally, the study has acknowledged the limitations and the recommendations for improving performance at School B and for future research were presented.

### **5.3. Strengths and shortcomings of the study**

The strength of this study was based on the fact that it used the domains of Danielson that covers majority of the teacher's practices and its credibility was solidified by observing each teacher five times to get the accurate results for each domain. The study can be used by teachers, education officers and inspectors of education to prioritise the activities that are aimed at improving performance in Physical Science subject, to facilitate efforts directed towards improving classroom environment.

One of the shortcomings of this study was that the study did not cover some practices, apart from the classroom practices, that can affect the school system like school administration, admission requirements and type of the feeding schools (where the school get learners from).

### **5.4. Limitations of the study**

Domain 4 (professional responsibilities) was not covered by the classroom observation because it required a longer observation period at schools to get the answers. Therefore,

domain 4 was covered by the interview but some elements of the components could not be set into interview questions and get reliable responses.

## **5.5. Conclusion**

This study found that the best practices that assist learners from school A to perform well in Physical Science were from Domain 2 (Classroom environment). Further, the presented mitigation strategies that School B and other schools with similar academic performance in Physical Science could employ to improve classroom environment were: creating an environment of respect and rapport, establishing a culture for learning, managing classroom procedures, managing learner behavior and organizing the physical space.

Recommendations to the Professional Development Subdivision and schools management are discussed below so that they are practiced at School B and other schools with similar academic performance in Physical Science for learners to be assisted to strengthen Domain 2. Suggestions for further research are highlighted for readers. In conclusion, the study expects to add new knowledge to a body of literature on the practices that help learners in Namibia to academically perform better in Grade 11-12 Physical Science.

## **5.6. Recommendations**

### **5.6.1. Recommendations to the Professional Development Subdivision**

Professional Development (PD) Subdivision is the department responsible for advising, training and ensuring teaching standards through Continuous Professional Development

(CPD) in the Ministry of Education. Therefore, the study recommends to PD, that, the CPD programs should be mostly focused on the activities that are aiming at strengthening the classroom environment at all poor performing schools in Physical Science in Omusati Region.

### **5.6.2. Recommendations to the schools' managements**

Firstly, Schools should strengthen career fair activities so that learners can identify themselves on what professional career they would want to pursue in the future. This will assist the learners who are hopeless to find the purpose of schooling and direct their own learning towards achieving their goals. Finally, Poor performing schools in Physical Science should empower learners through peer tutoring and group discussions so that learners can be encouraged to be part of learning process but not expect teachers to fill them up with knowledge and skills.

### **5.6.3. Suggestion for further research**

A further study could be conducted to address domain 4 in more details where a lengthy time will be spent to observe closely the level of performance of the teachers in this domain.

## REFERENCES

- Abbott, D. (2009). *Participant observation and non-participant observation*. Retrieved March 24<sup>th</sup>, 2014 from <http://www.tutor2u.net/socialogy/blog/participant-observation-and-non-participant-observation>.
- Aguilar, E. (2010). *How classroom environment can ignite learning and cultivate caring*. California: The George Lukas Educational Foundation. Retrieved February 20<sup>th</sup>, 2014 from <http://www.edutopia.org/blog/classroom-environment>.
- Archer, J., Childs, A., Covaciu, S., & De Young, C. (2012) Effective instruction tools or costly distribution: An examination on the effective implementation of technology in the classroom. *Peer-reviewing Journal of the Texas Council of Professors of Educational Administration*, 7(2),11-23. Retrieved June 2, 2013 from <http://scholar.goole.com/scholar?q=usinog+technology+in+the+classroom>.
- Awe, G. A. (2007). *An investigation into the knowledge and practice of learner-centered methods of teaching by physical science teachers in the Omusati Education Region* (Master's Thesis, University of Namibia, Windhoek). Retrieved August 7, 2015 from <http://respository.unam.na/handle/11070/396>.
- Callaban, P., Cannon, B., Chesick, E., Mackin, J., Mandel, S., & Wenning, C. (2009). *The role, education, qualifications, and professional development of secondary school physics teachers*. Retrieved August 30, 2016 from [http://www.Aapt.org/resources/upload/secondary-school-physics-teacher-role\\_booklet](http://www.Aapt.org/resources/upload/secondary-school-physics-teacher-role_booklet).

- Castro, F. G., Kellison J. G., Boyd, S. J., & Kopak, A. (2010). A methodology for conducting integrative mixed methods research and data analysis. *S. Mix Methods Res*, 4(4), 342-360.
- Charlesworth, R. (2015). *Math and Science for young children*. Retrieved August 10, 2016 from [http://books.google.com/books/about/math\\_and\\_science\\_for\\_young\\_children](http://books.google.com/books/about/math_and_science_for_young_children).
- Chavan, R. L. (2013). *Difficulties encountered by science teachers during teaching concepts of science*. Retrieved September 1, 2016 from [http://www.academia.edu/7751883/Difficulties\\_Encountered\\_by\\_Science\\_Teachers\\_during\\_Teaching\\_Concepts\\_of\\_Science](http://www.academia.edu/7751883/Difficulties_Encountered_by_Science_Teachers_during_Teaching_Concepts_of_Science)
- Chenail, R.J. (2011). Interviewing the investigator: Strategies for addressing instrumentation and researcher bias consensus in qualitative research. *The qualitative report*, 16(1), 255-262.
- Cooper, J. M. (2013). *Classroom teaching skills*. Retrieved August 7, 2015 from <http://books.google.com.na/books?isbn=1133602762>.
- Danielson, C. (2007). *Enhancing professional practice: Framework for teaching*. Alexandria VA: ASCD. Retrieved August 29, 2013 from <http://www.amazon.com>books>.
- David, B., & Resnik, J.D. (2011). *What is ethics in research and why is it important?*. NIH. Retrieved February 23<sup>rd</sup>, 2014 from <http://www.niehs.nih.gov/research/bioethic/whatis/>.

