AN INVESTIGATION INTO TIME ALLOCATION IN THE CURRICULUM AND ASSESSMENT POLICY STATEMENTS (CAPS) FOR GRADE 10 PHYSICAL SCIENCES

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DECLARATION

I declare that this thesis **An investigation into the time allocations in curriculum and assessment policy statements (CAPS) in physical sciences at Grade 10** is my own work. It has not been submitted for any other degree or examination at any other institution. The sources used or quoted in the text have been acknowledged and referenced by a complete list of references.

…….. ……

Zanoxolo Sibam **Date**

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Abstract

This study investigated the suitability of the prescribed and recommended time allocations for Physical Science in Grade 10 CAPS curriculum. More specifically, the study explored how different teachers in the rural part of a district in the Eastern Cape utilized the prescribed and recommended time allocations to cover certain topics in Physical Sciences in Grade 10. Since the introduction of CAPS, many physical science teachers complain that the prescribed and recommended time allocation have not afforded the teachers enough flexibility to explore different teaching strategies, especially for teachers in the rural district in the Eastern Cape. The aim of the study was to investigate how the teachers are able to adhere to the prescribed and recommended time allocation and the extent to which the prescribed and recommended time allocations allow for the application of different teaching strategies recommended by the Department of Basic Education. The study is underpinned by the reflective theory, pedagogical content knowledge and curriculum reform theory.

Seven (7) out of twelve (12) teachers in the rural part of the district in the Eastern Cape completed questionnaires that probed their experience with time allocations in the curriculum. Follow-up interviews were conducted with three randomly selected teachers who completed the questionnaires. The subject advisor for the district was also interviewed. The study is important for gaining an understanding of how teachers in rural schools in the district are coping with the time allocations in CAPS, and the impact that these time allocations have on the teachers' ability to cover the Grade 10 curriculum. The most prevalent challenges emanate from the fact that the teachers find difficulty adhering to the prescribed and recommended time allocation, and consequently fail to explore different teaching approaches in their classroom. The study concludes that the time allocations in CAPS are inadequate in affording teachers an opportunity to explore a variety of teaching methods in their classrooms. The researcher makes some recommendations with regard to the teachers' practices and exploration of technology to improve and expand contact time. The researcher recommends that further studies be conducted to explore how school management teams and the curriculum advisor effectiveness impact on the ability of the teachers to complete the curriculum. In addition, it is further recommended that studies that focus on observing teachers in the classroom be conducted to ascertain the extent to

which the teachers' classroom practices impact on their ability to cover the curriculum.

Key words:
Time allocations, Curriculum and Assessment Policy Statements, practical work, technology, rural schools, reflective practice.

LIST OF ABBREVIATIONS

CAPS	**Curriculum and Assessment Statements**
C2005	**Curriculum 2005**
NSC	**National Senior Certificate**
FET	**Further Education and Training**
OBE	**Outcomes Based Education**
Stats SA	**Statistics South Africa**
RNCS	**Revised National Curriculum Statements**
MTT	**Ministerial Task Team**
DBE	**Department of Basic Education**
PCK	**Pedagogical Content Knowledge**
RP	**Reflective Practice**
CR	**Curriculum Reform**
GET	**General Education and Training**
HIV	**Human Immunodeficiency Virus**
ES	**Environmental Sustainability**
IKS	**Indigenous Knowledge System**
ICT	**Information and Communication Technology**
STD	**Secondary Teachers Diploma**
ACE	**Advanced Certificate in Education**
REQV 13	**Relative Education and Qualification Value 13**
NS	**Natural Sciences**
SMT	**School Management Team**
DVD	**Digital Versatile Disc**

Chapter 1

Rationale of the study

1.1 Introduction

The purpose of the research was to gain an understanding of how Physical Science teachers, who are teaching Grade 10, are experiencing the Curriculum and Assessment Policy Statements (CAPS). This chapter provides the rationale for this study by presenting the background and context in which this study was conducted. It describes the research problem leading to the research question and provides the significance and limitations of the study.

1.2 Background to the study

According to the time allocations in the Curriculum and Assessment Policy Statement (2011) document, here referred to as CAPS (2011) there are 4 hours per week allocated for teaching of Physical Sciences at schools, with a total of 40 weeks per annum per Grade, including Grade 10. It also states that the allocated time is for teaching content, concepts and skills including the practical work. The content, concepts and skills is allocated 30 weeks and formal assessment is allocated 10 weeks in the annual teaching plan. The amount of instructional time allocated to Physical Sciences is 4 hours per week (ibid).

Most schools in the cluster are either reducing learner enrolments in Physical Sciences or phasing it out due to poor learner performance in the Grade 12 matric examinations. Teachers then offered various reasons for the poor performance in Physical Science, which includes, amongst others, inadequacy of the recommended and prescribed time allocations in junior grades for the teaching of concepts and skills required for the successful completion of Grade 12. Due to these challenges with recommended and prescribed time allocations, this means that the curriculum is not completed in junior grades especially grade 10. This, according to the teachers,

has an effect on the performance of learners within the cluster in Physical Sciences at Grade 12.

1.3 Curriculum change and development since 1994

Fiske and Ladd (2004) explained that education reform in South Africa was introduced to abolish the racially segregated education departments, and to form a single education department that was consistent with the South African post-apartheid constitution. The administrative duties were delegated to provincial departments and were consolidated in policy and philosophy by the national department. According to Jansen (1997) the stimulus for syllabus revision in South Africa was to do away with a curriculum that was out-dated and that showed inaccuracies with regard to the reality of the racial grouping in the country. Secondly the revision was to integrate the different syllabi that each department had for the same subjects or learning areas. Furthermore, according to Hugo (2005), the new curriculum revision was to establish a curriculum that complemented the post-apartheid constitution. A curriculum was required that integrated across different subjects or learning areas, knowledge and skills, with an intention of integrating knowledge into the real life of the people of South Africa.

According to Hoadley (2011), South Africa has seen three different curriculum changes since 1994. Curriculum 2005 (C2005) was the curriculum introduced after 1994. The second reform was the review of C2005, which culminated in the introduction and implementation of the National Curriculum Statement (NSC) in 2002. The third reform that he identified was the review of the NCS in 2009, which gave rise to the Curriculum and Assessment Policy Statements (CAPS), which was implemented for the first time in the further education and training (FET) band in 2012.The FET band begins in Grade 10, which therefore means that CAPS was introduced into Grade 10 in 2012.

Hoadley (2011) stated that C2005 was introduced in 1997, being influenced by both local and global trajectories. Local trajectories meant the integration of education and training, whereas global trajectories entailed outcomes-based education and

competency- based curriculum. It was defined in terms of an educational transition from a traditional apartheid curriculum to an outcomes- based curriculum. Bertman (2012) explained that the committee that reviewed C2005 recommended thatC2005 should be streamlined, and that NCS should use clear and simple language in its articulation and explanation of curriculum objectives. The review ultimately culminated in a reduction of the learning outcomes per learning area.

Ono and Ferreira (2010) asserted that the curriculum transition in South Africa was unprecedented in the history of the country, and this reform exhibited a tremendous difference between the envisaged curriculum which was out-comes based education (OBE) and Curriculum 2005 (C2005), compared to what teachers were actually exposed to. It was argued by Jansen and Christie (1999) that teacher training was wholly inadequate for the successful implementation of OBE. A “cascade” teacher training model was utilised by the Department of Education, that is, according to assertions by Ono and Ferreira (2010). Leu (2004) explained that the cascading model is an effective way of passing down curriculum reform messages, for certain aspects, but it does not cascade on its own without being properly supported. According to Fiske and Ladd (2004), this cascading model of teacher training led to a misrepresentation of important curriculum reform details. Ono and Ferreira (2010) viewed this as one in many other factors that had hampered the implementation of the curriculum reform. This fact is further emphasised by Villegas-Reimers (2003), who argued that any reform that excludes teachers in its development is a recipe for disaster and will inevitably fail. Ono and Ferreira (2010) also pointed out that inadequate teacher development is not the only factor that can be blamed for a failed curriculum reform.

1.4 Context of the study

In this study, the researcher investigated the suitability of the prescribed and recommended time allocations for Physical Science in Grade 10 CAPS curriculum. More specifically with regards to how different teachers in the rural part of a district in the Eastern Cape utilize the recommended and prescribed time allocations in CAPS. Moreover, study investigates the suitability of the recommended and prescribed time

allocations to allow teachers to utilise different instructional methods in covering the Physical Sciences in Grade 10 CAPS curriculum.

The researcher has 8 years of teaching experience in Physical Sciences in a school located within the cluster in a particular district in the Eastern Cape where the study has been conducted. The district is a semi-urban area with certain clusters demarcated in deeply rural areas. The district is divided into 4 clusters and the study is focused on the deep rural segment of the district, with the schools classified as Quintile 1 and 2. Quintile 1, 2 and 3 schools are regarded as the poorest, graded according to the treasury national poverty tables. The quintile allocation of schools is determined by the poverty data index at ward level, as calculated by Statistics South Africa. Various factors are included in the calculation of the index of deprivation of the community that surrounds a particular school. The factors that are used include income and material deprivation, employment deprivation, health deprivation, education deprivation and living environment deprivation. It is also very important to note that the physical conditions of the school are not considered for the calculation of the index of deprivation.

The quintile allocation of the school can be amended if it contested successfully by interested parties. Moreover, due to the resource allocation that the schools in the low quintile ranks receive, calls have been made by many to do away with the system, as it is perceived as disadvantaging urban schools that cater for learners coming from nearby disadvantaged communities. Imperative to note is that the schools, in quintile 1 in particular, happen to be the more under- resourced in terms of provision of science learning resources and laboratories, and provision of computing laboratories. This is despite the fact that these schools are the ones which receive more funding per learner compared to other schools in high quintiles.

Furthermore, because of the vastness of the area learners from the schools in the area benefit from the scholar transport programme paid for by the government. The scholar transport is provided to learners who stay at homes that are more than 5km away from the school. Taxi owners are contracted to provide the necessary transportation services to the school, and schools have to monitor the transportation of the learners and provide the Department of Transport with the necessary administration capacity for the smooth running of the programme. In addition to the

learners benefiting from the latter programme, learners are also beneficiaries of the school nutrition programme. Under the school nutrition programme learners are provided with a meal during break time to ensure that no learner goes hungry during the school day.

The teacher racial demographics constitute historically Black South Africans, who are predominantly Xhosa- speaking, foreign teachers, mostly from Zimbabwe, and a few teachers of Indian ancestry. The road infrastructure is mainly gravel which is poorly maintained, making certain areas difficult to reach.

1.5 Rationale for the research

1.5.1 NSC results over 5-year period

The table below shows the performance in Physical Sciences at matric level in percentages.

Table 1: Trend in matric performance comparing national, provincial and district results

Year	National Pass Rate	Eastern Cape Pass Rate	District Pass Rate
2016	62	53	53
2015	56.6	64.9	60.6
2014	61.5	51.5	46.3
2013	67.4	49.5	52.8
2012	73	49.6	49.3

The table above shows pass rate trends for Physical Science at Grade 12 level. It is clear from the graph that the trend for the district under examination has been lower than the provincial and national levels thus the need arose to investigate some of the factors that influence results at Grade 12. In addition, the results for the districts are far lower than the national target of 60%, except for the year 2016, where the results were on par with the national target. These kinds of results compelled the researcher to consider the neglected aspect in science education research, which is the effects of prescribed and recommended time allocations on the overall pass rate in Physical

Sciences, particularly within the rural context, with limited material and human resources.

Below is the graph that shows the trends in Physical Sciences across the three levels, namely national, provincial and district level results.

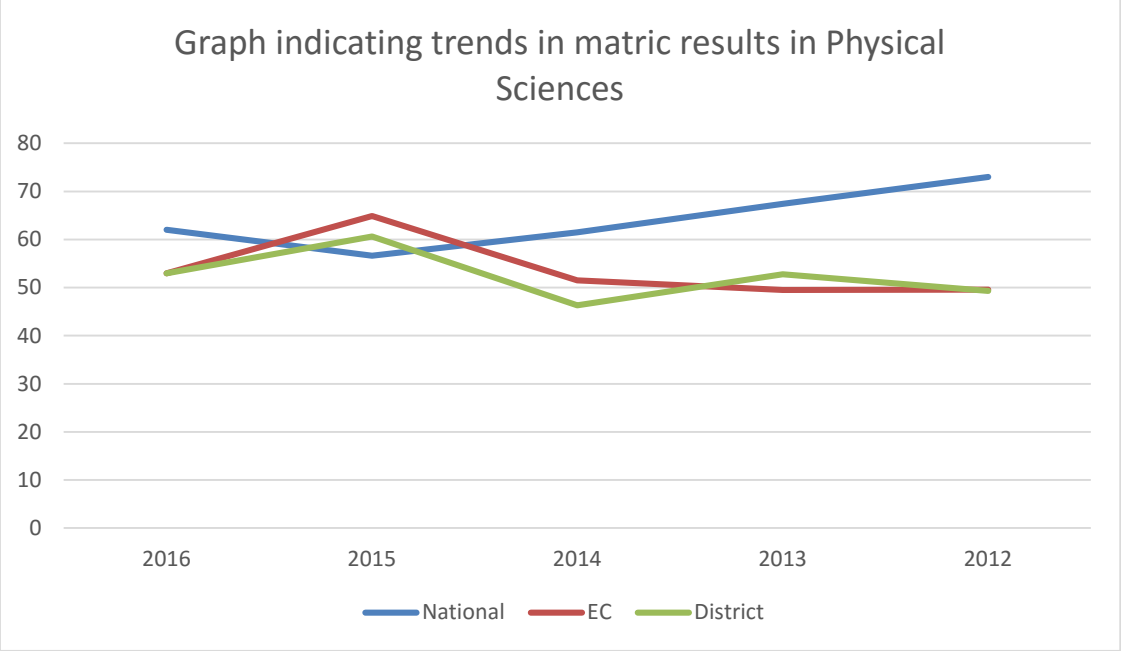

Figure 1: Graph indicating trends in matric results between national, provincial and district level

From the graph it becomes apparent that the national results have been on a downward spiral since 2012, except for 2016 which showed a spike in the results. However, the district results have always been below the national pass rate besides the year 2015, when they were marginally higher than the national results.

1.5.2 Issues brought out in the chief examiners diagnostic reports

The 2015 and 2016 diagnostic reports both indicated a concern that failure to cover the curriculum at Grade 10 and 11 was amongst the factors that contributed to the poor performance in Physical Sciences in Grade 12. The report argues that certain topics are not adequately dealt with in these grades hence the negative impact on the final matric results for the subject in grade 12.

1.6 Research problem

In South Africa there has been an outcry about the implementation of the Revised National Curriculum Statements (RNCS), which lead to the Minister of Basic Education appointing a ministerial task team (MTT) that was given a mandate to investigate and make recommendations on the RCNS. The Minister of Basic Education asserted that, to address barriers in teaching and learning, teachers should utilise different curriculum differentiation strategies such as those included in the Department of Basic Education (DBE) guidelines for inclusive education (DBE, 2011). In addition to this the minister argued that physical sciences should promote knowledge and skills in scientific inquiry and problem solving, the construction and application of scientific inquiry and problem solving, and the application of technology knowledge. The minister then went further to encourage a better understanding of the nature of science, technology, the society and the environment (DBE, 2011).

The DBE (2011) document further stated that practical work must be integrated with the theory to strengthen the concepts being taught. It is stated in the DBE (2011) document that the practical work can be in the form of a practical demonstration, an experiment or an investigation. It is this view by the minister that leads one to be curious of and to investigate the suitability of the recommended and prescribed time allocations to allow teachers to utilise different instructional methods in their teaching of grade 10 Physical Sciences.

Lunnetta and Hofstein (1991) suggested three ways in which teachers could teach physical science at schools. They argued that teachers can first explain theories, principles and concepts prior to engaging learners with practical work. The second way is to engage learners in practical work, prior to teaching theories, principles and concepts. Thirdly, they argued that the teacher can simultaneously allow learners to engage in practical work whilst the teacher engages with theories, principles and concepts of the observed phenomena.

In addition to the above, Lunnetta and Hofstein (1991) asserted that different activities lead to different performances of learners in classrooms. Furthermore, they argued that there are huge differences in learning and teaching techniques from one

teacher or school to another, that certainly affect learning outcomes, and these differences should be scrutinized and reported in studies involving use of practical work. We can further extend this view beyond practical work and look at the implication of employing these strategies in teaching and how they are affected by time allocations. They argued that some teachers follow deductive reasoning to draw connections between the data collected during practical work and the concepts and skills earlier learnt in class. This has important implications as to how teachers approach their lessons to enhance learners' understanding of the concepts being taught and consequently their learners' achievement of the learning outcomes.

The researcher noted that, since the inception of the curriculum and assessment policy statements (CAPS) in 2012, there has been an outcry by teachers about their ability to adhere to the recommended and prescribed time allocations in CAPS. This study examined how suitable these time allocations are in accommodating a diverse range of teaching strategies that teachers may employ in their classrooms. The Department of Education (2003) policy document advocates that Physical Sciences ensures that the historical imbalances are corrected or at least mitigated by ensuring that

(i) Learners are given the capabilities to work scientifically.
(ii) Awareness and curiosity about the world they lived in is deepened, through interest in their natural and physical world.
(iii) The skills and attitudes necessary for their employment and entrepreneurial skills are adequately prepared or developed.
(iv) They are empowered with an understanding of the correct application of technology, ensuring responsibility towards the social, human, environmental and economic developments of our country and the global community.

These are particularly important ideals that require that learners be properly taught and afforded ample opportunities to exercise these skills and perfect them. Therefore, it becomes imperative to probe the implications of and impact that the recommended and prescribed time allocations in CAPS have on the achievement of these ideals. In particular, having noted that South Africa is a country dominated by

inequality and class structures, a need to probe the extent to which these ideals can be realised within a rural context becomes of paramount importance.

1.7 Research question

Given the research problem identified in 1.5 above, this study was directed at answering the following research question:

How suitable are the time allocations in CAPS in accommodating a diverse range of teaching strategies that teachers employ in their Grade 10 Physical Sciences classes?

In order to address the above main research question, the following research sub-questions will be answered:

1. What were teachers' perceptions of the prescribed and recommended time allocations in CAPS for the Grade 10 Physical Science in a rural education cluster of a district in the Eastern Cape Province?
2. What was the education management perspective of the effect of the CAPS time-allocation on the teaching of Physical Science?

1.8 Significance of the study

Morrow (2007) argued that there is a deep disparagement about the significance of learning. He stated that underachievement happens in almost all schools, and is attributed to learner laziness. He furthermore argued that different teaching strategies can change learners' thoughts and provide learners with new perspectives with regard to learning. Consequently, it suffices to investigate how teachers are utilising the different teaching strategies and how there commended and prescribed time allocations in CAPS affect their ability to follow a particular teaching strategy.

According to Jay (1999) some problems in education maybe specific and explicit, such as when teachers identify a curriculum that is not working for their learners, and

discover that they somehow need to make a change; alternatively, some problems may not be so explicit, for example, in situations where teachers may feel there is some level of resistance emanating from the learners, and the reason for such resistance may not be immediately identified. This view is important since teachers need to reflect on how the recommended and prescribed time allocations are impacting on their teaching and the learners in their classroom.

Furthermore, Van Den Brink (1990) contended that the curriculum developers need more information than a simple remark that the curriculum being researched is workable. According to him there are three questions that ought to be asked during curriculum development, namely: Which criteria must be met? Which criteria will suffice? Which criteria are already satisfied? He further proposed three evaluation stages during curriculum development namely:

(i) When the developers design the curriculum, they have to ascertain quickly the type of material they are producing, whilst other factors that have an influence on the curriculum are being ignored. He identified these factors to be, amongst others, teacher and learner aptitude, motivation, the environment in which learning and teaching occurs, and pedagogical understanding of teachers.

(ii) The piloting of the prototype curriculum is crucial to ascertaining that the desired outcomes can be achieved.

(iii) Then finally, the curriculum is produced as a product for implementation.

Therefore, the study could be significant for the following reasons:

(i) To identify the challenges that teachers face in adhering to the time allocations

(ii) To influence policy makers and powers that be in education to consider contextual factors when designing the curriculum.

(iii) To assist curriculum managers and those who have an interest in education to better plan their interventions.

1.9 Structure of the thesis

CHAPTER 1: Rationale of the study

This chapter deals with the rationale of the study by looking at the background of the study. It then looks at the curriculum changes and developments since 1994 to date. Furthermore, the chapter outlines the context of the study, leading to the research question, and finally explains the significance of undertaking this study.

CHAPTER 2: Literature review

This chapter looks at the literature that expounds on the theoretical framework that underpins the study, namely reflective practice, pedagogical content knowledge and curriculum reform theories. In addition to the theoretical frameworks, the chapter also deals with literature that looked at studies on classroom based science teaching and learning.

CHAPTER 3: Methodology

This chapter discusses the methodology followed in conducting the study. The sampling technique followed is explained in detail, and the research data collection plan is expounded upon. Secondly the research instruments used, which are questionnaires and interviews, are explained. The types of questionnaires and interviews are explained and the advantages and disadvantages of each type are also discussed. A motivation for the use of each type of instrument is provided.