- Davis, E. A. (2013). *Scaffolding learning*. Retrieved August 7, 2016 from <http://www.link.springer.com/referenceworkentry/10.1007/978-94-007-2150-0>.
- Doody, O., & Noonan, M. (2013). *Preparing and conducting interviews to collect data*. Retrieved March 24<sup>th</sup>, 2014 from <http://scholar.google.com/scholar?>
- Ekborg, M., Ottander, C., Silfver, E., & Simon, S. (2013). Teachers' experience of working with socio-scientific issues: A large scale and in depth study. *Research in Science Education Journal*, 43(2), 599-617.
- Elger, D. (n.d.). *Theory of practice*. University of Idaho: Faculty Development Series. Retrieved November 4, 2015 from <http://www.webpages.uidaho.edu/ele/scholars/results>.
- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2013). *Active learning increases Learner performance in Science, Engineering and Mathematics*. Retrieved September 1, 2016 from <http://www.pnas.org/content/111/23/8410.short>.
- Gay, L. R., Mills, G. E., & Airasian, P. W. (2011). *Education research: Competencies for analysis and applications*. Upper Saddle River, New Jersey: Pearson.
- Graham-Clay, S. (n. d.). *Communicating with parents: Strategies for teachers*. Retrieved August 7, 2015 from <http://www.adi.org/journal/ss05/Graham-Clay.pdf>.

- Gunstone, R. F. (2012). *The content of science: A constructivist approach to its teaching and learning*. Retrieved August 29, 2016 from <http://books.google.com.na>.
- Hannan, A. (2006). *Observation techniques*. University of Plymouth. Retrieved June 2, 2013 from <http://www.edu.plymouth.ac.uk/resined/observation>.
- Hassard, J. & Dias, M. (2013). *The art of teaching science: inquiry and innovation in middle school and high school*. Retrieved August 29, 2016 from <http://scholar.google.com/scholar?q=>
- Index Mundi. (2007). *Namibia pupil-teacher ratio*. Retrieved August 7, 2015 from <http://www.indexmundi.com/facts/namibia/pupil-teacher-ratio>.
- James, T. (2013). *What collection instruments are appropriate for quantitative data collection*. Demand Media. Retrieved June 2, 2013 from <http://www.ehow.com/info>.
- Kibirige, I., & Hodi, T. (2013). Learners' performance in Physical sciences using laboratory investigations. *International Journal of Education Sciences*.5(4): 425-432.
- King, N., & Hollocks, C. (2010). *Interviews in Qualitative Research*. SAGE Publication: London.
- Klosterman, M. L., Sadler, T. D., & Brown, J. (2012). Science teachers' use of mass media to address socio-scientific and sustainability issues. *Research in Science Education Journal*, 42(1), 51-74.

- Kstashuk, K. (2007). *Creating a positive classroom environment*. Slide Share. Retrieved February 19<sup>th</sup>, 2014 from <http://www.slideshare.net/kstashuk>.
- Lassibille, G. (2013). Improving teachers' professionalism on an experimental basis. *Regional and sectoral economics studies*, 13(3), 36.
- Laurillard, D. (2013). *Teaching as a design science: Building pedagogical patterns for learning and technology*. Tylor & Francis Group, New York and London: Rutledge.
- Miller, A., & Cunningham, K. (2011). *Teaching and learning environment*. Education.com. Retrieved February 20, 2014 from <http://www.education.com/reference/article/classroom-environment>.
- Mji, A., & Makgato, M. (2006). Factors associated with higher school learners' poor performance: a spotlight on Mathematics and Physical science. *South African Journal of Education*. 26(2), 253-266.
- National Institute for Educational Development (NIED). (2009). *Namibia Senior Secondary Certificate: Physical Science Syllabus*. Okahandja: Ministry of Education.
- Noble, H., & Smith, J. (2015). *Issues of validity and reliability in qualitative research*. Retrieved March 7, 2017 from <http://www.ebn.bmj.com/content/18/2/34>
- Noor, A. M., & Hamidon, Z. (2010). *Improving teachers professionalism to face the global education challenges: The context of Brunei Darussalam*. Retrieved

August 30, 2016 from <http://mindamas->

[\\_journals.com/index.php/sociohumanika/article/view](http://journals.com/index.php/sociohumanika/article/view).

Odeh, R. C., Oguche, O. A., & Ivagher, E. D. (2015). Influence of school environment on academic achievement of students in secondary schools in zone “A” senatorial district of Benue state Nigeria. *International Journal of Recent Scientific Research*, 6(7), 4914-4922.

Oladejo, M. A., Ojebisi, A.O., Olosunde, G.R., & Isola, O.M. (2011). Instructional materials and learners’ academic achievement in physics: Some policy implications. *European Journal of Humanities and Social Sciences*.2(1): 228-235.

Omusati Regional Advisory Services.(2014). *Examination analysis* [Fact Sheets]. Outapi: Regional Directorate of Education.

Orlich, D., Harder, R. J., Callaban, R. C., Trevisan, M. S., & Brown, A. H. (2012). *Teaching strategies: A guide to effective instruction*. Retrieved August 10, 2016 from <http://books.google.com.na/books?hl=en&lr>.

Palinkas, L. A., Horwitz, S. M., Green, C.A., Wisdom, J. P., Duan, N., & Hoagwood, D. K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health Service Research*, 42(5), 533-544.

Philippi, J., & Lauderdale, J. (2017). *A guide to field notes for qualitative research: context and conversation*. Retrieved March 7, 2017 from <http://www.journals.sagepub.com/doi/full/10.1177/>

- Pluye, P., & Hong, Q. N. (2014). *Combining power of stories and the power of numbers: Mixed methods research and mixed studies reviews*. Retrieved March 7, 2017 from <http://www.anualreviews.org/doi/full/10.1146/>
- Sahin, M., & White, A. L. (2015). Teachers' perceptions related to characteristics of a professional environment for teaching. *Eurasia Journal of mathematics, Science & Technology Education, 11(3), 559-575*.
- Samy, A. A. (2005). The qualities of a good teacher: how can they be acquired and sustained. *Journal of the Royal Society of Medicine, 98(2), 67-69*. Retrieved March 24<sup>th</sup>, 2014 from <http://www.nlm.nih.gov/pmc/articles>.
- Sarniak, S. (2015). *9 types of research bias and how to avoid them*. Retrieved March 7, 2017 from <http://www.quirks.com/article/>
- Schank, R. C. (2015). *Teaching minds: How cognitive science can save our schools*. Retrieved September 2, 2016 from <http://books.google.com.na/books?hl=en&lr>.
- Shaw, S. G. (2013). *Intentions and behaviors: record-keeping practices of pre-service teachers during professional experience*. Retrieved August 7, 2015 from <http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=1905&context=ajte>.
- Sleigh, M. J., & Ritzer, D.R. (2004). *Beyond the classroom: Developing learners' professional social skills*. Retrieved August 7, 2015 from <http://www.psychologicalscience.org/.../beyond-the-classroom>.

Spillane, J. P. (2015). *Leadership and learning: conceptualizing relations between school administrative practice and instructional practice*. Retrieved August 7, 2015 from <http://www.mdpi.com/journal/societies>.

Stephen, M. M. (2013). *An investigation of how factors related to teacher quality affect the grade 12 Physical science performance in Tswane District*. Retrieved November 5, 2015 from <http://uir.unisa-ac.za/handle/10500/13836>.

Stronge, J. H. (2007). *Qualities of effective teacher*. Retrieved September 2, 2016 from <http://www.ascd.org/publications/books/105156/chapters/section-11>.

Taylor-Powell, E., & Renner, M. (2003). *Analyzing qualitative data*. University of Wisconsin. Retrieved May 19, 2013 from <http://www.learningstore.uwex.edu/assets/>

Wenglinsky, H. (2001). *Teacher classroom practices and Learner performance: How schools can make a difference*. Retrieved August 7, 2015 from <http://www.ets.org/media/research/pdf>.

## APPENDIX 1: Ethical Clearance Certificate



### ETHICAL CLEARANCE CERTIFICATE

**Ethical Clearance Reference Number:** FOE/142/2016

**Date:** 5 December, 2016

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

**Title of Project:** Investigating Practices That Help Grade 12 Learners to Improve Their Performance in Physical Science: A Case Study of the Omusati Educational Region, Namibia

**Nature/Level of Project:** Masters

**Researcher:** M. H. Haimbangu

**Student Number:** 200112805

**Faculty:** Faculty of Education

**Supervisors:** Dr. M. Chirimbana (Main) Dr. E. Elago (Co)

Take note of the following:

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

UREC wishes you the best in your research.

Prof. P. Odonkor: UREC Chairperson

A handwritten signature in blue ink, appearing to be "P. Odonkor", written over a horizontal line.

Ms. P. Claassen: UREC Secretary

A handwritten signature in blue ink, appearing to be "P. Claassen", written over a horizontal line.

## APPENDIX 2: Permission letter



REPUBLIC OF NAMIBIA



### OMUSATI REGIONAL COUNCIL

#### DIRECTORATE OF EDUCATION, ARTS AND CULTURE

*Team Work and Dedication for Quality Education*

Tel: +264 65 251700

Private Bag 529

Fax: +264 65 251722

OUTAPI

Enq: Apollonia Hango

06 January 2017

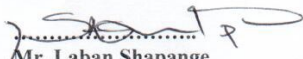
Mr. Malakia H. Haimbangu  
P.O. Box 7132  
OSHAKATI

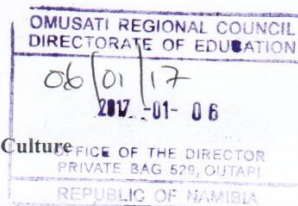
**Subject: Request for Permission to conduct research at selected schools in Omusati Region.**

This letter serves to notify you (Mr. Malakia H. Haimbangu) that permission has been granted to conduct a research regarding 'Investigation practices that help grade 12 learners to improve their performance in Physical Science: at [redacted] and [redacted], in Omusati Region. Please be informed that the research to be conducted at school should by no means whatsoever disrupt teaching and learning.

We hope and trust this exercise will enhance quality education in the Region.