CHAPTER 4: Findings

This chapter discusses some of the major findings that emanate from the data. The trends and patterns are interpreted and substantiated with quotes from the data sources, namely the questionnaires and interviews that were collected using the techniques mentioned in Chapter 3.

CHAPTER 5: Discussion

This chapter provides a detailed discussion of the findings and substantiates these findings with the relevant literature that either disproved or agreed with the findings. The researcher's voice is put as the discussion follows an interpretive stance. The findings, as discussed in Chapter 4, are given meaning from the lenses of the researcher.

CHAPTER 6: Conclusion and recommendations

This chapter provides an overview of the study by giving a brief description of the chapters in the study. It further outlines the major finding emanating from the study and the implication thereof. Moreover, the chapter then discusses recommendations for future studies and further suggests recommendations for teaching and learning within a rural context. Finally, the chapter closes by describing the limitations of the study.

List of References

A detailed list of references quoted and cited in the text is given.

1.10 Summary of the chapter

This chapter provided the rationale for the research problem by describing the background and context in which the study was conducted. The research problem and its research question are also outlined. The research problem is unpacked and explained, leading to the research question. The significance of the study and the outline of the structure of the thesis are prefaced. The structure of the thesis is highlighted by giving a brief description of what each chapter in the report entails. The next chapter will provide the theoretical basis of the research, by describing the theoretical framework and a review of literature on studies on classroom- based science teaching and learning.

Chapter2

Literature Review

2.1 Introduction

This chapter provides a detailed study of the literature within the field of science education, especially with regard to time allocations. It further discusses the reflective practice and curriculum reform theories as theoretical foundation which underpins the study. The pedagogical content knowledge (PCK) is also explored as a theoretical framework that underpins the study.

2.2 Theoretical frameworks

This study is underpinned by the theories of Reflective Practice (RP), pedagogical content knowledge (PCK) and Curriculum Reform (CR). Hereunder the theories are discussed in detail and how they influence the study at the methodological level.

2.2.1 Reflective practice

The first theoretical framework that underpins the study is the theory of reflective practice. According to Greenwood (1993), reflection is when the practitioner considers what he is doing, whilst busy doing it. He further suggested that the consideration can be stimulated by surprise. On the other hand, Patil (2013) viewed reflective practices as the means to which one engages in a process of on-going learning and developmental awareness whilst paying attention to the practical values and theories. He sees it as an instrument that practitioners may utilise to gauge their professional development and improvement and their practice- based professional learning. This is consistent with Osterman & Kottkamp (1993) who defined reflective practice as a means by which educators can develop a deeper level of self-awareness about the nature and impact of their performance, an awareness that creates opportunities for professional growth and development.

This definition of reflection above is consistent with Schon's (1983) definition of *reflection-in-action*. This type of reflection affords the practitioner the opportunity to redesign the task at hand whilst doing it. It refers to the process of interpretation,

analyses and yielding alternate solutions to the task at hand at the time it occurs. It entails assessing the teaching scenario as it happens, evaluating its level of effectiveness with regard to the learners' understanding of the work and the paying of attention to the theories being used (Nyaumwe & Mtetwa, 2011). In addition, van Manen (1991) defined "reflective-in-action" as the interactive reflection that affords the practitioners an opportunity to respond immediately to problems or situations that they are confronted with. He views it as a *stop-and-think* process that allows practitioners to make decisions on their feet. This, according to Beck and Kosnik (2002), means that forgetting what happened during the lesson is averted and an immediate remedy is provided as opposed to waiting for future remediation.

Furthermore, Larrivee (2008) and Korthagen (2004) have placed emphasis on the role reflection can play in improving the professional development of teachers. In Physical Sciences teaching a need arises to ensure that reflection on teaching activity is not a lip service, but rather, teachers are actively evaluating their own teaching practice. Educators need to reflect on the time they have spent on the activity and how this has affected their intended outcomes, what Schon (1983) refers to as reflection-on-action. He defines reflection-on-action as a process whereby the practitioner intentionally recalls a specific event/action after it has occurred.

Moreover, Day (1999) contended that reflection-on-action is a systematic process that knowingly allows for analysis, reconstruction and re-framing of past actions/events to plan for future events. He goes further to suggest that reflection-on-action may lead to productive collaborations, with regard to planning for future, as it allows for interaction with other practitioners. These views are also in agreement with Butler(1996); Pinksy, Monson and Irby(1998), who also contended that reflection-on-action is a process where teachers look back on past events, analyse their strengths and weaknesses, interrogate their teaching techniques and place challenges where found, and in addition, suggest solutions and future directions that their teaching might follow.

Patil (2013) provided that, within the educational context, reflection refers to the process in which the teacher studies his own teaching methods, and identifies the best practices. This includes considering the ethical consequences of the classroom procedure on learners. Within the context of this study, this view has implications, as

time allocation and the failure to cover the syllabus have ethical implications on the side of the teacher.

Boud et al. (1985) stated that reflection is an important people endeavour, in which individuals relive their personal experience, rethink about it, reconsider it and evaluate it. They view experience as crucial to learning and teaching. On the other hand, Dewey (1933) provided three qualities of reflective people, namely, that they are open-minded, they exercise restraint, and they show devotion. Dewey (1933) explained that open-mindedness is the ability to listen to both sides of the issue, paying more attention to alternatives and acknowledging that traditional beliefs are also subject to scrutiny. He also viewed responsibility as ones' aspirations to probe for truth and the application of the information gathered to solve problems. He further argued that wholeheartedness refers to the individual's ability to deal with fears and uncertainty to effect change and evaluate one's practices, that of children, school and society.

On the other hand, Larrivee (2008) considered four (4) levels of teacher reflection; firstly *pre-service level*, which he argued to be the level where the teachers only consider the classroom situation, and ignore all other factors that can have an effect on learning. Secondly, he identified *surface reflection level*, which he described as the stage where the teacher is preoccupied with tactical issues necessary to achieve the predetermined outcomes and standards. He termed his third level, *pedagogical reflection level*, which he argued to be a level where the teacher takes into consideration how his classroom practices are affecting learners or learning and how to improve such practices. Lastly, he identified the *critical reflection level.* He described critical reflection as, on-going and critical inquiry of one's teaching, considering the philosophy and ideologies that inform practice. In this study the third and fourth levels of Larrivee are more relevant, as the teachers' approach to teaching and the philosophy and ideology on which CAPS is based can have implications for learners and/or learning in general. According to Day (2001) reflection involves the practitioners' critique of his practice, in accordance to the values espoused in his practice, regardless of whether they are implicit, personal, social, and institutional; and the policy context in which practice occurs; as these have implications for the improvement of one's practice.

Ferraro (2000) further argues that, by acquiring a better understanding of one's own practices through reflection, teachers can be more effective in their teaching. Harris (1998) argued that for teaching to be effective it needs teachers to be continuously engaged in reflective practice. Similarly, Leachy and Corcoran (1996) viewed effective teachers as those teachers who are reflective of their practices, beliefs, values and are able to identify options availed to them, and take into cognisance their professional values. In addition, they view effective teachers as those who make conscious choices that improve the quality of their work and ensure that such choices maintain their effectiveness.

However, reflective practice is not without its challenges as Osterman and Kottkamp (1993) argued that emotions of practitioners have a significant effect on reflection, due to the fact that they cloud our understanding and decision- making capabilities. The point above is also argued by Hargreaves (1998) as he viewed teaching as an emotional endeavour. Contrary to the views expressed above, Day (1999) contended that, to disregard emotions in reflection on, in or about teaching and learning, leads to a failure to understand or appreciate the impact on the quality of classroom experience for both teachers and learners. Whereas Zembylas (2007) argued that utilising pedagogical knowledge depends on the practitioner's emotions, experiences and attitudes are as a direct consequence of these emotions, which end up influencing the classrooms' emotional environment.

Plummer & Krajcik (2010) suggested that to improve teaching and learner understanding of scientific concepts, teachers should identify learners' conceptions prior to teaching and after teaching. They argue that teachers armed with this understanding can develop better plans for long term teaching, when they know what conceptual aspects their learners find to be challenging. Steyn (2008) suggested that it remains the responsibility of each teacher to experiment continually, reflecting with deliberation on what transpired as a result of his or her individual effort; collective team effort with colleagues could improve practice by reflecting on their whole school system within the school and the school context.

Henke (2002) as cited in Jacobs (2013) proposed a reflective cycle that teachers can utilize when embarking on reflective teaching. The diagram below shows the steps in the Henke (2002) proposition about reflective teaching:

Figure 2: Henke (2002) steps in reflection cycle

The first step in the cycle suggests that the teacher embarks on teaching a particular lesson. The second step directly follows the first step, with the teacher thinking back about the teaching and learning process. The teacher follows to the third step where the teacher would either verbally or in written form describe in detail the aspect of the lesson or topic that the teacher wants to reflect on. The fourth step involves the teacher in an investigative mode, wherein the teacher would probe deeper into what actually transpired during the lesson, why it occurred and how it can be improved or modified. In this step the teacher can question his or her own attitudes and beliefs and how they had impacted on his/her actions. The fifth step comprises the teacher using multiple theoretical frameworks to objectively interrogate multiple perspectives and opinions about his or her actions. The sixth step involves the teachers' generation of different understandings that underpinned his teaching, and from this step finally deciding the best cause of action and the approach by which to confront the situation in future, as a final step.

Jacobs (2013) suggested a repertoire of reflective tools, after making an assertion that reflective teaching should raise the teacher's awareness as its primary objective, implying that teachers should be aware of their shortcomings, since most teachers cannot realistically and objectively identify their own weaknesses. In order for teachers to raise their awareness, they ought to employ the tools and techniques suggested below:

(i) They must engage fellow colleagues, and form reflective partnerships where they observe and critique each other constructively.
(ii) Foster a spirit of collegiality where they embark on reflection as a group.
(iii) Take videos of their lessons and view themselves in action.
(iv) Arrange for colleagues to visit their classes and observe their teaching.
(v) Formulate or use the schools' assessment or observation forms to evaluate their teaching.
(vi) Allow learners to complete subject or teacher evaluation forms, in order to gain information about the views of their learners with regard to their teaching.
(vii) Teachers should assume the role of *teacher as researcher* and embark on action research in their classrooms.

2.2.2 Pedagogical Content Knowledge (PCK)

Pedagogical content knowledge, according to Shulman (1987), is the instructional representation of subject matter knowledge by transforming that subject matter into useful forms. These can be used by diverse groups of learners who have different strengths and socioeconomic contexts. Adadan & Oner (2014) argued that pedagogical content knowledge is a trait or skill that is practised by educators and distinguishes science educator from other science practitioners. It is argued that different researchers have identified the constituent parts of PCK in relation to their beliefs, agendas and empirical evidence. According to Shulman (1987), pedagogical content knowledge has two main characteristics, namely

(i) Knowledge is viewed as a form of instructional strategy, and

(ii) Knowledge of learners' challenges to learning, with regard to a specific content area.

Magnusson et al. (1999), on the other hand, viewed pedagogical content knowledge as transforming different types of knowledge in order to teach. They categorized these knowledge types into the following:

(i) Subject matter knowledge
(ii) Pedagogical content knowledge, and
(iii) Awareness of the learning context.

In addition, Magnusson et al. (1999) viewed subject matter and pedagogical content knowledge as developmental sources for PCK rather than elements of PCK. They, furthermore, modelled PCK around five (5) main interactive themes, namely:

(iv) Science teaching orientation
(v) Science curriculum knowledge
(vi) Understanding the learners' understanding of science
(vii) Assessment knowledge
(viii) Instructional strategies knowledge

The last four components of the model are perceived to be strongly linked to the orientation for science teaching. It was argued by Magnusson et al. (1999) that orientation towards science by educators influence their teaching decisions, the way in which they design their class activities, the content they put on assignments, how they evaluate their learners understanding and the use of curriculum resources. The emphasis is on combining the content knowledge and how the content knowledge is presented to learners.

Adadan & Oner (2014) contended that different components of PCK develop simultaneously, such as knowledge of learners' understanding of science and the educators' instructional strategies. This indicates that there exists a strong relationship between the three components of PCK, namely orientation towards teaching of science, knowledge of learners' understanding of science and the teaching strategies.

According to Chantaranima & Yuenyong (2014) PCK is regarded as complex and complicated given the different interpretations to which the basic conceptualisation of PCK theory was exposed. The theory of PCK is prone to different interpretations by different scholars, as it is varied and diverse.

2.2.3 Curriculum reform

Kanjee, Sayed & Rodriguez (2010) examined the factors of curriculum reform that had an impact on educational quality. The factors include, amongst others, core and optional subjects, distinguishing between subjects and learning areas, new focus or concentration areas, pedagogies for learning, and finally the role of teachers. In relation to the core subjects against optional subjects Kanjee et al. (2010) conceded that core subjects are dependent on the specific needs of the country implementing the reform. However, they argued that within this broad spectrum of subjects, policy-makers must consider issues of relevance, accessibility, and equity whilst setting their priorities clear. This, they argued, implies a consideration of what is basic necessity, weighed against what is an absolute necessity versus what is desired. In line with the above they deduced that issues of balanced cognitive development, the development of skills and values, consideration of limitations in implementations, and ensuring responsiveness to the economic and human needs a person should keep in mind. In South Africa the CAPS document offers a selection of subjects and optional subjects, at further education and training (FET) level, in which Physical Sciences is an optional subject beginning in Grade 10.

In distinguishing between a subject and a learning area, they argue that a subject emphasizes focus on well-established bodies of knowledge, whereas a learning area cuts across the different subjects to explain a particular phenomenon. The natural sciences, offered in the general education and training (GET), which incorporates Grade 7 to 9 in South Africa, builds the base of Physical Sciences in its two strands, namely Matters and Materials, and Energy and Change.

With regard to new focus or concentration areas, they contend that these are topical issues that are critical to society. For instance, issues such as human immunodeficiency virus (HIV), environmental sustainability (ES), indigenous knowledge system (IKS), politics and civic rights. They argue that such issues should

not overcrowd the curriculum. The CAPS curriculum considers this aspect by mandating that issues of HIV, IKS and ES should be incorporated into teaching. The CAPS documents state that IKS is used to express challenges that confront society. IKS, according to the CAPS document, is that knowledge that generations have been passing on to younger generations, which acts as a source of innovation and development. Furthermore, the document emphasizes that concepts of IKS can be explained utilizing the scientific method, whereas it is sometimes not explained in this way, but nonetheless this is still regarded as knowledge worth teaching to learners.

In addition, according to Bhaktawar (2013), the implementation of the curriculum in 2012 focused on Grades 1, 3 and 10. They suggested that CAPS is a single, concise and comprehensive curriculum which has substituted three policy booklets and which explains the curriculum in the National Curriculum Statements (NCS) Grade R to 12. The booklets substituted are, namely, the learning area statements, learning programme guidelines, and subject assessment guidelines. Furthermore, they explained that CAPS was to be phased in over three years, beginning in Grades 1, 3 and 10 in 2012, then progressively in Grades 4 to 6 and Grade 11 in 2013. In 2014 the CAPS would then have been implemented in Grade 7 to 9 and Grade 12 (ibid). Bhaktawar (2012) argued that introducing CAPS would result in a single, concise and comprehensive curriculum that would ensure that teachers were provided with a policy document with information on what to teach and assess on a grade-by-grade basis, and subject-by-subject basis. He suggested that the review of the curriculum is aimed at reducing the administrative workload on teachers, give teachers clear guidance and maintain consistency for teaching.

2.2.4 Studies on classroom based science teaching and learning

2.2.4.1 Practical Based Science Teaching and Learning

Different arguments have been advanced with regard to practical based science teaching and learning in schools, both domestically and internationally. One such assertion is advanced by Tobin (1990) who argued that effective learning is possible

in the science classroom if the learners are given a chance to work with the equipment and materials in an environment suitable for them to make up their own knowledge of scientific phenomena and related scientific concepts. Furthermore, he asserted that, in general, research has not provided evidence that such opportunities are offered in school science. Roth (1994) argued that even though laboratories have long been identified for their potential to facilitate the learning of science concepts and skills, this potential had yet to be exploited fully. Research conducted in South Africa by Makgato (2007) discovered factors that led to poor performance of learners in Physical Sciences in South Africa. He categorised these factors as being a lack of practical work in schools, coupled with inadequate teacher knowledge in Physical Sciences. The observation about the lack of practical work confirmed the assertions by Roth (1994) that the potential of practical work is not taken advantage of in science classrooms.

According to Melville, Campbell, Fazio, Stefanile & Tkaczsyk (2014), historically, science and science education are in opposition with science inquiry or the way science is practiced. They defined science inquiry or practice as two-pronged, namely as

(i) an understanding and abilities that learners should acquire and master, and

(ii) as processes that go with the teaching and assessment approaches that move toward scientific inquiry.

Melville et al. (2014) argued that teachers' biographies that teachers bring into their teaching, dictate their choice or mode of teaching. That is whether they follow the transmission approach to their teaching of science or the teachers opt for a more inquiry or practical work based approach to their teaching. Teachers' biographies are defined as the teachers' experiences that include the teachers' past personal experiences, including critical moments in the teachers' lives, which ultimately shape and inform their teaching practices. They argued that the teacher default position to their teaching is mainly the way the teacher has been taught whilst he/she was a learner him/herself. They contended that if this culture is left unchanged or unchallenged, teachers will unconsciously reproduce the cycle of teaching that is dominant within that teaching community. They argued that teachers who are

challenged about their past experiences in teaching might be exposed to new challenges that might create tensions with their traditional practices, such as:

(i) insufficient understanding of practical work,
(ii) misunderstanding of the nature of science and therefore possible limitations on their potential collection of teaching skills
(iii) lack of experience with different forms of practical teaching approaches or methods
(iv) Lack of syntactic and substantive content knowledge

Garvin-Doxas and Klymowsky (2007) also argued that learners should leave a science lesson with an understanding of key science concepts and with deeper levels of evidence- based scientific constructs, rather than purely memorised scientific knowledge. Plummer and Krajcik (2010) suggested that scientific ideas should be introduced in their simplest form, in such a manner that in the long run, big scientific concepts can be understood; whereas Seng and Hill (2014) argued that approaches to teaching science must involve active participation of learners in the scientific dialogue process. Furthermore, they argued that teachers must be conscious of the methodological impediments that influence classroom dialogue, so that they may improve the outcomes of science learning. Melville etal. (2014) asserted that teacher practical knowledge is a subjective phenomenon, which includes the teachers' experiences such as feelings, judgements, willingness and action.

Gallegos-Cazares, Flores-Camacho, Calderson-Canales, Perrusqua-Maximo and Garcia-Riverra (2014) provided suggestions for science to be implemented in a practical way. They suggested that the following considerations be taken into account, in order to create a practical- oriented science classroom environment:

(i) Transformation of the classroom by introducing a dedicated science space
(ii) Transformation of the teaching-learning process to make it more collaborative
(iii) Introduction of materials needed to carry out the activities
(iv) The proposal of activities that entail reflection
(v) Data recording and analysis to reproduce the process for building scientific thinking in students.

2.2.4.2 Physical Science teaching and learning strategies

Staver (2007) asserted that learners of science must learn to do scientific enquiry and be able to use scientific knowledge to decide about how science affects their personal life, career choices and their societies. He argued that in order for teachers to do this, they must avoid teaching science as a series of lectures and the reading of assignment on the existing scientific knowledge. Furthermore, he argued that teachers must focus their teaching on the core scientific knowledge, whilst also increasing the emphasis on scientific inquiry as their teaching strategy. It is therefore important that learning environments reflect the intellectual rigour, attitude, and social values that characterize the methods scientists and mathematicians apply (Brown & Campione ,1994).

The CAPS document DBE (2011) states that physical sciences should promote knowledge and skills in scientific inquiry and problem solving, the construction and application of scientific inquiry and problem solving and the application of technological knowledge. In the foreword of the document the minister then goes further to encourage a better understanding of nature of science, technology, the society and the environments. The DBE (2011) document further reads that practical work must be integrated with the theory to strengthen the concepts being taught. It is stated in the DBE (2011) CAPS document that practical work can be in the form of a practical demonstrations, experiments or investigations.

Tobin and Fraser (1991) argued that one of the teacher's primary roles is developing learners' independence by using effective management strategies. The teachers are accountable for meeting curriculum requirements in their schools. So instead of allowing students to determine curriculum content on their own, the teacher sets instruction on the curriculum to be covered. While the teacher chooses the knowledge areas, learners should be encouraged to nominate specific topics within knowledge areas (Brown & Campione, 1994).

Contrary to the views expressed above, the curriculum and assessment policy statement in its current form, prescribes to teachers. By so doing it takes away the

autonomy of teachers to choose content suitable to their learners, which should take into account the contextual factors under which these teachers are teaching. One may argue that these contextual factors include, amongst others, the availability of laboratory space, and the equipment at their disposal for effective teaching of science. Over and above these, the type of community from which the learners come and the type of parenting that the learners are receiving, particularly with regards to the literacy levels of the parents or guardians who are responsible for the daily monitoring of the learners, are important factors too.

In view of this fact, Tsanwawi, Harding, Engelbrecht and Maree (2014) also argued that circumstantial factors that include the environment at the home of the learner, the level of education of the parents and their income, the teachers' knowledge about pedagogy and the schools' approach to teaching and learning strongly influence learner achievement. Furthermore, Tsanwawi et al. (2014) contended that the attitude of the learners and the learners' work ethic definitely affects the achievement of the learner. Tsanwawi et al. (2014), however, explained that these factors are generalisations and there are exceptional cases where learners do perform better under difficult circumstances; there are also schools which perform and produce results despite the many challenges that confront the schools.

Furthermore, in most science classrooms the issue of barriers to learning are often neglected.

2.2.4.3 Science Learning Styles

According to Paris and Winograd (1990), an effective learner is a learner who engages in more planning than a poor learner. Effective learners not only know a lot about learning, but are also motivated to be effective learners. Effective learners know how to use a variety of study skills and learning to reach a particular goal (Paris & Winograd, 1990). Learning strategies are defined as the behaviours and thoughts that learners engage in either prior to, during, or after performance of a learning task and which are intended to facilitate information (Monteith & Nieuwoudt, 2012). Paris and Winograd (1990) argued that there are two variables considered to be of utmost

importance for effective learning, namely self-efficacy and attributions. According to Schunk (1994) self-efficacy is defined as the learners' beliefs about their own abilities to organise and carry out their actions sufficient to attain their desired performance and set outcomes. Self-efficacy is viewed as contributing towards the learners' choices about their learning activities and the effort they are willing to invest in completing assigned tasks.

Biggs (2001) explained three approaches to learning utilised by learners, namely (i) surface approach (ii) deep approach and (iii) achievement approach. He defined the surface approach as a learning strategy where the learner's motivation to learning is due to an external factor, such as graduating and getting a job after one's completion of studies. This, he said, leads learners to rely on rote learning rather than the meaning of information, and this encourages learners to treat concepts as a series of unrelated topics or tasks.

The deep learning approach is defined as that where the learner is more focused on the subject matter of the task. This type of approach to learning leads learners to maximise their understanding of the concepts, since the learners view activities as personally interesting. A learner utilising this strategy goes on to read widely about the concepts learnt and discusses them, as opposed to focusing on literal meaning of the concepts (Biggs, 2001). The achievement approach to learning, according to Biggs (2001), is that where learners are motivated by achieving higher levels of achievement and test marks. A learner following this approach is the one that plans ahead, works neatly and systematically, and allocates time to the activities based on their mark earning potential.

Contrary to the argument advanced above, Daniaa, Fitzgerald and McKinnon (2013) argued that developing countries have been seeing a decrease in the number of learners showing interest in science, beyond the class levels where science is a compulsory subject at secondary school. They argued that the curriculum offered at schools in these countries is viewed by many learners as irrelevant to their personal needs and future endeavours. They contended that the science curricula in these developing countries are meant to drive a few gifted science learners towards being scientists at the expense of the majority of learners. The consequence of that, they maintained, is that more learners shy away from science or perform badly.

Danaiaetal. (2013) further asserted that science curricula should yield two outcomes namely

(i) As opposed to merely teaching learners to learn science concepts and accept them as absolute truth, science learning should empower learners to be able to question scientific knowledge, adopt their own investigations about phenomena that interest them, and build their knowledge about current developments in the scientific arena.

(ii) Once the learners are able to deal with science as suggested in the paragraph above, they would be able to take responsibility for their scientific development and be able to make informed scientific decisions.

2.2.4.4 Use of ICT as time management tool in science education

Mokhele and De Beer (2007) argued that the main discourse in South Africa with regard to information and communication technologies (ICT) access is that many people live in poverty and this has created a digital divide across the citizenry. They contended that the populace in rural areas and disadvantaged parts of the country have limited access to electricity and telephone cable lines, and furthermore the biggest barrier to access of ICT is the exorbitant price payable for internet connectivity, and the lack of technical ICT skills to ensure maintenance of the ICT infrastructure. Lastly, they identified the small number of computers in schools that have internet connectivity as another barrier to access to ICT. Hence giving teachers laptops will assist in bridging the divide, thus eliminating the problem of ICT scarcity.

Miller (2013) suggested that teachers, when deciding to use ICT in their teaching, should place focus on one skill, and they argue that use of technology should be planned properly for a specific outcome. In so doing, the teacher needs to be aware of the learner skills level, and plan accordingly. Furthermore, they suggested that the teacher gradually introduces technology based on the learners' abilities to engage with the require technology. For example, when utilizing Facebook as a medium for extended instruction, teachers should ensure that learners are able to setup email, use the emails to open Facebook accounts, and assist learners with locating

Facebook groups that deal with Science content. They provide for the following checklist in order for teachers to use ICT effectively in the classroom.

Checklist for use of ICT in classroom

Technology being used	**List of requirement**
Computers	There should be enough computers for every learner in class
Internet	• The internet traffic is able to accommodate the number of learners that would be logged in during the period. • Enough data is provided for learners to complete the required tasks. Eg. Sufficient WiFi. • In the event that not enough data is available the websites should be downloaded and stored for offline access.
Printers	• Printers should be fed with enough toner and paper to enable learners to print freely. • Each printer is properly installed to each computer available. • Each learner is given the specific amount of printing credits required for the lesson
Seating	Adequate seating should be available in the computer room.
Software	Software required to view documents, such as pdf and others programs, is installed on the computers.
Speakers	Speakers should be audible enough to ensure that the sound reaches every corner of the room.
Storage	There should be enough storage space in order for learners to store their work on the computer. If such space is not available external storage devices should be utilized to store learners work.

In addition, Miller (2013) advised that schools that have a challenge with data cost or wanting to save on data may use Httrack, a software utility that allows one to download an entire website for offline viewing.

Another challenge pertaining to the use of ICT is the issue of plagiarism. Miller (2013) contended that plagiarism is the use of information obtained from the internet and other sources without acknowledgement. Learners should engage with the material they receive on the internet and other sources and paraphrase it in order to find their own voice. This implies that teachers have to do their best to verify information to prevent plagiarism. To prevent plagiarism, teachers can utilize a software package such as *Turnitin* to check for plagiarism.

2.2.4.5 Impact of time on teaching and learning

According to Aronson, Zimmerman and Carlos (1998), for learners to be competent with the challenging curriculum content, they need more time to cater for the learners' diverse learning styles. They argued that allocated time for studying is not a helpful measure of examining the relationship between time and learning. Furthermore, they asserted that studying time allocations neglects to examine how schools, teachers and learners are using time and the quality of teaching activities.
They further maintained that learning time in schools is often taken away by other factors, which include, amongst others,

(i) poor classroom management,
(ii) disciplinary activities,
(iii) ineffective teaching strategies
(iv) inappropriate curriculum and
(v) learner absenteeism.

However, Allison (2011) argued that implications for insufficient time frames include: mass failure, continuous examination malpractices in internal and external examinations, learners develop negative attitudes and phobia for the subject,

deepens the falling standards, aims and objectives are lost, and gaps are created in learners' understanding.

2.2.4.6 Assessment

According to Nieuwoudt and Reyneke (2013) assessment is an integral part of teaching and learning. It has different phases that span from planning the assessment, implementing assessment, interpretation and utilization of assessment information for any other intended purpose. An assessment plan, according to Nieuwoudt and Reyneke (2013), ought to be drawn up for the whole year, for each particular grade and specific subject. This assessment plan should show formal and informal assessment tasks that are completed for each subject for each grade. They argued that each teacher should have his or her own daily assessment plan that he or she has to implement in each classroom and grade, after the teacher has made a thorough consideration of the purpose of each assessment task.

The plan should ensure that there is fair balance and weighting for different tasks. Furthermore, they argued that in implementing CAPS the teachers should employ different assessment methods and tools to test skills, attitude and values espoused by CAPS on the specific subject. This is done because different learners employ different learning strategies and styles, hence the difference in performance levels and understanding. This ought to propel teachers to employ different assessment methods to give learners ample opportunities to demonstrate competence and understanding.

In addition, Nieuwoudt and Reyneke (2013) argued that in conducting assessments teachers should gather and record information as learners' complete assessments using various types of assessment, tools and methods, ensuring that each task provides a learner with an opportunity to demonstrate competence and understanding. They stated that these assessment records and information about the learner performance, illuminates a reflection about the acquired knowledge, skills, attitudes and values. These records and information ought to be interpreted to extrapolate information that can be utilized to inform the teacher about the successfulness of his teaching strategies.

The gathered information should assist the teacher to improve teaching for improved learning outcomes. It should, furthermore, provide the teacher with a lens to identify the learning behaviour of his or her learners, and thus provide the learner with specific and targeted feedback, with regard to the learners' performance. This feedback presented to the learners should be timely and relevant to encourage learners to be responsible for their educational development, by giving them guidance with regard to the gaps in their understanding and the steps they ought to follow to remedy and close the gaps in their understanding.

The purpose of assessment is achieved when the teacher exhibits clarity for the underlying issues they seek to achieve when embarking on learner assessment. Such awareness leads the teacher to a well- suited choice between summative and formative assessment.

2.3 Summary of the chapter

The chapter entailed a deep review of the literature that highlights the theoretical frameworks that underpin the study. The chapter described in depth the theories of reflective practice, pedagogical content knowledge and curriculum reform theories. A review of the literature of studies on classroom based science teaching and learning was explored. The following chapter will deal with the methodology that has been followed in conducting the study.

Chapter 3

Methodology

3.1 Introduction

This study investigated the time allocations in the curriculum and assessment policy statements (CAPS) in Physical Science in Grade 10. This chapter describes the step-by-step method followed in the study, to answer the research question below. A detailed explanation of the research design followed in the study is explained, together with the sampling procedure used. Research instruments utilized in data gathering, and how the data were collected, is explained. In addition to the above, the issues of validity and reliability of the study are explored and the ethical considerations undertaken in the study are provided. The methodology was designed to address the research question:

How suitable are the time allocations in CAPS in accommodating a diverse range of teaching strategies that teachers employ in their Grade 10 Physical Sciences classes?

In order to address the main research question, the following research sub-questions were answered:

1. What are teachers' perceptions of the prescribed and recommended time allocations in CAPS for the Grade 10 Physical Science in a rural education cluster of the Eastern Cape Province?
2. What is the education management perspective of the effect of the CAPS time-allocation on the teaching of Physical Science?

3.2 Research design

The study follows a mixed methods research design, which includes both quantitative and qualitative methods of data collection. According to Creswell (2007) qualitative data collection methods are useful ways of collecting data in science education

research, because they enable the researcher to probe deeper into the problem. According to Babbie et al. (2015), qualitative research paradigm deals with three meta-theories, namely phenomenology, symbolic interactionism and existentialism. They argued that these meta-theories sought to entrench and give credence to the existence of a qualitative research paradigm. They contended that a critical question was posed as to whether quantitative and qualitative research paradigm are mutual exclusive, complimentary or compatible. It is with a view that the two research paradigms when utilised together in a study would provide a complimentary and compatible research design that will enrich the study.

Within this study an interpretative phenomenological analysis is utilised. This qualitative approach has two parts built into it, namely the interpretative part and the phenomenological part. The interpretative part acknowledges the interpretation of the research data and findings by the researcher. Furthermore, it recognises the interaction of the researcher and the research participants in a subjective viewpoint that allows for insider perspective, whereas the phenomenological part deals with how the participants in the study are experiencing a particular phenomenon under investigation. Phenomenology is viewed as having a focus on the differences and dis-analogies between the human subjects and the natural phenomena. In this study the researcher sought to interpret how the teachers within the cluster in the district are experiencing the CAPS prescribed and recommended time allocations, and the suitability of the prescribed and recommended time allocations to allow the teachers to explore a diverse range of teaching strategies.

Quantitative methods are data collection methods that involve prediction of "hard" data based on numerical measurements, with an objective intention of proving closed (laboratory) experiments. It is important to note that although quantitative data is numeral, and established in this manner, it cannot always be collected as quantitative data but can be extracted from qualitative data. It for this reason that in the study the researcher will be using mixed methods of analysis, to examine and analyse the data collected during the study. Creswell (1994) asserted that there is seemingly a "paradigm war" between the two methods that results from incompatibility of the world views that underpin the methods.

Hancock, Ockleford and Windridge (2009) showed the contrasts between quantitative and qualitative research. They, firstly, argued that qualitative research disposes how people or groups of people, hold different views about their reality, within a social and psychological framework, whereas, in contrast, quantitative research has a tendency to focus on discovery of general laws and hypothesis reality.

Secondly, qualitative research looks at bringing together different dimensions that explain the complex relationships in a real world context, as opposed to quantitative research, which seeks to accurately measure reality, and discard non-significant information. Thirdly, qualitative research is devoid of variable manipulation, as it focuses on studying behaviour in a natural setting, by giving people's accounts of phenomena. In contrast, quantitative research involves data manipulations, by fixing variables as either dependent or independent and, at times, as controlled variables.

Fourthly, qualitative research reports on the experiences of individuals and groups of persons, which cannot numerically be expressed. On the other hand, quantitative research employs statistical procedures, by looking at probabilistic objectivity of data. Fifthly, qualitative studies describe and interpret data, might give dual outcomes, either providing a development of new concepts or theories or reassessment of organisational norms. They also concede that quantitative studies focus on cause and effect relationships between variables.

Lastly, qualitative research uses a flexible and systematic approach to the research process, whereas in qualitative research the process is predetermined.
Furthermore, Hancock et al. (2009) suggested that qualitative research affords the researcher flexibility to reformulate and refine the research question, which is not the case with a quantitative research, since reformulation and refining of the research question will require the whole study to be changed, and a new hypothesis formulated.

Hancock et al. (2009) provided that qualitative research is mainly concerned with social explanations of phenomena. Its main focus is to aid with the understanding of social contrasts as to why, and how things are what they are, and the manner in which people interact. Its main tenets seek to answer the following questions:

(i) What behavioural patterns are exhibited by individuals and group of people?

(ii) What view points and attitudes are people exhibiting?

(iii) What impact is caused by the events occurring around people or groups of people?

(iv) Interrogate the development of culture and cultural practices, in a manner in which they have developed.

According to Maxwell (1996) qualitative research has strength amongst others, which are:

(i) The experiences for participants of events, situations and actions they are involved in.

(ii) The context within which participants and influences emerge spontaneously in open-ended interviews and questionnaires in ways that they cannot in a structured survey.

(iii) The process by which events and actions take place.

(iv) Complex casual relationships. This implies the relationship between learning to teach and the implementation of this learning in a practical classroom context.

3.2.1 Sample

The cluster at which the study was conducted has twelve (12) schools that offer Physical Sciences from Grade 10 to 12. In the study the researcher purposefully distributed questionnaires to the 12 teachers in these schools who taught Physical Sciences in Grade 10. Seven (7) out twelve of those teachers responded positively and completed the questionnaire. This translated to a 58.33% response rate. The teachers have been teaching Physical Science at Grade 10 since the inception of the curriculum and assessment policy statement (CAPS) in 2012. The teachers were chosen from previously disadvantaged schools that are on Quintile 1. The schools were predominantly rural village schools. The teachers were purposefully chosen given the background of the learners whom they teach and the conditions at their schools. The first condition was that the school should be in a village. Secondly the school should be under-resourced without any science laboratory facility.

Furthermore, three of the seven teachers that had completed the questionnaire, were randomly selected for semi-structured interviews. The subject advisor responsible for support and monitoring of the teachers was interviewed.
Table 2 shows the overview of the sampling plan.

Table 2: Sampling Plan

Participants	**Samples**	**Criteria**
Teachers' Questionnaires	7 of 12 responses	Must teach Physical Sciences Grade 10 within a cluster in the district and been teaching in Caps since its inception in 2012
Teachers' Interviews	3	Randomly selected from the teachers who completed the questionnaires
Curriculum Advisor Interview	1	There is only 1 Curriculum Advisor for Physical Sciences in the District.

3.2.2 Research data collection plan

The first comprised the researcher disseminating questionnaires to the 12 teachers within the cluster of the district. The researcher phoned each participant and made arrangements to meet with participants in order to discuss the questionnaire, in order to ensure that each participant understood how to complete the questionnaire.

The second step data collection for the study was to conduct follow-up interviews with six (6) randomly selected teachers from the teachers who had completed the questionnaire, to probe deeper into the responses that they had provided in the questionnaire. In this step of data collection, the researcher set appointments with the participants in dates and venues where the participant felt comfortable. This was done to ensure that participants do not incur costs that would discourage them from participating in the study. In addition to distributing questionnaires and conducting follow up semi–structured interviews with the teachers, the curriculum advisor in the district was interviewed. The district has one subject advisor, who was interviewed in order to corroborate or dismiss the teachers' claims, to ensure that there is triangulation of data in the study.

Table 3: Data Collection Plan

Research Question	Method	Instruments	Respondents	Analysis
How suitable are the time allocations in CAPS in accommodating a diverse range of teaching strategies that teachers employ in their Grade 10 Physical Sciences classes?				
What are teachers' perceptions of the prescribed and recommended time allocations in CAPS for the Grade 10 Physical Science in a rural education cluster of a district in the Eastern Cape Province?	Surveying teachers' perceptions	Open-ended Questionnaire	Teachers	Thematic analysis and Excel analysis
	Semi-structured Interviews	Interview schedule	Teachers	Thematic analysis
What is the education management perspective of the effect of the CAPS time-allocation on the teaching of Physical Science?	Semi-structured Interview	Interview Schedule	Subject Advisor	Thematic analysis

3.3 Research instrument

The researcher made use of two instruments, namely an open-ended questionnaire and semi-structured interviews. Questionnaires were administered to the teachers, and follow up interviews were also conducted with some of the teachers who had completed the questionnaire. The second set of interviews was conducted with the

subject advisor in the district, who had oversight on the work being done by the teachers.

3.3.1. Questionnaires

Questionnaires are popular methods in social science research, because social scientists are interested in people and the best way to study individuals is by asking them or those close to them. A questionnaire is one way in which one can achieve this. According to Bulmer (2004), a questionnaire is a well-established tool within social science research for acquiring information on participant social characteristics, present and past behaviour, standards of behaviour or attitudes and their beliefs and reasons for action with respect to the topic under investigation.

Babbie, Mouton, Vorster and Prozesky (2015) asserted that the wording used in developing the questions on the questionnaire is important. They argue that a question that has been inappropriately phrased or placed incorrectly in the questionnaire may cause confusion about the intended objectives of the question. They contended that a questionnaire with these flaws may encourage participants to discard the questionnaire. This might have serious ramifications for the response rate that the researcher is able to secure for the study.

An open- ended questionnaire will to be used to probe the teachers' views about the suitability of the time allocation in CAPS and how these time allocations are affecting their ability to use different teaching strategies. Furthermore, the questionnaire will also probe other factors that have an impact on the teachers' ability to adhere to the time allocation. These other factors are probed to ensure that the data interpretation is reliable and answers pertinent issues related to the research question.

The questionnaire was designed in such a way that both quantitative and qualitative data about the time allocation in CAPS can be derived and analysed. The questionnaire, which is provided, is divided into two sections; the first part contains biographical information of the respondent, such as years of experience, and whether or not the teacher has experience teaching Physical Science in Grade 10. The second section delves deeply into probing the research question. The questions are categorized in themes to aid with ease of analysis. The themes in the questionnaire

have items that illuminate the answer to the research question. The themes are adherence to time frames, assessment and feedback, teaching strategies used, disruption to teaching and learning, and extra lessons.

3.3.2. Development of the questionnaire.

The questionnaire's biographical sections asked respondents to provide their age, the qualifications that they hold, their years of teaching experience, the number of years that the teacher has been teaching Physical Science in Grade 10, and any other teaching duties that are allocated to the teacher. The second section of the questionnaire was meant to probe the respondents for data that would illuminate the research question. The questions that were asked in the questionnaire were, (i) do you find time allocation for Grade 10 Physical Sciences adequate? Respondents were to choose between two options, yes or no, and they were then requested to explain their choice of answer. The second question was designed to probe assessment practices and how they are affected by times.

The question asked was, if you have planned a lesson, with an assessment component in it, with time specified for learners to finish that activity, please answer the following questions. Are your learners able to finish the assessment in time? The respondents had to choose between two options, yes or no, and they were further requested to explain their choice of an answer.

A supplementary question was then asked, which asked respondents to indicate whether they were then able to provide learners with feedback within that time. The respondent had an option to answer either yes or no, in which case they were requested to explain their choice of answer.

The next question asked was to describe the daily teaching approach that teachers employed in their classroom. They had to choose between three options which were presented to them. The options were (i) the teacher teaches the practical first before teaching theories and concepts, (ii) the teacher simultaneously teaches theories and concepts whilst doing the practical activities, and lastly (iii) the teacher teaches the theories and concepts first before doing the practical. A supplementary question was then asked, which was how the time allocations affect the teachers' decision in

choosing the teaching approach. They were requested to explain their answer to this question.

A question was posed that requested teachers to indicate if they organized any extra classes for Grade 10 Physical Sciences learners. They had to respond yes or no, and explain how much time they used for these extramural classes. If they had answered no, they had to indicate the factors that prevented them from organizing extramural classes. Another question that was posed was whether the teachers had any learners in their classes who were receiving external tutoring, either organized by the learners or the parents of the learner, to assist the learner with Physical Sciences. They were also requested to explain their answer to this question.