Yours faithfully

  
Mr. Laban Shapange  
Director of Education Arts and Culture



Teamwork and dedication for  
quality education

Cc: The Principals for [redacted] and [redacted]  
Inspectors of Education for [redacted] and [redacted] Circuits

*All official correspondence must be addressed to the Chief Regional Officer.*

## APPENDIX 2: Informed Consent for Teachers

### Informed Consent Document for Teachers

I, Malakia Haimbangu, am a Learner currently registered for Master of Education (Science Education) Degree with the University of Namibia. Part of the requirement for the degree is a thesis and I have chosen the following topic:

*“Investigating practices that help grade 12 learners to improve their performance in Physical Science: a case study of Omusati educational region, Namibia”*

My academic supervisor is Dr. Moses Chirimbana based at the University of Namibia Northern Campus. He can be contacted on [mchirimbana@unam.na](mailto:mchirimbana@unam.na) or at telephone 065-223 2289.

I can be reached on [malakiahaimbangu@gmail.com](mailto:malakiahaimbangu@gmail.com) or on +264812537636.

The purposes of this research is to ascertain the best practices that can help grade 12 learners to improve their Physical Science performance in Omusati region. Due to the in-depth knowledge required to make a meaningful contribution to this study, experts such as yourself have been selected as representatives of the teachers. Information gathered will include data retrieved from the interview that I would require you to answer and the classroom observation that I will carry out. Please note that your name or that of your school you represent will not be included in the report. Information will be seen only by supervisor, examiner and I. Your anonymity and confidentiality is of utmost importance and will be maintained throughout the study.

Your participation in completing the interview is completely voluntary and you are no way forced to attend the interview or to allow me to observe your lessons. You have the right to withdraw at any time during the study.

I appreciate the time and effort if you would take to time to participate in this study. I will be very grateful for your participation, as it would enable me to complete my thesis.

I ..... (Full names of participant) consent to participate  
in this research project.

Date .....

Signature of participant.....

## APPENDIX 4: Informed Consent for Principals

### Informed Consent Document for Principal

Malakia Haimbangu is hereby given permission to use .....School as the research site for the research study he is required to conduct in partial fulfilment for the Master's degree in Education of the University of Namibia.

His academic supervisor is Dr. Moses Chirimbana based at the University of Namibia Northern Campus. The supervisor can be contacted on [mchirimbana@unam.na](mailto:mchirimbana@unam.na) or at telephone 065-223 2289.

The researcher can be reached on [malakiahaimbangu@gmail.com](mailto:malakiahaimbangu@gmail.com) or on +264812537636.

I understand that:

- Three Physical Science teachers will be interviewed and observed while teaching five times in any topic as per the Regional Year Plan.
- Classroom observations will be conducted during normal lessons
- The information from these instruments may be used in the final report of this study.

I have been assured that the school and the learners will have anonymity in the final report and the information collected will be used for the sole purpose of the study.

\_\_\_\_\_  
**Principal's signature**

\_\_\_\_/\_\_\_\_/2016  
**Date**

\_\_\_\_\_  
**Researcher's signature**

\_\_\_\_/\_\_\_\_/2016  
**Date**

**APPENDIX 5: Classroom Observation Instrument**



**CLASSROOM OBSERVATION  
INSTRUMENT**

**Domain 1-3 of Danielson (2007)**













**By: Malakia Haimbangu (200112805)**













**Master of Education (Science)**

<b>Teacher's code:</b> .....	<b>School's code:</b> .....
<b>Lesson's code:</b> .....	<b>Name of the topic:</b> .....
<b>Date:</b> .....	<b>Time:</b> .....
<b>Class size:</b> .....	<b>Teacher's qualification:</b> .....
<b>Teacher's years of experience:</b> .....	

## DOMAIN 1: Planning and preparation

NB: 1=Unsatisfactory, 2=Basic, 3=Proficient and 4=Distinguished

Component	1	2	3	4	COM
<b>Ia: Demonstrating Knowledge of Content and Pedagogy</b>	Teacher demonstrates little to no knowledge of relevant content standards within and/or across grade levels. Teacher demonstrates no knowledge of the disciplinary way of reading, writing and/or thinking within the subject area. Teacher demonstrates little understanding of prerequisite knowledge important to Learner learning of the content/skills. Teacher's plans reflect little or no understanding of the range of pedagogical approaches suitable to Learner learning of the content/skills being taught.	Teacher demonstrates knowledge of the relevant content standards within the grade level but displays lack of awareness of how these concepts relate to one another and/or build across grade levels. Teacher demonstrates some knowledge of the disciplinary way of reading, writing, and/or thinking within the subject area. The teacher demonstrates some understanding of prerequisite learning, although knowledge of relationships among topics may be inaccurate or incomplete. Teacher's plans reflect a limited range of pedagogical approaches suitable to Learner learning of the content/skills being taught.	Teacher demonstrates knowledge of the relevant content standards, within and across grade levels. Teacher demonstrates knowledge of the disciplinary way of reading, writing, and/or thinking within the subject area. Teacher demonstrates accurate understanding of prerequisite learning and relationships among topics and concepts. Teacher's plans reflect a range of effective pedagogical approaches suitable to Learner learning of the content/skills being taught.	Teacher demonstrates knowledge of the relevant content standards within the grade level and across grade levels, as well as how these standards relate to other disciplines. Teacher's plans demonstrate extensive knowledge of the disciplinary way of reading, writing, and/or thinking within the subject area. Teacher demonstrates deep understanding of prerequisite learning and relationships among topics and concepts. Teacher's plans include a range of effective pedagogical approaches suitable to Learner learning of the content/skills being taught and anticipate Learner misconceptions.	
					