Do you find it easy to adhere to the prescribed times? This was another question that was asked from the respondents. The teachers had to choose from two options, yes or no. They were then requested to explain the factors that prevented them from adhering to the prescribed times. Finally, the last two questions asked probed curriculum coverage. The teachers were requested to comment generally on how time allocations affected their Grade 10 Physical Science curriculum coverage, and they were also asked to identify any other factors that affected their curriculum coverage.

The questionnaire was piloted, what some researchers call pre-testing, by giving it to teachers who are teaching Physical Sciences and were registered for the same course as the researcher. According to Babbie et al (2015) piloting of the questionnaire is a neglected part of research studies in South Africa. They further argued that the respondents to the pilot questionnaire need not be representative of the population that the research is studying. They agreed, though, that at least the subject should be relevant to the respondents participating in the pilot study. In the case of this research the respondents to the pilot study were teachers to whom the contents of the research had relevance.

3.3.3. Interview

Cohen and Manion (1980) suggested that an interview consists of a researcher asking questions to a respondent, in a one-on-one setting or telephonically in some

instances, at a place of convenience for the researcher or the respondent. Interviews offer their own advantages and disadvantages, in term of research. Amongst the advantages offered by interviews is the flexibility at which the researcher has to probe deeper into the respondents' understanding of the questions, and the researchers' ability to probe deeper into the respondents' responses to particular questions, thereby giving the researcher more insight with regard to the respondents' responses.

Types of interviews

According to Patton (1990), different types of interviews, amongst others, include structured, unstructured and standardised interviews. He argued that in structured interviews the questions are predetermined by the researcher and rigidly structured, and offer no flexibility to probe deeper than the researcher has predetermined. In addition, Schuman and Presser (1981) argued that a structured interview limits the freedom of expression of the participant. Participants express views within the constraints of the question.

On the other hand, in an unstructured interview, Patton (1990) suggested that it is more like a conversation, even though the researcher would have planned the line of conversation in such a way that guides the conversation towards the desired path. Schuman and Presser (1981) contended that unstructured interviews remove the constraints to freedom of expression of the respondent to beyond what is being questioned and gives them the space to full express themselves.

3.3.4. Development of interview schedule for teachers:

One-on-one semi-structured follow-up interviews were conducted with the teachers. The interview with the teachers probed both outside the classroom and inside class factors that impact on their time for teaching. Outside classroom factors are identified as teacher absenteeism, due to personal reasons. These include the frequency of permitted and non- permitted leaves. Another outside classroom factor is the extra administrative duties that the teachers perform. The teachers were asked whether they had some administrative duties that had an impact on their teaching, and whether or not there was time specifically set aside to perform those duties.

Furthermore, teachers were requested to indicate other teaching responsibilities which were not Grade 10 Physical Sciences. Teachers were requested to indicate whether these teaching responsibilities affect their teaching of Grade 10 Physical Sciences, and explain how they affected their teaching. The teachers were also requested to indicate how attendance of professional development workshops, cluster moderations, subject meetings and union activities affected their teaching. Furthermore, teachers were also called upon to indicate how extra-mural activities impacted on their teaching.

Inside classroom factors that teachers were asked to respond to were firstly, lesson planning. Teachers had to indicate whether they planned lessons according to their unique circumstances. In addition, they had to indicate if they used these plans. If they had not been using their plans, they had to reflect on the reasons as to why they were not utilising the plans.

Secondly, availability of resources was also probed. Teachers had to indicate what teaching resources they had, including textbooks, past papers, computers, photocopies and projectors.

The third question asked teachers to indicate whether their timetable was CAPS compliant. If they indicate their timetable was not CAPS complaint they then had to provide reasons why that was the case.

The fourth question requested teachers to indicate if they had any learners who had identifiable special needs and learning barriers, the number of such learners in their class and the provisions they had set in place to assist those learners.

Furthermore, teachers were asked questions that relate to completion of class activities by learners and provisions for offering feedback to learners. They were asked to indicate if learners completed assigned classwork activities within the teachers planned time. If their answer was no, the teachers were then asked to indicate what was the common problem that led to non-completion. In addition, they were asked to indicate the interventions that they undertook to ensure timely completion of class activities that they assigned to learners.

Lastly, teachers were requested to answer questions pertaining to practical work. The teachers were asked if they conducted practical demonstrations for the learners, and whether learners were afforded the opportunity to perform practical demonstrations themselves as demanded by CAPS. Teachers had to reflect on reasons for allowing or not allowing learners to perform practicals. Finally, teachers were requested to indicate whether they believed that non-performance of practical work amounted to curriculum non-coverage.

Another set of interviews was conducted with six (6) teachers who had completed the questionnaires. In addition to these teacher interviews, the subject advisor for Physical Sciences in the district was interviewed to obtain his views about the time allocation and his understanding of the teachers' perception of the time allocations.

Interviews were conducted in English and recorded using a voice recorder. The interview would then be transcribed for analysis, to derive themes and patterns that are in opposition or agreement with teacher sentiments about the time allocations.

3.3.5. Development of interview schedule with the subject advisor

The first question directed to the subject advisor was that concerning his experience with the curriculum monitoring and how teachers under his supervision were adhering to the year plan. The specific question that was asked was: In your monitoring of Grade 10 CAPS curriculum,.are teachers under your supervision adhering to the year plan? A supplementary question was asked which was: If yes, are the teachers reporting any challenges with time, and how do they(teachers) overcome those challenges?

The second question that was directed to the subject advisor was to find out if schools had a CAPS compliant period register for teaching and learning at school. The question posed was: Is the timetable in the schools in line with CAPS? This question is important to the foreground of whether or not schools are adhering to the CAPS prescription of a 4 hours per week Physical Science time allocation.

The third question that was asked to the subject advisor was one that wanted to understand whether or not there was lesson planning by the teacher within the

cluster. More specifically, the question probed whether those lesson plans by teachers were taking into consideration the contextual factors under which the teachers operated.

The exact question that was extended to the subject advisor was: Are teachers planning their lessons based on their unique classroom circumstances? The fourth question was related to the third question, and it intended to establish if the lesson plans were being utilised in the delivery of the lesson, or if they were developed simply for compliance. The next question asked was: Are they (teachers) following those plans?

The fifth question was for the subject advisor to indicate if there are teachers who are not adhering to the prescribed and recommended times in CAPS. This question sought to establish if the teachers indicate any challenges to the subject advisor with regard to the prescribed and recommended time allocations in the curriculum. This question was followed by a supplementary question, which sought to establish the reasons put forward by the teacher who reported challenges with the prescribed and recommended time allocation. The specific question was, 'What are their (teachers) reasons that they put forward for not adhering to the prescribed and recommended time allocation?'

The sixth question that was directed to the subject advisor during the interview was posed to establish whether or not practical work was being conducted by the teachers in the cluster. The question also probed the perceptions of the teachers with regard to the time taken to conduct practical work. The exact question that was directed at the subject advisor was, "Are the teachers conducting practical work?" If the answer was yes, "What were their comments with regards to the time allocated for practical work?" The seventh question probed deeper in terms of those teachers who are not conducting practical work. Furthermore, the question sought to establish if time was part of the reasons for the non-performance of practical work. In addition, the subject advisor was requested to indicate other factors limiting the performance of practical work, besides time.

3.3 Data Collection

The data were collected in a cluster within a district. Twelve (12) questionnaires were distributed amongst the teachers in the cluster. The researcher contacted the teachers, personally handed them the questionnaire and requested the teachers to complete it when they had the chance to do so. Seven of the teachers completed the questionnaires and phoned the researcher to collect them. Follow-up was made with the remaining five teachers who provided various excuses for failing to complete the questionnaires. An attempt was made to ensure that the remaining teachers completed the questionnaires and returned them to the researcher, but this exercise proved fruitless and gave an indication that the teachers were unwilling to participate in the study. The researcher then took a decision to work with the remaining seven teachers to complete the study. This gave the response rate of 58%.

3.4 Data analysis and interpretation

The data were analysed in three stages. The first stage comprised data collected using the questionnaire with the teacher. The data collected from the questionnaire were transcribed and electronically coded on word processing software, Microsoft Word. Prior to capturing the data, the questionnaires were cleaned for data accuracy.

The second stage was the analysis of the teacher interviews and the final stage was that of analysing the interview with the curriculum advisor. The data were analysed using the statistical analysis package Microsoft Excel. The interviews were transcribed verbatim and coded for themes emanating from the data. The interview schedule was emailed to the subject advisor, who responded to the questions posed to her and emailed the responses back to the researcher.

A thematic analysis of the data was conducted, and themes were identified and extracted. Several themes emerged that showed the most frequent of themes in the responses. The themes were cross referenced to identify the most emergent themes from the data to give a consolidated view.

The interview data will be quoted in order to illuminate the teacher responses. The following conversion will be used to report direct quotes from interviews, $T_iS_iI_i$where the T_i refers to Teacher i, S_i refers to School i and I_i refers to Individual Interview i.

The data from the questionnaire will be reported using the following conversion: $T_iS_iQ_i$ where T_i refers to Teacher i, S_i refers to School i and Q_i refers to Questionnaire i, with i indicating the teacher number.

3.5 Reliability and Validity

3.5.1 Reliability

Reliability of the study is guaranteed when the study is replicated by a different researcher and the same outcomes are achieved using the same techniques as the original researcher (Lewis & Ritchie, 2003). Furthermore, reliability concerns convincing the audience and the self that the findings of an inquiry are worth paying attention to and worth taking account of (Lincoln & Guba, 1985). Lincoln and Guba (1985) further stated that the strategies used to ensure the reliability of qualitative research relate to the credibility and transferability of findings.

Bulmer and Warwick (1993) asserted that the reliability of questionnaires is only guaranteed if respondents understand the questions. Furthermore, they asserted that, if the respondents do not trust the purpose of the study or even the researcher, reliability of the study can be jeopardized.

To ensure reliability of this study the researcher will pilot the research instrument, to a sample of 5 teachers who are also Physical Science teachers in other districts, to ensure that the questionnaire addresses the research question. Any shortcoming identified was discussed with the supervisor and consensus was reached either to delete those items or rephrase them.

3.5.2 Validity

According to Loyd, Kern and Thomson (2005), there are two types of validity, namely internal validity and external validity. Internal validity refers to the ability to make inferences about the causal relationship between the variables in the study. When dealing with causal relations, the researcher should consider aspects of history, maturation, testing, instrumentation, statistical regression, selection and mortality. On the other hand, they define external validity as the extent to which the presumed causal relationship between the two independent variables can be generalised into

diverse causal alternatives and across different types of persons, settings and times. Simply put, Fraenkel and Wallen (2000) contended that validity of a study is based on the inferential ability that the instrument is able to give the researcher. For validation of the study the teachers and the subject advisor was interviewed, to triangulate the response of the teachers and the subject advisor.

3.6 Ethics

3.6.1 Permission to conduct the research

In order to conduct research at an institution such as a university or school, approval for conducting the research should be obtained before any data are collected (McMillan and Schumacher, 1993). In this study, the researcher first sought permission from the teachers who were identified as potential participants in the study before collecting data. The participants were teachers who taught Physical Science within the cluster and the district curriculum advisor for Physical Sciences.

3.6.2 Informed Consent

Participants should be given enough information pertaining to the study before data collection (Schulze 2002). In this study, the participants were given adequate information on the aims of the research, the procedures that would be followed, the possible advantages and disadvantages for participation, the credibility of the researcher and the way in which the results were to be used. The information supplied to the teacher and the curriculum advisor enabled participants to make an informed decision on whether they wanted to participate in the research or not. No form of deception was used to ensure the participation of the participants as suggested by De Vos,Strydom, Fouché, Poggenpoel, Schurink & Schurink (1998).

3.6.3 Confidentiality and Anonymity

Gay (1996) argued that a researcher has to be responsible at all times and be vigilant, mindful and sensitive to human dignity. This is supported by McMillan and Schumacher (1993) who stressed that information on participants should be regarded as confidential unless otherwise agreed upon through informed consent. In this study, participants' confidentialities were not compromised, as their names were

not used anywhere during the research data collection, analysis and reporting. No private or secret information was divulged as the right to confidentiality of the participants was respected (Huysamen, 1994). For this reason, no concealed media were used. Only the researcher had access to names and data to ensure the confidentiality of the participants. Research findings were therefore presented anonymously, by making use of pseudonyms at all times when a participant's view had to be quoted.

3.6.4 Dissemination of the research findings

Schulze (2002) suggested that as a mark of the researcher's gratitude to the participation, participants would be informed of the findings of the study. This was done in an objective manner. All the unnecessary detail and information were not supplied to the participants to ensure that the issues of confidentiality were not compromised. Each teacher who participated in the study was given a copy of the final research and the research outcome will be shared with the district, through the curriculum advisor. This step was also necessitated by ensuring issues of validity and reliability as the teachers had an opportunity to comment on whether or not their views were captured and interpreted correctly.

3.7 Summary of the chapter

This chapter explained in detail the research methodology employed in the study. The research design, which comprises both qualitative and quantitative data, was explained in detail. The sampling plan and the research data collection plan followed in data collection were put forward.

Furthermore, the chapter described the research instrument used in the research, which were questionnaires and interviews. The advantages and disadvantages of using each instrument were explained. Moreover, the development of the questions in the questionnaire and the interviews were explained in detail. The questionnaire was administered with the teachers whereas the interviews were conducted with the teachers and subject advisor. The data analysis, the reliability and validity of the study, including ethical issues, were expounded upon.

Chapter 4

Findings

4.1 Introduction

The previous chapter dealt with the methodology employed in collecting the data and the analysis of that data. This chapter discusses the patterns and trends that emanate from the data which were collected using questionnaires and interviews. The findings are presented and substantiated by providing direct quotes from the data. Graphs and tables are used to illustrate patterns, to consolidate the data and provide a clear picture of the findings of the study. The data presented address the following research question:

> How suitable are the time allocations in CAPS in accommodating a diverse range of teaching strategies that teachers employ in their Grade 10 Physical Sciences classes?

The findings in this chapter are presented to answer the research sub-questions:

1. What are teachers' perceptions of the prescribed and recommended time allocations in CAPS for the Grade 10 Physical Science in a rural education cluster of a district in the Eastern Cape Province?
2. What was the education management perspective of the effect of the CAPS time-allocation on the teaching of Physical Science?

4.2 What were teachers' perceptions of the prescribed and recommended time allocations in CAPS for the Grade 10 Physical Science in a rural education cluster of a district in the Eastern Cape Province?

4.2.1 Questionnaire findings:

Twelve (12) questionnaires were purposefully distributed to the teachers who teach in the rural village and township parts of the district in which the study was conducted. Six (6) of these teachers were interviewed to solicit additional information and for triangulation purposes. In total seven (7) questionnaires were returned to the researcher fully completed; this indicated a response rate of 58.33%. Loyd et al.

(2005) argued that a poor response rate in a study can be attributed to the fact that a researcher is not well known within the schooling system, and this leads to difficulty in terms of acceptance by the teachers, especially when one makes mention of the term ‘research’.

However, this was not the case in this study as the researcher is a colleague of the teachers within the cluster. Secondly, Lloyd et al. (2005) argued that even if one gains acceptance by the schooling community, the researcher still has to ask for the consent of teachers to use them as research objects or participants. They further suggested that consent by the teacher may be distracted by the main responsibilities of teachers that emanate from various sources, such as school administrators and parents. One is thus led to believe that the teachers who failed to complete their questionnaires, and consequently showed lack of interest in participating in the study, were overwhelmed by their own school responsibilities.

Thirdly Lloyd et al. (2005) also argued that there are three factors that can be used to increase the response rate to survey research studies, namely use of honorarium, the length and duration of the questionnaire and nature of the research. In this study an honorarium, which implies the issue of an incentive to encourage the participants to complete the questionnaire, was not used, for ethical reasons. The questionnaire was kept reasonably short and to the point, in an effort to meet the second suggestion. This aspect could be suspected as having had an influence, as the questions posed in the questionnaire sought to reflect practices in schools, some of which could make other teachers uncomfortable.

Three (3) of the teachers who completed the questionnaires were interviewed by the researcher, using an interview schedule which is attached in this report as Appendix 2 Instrument 2. The teachers who were interviewed were randomly selected from the pool that had fully completed and returned the questionnaire. This was done to follow up on the responses completed in the questionnaire months after the questionnaires were filled in. The interviews were conducted at venues convenient to the participants, so as to minimise costs incurred by the participant and to encourage participation, as using their own funds to participate in the researcher had a potential to demoralise participants.

4.2.2 Biographical data of respondents

The respondents to the study had on average 19 years of teaching experience in Physical Sciences, which implies that most of these teachers would have taught the in the previous curriculums. The qualification breakdown of teachers in the study showed that 4 of the teachers possessed a Secondary Teachers Diploma (STD) obtained from the now defunct teacher colleges, and all 7 of the teachers have at least an Advanced Certificate in Education (ACE), even though specialization was not specified. 3 of the teachers have foreign teaching qualifications. One of these teachers has a Diploma in Chemistry and 2 have Bachelor of Science degrees; the specialization was not specified. Hugo et al. (2010) asserted that in South Africa a qualified teacher is defined as a teacher who is in possession of a three years' post-school qualification in education, which is classified as a Relative Education Qualification Value 13 (REQV 13). A teacher with an undergraduate degree in a field which is not education is classified as professionally unqualified.

The data also showed that the teachers were teaching on average 3 Grades in a school, even though the data showed that most teachers were teaching more than one grade and subject. This could be attributed to the fact that there could be one teacher teaching Physical Sciences in the school, which is a norm for schools with smaller number of learners. All the teachers in the study had been teaching CAPS since its inception in 2012, which meant they had sufficient experience with the Grade 10 Physical Sciences curriculum.

4.2.3Summary of patterns emerging from the closed parts of the questionnaire

Some of the questions in the questionnaire were closed and the teachers were requested to either answer yes or no to the question; thereafter, they were requested to provide an explanation for their choice of answer. The table below summarises their responses.

Table 4 had the following indications: Y=Yes and N=No. Res i= Respondent i and Qi= Question i. The questions that have been left blank are those questions that were open-ended and teachers had to provide full answers without indicating yes or no. Option 3 abbreviated as O3 is the response given amongst the three options that had

requested teachers to indicate their dominant teaching approach. The option that was chosen by all the teachers was O3, which is an option that indicated that teachers teach theories and concepts first, before doing the practical. The last columns indicate the number and percentage of responses by participants in each question; the findings below discuss the outcomes in more detail.

Table 4: Summary of results from the questionnaire

Question	Res 1	Res 2	Res 3	Res 4	Res 5	Res 6	Res 7	Total (NO)	Total (Yes)	% No	% Yes
Q1	Y	N	N	Y	N	N	N	5	2	71%	29%
Q2	Y	N	N	N	Y	Y	Y	3	4	43%	57%
Q3	Y	N	N	N	Y	N	N	5	2	71%	29%
Q4	O3	O3	O3	O3	O3	O3	O3				
Q5											
Q6	Y	N	N	Y	Y	Y	Y	2	5	29%	71%
Q7	N	N	N	N	N	Y	N	1	6	14%	86%
Q8	N	N	N	N	N	N	N	7	0	100%	0%
Q9											
Q10											
Q11											

4.2.4Time allocation adequacy

The findings from the questionnaire that dealt with the question which sought teachers to answer if they find the time allocation for Grade 10 Physical Sciences adequate are discussed below.

The Figure 3 indicates that 5 teachers (71%) responded No to a question in the questionnaire that asked them to indicate if they found the time allocation in Grade 10 Physical Sciences adequate. 2 teachers (29% of the teachers) responded Yes, indicating that they found the time allocation for Grade 10 Physical Sciences adequate. The graph shows that a majority of the teachers who participated in the study do not find the time allocations in Grade 10 Physical Sciences adequate. There is a big difference in the number of teachers who view the time allocation as

inadequate compared to those who view it as adequate within the same cluster in the district. This finding brings to the fore the tone of the outcomes of the study.

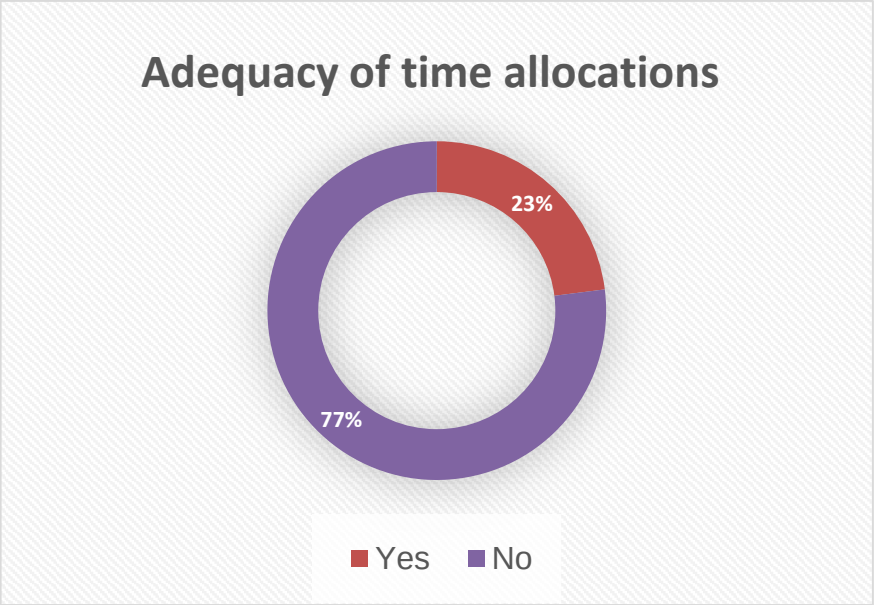

Figure 3: Graph indicating the percentage of respondents who find time allocations inadequate or adequate.

The teachers were then requested to explain the rationale behind their responses. The data indicate that teachers do not complete the Grade 10 curriculum. The teachers noted that the stipulated times make it impossible for them to cover the curriculum, as the allocated time frames are too little. They claim that the curriculum requires demonstrations and experiments to be done and this requires more time. The contextualisation of the curriculum is perceived as being a challenge due to the limited allocation of time as stipulated in the curriculum. As indicated by the extract below from Teacher 9, School 9, in Questionnaire 9:

> *"I had never finish my Grade 10 syllabus. Delivering the content and contextualising the content is difficult to do within the stipulated time. Doing activities becomes impossible. Timeframes allocated are too small considering the demonstrations and experiments to be done each topic. Learners find it difficult to understand and to do homework".* [$T_9S_9Q_9$]

Another teacher elaborated as follows:

"Most of the time when I am teaching, I find myself taken more due to a lot of work to be done. I even do extra-classes in afternoon as some of my learners are slow and also preparations for experiments takes more time". [$T_5S_5Q_5$]

Contrary to the general view indicated by teachers above, one of the teachers contends that he is able to cover the curriculum, and his learners are able to cope with assessment administered and finish their assigned tasks in time. As indicated in the quote below:

"I am able to cover the curriculum most of the time. The learners are able to write and finish assessment in time". [$T_6S_6Q_6$]

Another teacher who indicated that the time allocations in Grade 10 Physical Sciences are adequate, had this to say when elaborating on his response to the same question:

"I think 1 hour is enough per day. That's how the timetable in my school is arranged. Our time table has 6 periods per day, 1 hour each day." [$T_8S_8Q_8$]

The quote above shows that the school follows the CAPS guidelines when designing the school timetable. Even though not clear from his response, if Physical Science in Grade 10 is allotted 1 hour each day, that will imply that the teacher has an extra hour to teach Grade 10, as there will be 5 days in each week if we assume that the school functions normally, without any disruptions to teaching time as allotted in the timetable.

This then leads to a finding that, technically, by the design of the time table in his school, the teacher already has extra time in which to teach. Such a scenario is possible within schools that have streamlined their curriculum to offer a selected list of subjects. Schools with smaller numbers effectively stream down their curriculum and opt to offer only those subjects that are critical or which can attract learners to their school. In essence, if this is the case, the teacher is then afforded an extra 1-hour period which exceeds the prescriptions and recommendations of CAPS. It is customary for schools within the same catchment area to compete for learners, by

offering subjects that offer better opportunities after secondary education, such Physical Science, Maths and Accounting, as these subjects are perceived as holding the key to greater financial and economic prosperity beyond secondary education.

Another view that came strongly from the teachers was that time allocated for some topics was very short. In addition, the curriculum presented some sections of the document as being a revision section, whereas evidence showed teachers that such topics had not previously been taught to learners. Moreover, the teachers indicated that the formal and informal experimental work that is prescribed and recommended in the curriculum takes more time to complete, and they ultimately have adverse ramifications for curriculum coverage. The quotation below illustrates this point:
:

> *"Too long or the times allocated for certain topics are too small. Some work is claimed to be revision but learners are not taught those topics. Formal and informal experiment expected to be done, and it takes more time to finish the syllabus".* [$T_4S_4Q_4$]

In contrast to the finding above, some teachers indicated that they do complete the set curriculum, as per prescription. One specific teacher argued that he views the time allocations as adequate, as in their school they use a 6 period timetable with 1 hour each day devoted to Physical Science Grade 10. The quote below shows the response given by this particular teacher:

Moreover, one of the teachers indicated that the prescribed and recommended times are inaccurate, and out of sync with some topics. The quote below shows this argument:

> *"Times stipulated by CAPS document is not accurate, in terms of how much time we have to spend in certain topics. Some long topics are given short time".* [$T_8S_8Q_8$]

Furthermore, teachers indicated that Grade 10 lays the foundations for the successful study of Physical Science in the senior grade levels. Therefore, the teachers have to move quickly through some topics that they considered to be less important for the senior grades. They also indicated that they make sure that learners

understand the topics that are important in senior grades, and therefore they spend more time on those topics. One of the teachers remarked as follows, with regards to this finding:

> *"Basic of Physical Sciences starts at this grade, therefore the topic that I manage to complete I make sure learners understand. There are topics that I cannot afford not to teach. Therefore, I choose to start with certain topics."*
>
> [$T_4S_4Q_4$]

When this teacher was requested to remark generally about how the time allocations affected his curriculum coverage in Grade 10, he noted:

> *"Sometimes I rush to finish certain topic and that shows when learners are writing. Certain topics are not taught or taught at a small scale".* [$T_4S_4Q_4$]

This quote clearly illustrates that teachers do not complete the curriculum, and they do not do justice in terms of teaching the curriculum as they rush through topics. Having to rush through the topics is an indication of a time constraint. Furthermore, it is evident that the curriculum is not completed, as the teacher indicates that some topics are not taught.

4.2.5 Effects of time on assessment and feedback

The effect of time allocation was probed by asking the respondents to answer two questions about the activity that they planned within their lessons, which had an assessment component in them. They were requested to answer in terms of the ability of learners to complete the planned activities in time, and also to indicate whether they were able to provide feedback within the planned time. In answering the question which probed whether the learners were able to complete assessment given to them in time, the data indicates that 43% of the teachers indicated that their learners were able to complete the assigned activities in time. 57% of the teachers indicated that their learners were unable to complete the assigned assessment in accordance with the teachers' planned time. The bar chart below indicates this point.

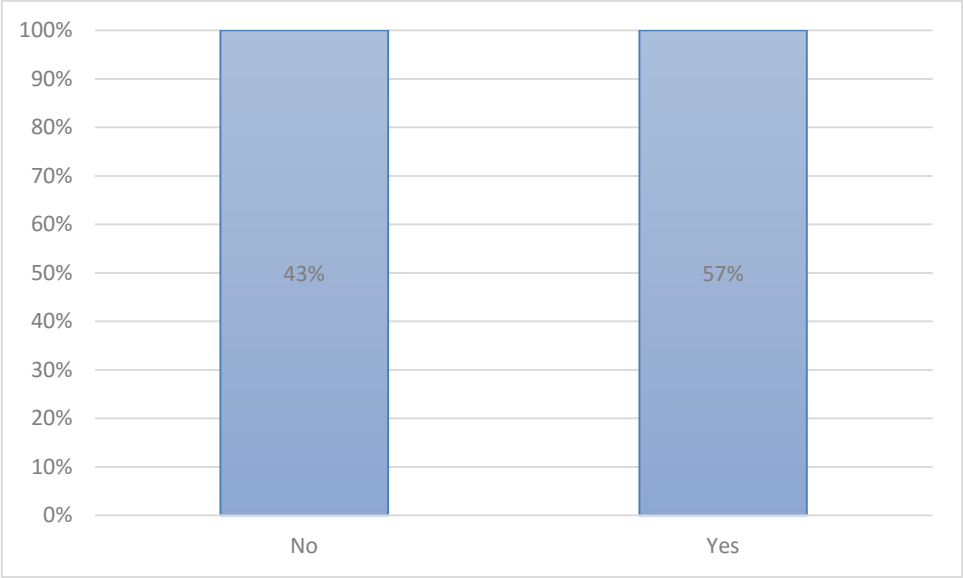

Figure 4: Graph indicating timely completion of assigned assessment

From the graph in Figure 4 it suffices to assert that it is inconclusive as to whether or not learners do complete or do not complete their assessment in time as assigned by the teacher. One teacher amongst the teachers affirmed that learners do complete the assigned activity and who made an important remark as illustrated below:

> "*When I assess them I give them a small portion of work in order for them to finish faster. e.g. listing, naming etc.".* [$T_5S_5Q_5$]

The response above indicates that the teacher somehow has to give low cognitive level questions to the learners in order for them to finish the assessment in time. It is unsure whether this is able to give the teacher sufficient information about the effectiveness of his teaching or the competency of the learners in the work being taught.

Contrary to what has been the trend from most of the teachers, one teacher indicated that his learners are able to complete their assigned assessment in time. He indicated that the learners are able to do so because he assesses a small portion of the work by asking learners to list, name, classify and identify questions, which are lower cognitive level questions. The effects of this strategy are discussed in detail in the next chapter.

On the other hand, the data also indicate that learners do not complete assigned assessment tasks administered to them within the teachers' planned time for the completion of the assigned activity. As Teacher 2, from School 2, remarked on the Questionnaire 2:

:

"It is difficult to do classwork. Learners take almost 40 minutes to 50 minutes to write the activity, and I am expected to do solutions or whether we do it collectively it takes time to complete". [$T_2S_2Q_2$]

Furthermore, the teacher also indicated that, when they give homework, learners either copy or do not do the work at all, claiming that they did not understand the work. Teacher 4, School 4, on Questionnaire 4, had this to say:

"Most of the time I give homework, but the challenge is, it can be copied and be presented. Often learners do not do their homework but when asked they claim that they did not understand". [$T_4S_4Q_4$]

On the other hand, one of the teachers remarked that sometimes his learners do complete the assessment he assigns to them in time, failing which, he then allows the learners to complete that assessment as homework. But this particular teacher also remarked that, since he also teaches Grade 11 & 12, he makes an effort to increase his contact time, by having afternoon and weekend classes. He also stressed the importance of lesson planning, to help manage the assessment and lesson.

"Sometimes yes because it's all about lesson planning, sometimes no. I end up changing it, making it to be homework". [$T_7S_7Q_7$]

The second question under this made reference to the ability of teachers being able to give feedback within their planned time, in order to allow learners to reflect on their work and to give the teacher an indication of the extent to which lesson objectives have been achieved. As discussed above, some teachers conceded that their learners are unable to finish the assigned task in time and it follows from logic that they would not be in a position to give feedback within their stipulated time.

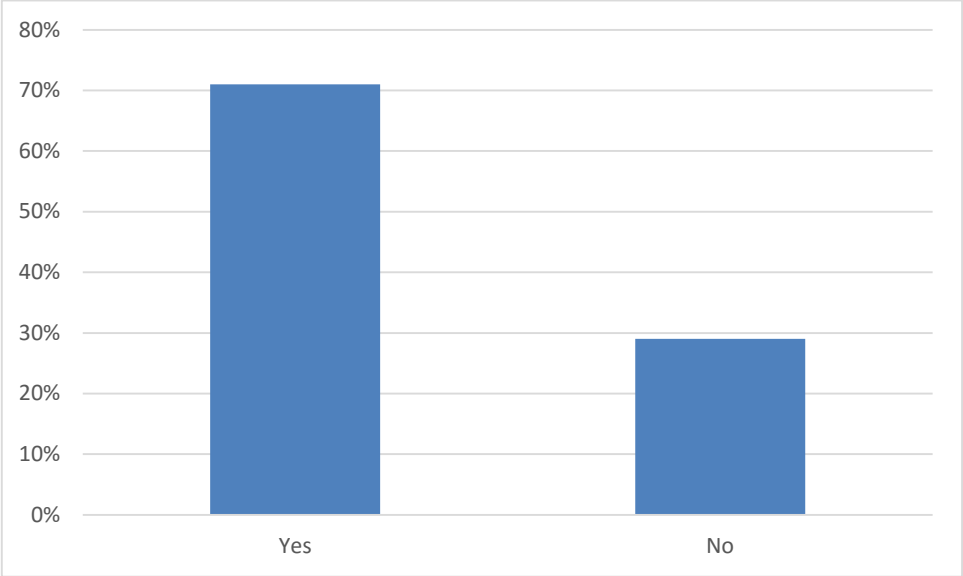

Figure 5: Graph indicating assessment feedback patterns

The graph above shows that 71% (5 teachers) affirmed that they are able to provide feedback within the stipulated time, whereas only two teachers (29%) indicated that they are unable to provide feedback timeously to their learners. This was a strange pattern; a majority of teachers showed that their learners are unable to complete assigned activities in time. This peculiar observation becomes clearer when one investigates the explanations that are given to elaborate on this question: The quotes below can help clarify this peculiar observation:

> "*Learners struggle to complete their classwork in time. They take a lot of time to complete, and if you are not patient you end up answering the classwork with them.* [TSQ]

This indicates that the teacher concerned is very authoritative and does not allow learners enough time to engage with the activity. The teacher resorts to disengage learners from the activity because he feels pressured by time constraints. The implication of this is that learners who had a chance of succeeding in terms of solving the problem are denied that opportunity as the teachers takes charge of completing the assigned assessment.

Another teacher had this to say:

"*Most of the time I give homework, but the challenge is that it can be copied and presented. Often learners do not do their homework but when asked they claim that they did not understand*" [$T_7S_7Q_7$]

In terms of being able to give feedback to the learners, he indicated that because he assesses a small amount of work, he is able to give feedback timeously to the learners. However, he expressed that if the activity given to the learners involved calculations, he then faces challenges of time and has to resort to afternoon classes. The extract below illustrates his point:

"Because it's a small portion I manage to give them feedback, but when its calculations its tough, so I use afternoon classes". [$T_5S_5Q_5$]

4.2.6 Effect of time allocation on deciding teaching approach

The graph below indicates patterns of teachers who responded to a question that requested them to indicate whether or not time is a factor that affects their decision to choose a teaching approach.

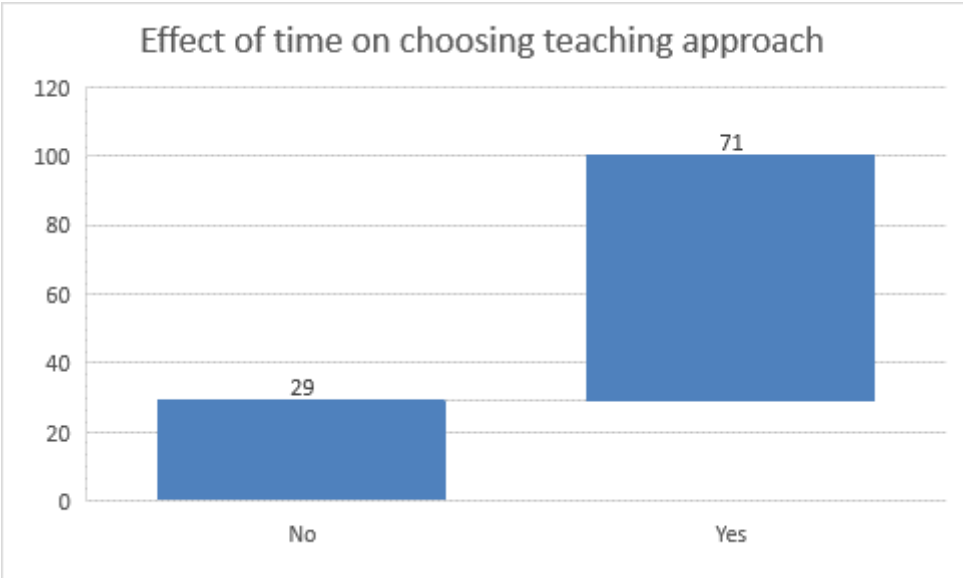

Figure 6: Graph indicating effect of time on choosing a teaching approach

The daily teaching approach that is predominantly followed by the educators is the teaching of theories and concepts first before the teacher completes the practical activities. They further indicated that their choice of teaching approach is influenced

by the fact that the preparation required and the performance of the practical activities is impeded upon by time constraints. They emphasised that it requires a lot of time to integrate the concepts with practical work. The quote below illustrates this point:

> *"Yes, teaching the concepts first for me is my approach but sometimes preparations and performing the practical at the same (time) is difficult because of time. For practical approach I need a day or 1 hour for integrating the concepts with practice".*
>
> [$T_4S_4Q_4$]

Another teacher remarked as follows, with regards to the influence of time in his teaching approach:

> *"Yes. When doing practical I need learners to be participative and hands on. But it takes time to setup the practical apparatus and to introduce the practical and expressing the Do's and Don'ts in the lab, and doing the main demonstration of a practical before learners do the practical".*
>
> [$T_8S_8Q_8$]

In essence, the quote above indicates that the teacher requires learners to take an active part in performing the practical. He further brings an important point of lab safety, and the rules pertaining to safety in laboratory. He further indicates that time constraints influence his practical lessons with regard to the setting up of practical equipment and conducting the demonstration for the learners.

Another teacher conceded that if he had to embark on practical work, he would not be able to complete the curriculum. He argues that within their school setting there is not science teaching assistance, as is often the case at universities and in other countries that have enough human resources. The teacher argued that because of workload, even if the school had no deficiency in terms of science apparatus, it would still be impossible to do practical work. He argues that the setting up of apparatus and preparation for the experiment is not possible.

"*Yes, it does. If you embark on practical work a lot, you will not finish the syllabus. In our schools there are no assistant teachers, and therefore preparing and setting up experiments will be impossible even if you have the equipment; also teaching the whole school from Grade 8 to 12, means you can't have time to plan and test the chemical before the period starts.* [$T_1S_1Q_1$]

Another teacher had this to say with regards to his choice of a teaching approach:

"*Less time means less teaching. I won't like being cut-off during my lesson. Therefore, the smaller the time the smaller the lesson. Unfortunately, time always limits me which leads me into taking afternoon classes. My teaching approach is always direct as I know I don't have much time.* [$T_5S_5Q_5$]

It is clear from this statement is that the teacher has a strong belief that time is an important factor that contributes towards deciding on the appropriate teaching approach. The teacher exhibits signs of panic when it relates to time and as a result does not seem to explore any other teaching approach to save or create time. Consequently, the teacher follows a transmission teaching approach, because of time constraints.

4.2.7 Organisation of extra-mural classes and external tutoring

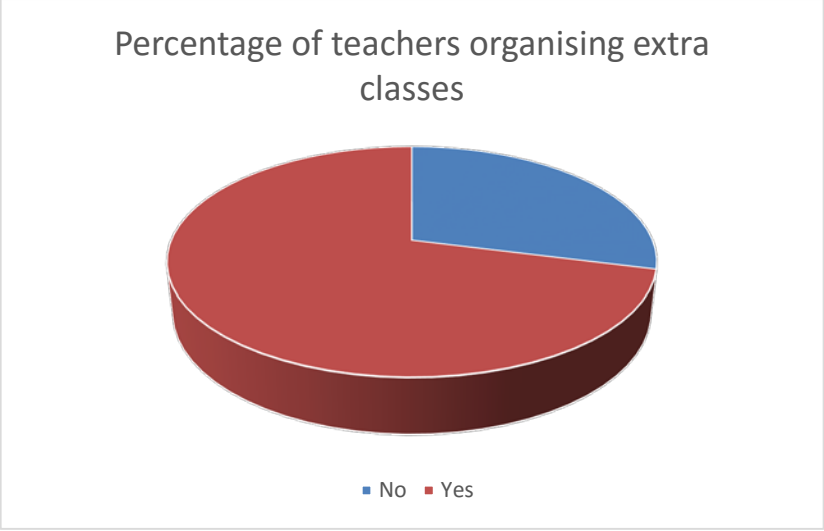

Figure 7: Pie chart indicating percentage of teachers organising Grade 10 extraclasses

Figure 7 indicates that a large proportion of teachers do organise extra-classes for Grade 10 Physical Sciences learners. Another reason as to why they have to resort to extra lessons is discussed below and substantiated with relevant quotes from the questionnaires.

The data indicate that the teachers do organise extra classes for Grade 10 learners. From the discussion above and some of the quotes, the teachers have indicated that extramural classes in various forms were an integral part of their teaching, because in most instances they are unable to cope with the prescription of the curriculum. For example, in Section 4.2.4 above, teacher $T_5S_5Q_5$ indicated that he organises afternoon classes, particularly when his learners struggle with solving problems that involved calculations. However, teachers consistently reported that they conduct extramural classes for Grade 10, whenever they had challenges with practical work or other problems such as uncompleted tasks. For example, one teacher said:

> "*I also teach Grade 11 & 12 Physical Sciences which also demands extra classes. Basically I don't find time for Grade 10s. It is only when we do practical work that we meet in the afternoon."*
>
> [$T_4S_4Q_4$]

Remarks of Teacher ($T_5S_5Q_5$) provided below are an illustration of the fact that teachers use extra lessons to mitigate problems encountered during their teaching, problems which could not be accommodated during the prescribed and recommended teaching time.