<b>Ib: Demonstrating Knowledge of Learners</b>	The teacher demonstrates little to no understanding of how learners learn and does not attain information about levels of development. Teacher does not gather knowledge about learners' backgrounds, cultures, prior knowledge, skills, language proficiencies, learning styles, interests, and special needs and does not indicate that such knowledge informs teacher's practice.	The teacher displays generally accurate knowledge of how learners learn and attains information about levels of development for the class as a whole. Teacher gathers some knowledge about some learners' backgrounds, cultures, prior knowledge, skills, language proficiencies, learning styles, interests, and special needs.	The teacher demonstrates an understanding of the active nature of Learner learning and attains information about levels of development for groups of learners. Teacher purposefully gathers information from several sources about most learners' backgrounds, cultures, prior knowledge, skills, language proficiencies, learning styles, interests, and special needs.	The teacher demonstrates an understanding of the active nature of Learner learning and attains information about levels of development for individual learners. Teacher purposefully and continually gathers information from several sources about all learners' individual backgrounds, cultures, prior knowledge, skills, language proficiencies, learning styles, multiple intelligences, interests, and special needs.	
					
<b>Ic: Selecting Learning Objectives</b>	Learning objectives are not standards based, are unclear, or are stated as activities rather than as Learner learning outcomes, prohibiting a feasible method of assessment. Teacher does not sequence and align learning objectives to build toward deep understanding and mastery of the standards. Objectives reflect only one type of learning and/or only one discipline.	Learning objectives are partially standards-based, clear, written in the form of Learner learning outcomes, aligned to methods of assessment, and/or are only written for the class as a whole. Teacher demonstrates an attempt to sequence and align some standards-based learning objectives, but does not build toward deep understanding or mastery of the standards. Objectives reflect more than one type of learning, but teacher has made no attempt	Learning objectives are standards-based, clear, written in the form of Learner learning outcomes, aligned to methods of assessment, and varied to account for the needs of groups of learners. Teacher sequences and aligns standards-based learning objectives to build toward deep understanding and mastery of the standards. Objectives reflect several different types of learning and invite opportunities for	Learning objectives are standards-based, clear, written in the form of Learner learning outcomes, aligned to methods of assessment, and varied in whatever way is needed to account for individual learners' needs. Teacher sequences and aligns standards-based objectives to build toward deep understanding, mastery of the standards, and meaningful authentic application. Objectives reflect several different types of learning and provide	
					

		at coordination of the disciplines.	coordination within and across the disciplines.	multiple opportunities for coordination and integration within and across the disciplines.	
					
<b><i>Id: demonstrating Knowledge of Resources</i></b>	The teacher is unaware of resources to assist Learner learning beyond materials provided by the school or district, nor is the teacher aware of resources for expanding one's own professional skill.	The teacher displays some awareness of resources beyond those provided by the school or district for classroom use and for extending one's professional skill but does not seek to expand this knowledge.	The teacher displays awareness of resources beyond those provided by the school or district, including those on the Internet, for classroom use and for extending one's professional skill, and seeks out such resources.	The teacher's knowledge of resources for classroom use and for extending one's professional skill is extensive, including those available through the school or district, in the community, through professional organizations and universities, and on the Internet.	
					
<b><i>Ie: Designing Coherent Instruction</i></b>	Teacher does not coordinate knowledge of content, learners, and resources to design units and lessons. Learning tasks are not aligned to objectives. Tasks are not cognitively challenging and do not require learners to provide evidence of their reasoning. There is no evidence of scaffolding and differentiation for learners to access the content/skills. The progression of tasks is not coherent and has unrealistic time allocations. Units and lessons do not include grade-appropriate levels of texts and/or other materials and do not represent a cognitive challenge. The lesson or unit does not have a recognizable structure and makes no use of instructional groupings to support the learning objectives.	Teacher coordinates some knowledge of content, learners, and resources to design units and lessons. Learning tasks are partially aligned to objectives. Tasks are cognitively challenging, designed for the class as a whole, and occasionally require learners to provide evidence of their reasoning. There is some evidence of scaffolding and differentiation for some learners to access the content/skills. The progression of tasks in units and lessons is not always coherent, and some time allocations are unrealistic. Units and lessons include grade-appropriate levels of texts and other materials that represent a moderate cognitive challenge. The lesson or unit has a recognizable structure with some evidence of instructional groupings that partially support the learning objectives.	Teacher coordinates knowledge of content, learners, and resources to design units and lessons. Learning tasks are aligned to objectives. Tasks are cognitively challenging, designed for groups of learners, and require learners to provide evidence of their reasoning. There is evidence of scaffolding and differentiation for most learners to access the content/skills. The units and lessons are paced appropriately. Units and lessons include grade-appropriate levels of texts and other materials, representing a cognitive challenge. The lesson or unit has a clear structure with intentional and structured use of instructional groupings that support the learning objectives.	Teacher coordinates in-depth knowledge of content, learners, and resources (including technology) to design units and lessons. Learning tasks are aligned to objectives. Tasks are cognitively challenging for individual learners and require learners to provide evidence of their reasoning. There is evidence of scaffolding and differentiation for all learners to access the content/skills. The units and lessons are paced appropriately. Units and lessons include grade appropriate levels of texts and other materials so every Learner can access the content/skills. The lesson or unit has a clear structure that incorporates Learner choice, allows for different pathways of instruction aligned with diverse Learner needs, and uses instructional groupings intentionally.	
					