> *"Because it's a small portion I manage to give them feedback, but when its calculations its tough, so I use afternoon classes".* [$T_5S_5Q_5$]

One of the many reasons cited from the data is that they are more concerned with extramural classes in the more senior grades, especially Grade 12. One teacher indicated that the only time that they have extramural classes for Grade 10 learners is when these learners have to complete a practical activity (refer to quote above [$T_4S_4Q_4$])

In addition, the data indicate that the learners do not have any external tutoring organised by their parents. The learners mostly rely on the teachers and the material that is provided at school, mostly textbooks, to supplement their learning at home. In addition to the above, one teacher indicated that even parents have no understanding of tutoring and extra-classes, as most learners live with their grandparents who are satisfied with the learners merely attending school. Moreover, these grandparents cannot afford to pay for extramural classes or lessons. Another point that emerged from the data, is that the school is located in the village, and this meant that no tutors are available to offer extra-mural classes to the learners. The following quote illustrates this point:

> "*Learners that I teach do not have tutors (externally) due to the fact that they come from the village, and raised by grandparents who do not have money for a tutor and do not even understand extra time besides school time".*
>
> [$T_7S_7Q_7$]

Another factor that affected the implementation of extra classes by the teachers was that of transportation. Learners are transported as they reside far away from the school. This meant that teachers had limited time to implement extra-mural classes, as the following quote indicates:

> "*We take two hours of time afternoon which is also small when you look at preparing the experiment and execution of the experiment. Transportation is also limiting, which forces us to use two hours only".* [$T_5S_5Q_5$]

4.2.8 Other factors affecting curriculum coverage

The data show that teachers are faced with other adverse challenges which affect their curriculum coverage. Teachers are overloaded, as they teach too many grades and sometimes they have a whole repertoire of subjects that they teach. Due to the size of the schools, particularly in rural areas, teachers have to teach subjects that they have not even studied themselves, and the schools they teach tend to have expanded curriculum streams in an attempt to attract learners in order to increase their enrolment numbers. The quote below from one of the teachers shows this point:

”*I teach 6 subjects namely: NS (Natural Sciences), Technology, Arts and Culture, Life Sciences, Physical Sciences etc. It is impossible to think that there would any ‘enough’ time for me”* [$T_5S_5Q_5$]

The type of learners who come into the Physical Science class is also seen as a problem. For example, one teacher remarked:

“Being a Grade 12 and 11 educator, long syllabus in Grade 10. Type of learners I am teaching in that particular grade affects teaching. Learners do choose incorrect streams”. [$T_5S_5Q_5$]

Furthermore, data indicated that they also have to cope with other duties besides teaching, which meant their teaching was affected negatively and they lose teaching time. Teachers listed that teaching more subjects meant they had to spend more time planning lessons for the different subjects and grades that they teach. This is done in an environment where there is lack of resources. They also indicated that the type of community in which they teach affected their teaching, and that work dynamics and politics also exacerbated the problem. They also perceived administration of discipline at school as taking away precious teaching time, as they had to deal with bullying, drug abuse, and other safety issues experienced at school. The extract below illuminates this view:

“Six subject lesson plans, six assessments, many periods per day, less resources, backwards community(village) work politics and many responsibilities such as school safety (drug abuse, monitoring bullying, etc.) all contribute to poor curriculum coverage”. [$T_5S_5Q_5$]

One teacher held a contrary view to the general pattern of views of the other teachers. The teacher remarked that lack of adequate provision of learning resources impacted negatively on his teaching; the response was provided for a question that had asked the teachers to indicate what other factors affected his curriculum coverage. The quote below indicates this teacher’s views:

" *Lack of resources, textbooks, practical apparatus"* [$T_6S_6Q_6$]

4.2.9 Adherence to prescribed time allocations

The data show that teachers do not always find it easy to adhere to the prescribed and recommended time allocations, different reasons being provided to support this view.. They indicated that they are often behind in the syllabus. Some cited shortage of apparatus for practical work, others indicated that they are teaching too many subjects at their school.

> *"Sometimes in experiments you have a shortage of apparatus. Sometime curriculum coverage. e.g. being behind the syllabus".* [$T_8S_8Q_8$]

> ***"****Basic of Physical Sciences starts at this grade, therefore the topic that I manage to complete. I make sure learners understand. There are topics that I cannot afford not to teach. I choose to start with certain topics".* [$T_4S_4Q_4$]

> ***"****More work on my shoulders and responsibilities. I teach 5 subjects, namely: Natural Science, Technology, Arts and Culture, Life Sciences and Physical Sciences. It's impossible to think that there will be any "enough" time for me".* [$T_5S_5Q_5$]

4.3 Interview with teachers

4.3.1 Implications of copied homework on time

Implications of copied work emerged as a trend that was prevalent in the data. The teachers indicated that they are able to assess learners and especially homework, as schools have a clear homework policy that is strictly adhered to. They also indicated a challenge with regards to homework. The teachers claim they experience copying of homework, and in some cases whole groups copy homework. This they viewed as detrimental to the intended objectives of homework, as expressed by one of the teachers below:

"*Generally, as a school we have a home work policy that we have been effecting. In terms of submission of the work in the morning time we have had no challenges as learners do their work. Albeit our challenge here is the authenticity of the work, because most of the work is copied from one person. So the whole reason for homework is being eroded by copying, which as a school we have not managed it effectively to control it as it requires a lot of labour on the educator".* [$T_1S_1I_1$]

4.3.2 Use of lesson planning as a time management tool

One of the themes that emanated from the data is that of the use of lesson planning as a time management tool for teachers. The data from the interviews indicated that lesson planning is done by the teachers but it is not structured, because teachers use a simplified report where they indicate the topics that they will teach on a specific day, instead of a fully-fledged or detailed plan, that accounts for every activity and how it is going to be presented in class. The extract below, from Teacher 1, School 1 and Individual Interview 1 ($T_{1;}S_{1;}I_1$) illustrates this point:

"Yes, lesson plans are used for all classes conducted. Challenge is when maybe some work has to be repeated and/or the previous lesson was not completed. This can disrupt the planned lesson for the day. Other thing is in rural schools' meetings are generally conducted during tuition time because most educators would want to travel back home in town. This generally has a massive setback in completing the amount of work set out."

[$T_{1;}$ $S_{1;}$ I_1]

This quote also indicates that there are implications for time, since the teacher points out that sometimes the challenge is when the work that has been planned for a particular lesson is not completed during on the specific lesson for which it has been planned. The consequence of this incompletion is that it filters into the next lesson, and disrupts planning for the next day's or week's lesson. Secondly, the work done in the previous lesson has to be reiterated in the next lesson. In addition, the assertion by the teacher indicates that staff meetings also affect the teaching and learning time.

The reason provided for this is that teachers stay in town as the school is in the village and therefore they have to travel back home in time. The frequency of the meetings, therefore, has adverse consequences for time on task by the teachers. In his interview, one teacher indicated that, due to the many other responsibilities and the classes he teaches, he even fails to plan for lessons and at times ends up not teaching anything at all, because he gets tired during the day and becomes unproductive in the afternoon. The quote below shows the teacher's assertions:

> *"They affect my teaching to prepare for these subjects you see… You end up not planning and just go to class. Sometimes in the afternoon period you are tired and cannot teach properly you see".* [$T_2S_2I_2$]

4.3.3 Other factors affecting curriculum coverage

Another factor that came out of the data collected during the interviews that has an impact on curriculum coverage was that of teacher workshops. The teachers indicated that they are often called away from classes for developmental workshops that normally take up 2-3 days, starting in the morning each day. This therefore meant that those teachers could not attend their schools to teach on such days as they have to attend the workshops. Furthermore, cluster moderations also affect teachers' classroom teaching, as the teachers who live far from moderation venues had to leave school early to ensure that they are not late for the cluster moderations. The extract below illustrates this finding:

> "*It affects a lot you see, they call workshops M+1 almost every Monday, and I have to attend for Grade 9 Maths, and some workshops there's no planning from the department, you go there 2-3 days, starting at 8 am morning every day, then I am not at school those days, so my classes are not taught. For moderation because venue is far and I am at the village I go there early or sometimes just go straight to the moderation and not start at school otherwise I will be late for the moderation."* [$T_4S_4I_4$]

Secondly, the data indicated that the teachers sometimes are compelled not to attend school, due to challenges with transport when they have to attend union meetings that are set to start at 10am in the morning. This meant these teachers

choose to absent themselves school whenever there is a union meeting, as they see no point in going to school in afar villages, knowing they will leave school early. The quote below illustrates this argument:

> *"The unions call the meeting at 10 a.m., so if I am attending there is no point to come to school. I struggle with transport to go back and attend the meeting."*
>
> [$T_3S_3I_3$]

4.4 What was the education management perspective of the effect of the CAPS time-allocation on the teaching of Physical Science?

4.4.1 Interview with the curriculum advisor

The data coming from the curriculum advisor indicate that the teachers are falling behind the year plan, mostly because of improper monitoring by the school managers. This means the school management does not put in place proper curriculum management plans or plans that have been made are not implemented. He indicated that the challenge is that schools' sporting activities disrupt teaching, as they overlap with tuition. Moreover, he indicated that the teacher utilises extra classes to recoup lost time.

> *"Yes but some are behind the schedule due to lack of monitoring at their schools. One of the challenges is overlapping of programs like sporting activities; they use extra classes to address the issue of time".* [CA_1]

The curriculum advisor also indicated that the schools timetables are drafted according to the curriculum and assessment policy statement prescripts. This implies that the 4 hours per week for Physical Sciences is observed in the drafting of school timetables. He further indicated that even though the timetable is CAPS compliant it is not adhered to in most schools, due to insufficient monitoring and supervision of teachers at schools by managers.

> *"The timetable is CAPS compliant but not adhered to by most schools due to lack of monitoring and supervision by school management. The school*

management is given an urgent training on monitoring and evaluation and educators are taken through the CAPS". [CA1]

With regard to lesson planning the curriculum advisor indicated that teachers do not plan their lessons according to their unique circumstances. The teaching at schools is mostly general, and does not address the difference in learning capacities of different learners. He observed that schools do not identify learners with barriers to learning. Furthermore, he noted that the lesson plans focus on content with complete disregard of other factors that are prevalent in classrooms. Moreover, the curriculum advisor alluded to the fact that the lesson plans are not utilised and implemented in class by other teachers.

"No the teaching is general no provision is made for any circumstances, no individualization of learners nor special cases. The learners are just treated the same. The lesson plans just address the content without considering other factors or the plans only end in paper without implementation. Lesson plans and learner needs are not contextualized''. [CA1]

The curriculum advisor indicated that practical work had a 25% weighting on the standardised common final examinations across all grades in the FET level, and that almost all teachers had reservations about the prescribed and recommended times for practical work, and felt that time for practical work was not catered for appropriately in the CAPS. Teachers then had to resort to extra classes to ensure that the practical work is done and completed by the learners. He felt that a lot of that is used up during practical work since learners are afforded the opportunity to discover laws, concepts and perform data analysis, in order for the learners to make deductions and arrive at meaningful conclusions. The extract below illustrates this finding:

"Yes practical work is prescribed for all learners and carries 25% of the final exam mark. Almost all educators complain that Caps does not cater time for practical work and the case is worse when the practical work has many steps or stages like grade 11 intermolecular forces, factors affecting reaction rate, resistance (series & parallel connection and internal resistance) therefore they end up using extra classes on weekends and afternoons. Lot of time is

consumed on experiments because learners have to discover laws and concepts, collect & analyze data, make some deductions and draw up conclusions." [CA1]

When the curriculum advisor was requested to indicate whether teachers who were not conducting practical work had cited time as a reason for not doing so, he remarked as follows:

"Well yes time is a limiting factor because some teachers end up using simulations even though they have apparatus to conduct practical work. Hands –on activity requires time for observations, other reactions are lengthier than others therefore an hour or 30 min may not yield the expected results." [CA1]

The quote above indicates that time is perceived as an impeding factor to effective integration of practical work in teaching Physical Sciences, to such an extent that some teachers have to use simulation to give learners an idea and a feel of how science is done, as hands-on practical work necessitates the need for more time which cannot be catered for in a single 1-hour period that most schools are following as the data in the study indicates.

The subject advisor also remarked that extra classes are used for assessment, teaching and practical work, to the extent that if the prescribed time is used for teaching, then the extra classes will be utilized for assessment and practical work, meaning, according to subject advisor admission, time for assessment and practical work is not adequately catered for in the curriculum. This has a consequence of offering no rest to Physical Science teachers. The extract below illustrates the point expressed in this finding:

"*Yes, they use this time for teaching, assessing and practical work as I have already mentioned. For example, if the prescribed time is used for teaching the extra time will be used for practical work and assessment, in a nutshell assessment &practical are not catered for such that physical sciences educators have no rest."* [CA1]

Finally, the subject advisor remarked that other factors that influence teachers' curriculum coverage are time and the competency of teachers, contextualization of the curriculum to cater for learners and lessons, shortage of the apparatus and laboratories, and the shortage of the teachers at schools.

> *"Time, competency, contextualization of learners and lessons, shortage of apparatus and shortage of human resource."* [CA_1]

4.5 Summary of the chapter

The above chapter discussed the key findings that emanate from the data analyses. There are eight (8) main findings that emanate from the following themes, (i) Time allocation adequacy (ii) effect of time on assessment and feedback (iii) effect of time on deciding the teaching approach (iv) organisation of extra classes and external tutoring (v) other factors affecting curriculum coverage (vi) adherence to the prescribed time allocations (vii) effects of copied homework on time and lastly (viii) use of lesson planning as a time management tool.

These themes were derived from all data sources, which were the teacher questionnaire, the teacher interviews and the interview with the subject advisor. Key findings were that the time allocations in CAPS as prescribed and recommended are inadequate, and due to inadequate time allocations, learners were unable to complete assessment in time as envisaged by the teacher, and that teachers consequently struggled to offer sufficient feedback to the learners. Furthermore, the findings showed that the teachers were limited in their choice of a teaching approach, and preferred to teach first, and deal with issues of practical work later, once they had completed the teaching of theories, concepts and scientific skills. In addition, teachers had to resort to extra classes to ensure that learners completed their assessment and practical work, and the data showed that the teachers had no knowledge of any learners in their classrooms who were receiving external tutoring. Other factors that affected curriculum coverage by the teachers were cited to be the attitude and ability of learners that teachers had to deal with in their classroom, and poor management of extra-curricular activities and staff meetings that were conducted during teaching time, as most teachers reside in urban areas, and had to rush home after school.

Chapter 5

Discussion

5.1 Introduction

The previous chapter dealt with the findings that emanated from the data that were collected. This chapter discusses the data in detail and links them with the relevant literature to illuminate how the findings of this study fit within the overall body of knowledge. The data coming from the different sources will be collated, contrasted and similarities pointed out to give the overall sense of the implications of the study. Major findings that arose from the data indicated eight (8) key themes that were prevalent across the data, and full discussion of these findings is provided in the chapter. The discussion on this chapter seeks to interpret the findings that sought to illuminate answers to the research question

> How suitable are the time allocations in CAPS in accommodating a diverse range of teaching strategies that teachers employ in their Grade 10 Physical Sciences classes?

The findings from chapter 4 are discussed with the view of addressing the following research sub-questions:

1. What are teachers' perceptions of the prescribed and recommended time allocations in CAPS for the Grade 10 Physical Science in a rural education cluster of the Eastern Cape Province?
2. What was the education management perspective of the effect of the CAPS time-allocation on the teaching of Physical Science?

5.1 Time allocation adequacy

From the findings, a majority of teachers reported challenges with adhering to the time allocations in CAPS. A large proportion of teachers in this study perceived the time allocations prescribed and recommended in the curriculum as inadequate. The perceptions of the teachers cannot be ignored as they are directly involved with

delivering the curriculum; any negative perceptions may negatively impact on the ability of teachers to deliver the curriculum effectively and efficiently.

Poorly managed perceptions result in anxiety and panic from teacher; more so because Grade 10 Physical Science final examinations are standardised across the province of the Eastern Cape. Performance trends in these standardised examinations are not yet reported at the level such as those of the Grade 12 final examinations. But what has been prevalent within the cluster has been the deteriorating number of enrolments and the phasing out of Physical Sciences at some schools, owing to learner attrition, shortage of suitably qualified teachers and poor learner performance in the Grade12 final examination results in some schools.

Therefore, according to an observation made by Allison (2011), it would be interesting to note how teachers are reporting the performance of their learners. Allison (2011), as discussed in Chapter 2 Section 2.2.4.5, argued that inadequate time allocation may lead to examination malpractices and contribute towards poor learner performance. With this view in mind it then suffices for one to speculate that the teachers in these schools might not administer the standardised final examination for Grade 10. If they do, the learners inevitably perform badly because of the perception by the teachers that time allocations are inadequate.

The teacher ($T_9S_9Q_9$), as shown in the quote on Chapter 4 Section 4.2.2, clearly articulates this fact. He concedes that contextualising the curriculum as demanded by Staver (2007) is a challenge. The view that curriculum contextualisation is a challenge negates Staver's call for teachers to contextualise the science curriculum in order for learners to better make decisions about how science impacts on their personal life, including career choices and their social environment. This has serious consequences for a country like South Africa which is developing and requires citizens who have scientific awareness. South Africa is in serious need of more scientists and engineers in order for the country to be globally competitive, and the failure by teachers to contextualise the curriculum affects the learners' choice to follow a science related career.

5.2 Effects of time on assessment and feedback

From the data it is evident that teachers are unable to provide adequate feedback to learners as there are time restraints that limit them. This suggests that learners themselves take a lot of time to complete the activities assigned to them and this creates a chain reaction of time delays. When a learner has not finished an assigned task, it becomes a challenge for the educator to proceed with the next planned activity on his teaching plan, because of the lack of information as to whether the learners have understood the lesson or the section of work that was taught to the learners. Another point to note would be learners themselves cannot evaluate their own understanding of the work that has been taught if they are not provided with the necessary feedback, on time.

On Section 2.2.4.6, in Chapter 2, Nieuwoudt and Reyneke (2013) argued that assessment should be an activity planned thoroughly, implemented fully and interpreted to extract information and records about the learners' performance. The indication that learners are incapable of completing the assessment in time gives rise to two possibilities, namely that the teachers fail to adequately plan their assessment activities, hence learners will be unable to complete such assessment. On the other hand, the learners themselves might be unprepared to learn and hence rob the teacher of an opportunity to assess their competence and understanding in order for the teacher to get an understanding of the effectiveness of his teaching strategies. Nieuwoudt and Reyneke (2013) contend that various assessment methods should be employed by the teacher to give learners ample opportunity to demonstrate their understanding, and for the teacher to give the learners specific and targeted feedback with regard to learner performance; however such ideals cannot be realized in a classroom context where assessment is not completed in time.

Furthermore, failure to complete the assessment in time contradicts the principle of assessment, as asserted by Nieuwoudt and Reyneke (2013) that assessment feedback should be given timely and be relevant to the learner, in order to encourage learners to be responsible for their educational development. This researcher argues that the time allocated for assessment of concepts in the CAPS is only considered for the purpose of summative assessment and neglects the needs for formative assessment which informs the daily teaching by the teachers. This biased allocation

of time, for purposes of summative assessment, robs the teachers of an opportunity to fully apply the principle of assessment as espoused by the relevant literature discussed in Section 2.4.4.6 of Chapter 2.

5.3 Effects of time on deciding a teaching approach

One of the key findings was that teachers tend to follow this teaching approach where science is presented as a series of lectures and practical work or scientific inquiry- based teaching is avoided at all costs, due to lack of time and material resources to perform practical work. Teachers have to resort to extra classes to be able to afford the learners an opportunity to perform practical work. Although teachers attempt to expose learners to practical work, the data that came from the study showed that the teachers are confronted with impediments such as transportation arrangements for the learner, when they attempt to engage learners in practical work after school. Such issues make the ideals as envisaged in the CAPS and espoused by the Minister of Basic Education impossible to realise within the rural cluster of the district investigated in this study.

This implies that the teachers can only teach concepts and skills and learners are deprived of an opportunity to embark on any practical work. Therefore, the teaching approach is transmission of content without exposure to practical work. This goes against the envisaged policy prescripts that seek to produce learners that are well versed in scientific inquiry.

The dominant approach followed by teachers in their teaching is that of teaching theories first before they teach practical work. This approach is often characterised by the “chalk and talk” method of teaching. Teachers indicated that they choose this method of teaching because of time constraints, as their time was limited with a curriculum that was overloaded despite the teachers’ many other responsibilities at school, such as maintaining discipline and teaching to many subjects and classes. Kelly (2007) argued that teaching that follows the transmission approach leads to science being viewed as narrow and authoritarian. He notes that transmissivity of teaching dominated by teacher talk might be necessary to direct and control the lesson.

One of the teachers remarked as follows:

"Less time means less teaching. I won't like to be cut off during my lesson. Therefore, the smaller the time the smaller the lesson. Unfortunately, time always limits me, which leads me into taking afternoon classes. My teaching approach is always direct as I know I don't have much time." [$T_5S_5Q_5$]

In addition to the above Melville et al. (2014) argued that teachers tend to teach the way they have been taught, when they were still learners themselves. This teacher agrees that he does not like to be disturbed when teaching. This shows a strong transmission approach to his teaching, which explains his choice of the teaching method and, in South African education, the authority of the teacher was historically central to teaching and learners were passive consumers of knowledge, which is evidenced by the teachers' attitude towards teaching his learners.

His educational background was dominated by teacher authority which would support the views expressed by Melville et al. (2014) that teachers will teach the same way that they had been taught when they were still learners. The researcher then argues that if South Africa needs to move to a more diverse way of science teaching it suffices to propose that the current crop of teachers should use modern technological teaching techniques. This will require more focused and robust professional development of teachers especially in information and communication technologies (ICT) and how to use ICT for effective teaching and learning. This will ensure that the teacher of the future would be able to teach the next generation of learners using the technologies they were exposed to when they themselves were learners.

Secondly in Chapter 2 Section 2.2.4.1, a reference was made to assertions by Melville et al. (2014) that teachers' practical knowledge is a subjective. This is evident from the teacher's response that personal considerations are more important than impacting correct scientific knowledge. The teacher's judgement of the limited time leads him to follow a direct transmission approach to teaching and neglect to take into cognisance the theoretical prescripts. Tobin (1990), as discussed in Chapter 2 Section 2.4.4.1, argued that for science learning to be effective, learners should be exposed to the material in an environment familiar to them, in order for learners to construct their own meaning of scientific concepts. The teacher's strong feelings about not liking being "cut-off" suggest that the learners in his class are suppressed and have minimal opportunity for questioning.

In addition, Danaia, Fitzgerald and McKinnon (2013) argued that the transmission approaches to science teaching are dominant because teachers have to deal with an overcrowded curriculum within time-bounds, in order to prepare learners for standardised assessment. As discussed in Chapter 2 subsection 2.2.4.3, Danaia, Fitzgerald and McKinnon (2013) made a contention that teachers transmit knowledge to learners in order to cope with an overcrowded curriculum, which often has to be completed within strict timeframes. This is true for South Africa where Mathematics and Science assessment in Grade 10 have been standardised and learners throughout the province write common set examinations. Interesting enough to note is that in Grade 10 it is only Physical Sciences and Mathematics that are provincially set, and all other subjects are either set at district level or school level. This leads the researcher to argue that teachers have to focus more on the content, and spend little time in practical teaching and understanding of the applications of science.

The data collected in this study showed that teachers do exactly as suggested above; they focus their energy on the mastery of content that they know will be examined, more especially content that form the basis for senior grades including the matriculation level which is an exit point, and where the odds are stacked high to remain at the top of the league tables of good matriculation passes. Millar (1998), however, advocates that practical work should be perceived as an alternative method in support of established science knowledge. In this study, time was a critical factor that was cited by teachers that prevented them from following a more practically biased teaching approach in their classroom. In the questionnaire teachers were requested to choose the teaching approach that was dominant in their classrooms as suggested in Chapter 2, which were derived from a paper by Lunnetta and Hofstein (1991).

Mellville et al. (2014) asserted that human experiences, for example, feelings, judgement, willingness and actions are elements that influence practical knowledge, more than just mere teacher knowledge of practical work. In this study, regardless of teachers' knowledge of practical, data indicated that the feelings of teachers with regards to time was a key determinant as to whether or not teachers follow a practical based teaching approach. Given the teachers' views of limited time, the methods of teaching that incorporates a practical on a daily basis was not popular.

The data do not indicate the views expressed by Melville et al. (2014) who argued that teachers who follow the practical based approach to their teaching might face different challenges, which includes, amongst others, insufficient understanding of the practical approach to teaching science, insufficient understanding of the nature of science, and limitations in the teachers' teaching inventories, limited content knowledge, both substantive and syntactic, lack of experience with the different practical teaching approaches, that is, investigations, experiments, projects etcetera.

The researcher may argue that the teachers who participated in this study might have also experienced these challenges if they opted for a more practical based approach to their physical science lessons. In addition, one can also argue that the teachers' choices could have been due to their lack of understanding of how to incorporate practical work in their teaching, their limited understanding of the importance of the nature of science, and perhaps a deficiency in their content knowledge and understanding of different practical teaching approaches.

Further, Seng & Hill (2014) contended that approaches to teaching science must involve active participation of learners in the scientific dialogue process. They argued that teachers must be conscious of the methodological impediments that influence classroom dialogue, so that they may improve the outcomes of science learning. This view was supported by some of the teachers who indicated that they prefer their learners to be participative during practical work.

The teachers expressed challenges of limited time with regards to preparing for the practical work, and that this prevalent lack of time meant that performing demonstrative experiments before the learner embarked on the practical activity was also affected by time constraints. This means that the teachers are aware of the shortcomings that they face in their classroom that impact on their teaching, as supported by the literature. This is more so because according to Putnam and Borko (2000), learning is affected by the physical and social context in which the learning activities take place. In addition, the context in which a person learns is a fundamental aspect of what is learnt. One of the findings discussed in Chapter 4 above, was that the context in which the teachers teach, which is a village, affected their teaching. Learners stay in distant villages and have to be transported to their homes. This meant that even though teachers were making efforts to supplement

and extend contact time with learners, they were impeded upon by the context in which they teach. Garvin-Doxas and Klymowsky (2007) also argued that learners should leave a science lesson with an understanding of key science concepts and with deeper levels of evidence- based scientific constructs, rather than purely memorised scientific knowledge. Plummer and Krajcik (2010) suggested that scientific ideas should be introduced in their simplest form, in such a manner that in the long run, big scientific concepts can be understood.

In this study, even though teachers attempt to expose learners to practical work, the data indicated that teachers are often constrained by time. This is contrary to the view expressed by Makgato (2007) who found that teachers' inadequate knowledge of Physical Sciences and lack of practical work were two of the factors that affected learner performance in science Therefore, lack of time has an impact on the capacity of the teachers to roll-out practical work, as they have to resort to extra classes, which are also impeded upon by other challenges such as transport arrangements, as expounded on above, and poor parental involvement in the education of their children.

The data that came out of this study indicated that lack of parental involvement was a challenge. An observation was made that parents lack an understanding that learners may require extra classes. Secondly, the parents' or guardians' lack of finances meant that even if parents were aware that learners have to be tutored after class or at home, their lack of finances meant that they could not offer their children this kind of support. This observation is in agreement with assertions by Tsanwani, Hansie, Engelbrecht & Maree (2014), who stated that factors such as parents' level of education, their income and home environment impact negatively on learner outcomes. In addition, they also argued that teachers' pedagogical knowledge, attitudes and work ethics also have an impact. The researcher then argues that in rural areas the points discussed below are relevant.

(i) Learners who have passed matric with better symbols in physical science and would be in a better position to assist their siblings, are less likely to be around as they would have gone to university or university of technology, to further their studies.

(ii) Poor teaching and learning strategies. Teachers' choice of a teaching method, which is characterised by "chalk and talk", and isolated practical activities, means that teachers need to reflect on their teaching method. The data indicated that the two other methods of teaching, which have a practical bias, were not being applied by the teachers. If teachers were to follow the method of teaching that allowed learners to perform practical work to arouse their interest as to why the observation they make came about, or to perform the practical and discover certain observations, the teacher's role would be to explain those observations as they are being made. This way of teaching would certainly interest learners and motivate them to discover more information about the observed phenomena.

The data indicated that learners were not completing their work and blamed their non-completion of homework to poor understanding of the work taught and assigned as homework. This is a clear indication of the learners' poor learning strategies. Their response to their teachers, that they fail to complete the work because they do not understand it, implies that the learners do not take an initiative to research answers to the assigned tasks. The reasons for this might be lack of access to computers with internet connectivity and smartphones that have internet connectivity. Another reason could be lack of knowledge of how to use their smartphones for research, if they do have access to the technology.

The lack of financial muscle of the parents could mean that even those learners who have access to smartphones, cannot afford to pay for internet connectivity because of the exorbitant prices of data bundles and airtime in South Africa. In view of the latter point, Tsanwani, Harding, Engelbrecht and Maree (2014) also argued that circumstantial factors that include the environment at the home of the learner, the level of education of the parents and their income, the teachers' knowledge about pedagogy and the schools approach, all strongly influence learner achievement. In terms of teachers' pedagogical skills, the teachers' awareness and ability to integrate technology in their lessons could account for the failure of the learners to explore technologies that they can use to help them to learn at their homes. The integration of the technology might save the teachers a lot of time in having to manage incomplete homework, as fewer learners would fail to complete their homework.

(iii) Poor motivation and interest from both teachers and learners. As the findings discussed in the previous chapter, some of the data indicated that the type of learner that teachers teach impacts on their teaching. Even though the teachers do not indicate what they mean by the "type of learner", one can claim that they refer to learners who exhibit bad attitudes, learners who lack academic aptitude towards the subject, and learners with poor background in the subject because they had not been taught adequately in the junior grades. Furthermore, Tsanwani et al. (2014) contended that the attitude of the learners and the learners' work ethic definitely affects the achievement of the learner. These factors are prevalent in South African schools, in particular in rural areas because there are no facilities for career guidance, and therefore learners are not adequately advised in terms of subject choices. Tsanwani et al. (2014), however, explained that these factors are generalisations and there are exceptional cases where learners do perform well under difficult circumstances and also there are schools who perform and produce results despite the many challenges that confront the schools.

In addition, Kriek and Basson (2008) noted that teachers with a diploma level qualification exhibited more concern with regard to teacher training workshops in practical work compared to teachers that had degree qualifications. Furthermore, these teachers indicated that the changes in the curriculum had a negative effect on their teaching, over and above their insufficient training. The CAPS (2010) document advises teachers in some topics to integrate practical work and teaching. In the section of teaching the periodic table and the conceptual understanding of bonding, teachers are advised to spend more time on this section.

5.4 Organization of extra-classes and external tutoring

According to Aronson, Zimmerman & Carlos (1998), for learners to be competent with the challenging curriculum content, teachers need more time to cater for the learners' diverse learning styles. Similarly, if learners are to meet the same standard, some learners will need more time than others. These diverse learners' needs imply that schools should allow for creativity and flexibility to allow learners to cover the syllabus at their own pace and be given support to meet the curriculum needs. The findings as described in Chapter 4 above, indicate that some teachers do not organise any extra classes for Grade 10 learners in their Physical Science classes.

This implies that there is no mechanism to assist the learners to master the work they have been taught. The researcher, then, is arguing that this lack of support from the teachers and at home leads to learners' failure to complete the given homework. Consequently, the learners' lack of mastery of the work covered forces the teacher to embark on remedial work or re-teaching the concepts, instead of completing the curriculum. In view of this, one teacher conceded that he ensures that learners understand the work in Grade 10 that is required in more senior grades. This assertion implies that the teacher devotes more time than prescribed or recommended by the curriculum on these topics that they view important, and this has a ripple effect as the time used in stressing the topics required in senior grades, will affect other topics which are to be covered later. Moreover, Lopes et al (2008) argued that the tasks are not immune to the teachers' "teleology", teaching and learning processes and other constraints which include time and material resources.

5.5 Other factors affecting curriculum coverage

The data indicate that teachers are often disrupted by a myriad of other factors at schools which impact negatively on their teaching. Teachers report that staff meetings are often held during teaching time and this inevitably takes away a lot of teaching time that teachers could utilize emphasizing the skills, attitudes and values of physical science on learners. This disruption, the researcher argues, takes away viable time that teachers could use to support learners and give the learners valuable feedback. If such disruption can be minimized or totally eliminated teachers could spend more time assisting those learners who are underperforming in physical science. School management teams in these schools seems to be disregarding the importance of increased contact time on learner performance and ultimately curriculum coverage by the teachers in their school, as such practices would not impact on science teachers alone.

The second issue that emanates from the data is that of teachers being overloaded with other duties that end up taking away the teachers' teaching time. Schools plan a lot of activities that negatively impact on teaching time and disciplinary issues that teachers have to attend to do affect the teachers in discharging their core duty which is teaching and learning. The teachers are taken away from class to attend to drug issues that learners are bringing and using in schools. This certainly does affect other

learners from enjoying a conducive learning environment and hence the teachers have to intervene, at the expense of teaching time.

The third issue that seems to be affecting teaching and learning time at schools is their participation in extra-mural activities. The teachers are compelled to reduce and utilize teaching time to afford learners opportunities to participate in the extra-mural activities offered by the school. They have to do this because learners and teachers live in areas far from the school and it becomes impossible for teachers and learners to organize and participate in sports and other activities after school. Teachers have to rush home and attend to their personal business and the learners have to use the scholar transport provided by government in order to return home. Even if a teacher might be available after school to do extra-mural activities the learners will always need to leave with the available scholar transport.

5.6 Adherence to the prescribed and recommended time allocations

As indicated by some of the findings, teachers have to leave class to attend to disciplinary issues related to learner ill-discipline. The data also indicated that whenever they call morning classes not all learners avail themselves, which makes it difficult for the teacher to embark on any meaningful teaching. The quote below indicates this point:

> *"I normally have morning classes, you see but learners do not all come, so it becomes difficult to really do anything meaningful."* [$T_2S_2I_2$]

5.7 Implications of copied homework on time constraints

The data indicate that teachers do assess learners, and the schools have made sufficient efforts to ensure that there is a homework policy that is responsive to assessment. Even though this is to be applauded, the data showed that teachers who participated in this study have limited scope in terms of understanding of assessment or they fail to explore different assessment techniques in their classrooms. This is because they indicated homework and classwork as the mode of

assessment dominant in their classrooms. Secondly, the teachers indicated that a culture of copying existed amongst their learners. One teacher even conceded that such practice erodes the tenets of giving homework.

This leads one to argue the impact of this culture of copying with regards to time, as indicated by one teacher's remark that management of copying "requires a lot of labour on the educator". Teachers would need much time to monitor copying, ensuring that the learners' homework is authentic, punishing the offenders who copy and liaising with parents with regard to the parents' responsibility with regard to homework given to their children. Liaising with parents who might themselves be illiterate might compound the problem and create more frustration for the teacher. With the large workload that teachers currently have, it becomes extremely difficult to monitor homework effectively and prevent the problem of copying. This copying inevitably leads to teachers losing precious teaching time, which impacts negatively on their curriculum coverage.

Instead of the teacher managing the learning assessment to meet the standards suggested by Witzig et al. (2014), that assessment should serve the following purposes in terms of teaching and learning:

(i) The assessment should be of appropriate level in terms of language and what has been covered in the course of study, in the case of this study Physical Sciences in Grade 10, or a particular lesson that has been taught.

(ii) Knowledge and skills that had been taught to the learners should be asked. This means questions that are examined or asked should be in line with what has been presented to the learner. Learners' failure to complete their homework, and the copying thereof, diminishes the teachers' capacity to identify whether the assessment in question addressed the competences of learners with regard to what has been taught. Such actions certainly do affect the teachers' time on task.

(iii) Assessment should meet cognitive challenges, to promote critical thinking as opposed to reinforcing rote learning. In addition, learners should be afforded the opportunity for self-evaluation, personal reflection and interpretation of the work being taught. Copying of homework, as one teacher indicates, "erodes the reason for

homework". Copied work then means the impact of the time that was used to teach the learners cannot be evaluated. Teachers, as reflective practitioners, will have to spend time reflecting on what could be the possible reason for copying the work.

(iv) Above all, any assessment activity should support learning. It is argued that if assessment scaffolding is used, it may aid learners to answer questions that might have initially appeared to be beyond the learners' ability. If learners copy assessment tasks, then these ideals cannot be realised and the teachers end up guessing what interventions to make. The teacher may put in place an intervention that is completely unnecessary and spend a lot of time on an activity that doesn't warrant his or her attention.

(v) Lastly, assessment should ensure fairness and equity, and be immune of any bias. With this view, assessment should motivate learners to achieve high standards. This can help learners who score low marks to improve in their educational attainment.

Furthermore, Lopes et al. (2008) argued that the task administered to learners plays a crucial role in terms of teaching and learning. By tasks they referred to the given activities, which incorporate what the learners are instructed to do and what the learners actually perform. If learners fail to complete the required work given to them, such as homework, teacher plans are disrupted and they cannot continue with their planned activities without addressing the challenges and problems faced by the learners. Copying could be as a result of many factors including lack of understanding of the work, and also it could be because of lack of commitment by the learners. Irrespective of what the reason could be, the teacher has to forge ahead and provide remedial work, which at times might mean having to re-teach the whole concept again. If this approach is adopted, then teachers certainly lose time and curriculum coverage is impacted upon negatively.

5.8 Use of lesson plans as time management tools

From the data it became clear that the use of lesson plans was not strictly followed by the teachers. The teachers' failure to effectively use lesson planning contradicts

the principles of lesson planning as suggested by Gunter, Esters and Mintz (2007), who contended that fundamental considerations when planning a lesson should be:

(i) That the teacher should limit the concepts and content taught in order to create sufficient time for the lesson to be reviewed, and for the learners to practise the skills learnt and the teacher to give feedback.

(ii) There should not be a disjuncture between what has been previously learnt and what is currently being taught. The lessons should merge together harmoniously.

(iii) Ensure that the intended learning outcomes are achieved, by constantly checking for facts and re-teaching the concepts, if learning has not occurred.

(iv) Lastly, he contended that no teacher should accept failure as a non-avoidable and undoubted phenomenon that occurs in every classroom.

I argue that these principles are not realised in the context under which these teachers are teaching, given the fact that the data indicate that the teachers often have to resort to extra lessons to allow learners ample opportunity to engage in practical work and exercises that involved calculations. In fact, the data show that teachers are faced with challenges regarding giving feedback to learners due to the lack of adequate time, implying that they are not following the suggestion that the lessons should be short to allow for review of the work taught, practising of that work and feedback on the lesson that has taken place.

No evidence from the data suggests that the lessons do not merge together but one might argue that the desperation to catch up on lost time must have an adverse effect with regard to the teachers' ability to properly merge the lessons and link them to other subject areas that might require that same knowledge, skills, attitude or values, even though the lessons in Physical Science might merge harmoniously. On the other hand, without properly considered lesson plans the teachers have no tool to ensure that the intended learning outcomes are achieved and thereby re-teaching and checking for facts as they are already constrained by time that has been lost previously. This consequently leads the teachers to accepting that their learners are underperforming as evidenced by the findings in Chapter 4.

Chapter 6

Conclusions and Recommendations

6.1 Introduction

This chapter builds on the previous chapter that dealt with the discussion of the findings of this research study. The main points that emanate out of the research study will be summarised and conclusions provided. Furthermore, recommendations are made to guide practice to ensure that the main issues related to time prescriptions and recommendations in Grade 10 Physical Science CAPS curriculum are mediated.

6.2 Overview of the thesis

6.2.1 Chapter 1 Rationale for the research

The first chapter of the report dealt with the background to the study. The background to the study was informed by the time allocations as prescribed and recommended in CAPS. The teachers within the cluster being investigated informally reported challenges with regards to the time allocations in CAPS. In addition, the chapter outlined a brief description of the curriculum changes and development in the post-1994 era. The major issue cited in the literature is that the changes in the curriculum were largely informed by politics. The incoming government of the democratic dispensation had to ensure that there was an integrated curriculum and that the segregated pre-1994 education departments were integrated.

The literature report indicated that there had been three major curriculum changes in South Africa, namely the OBE curriculum which was also known as C2005. The second curriculum change was the revision of C2005 which gave rise to RNCS, and the last revision of the curriculum which culminated in CAPS.

The context of the study was outlined by giving the research objectives which were to investigate the suitability of prescribed and recommended time allocations to allow teachers to utilize different instructional methods. The background of the researcher

was placed into context. The geographical placing and the quintile grading of schools in the study was also explained.

The research problem was outlined by looking at CAPS and the literature that guides science instruction as proposed by Lunneta and Hofstein (1991). Consequently, the research question was posed as “How suitable are the time allocations in CAPS in accommodating a diverse range of teaching strategies that teachers employ in their classroom?” Following the research question, the significance of the study was elaborated upon.

Firstly, the significance of the study highlighted the importance of using different teaching strategies to give learners a different perspective to knowledge gathering. Secondly, through review of literature, emphasis was placed on the view that teachers should be able to make an assessment of a curriculum that does not meet their needs, and thus initiate the necessary changes. Suggestions for curriculum developers, found in literature highlighted, gave a balanced review of the significance of the study. Finally, the study is significant in that it identified the challenges that teachers face in adhering to the time allocations, in order to influence policy makers to consider contextual factors in developing the curriculum, and lastly, to be of assistance to curriculum managers and education stakeholders to improve their interventions.

6.2.2 Chapter 2 Literature review

Chapter 2 of this study dealt with the literature review. The study is underpinned by the theories of reflection, pedagogical content knowledge and curriculum reform theories. In this chapter literature that dealt with studies on classroom based science teaching was discussed, and practical based science teaching and learning was also reviewed. . Furthermore, literature in physical science teaching and learning strategies was explored, together with science learning styles. In addition, literature in the use of ICT as a time management tool in science education was espoused upon, as a strategy to increase teacher contact time and a tool for effective lesson planning and delivery.

Lastly the chapter explored literature on the impact of time allocations on teaching and learning and finally, literature that explored assessment was dealt with.

6.2.3 Chapter 3 Methodology

Chapter 3 outlined the methodology employed in the study. This chapter described the research design followed in the study to gather data. The sampling procedure followed was expanded upon and the research data collection was explained in detail. Moreover, the research instruments used in the study and their development were explained in detail. The research instruments used in the study were questionnaires and interviews. In addition, this chapter explored the manner in which data would be analysed and interpreted. Finally, the chapter looked at issues of reliability and validity of the study and ethical issues were elaborated upon.