<b><i>If: Designing Learner Assessment</i></b>	The plan for Learner assessment is not aligned with the standards-based learning objectives identified for the unit and/or lesson. Assessments contain no criteria or descriptors aligned to Learner expectations. Teacher does not select or design formative assessments that measure Learner learning and/or growth. Teacher does not use prior assessment results to design units and lessons.	The plan for Learner assessment is partially aligned with the standards-based learning objectives identified for the unit and/or lesson. Assessments do not clearly identify and/or describe Learner expectations. Teacher selects or designs formative assessments that measure only part of Learner learning or growth. Teacher uses prior assessment results to design units and lessons that target the class as a whole.	The plan for Learner assessment is aligned with the standards-based learning objectives identified for the unit and/or lesson. Assessment methodologies are designed or adapted for groups of learners as needed. Assessments clearly identify and describe Learner expectations and provide descriptors. Teacher selects and designs formative assessments that accurately measure Learner learning and/or growth. Teacher uses prior assessment results to design units and lessons that target groups of	The plan for Learner assessment is aligned with the standards-based learning objectives identified for the unit and lesson. Assessment methodologies have been designed or adapted for individual learners as needed. Assessment criteria are thorough, describe high expectations for learners, and provide clear descriptors. Teacher's formative assessments are complex, well designed or selected, and tailored for individual learners, when necessary, in order to measure varying degrees of each Learner's learning and growth effectively. Teacher uses assessment	













			learners.	results to design units and lessons that target the diverse needs of every Learner.	

Average Score: .../6



## DOMAIN 2: The Classroom Environment

Component	1	2	3	4	COMMENT
<b>2a: Creating an environment of respect and rapport</b>	Patterns of classroom interactions, both between the teacher and learners and among learners, are negative, inappropriate, or insensitive to learners' ages, cultural backgrounds, and developmental levels. Interactions are characterized by sarcasm, putdowns, or conflict. Teacher does not respond to disrespectful behavior.	Patterns of classroom interactions, both between the teacher and learners and among learners, are generally appropriate but may reflect occasional inconsistencies, favoritism, and disregard for learners' ages, cultures, and developmental levels. Learners rarely demonstrate disrespect for one another. Teacher attempts to respond to disrespectful behavior, with uneven results. The net result of the interactions is neutral: conveying neither warmth nor conflict.	Teacher-Learner interactions are friendly and demonstrate general caring and respect. Such interactions are appropriate to the ages, developmental levels, and cultures of the learners. Learners exhibit respect for the teacher. Interactions among learners are generally polite and respectful. Teacher responds successfully to disrespectful behavior	Classroom interactions among the teacher and individual learners are highly respectful, reflecting genuine warmth and caring and sensitivity to learners as individuals. Learners exhibit respect for the teacher and contribute to maintain high levels of civility among members of the class.	
<b>2b: Establishing a culture for learning</b>	The classroom culture is characterized by a lack of teacher or Learner commitment to the learning, and/or little or no investment of Learner energy into the task at hand. Learning is not expected or valued.	The classroom culture is characterized by little commitment to the learning by teacher or learners. Learner engagement in the task at hand is inconsistent. The teacher appear to be only "going through the motions, and learners indicate that they are interested in completion of a task, rather than quality."	The classroom culture is a cognitively busy place where learning is valued by all. Learners understand their role as learner and consistently expend effort to learn by engaging in the task at hand. Instructional outcomes, activities and assignments convey high expectations for most learners.	The classroom culture is characterized by a shared belief in the importance of the learning. Instructional outcomes, activities and assignments convey high expectations for all learners. Classroom interactions may extend learning. Learners assume responsibility for high quality work by initiating improvements, making revisions, adding detail and/or helping peers. High expectations are internalized by learners.	
<b>2c: Managing</b>	Much instructional time is lost due to	Some instructional time is lost	There is little loss of instructional	Instructional time is maximized due	













<i>classroom procedures</i>	inefficient classroom routines and procedures. There is little or no evidence of the teacher managing instructional groups, transitions, and/or the handling of materials and supplies. Learners do not appear to know or follow established routines. Volunteers and paraprofessionals have no clear roles.	due to only partially effective classroom routines and procedures. The teacher's management of instructional groups, transitions, and/or the handling of materials and supplies is inconsistent, leading to disruption of the learning. With regular guidance and prompting, learners follow established routines. With guidance, volunteers and paraprofessionals are able to make a contribution.	time due to effective classroom routines and procedures. The teacher's management of instructional groups and/or the handling of materials and supplies is consistent. With minimal guidance and prompting, learners follow established classroom routines. Volunteers and paraprofessionals have clearly defined roles.	to efficient classroom routines and procedures. Learners contribute to the management of instructional groups, transitions, and/or the handling of materials and supplies. Routines are well understood and engaged in consistently by learners. Volunteers and paraprofessionals work independently of the teacher and take initiative.	
					
<i>2d: Managing Learner Behavior</i>	<b>There is little or no teacher monitoring of Learner behavior. Learners challenge the standards of conduct. Response to learners' misbehavior is repressive, or disrespectful of Learner dignity.</b>	<b>Teacher tries with uneven results, to monitor Learner behavior and respond to Learner misbehavior. There is inconsistent implementation of the standards of conduct.</b>	<b>Learner behavior is generally appropriate. The teacher monitors Learner behavior against standards of conduct. Teacher response to Learner misbehavior is consistent, appropriate and respectful to learners and is successful.</b>	<b>Learner behavior is entirely appropriate. Learners take an active role in monitoring their own behavior and that of other learners against standards of conduct. Teachers' monitoring of Learner behavior is subtle and preventive. Teacher's response to Learner misbehavior is sensitive to individual Learner needs and receives a positive reaction.</b>	
					
<i>2e: Organizing physical space</i>	The physical environment is unsafe, or many learners don't have access to learning. There is poor alignment between the arrangement of furniture and resources, including computer technology, and the lesson activities.	The classroom is safe, and essential learning is accessible to most learners, The teacher's use of physical resources, including computer technology, is moderately effective. Teacher may attempt to modify the physical arrangement to suit learning activities, with partial success.	The classroom is safe, and learning is accessible to all learners; teacher ensures that the physical arrangement is appropriate to the learning activities. Teacher makes effective use of physical resources, including computer technology.	The classroom is safe, and learning is accessible to all learners including those with special needs. Teacher makes effective use of physical resources, including computer technology. The teacher ensures that the physical arrangement is appropriate to the learning activities. Learners contribute to the use or adaptation of the physical environment to advance learning	
					









Average Score: .../5 =








### DOMAIN 3: Instruction

Component	1	2	3	4	COMMI
<b>3a:</b>	The instructional purpose of	Teacher's attempt to explain the	The instructional purpose of the lesson is	The teacher links the instructional purpose	

<b>Communicating with learners</b>	the lesson is unclear to learners and the directions and procedures are confusing. Teacher's explanation of the content contains major errors. The teacher's spoken or written language contains errors of grammar or syntax. Vocabulary is inappropriate, vague, or used incorrectly, leaving learners confused.	instructional purpose is only partially successful, and/or directions and procedures must be clarified after initial Learner confusion. Teacher's explanation of the content may contain minor errors. Teacher's explanation consists of a monologue, with no attempt to engage learners intellectually. Teacher's spoken language is correct; however, vocabulary is limited, or not fully appropriate to the learners' ages or backgrounds.	clearly communicated to learners, including where it is situated within broader learning; directions and procedures are explained clearly. Teacher's explanation of content is well scaffold, clear and accurate, and connects with learners' knowledge and experience. During the explanation of content, the teacher invites Learner intellectual engagement. Teacher's spoken and written language is clear and correct. Vocabulary is appropriate to the learners' ages and interests.	of the lesson to Learner interests; the directions and procedures are clear and anticipate possible Learner misunderstanding. Teacher's explanation of content is thorough and clear, developing conceptual understanding through artful scaffolding. Learners contribute to extending the content, and in explaining concepts to their classmates. Teacher's spoken and written language is expressive, and the teacher finds opportunities to extend learners' vocabularies.	
					
<b>3b: Using questioning and discussion</b>	Teacher's questions/prompts are poorly aligned with lesson outcomes, with low cognitive challenge, single correct responses, and asked in rapid succession. Interaction between teacher and learners is predominantly recitation style, with the teacher mediating all questions and answers. A few learners dominate the discussion.	Teacher's questions/prompts are a combination of low and high quality, some related to the lesson objectives and of moderate cognitive challenge inviting a thoughtful response. Teacher attempts to engage all learners in the discussion and to encourage them to respond to one another, with uneven results.	Most of teacher's questions/prompts are of high quality and support the lesson objectives, with adequate time for learners to respond. A variety or series of questions / prompts are used to challenge learners cognitively, and advance high level thinking and discourse. Teacher creates a genuine discussion among learners, stepping aside when appropriate. Teacher successfully engages all learners in the discussion, employing a range of strategies to ensure that most learners are heard.	Teacher's questions/prompts are of uniformly high quality and fully support the lesson outcomes, with adequate time for learners to respond. A variety or series of questions / prompts are used to challenge learners cognitively, advance high level thinking and discourse, and promote meta-cognition. Learners formulate many questions, initiate topics and make unsolicited contributions. Learners themselves ensure that all voices are heard in the discussion.	
					
<b>3c: Engaging learners in learning</b>	The learning tasks and activities, materials, resources, instructional groups and technology are poorly aligned with the instructional outcomes, or require only rote responses. The lesson has no clearly defined structure, or the pace of the lesson is too slow or rushed. Few learners are intellectually engaged.	The learning tasks or prompts are partially aligned with the instructional outcomes but require only minimal thinking by learners, allowing most learners to be passive or merely compliant. The lesson has a recognizable structure; however the pacing of the lesson may not provide learners the time needed to be intellectually engaged.	The learning tasks and activities are aligned with the instructional outcomes and are designed to challenge Learner thinking, resulting in active intellectual engagement by most learners with important and challenging content, and with teacher scaffolding to support that engagement. The lesson has a clearly defined structure, and the pacing of the lesson is appropriate, providing most learners the time needed to be intellectually engaged.	Virtually all learners are intellectually engaged in challenging content, through well-designed learning tasks, and suitable scaffolding by the teacher, and fully aligned with the instructional outcomes. In addition, there is evidence of some Learner initiation of inquiry, and Learner contributions to the exploration of important content. The lesson has a clearly defined structure, and the pacing of the lesson provides learners the time needed to intellectually engage with and reflect upon their learning, and to consolidate their understanding. Learners may have some choice in how they complete tasks and may serve as resources for one another	
					
<b>3d: Using</b>	There is little or no	Assessment is occasionally used to	Assessment is regularly used during	Assessment is fully integrated into	

<b>Assessment in Instruction</b>	assessment or monitoring of Learner learning; feedback is absent, or of poor quality. There is no attempt to adjust the lesson as a result of assessment. Learners are not aware of the assessment criteria and do not engage in self-assessment.	support instruction, through some monitoring of progress of learning by teacher and/or learners. Feedback to learners is inaccurate or unspecific, and learners are only partially aware of the assessment criteria used to evaluate their work. Questions / prompts / assessments are not used to diagnose evidence of learning.	instruction, through monitoring of progress of learning by teacher and/or learners, resulting in accurate, specific feedback that advances learning. Learners are aware of the assessment criteria. Questions / prompts / assessments are used to diagnose evidence of learning, and adjustment to instruction is made to address Learner misunderstandings.	instruction, through extensive use of formative assessment. Learners are aware of and may contribute to the assessment criteria. Learners self-assess and monitor their progress. A variety of feedback, from both the teacher and peers, is accurate, specific, and advances learning. Questions / prompts / assessments are used regularly to diagnose evidence of learning and instruction is adjusted and differentiated to address individual Learner misunderstandings.	
					
<b>3e: Demonstrating flexibility and responsiveness</b>	Teacher adheres to the instruction plan in spite of evidence of poor Learner understanding or learners' lack of interest. Teacher ignores Learner questions; when learners experience difficulty, the teacher blames the learners or their home environment.	Teacher attempts to modify the lesson when needed and to respond to Learner questions and interests, with moderate success. Teacher accepts responsibility for Learner success, but has only a limited repertoire of strategies to draw upon.	Teacher promotes the successful learning of all learners, making minor adjustments as needed to instruction plans and accommodating Learner questions, needs and interests. The teacher persists in seeking approaches for learners who have difficulty learning, drawing on a broad repertoire of strategies.	Teacher seizes an opportunity to enhance learning, building on a spontaneous event or Learner interests or successfully makes a major adjustment to a lesson when needed. Teacher persists in seeking effective approaches for learners who need help, using an extensive repertoire of instructional strategies and soliciting additional resources from the school or community	
					

Average: .../5 = 

Domain  + Domain 2  + Domain 3  . /3 = Overall Score 

Source: Danielson, C. (2010). *Domains 2 and 3 critical attributes and possible examples*. Retrieved October 1<sup>st</sup>, 2015 from <http://tpep-wa.org/wp-content/uploads/recording-sheet-for-evidence-and-critical-attributes.pdf>

## APPENDIX 6: Interview Instrument



# INTERVIEW

**Domain 4 of Danielson (2007)**

**By: Malakia Haimbangu (200112805)**

**Master of Education (Science)**

Teacher's Code: .....	School's Code: .....
Date: .....	Time: .....

**DOMAIN 4: PROFESSIONAL RESPONSIBILITIES**

**4a – Reflecting on teaching**

- 1. Looking at your previous lesson. Was the lesson successful or not successful?  
Give a reason to for your answer.

.....  
.....  
.....  
.....  
.....  
.....

- 2. How did the yesterday lesson compare to the today lesson?

.....  
.....  
.....  
.....  
.....  
.....

**4b – Maintaining accurate records**

- 3. Explain on how do you monitor the learners' progress?

.....  
.....  
.....  
.....  
.....  
.....

- 4. How does the recording of learners' marks significant to the learners' academic performance?

.....  
.....  
.....  
.....  
.....  
.....

**4c - Communicating with families**

5. How do you rate (good, moderate or poor) the parental involvement in their learners' education? What kind of involvement and how often?

.....  
.....  
.....  
.....  
.....  
.....

**4d – Participating in a professional community**

6. How do you rate the interrelation/cooperation between Physical Science teachers at the school?

.....  
.....  
.....  
.....  
.....  
.....

7. How many subject meetings conducted this year at your school?

.....  
.....  
.....  
.....  
.....  
.....

8. How many times did you partake in a school function and can you name them?

.....  
.....  
.....  
.....  
.....  
.....

9. Do you participate in circuit/regional projects e.g.: field trips, science fair and quizzes?

.....  
.....  
.....  
.....  
.....  
.....

**4e – Growing and developing professionally**

10. Is there any professional development done for you in the subject? When and by who?

.....  
.....  
.....  
.....  
.....  
.....

11. Do you receive feedback from your co-workers, Head of department and the School principal?

.....  
.....  
.....  
.....  
.....  
.....

12. How often do you conduct department meetings at the school?

.....  
.....  
.....  
.....  
.....  
.....

**4f – Showing professionalism**

13. How the confidentiality is maintained in the subject and the school at large?

.....  
.....  
.....  
.....  
.....  
.....

14. How the after school and remedial teaching does is handled in your subject?

.....  
.....  
.....  
.....  
.....

15. Do you feel part of the decision making at the school when it comes to Physical Science subject at the school?

.....  
.....  
.....  
.....  
.....

16. How do the science teachers comply with school and regional regulations?

.....  
.....  
.....  
.....  
.....

*We came at the end of the interview. Thank you very much for your time and the views you have shared during this interview.*