6.2.4 Chapter 4 Findings

Chapter 4 of the study sought to deal with the findings from the research data that illuminated the research question: How suitable are the time allocations in CAPs in accommodating a diverse range of teaching strategies that teachers employ in their Grade 10 Physical Science classes? The sub-research question, What were the teachers' perceptions of the prescribed and recommended time allocations in CAPS for the Grade 10 Physical Science in a rural cluster of a district in the Eastern Cape Province, was probed using two instruments, namely, the questionnaire and teacher interviews.

The findings that emerged from the thematic analysis of the questionnaire were classified into 5 themes, namely:

(i) time allocation adequacy
(ii) effects of time on assessment and feedback
(iii) effects of time allocation on deciding a teaching approach
(iv) other factors affecting curriculum coverage
(v) adherence to the prescribed and recommended time allocations

Thematic analysis of teacher interviews revealed the following themes:

(i) Implication of copied homework on time
(ii) Use of lesson plans as a time management tool
(iii) Other factors affecting curriculum coverage

Finally, the findings emerging from the interviews with the curriculum advisor were elaborated upon. The interview with the curriculum advisor sought to shed light on

the sub-research question, What was educational management perspective of the effects of the CAPS time allocation on the teaching of Physical Science?

6.2.5 Chapter 5 Discussion

Chapter 5 discussed the findings as addressed in Chapter 4 by providing a comprehensive analysis of the findings, cross-referencing the findings and providing elaborative remarks, emanating from literature discussed in Chapter 2 and providing the researcher's interpretation and understanding of the findings. The discussion was guided by the following themes:

(i) Time allocation adequacy
(ii) Effects of time on assessment and feedback
(iii) Effects of time on deciding a teaching approach
(iv) Organisation of extra-classes and external tutoring
(v) Other factors affecting curriculum coverage
(vi) Adherence to the prescribed and recommended time allocations
(vii) Implications for copied homework on time
(viii) Use of lesson plans as a time management tool.

6.3 Major findings of the study

6.3.1 Inadequate time allocation's effect on curriculum coverage

From the data it is evident that the time allocations as prescribed and recommended in the curriculum and assessment policy statements (CAPS) are inadequatefor allowing teachers to cover the Grade 10 Physical Science curriculum. Furthermore, the data indicate that the teachers are unable to follow a diverse range of teaching strategies. The results at exit- level matriculation examinations can be used as an indicator of what happens in the lower grades, as suggested by Reddy (2005). Therefore, failure to complete the Grade 10 Physical Sciences curriculum by teachers at the schools under this study, has a direct bearing on the outcomes of their school matriculation performance in Physical Sciences.

6.3.2 Poor response to efforts to increase contact time

In view of this fact, teachers who participated in the study indicated that they needed to resort to extra classes to complete some of the work. It is important to note that teachers are constrained by contextual factors that affect their teaching time, which ultimately inhibit their ability to effectively teach Grade 10 Physical Sciences. One reason for the poor response to increased contact time is due to the fact that learners use scholar transport which makes it a challenge for the teacher to engage learners after school, or in morning classes. Learners tend to unavailable for these sessions even if the teacher makes an effort to be available. The researcher concludes that a curriculum that requires of teachers to resort to extra lessons to supplement their teaching is unrealistic.

One is led to conclude that the curriculum was modelled for an ideal situation, which is not what happens on the ground. There is a disjuncture between curriculum planning and curriculum implementation. Contextual factors must be taken into consideration when curriculum is being designed in order for the curriculum to find expression amongst the teachers who rollout the curriculum objectives and the learners receiving the curriculum. This, in a nutshell, means that the time prescription and recommendations in the curriculum are not suitable for the teachers in the schools that participated in this study, as the times allocations are not sensitive to the context in which these teachers operate.

6.3.3 Poor time management by school management teams (SMT)

From the data it emerged that a lot of activities that happen at school impact negatively on teaching and learning at schools in the cluster. It was found that staff meetings, extra-mural activities, union gatherings and professional development workshops take teachers away from their core business of teaching. The fact that the schools have no plans in place to manage the loss of contact time due to these extra-curricular duties and distractions implies that the SMT is not well equipped to manage the situation posed by the rural nature of the school location. It seems that the school management does not discharge its administrative duties adequately with regard to effective planning, and as a result valuable contact time is lost.

6.3.4 Time plays a key role in deciding a teaching approach

Teachers cited the lack of time as a major factor that affected their ability to conduct practical work. In situations where teachers attempted to conduct practical work they were often constrained by time and had to resort to organizing extra-mural classes in order to afford learners sufficient time to complete the practical activities assigned to them. This was done under pressure where even those extra-mural classes were restricted by other constraints such as the availability of transport. Consequently, teachers had to resort to one method of teaching, which is characterized by “chalk and talk”. The researcher then concludes that, should sufficient time be available, teachers would at least attempt to use different teaching approaches in their classrooms.

6.3.5 Negative effects of time allocations on assessment and feedback

The teachers who participated in this study indicated that learners are unable to finish the assigned assessment tasks in time and teachers had to resort to issuing homework for activities that they had initially planned to be completed in class. This trend implies that teachers do not give feedback timeously and do not proceed with the planned lesson. These consequences imply that the basic tenets of assessment and feedback are not fulfilled. Assessment and feedback have to support learning and allow the learner and the teacher to assess progress of the learning programme. The teachers are unable to ascertain the extent to which cognitive demands of the lesson have been met. The researcher then concludes that if the time allocation were adequate the teacher would be able to explore the different types of assessment tools that are available, but lack of sufficient time allocations as prescribed and recommended in Caps impedes such efforts.

6.4 Implications of the study

The implications of the study are three-fold, relating to the teachers, school management and the curriculum advisors. Firstly, with regard to teachers, one can argue that teachers need to take cognisance of the impact of their planning to ensure that it fits within the overall prescripts of the curriculum in order to afford learners adequate opportunities for success. Lesson planning should be done with the

contextual factors in mind. This will help teachers to avert time- wasting activities and disruptions to teaching whilst maximising teaching and learning time.

Secondly, with regard to school management, it has surfaced from the study that school management within the cluster in the district allows activity that disrupts teaching time to take place at schools. School management needs to make sure that adequate provisions for staff meetings and other extra-mural activities that have an impact on affecting teaching time need to be properly planned. Research focusing on how management of schools in rural areas can be enhanced are required, in order to give directed interventions that will address key challenges confronting school managers in rural settings; addressing these challenges should improve the teaching and learning of Physical Science and other subjects at schools in these areas.

Thirdly, with regards to curriculum advisors, there needs to be more support given to teachers to ensure that teachers are able to effectively utilise the allotted time allocations for the benefit of their learners. Research is required that investigates how the curriculum advisors are supporting teachers, especially those teachers in rural areas, and whether the kind of support that they give these teachers is adequate to deal with the myriad of challenges that these teachers face. The support given to teachers should be focused not only on the curriculum content but also on teaching techniques and skills which include, amongst others, proper time management and dealing with teaching within a rural, largely illiterate context.

6.5 Recommendations

6.5.1 Recommendations for future studies

(i) Teacher observations at schools could be undertaken to ascertain whether their own behaviour does not contribute to their failure to complete the curriculum
(ii) A study of the significance of school management teams (SMTs) in contributing to the adherence or non-adherence of science teachers to prescribed and recommended time allocations.

6.5.2. Recommendations for teaching and learning purposes

It is commendable that these teachers are prepared to go an extra mile to ensure that they cover the curriculum. It then suffices to derive the following recommendations for teaching and learning from the study. There needs to be greater emphasis on the utilisation of information and communication technologies as a means of increasing contact time and keeping learners engaged in curriculum work beyond the prescribed and recommended time allocations. These technologies, amongst others, include the following:

(i) The development of DVDs that can be used by teachers to demonstrate the practical activities required in Grade 10, so that teachers do not have to spend a lot of time to prepare and perform these demonstrations for the learners, as Lacy (1989) suggested in his study of primary science education in Western Australia. He found that amongst other problems associated with science teaching was that of limited time for laboratory preparation and the challenge of the diverse abilities of learners.
The DVDs should, furthermore, be developed in such a way that they provide teachers with supplementary knowledge on how to improvise in situations where there are insufficient or no resources at all to perform these practical activities in Grade 10. This is important to ensure that learners are given the experience of scientific data gathering and manipulation so that science becomes alive: this would avert an adverse finding by Lacy (1989), that teachers face a challenge with regard to ensuring that science lessons were hands-on, and maintaining a high level of interest in all topics.

(ii) Teachers in rural schools, such as those sampled in this study, should be supplied with laptop computers and internet modems, to enable them to have internet connectivity, so that they can utilise platforms such as YouTube and Vodacom e-school. Access to these technologies would allow teachers to explore methods/strategies on how they can integrate these technologies into their lessons.

(iii) Learners need to be provided with counselling in order to assist them with subject choices and career planning. This will ensure that learners with the requisite aptitude to study Physical Science are identified, and their academic strengths and weakness supported by informed interventions. In addition, these learners need to be

shown proper subject specific learning techniques, particularly how to study effectively at home, where most individual learning should be taking place. Furthermore, learners need to be trained on how to exploit technological platforms such as YouTube and Vodacom e-school as academic support tools.

In addition to the above, the recommendation would be that of strengthening management and administration in schools. Principals and school management teams should be trained in curriculum time management. The frequency and length of staff meetings should be reduced. Moreover, time should be set aside for staff meetings, such that the meetings do not affect teaching time. Principals and school management teams must use memorandums and briefing sessions to communicate with the teachers. Furthermore, they should explore the use of technologies such as Skype, and online discussion forums, to engage teachers. The use of technology will ensure that disruptions to teaching time due to staff meetings is minimised.

6.6 Limitations of the study

The study has limitations in that it focuses on the rural aspects of one district within a particular province, whereas the curriculum roll-out covers the entire country. The cluster comprises a small portion of schools within the district. Moreover, the rural nature of the district posed the following problems for the researcher, namely

(a) the roads are gravel roads with a large geographic spread across the area, where it became a challenge to access schools. This limited the researcher's capacity to engage further with different teachers and hence led to a poor or moderate response rate of the study. Observation of lessons to ascertain how teachers utilise their times was also a challenge, due to the vastness of the area. This provided a limitation in that it would have been valuable to observe lessons to get an indication of other factors that might be impeding effective curriculum implementation.

(b) The broadness of the issue of time meant that the teacher had to focus on one aspect of time; that is the time utilised in classroom. There exists a much broader

scope of what one can study when examining classroom time management constraints.

6.7 Summary of the chapter

The final chapter gave a brief overview of the study and the path that the researcher followed in conducting the study by explaining the major trends and findings emanating from the study and the implications thereof. The chapter further suggested recommendations for future studies to cast further light on the impact of time allocation in the South African curriculum.

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Appendix: Ethical Documents and Clearance

Appendix 1: Letters of Consent

XX Zone X
XXXX Township
Seaview
5xxx
-2015

Principal of YYYY
District XXXXX
Seaview

5xxx

Dear Sir

RE: PERMISSION TO CONDUCT RESEARCH

I, SibamZanoxolo, hereby request permission to conduct a research in your school.
I am a student at the University of Western Cape studying Masters of Education Degree. The research I wish to carry out is a requirement to fulfil the degree.
I pledge and promise not to disrupt any programs of the department and the school. I will use the time I get with the teachers, while I conduct the study, to benefit the teachers and the school. I will work within the framework of the school' and department's disciplinary arrangements.
I have also written a letter to the Education Head Office in this regard.

Yours in Education

XX Zone X
XXXX Township
Seaview
5xxx
-2015

The Chairperson –Ethics Committee
University of the Western Cape
Bellville
Cape Town ,7493

Dear Sir / Madam

RE: PERMISSION TO CONDUCT RESEARCH

I, SibamZanoxolo, hereby request permission to conduct a research at a school.
I am a student at the University of the Western Cape studying Masters of Education Degree. The research I wish to carry out is a requirement to fulfil the degree.
I pledge and promise not to disrupt any programs of the department and the school. I will work within the framework of the department's disciplinary arrangements and the parents of the learners.
I have also written a letter to the school in this regard. I have a strong belief that the research will benefit the school and other schools that may be affected by the challenge in question.

Yours in Education

UNIVERSITY OF WESTERN CAPE

FACULTY OF EDUCATION

CONSENT FORM

NOTE: This consent form is to be retained by the parent of the learner and the school principal and kept in a secure location. The student may be required to present the original copy to the University of the Western Cape Ethics Committee as evidence that consent has been granted to conduct research at your school.

I, _____, hereby give permission for SibamZanoxolo (MEd) who is a student of the University of the Western Cape and is involved in the planning and implementation of this research project permission to use the material which has been obtained during the course of the research.

I understand that the above research project has been explained and specified and those involved intend to share the research in the form of publications.

I also understand that:

- My participation is a personal decision and entirely voluntary.
- There are no rewards for granting permission.
- I will not be penalised for granting permission.
- I have the right to withdraw my permission at a later stage.
- The content obtained through the interview and questionnaire will only be used for the purpose of this research project.
- My own identity shall remain anonymous.

My signature below indicates my permission to use the material for research.

Signature _____

Date _____

Appendix 2: Instruments

Instrument 1: Questionnaire

SECTION A: TEACHER BIOGRAPHICAL INFORMATION			
AGE	**QUALIFICATIONS**	**TEACHING EXPERIENCE**	**EXPERIENCE IN CAPS**
List other duties you perform			
SECTION B: QUESTIONS ON TIME ALLOCATIONS			
Do you find time allocation for Grade 10 Physical Sciences adequate?		**Yes**	**No**
Please explain:			
If you have planned a lesson, with an assessment component in it, with time specified for learners to finish that activity, please answer the following questions.			
Are your learners able to complete the assessment in time?		**Yes**	**No**
Please explain:			
Are you able to provide learners with feedback within this time?		**Yes**	**No**
Please explain:			
Which teaching method, describes your daily teaching approach. Choose one			

from those given below.		
You do the practical first, before teaching theories and concepts?		
You simultaneously teach the theories and concepts whilst, doing the practical activities		
You teach theories and concepts first, before doing the practical.		
Does time allocation affect your decision to choose the teaching approach:		
Please explain:		
Do you organise extra-mural classes specifically for Grade 10 Physical Sciences	**Yes**	**No**
If your answer is YES, please indicate the amount of time allocated to the extra classes, and why?/ If your answer is NO , what is the key factor(s) that prevents you from organising extra classes		
Do you have learners who get external tutoring, organised by them or their parents?	**Yes**	**No**
Please provide more details:		
Do you always find it easy to adhere to the prescribed times?	**Yes**	**No**
If no, explain factors that prevent you from adhering to the prescribed times?		

Comment generally about how time allocations affect your curriculum coverage in Grade 10 Physical Science:
What other factors affect your curriculum coverage

Instrument 2: Interview schedule for teachers

OUT OF CLASSROOM FACTORS

Are those identified as being these listed below:

(i) Teacher absenteeism, due to personal reason (The frequency of leaves permitted or not permitted)

a. How many days have you been absent from school, for personal reasons, this semester?

b. What plans do you set in place to recoup the lost time for the Grade 10 Physical Science class(es)?

(ii) Extra duties allocated to the teachers, such as administrative duties

a. What duties are allocated to you besides teaching duties?

b. Is there time specifically set aside for performing these duties?

c. How does your performance of these duties impact on your teaching of Grade 10 Physical Sciences?

(iii) Other subject that you teach besides Physical Sciences

a. What other subjects is the teacher teaching, besides Physical Sciences?

b. How does teaching of this/these subject(s) impact on your teaching of Physical Sciences? If yes, explain how?

(iv) Absenteeism due to professional development workshops, cluster moderation and subject meetings including union activities

a. How does attendance of workshops, cluster moderation and/or subject meetings affect your teaching?

b. How does attendance of union activities impact on your teaching?

(v) Other school activities that impact on teaching, such extra-mural activities

a. How does participation of your school in extra- mural activities impact on teaching at your school?

INSIDE CLASSROOM FACTORS

(i) Planning of lessons

a. Are you planning your lessons according to your unique circumstances?

b. Do you use/follow your plans, if you deviate, why do you do so?

(ii) Availability of teaching resources

a. What teaching resources do you have? e.g. different textbooks, past papers, computers, photocopiers, projectors etc?

(iii) **Timetabling requirements**

a. Is the timetable designed as per CAPS requirements?

b. If no, why not?

c. In what way is the timetable designed that ensures you that it(timetable) is CAPS compliant?

(iv) Learners' cognitive abilities (level of understanding, special needs learners, etc.)

a. Are learners with special needs or learning barriers identified?

b. How many such learners have been identified?

c. What provisions are there to cater for these learners?

(v) Completion of class activities by learners and provisions for offering feedback to learners

a. Are learners completing assigned classwork and activities within the teachers' planned time?

b. If not, what is a common problem that leads to none-completion? E.g. slow writing, misunderstanding of concepts or general lack of classroom control.

c. What intervention does the teacher take to ensure timely completion of class activities assigned to learners?

(vi) Conducting of practical work

a. Do you conduct practical demonstrations for the learners?

b. Do you afford learners an opportunity to perform practical work as per curriculum requirements? Why or why not?

c. Do you perceive failure to perform practical work as syllabus non-completion?

Instrument 3: Interview schedule with the curriculum advisor

(1) In your monitoring of Grade 10 CAPS curriculum, are the teachers under your supervision adhering to the year plan?

a. If yes, are they reporting any challenges with time, and how they overcome those challenges?

(2) Is the timetable in the schools in line with CAPS?

(3) Are teachers planning their lessons based on their unique classroom circumstances?

(4) Are they following those plans?

(5) If there are teachers who are not adhering to the prescribed times in CAPS,what are the reasons that they put forward for not adhering?

(6) Are the teachers conducting practical work? If yes, what are their comments with regard to time?

(7) Those teachers who not doing so (conducting practical work)? Is time one of the reasons? And what factors are they expressing?

(8) Are you aware of any teachers who embark on extra-mural classes to cover the Grade 10 syllabus? What is the main activity that they do during these extra classes?

(9) What other factors, in your view, influence the teacher's curriculum coverage?

Appendices 3: Extract from a transcribed interview with teacher 1:

INTERVIEW TRANSCRIPTIONS:

TEACHER1

OUTSIDE CLASSROOM FACTORS

OUT OF CLASSROOM FACTORS

Are those identified as being listed below:

(vi) Teacher absenteeism, due to personal reasons (The frequency of leaves permitted or not permitted)

a. How many days have you been absent from school for personal reasons, this semester?

Had a few absents, even though I do not know the exact number, it could be 3- 4 days am really not sure

b. What plans do you set in place to recoup the lost time for the Grade 10 Physical Science class(es)?

I normal have morning classes, you see but learners do not all come, so it becomes difficult to really do anything meaningful

(vii) Extra duties allocated to the teachers, such as administrative duties

a. What duties are allocated to you besides teaching duties?

There are a lot. I am in the disciplinary committee, that takes time attending to learner cases, I also do sport you see and also entertainment committee, I do a lot because I am also a class teacher.

b. Is there time specifically set aside for performing these duties?

Not really anytime you can be called to discipline a boy, at times you have to book venues and organise transport for farewell, so you can't be at school those days

c. How does your performance of these duties affect your teaching of Grade 10 Physical Sciences?

Whenever there is a function, I have to prepare for it. Meeting with parents, staff and SGB, you don't want to be failure you see, so teaching is affected a lot.

(viii) Other subjects that the teacher teaches besides Physical Sciences

a. What other subjects is the teacher teaching, besides Physical Sciences?

I teach a lot you see, Grade 8 & 9 Natural Sciences, and Tech Grade 8, also Maths Grade 9 then Physical Sciences Grade 10-12. I teach the whole day you see.

b. How does teaching of this/these subject(s) affect your teaching of Physical Sciences?

They affect my teaching to prepare for these subjects you see… You end up not planning and just go to class. Sometimes in the afternoon period you are tired and cannot teach properly you see

(ix) Absenteeism due to professional development workshops, cluster moderation and subject meetings including union activities

a. How does attendance of workshops, cluster moderation and/or subject meetings affect your teaching?

It affects a lot you see, they call workshops M+1 almost every Monday, and I have to attend for Grade 9 Maths, and some workshops there's no planning from the department, you go there 2-3 days, starting at 8 am morning every day, then I am not at school those days, so my classes are not taught. For moderation because venue is far and I am at the village I go there early or sometimes just go straight to the moderation and not start at school otherwise I will be late for the moderation.

b. How does attendance of union activities affect your teaching?

Union calls meeting at 10 am you see, so if I am attending there's no point to come to school, I struggle with transport to go back and attend the meeting.

(x) Other school activities that affect teaching, such as extra-mural activities

a. How does participation of your school in extra- mural activities affect teaching at your school?

You see when we have a match it has to start early because matches must finish by 3 p.m. and these learners do not come ready for school you see, they are looking for soccer boots from friends and we also have to prepare for the coming teachers as hosts, so we can't teach, it's impossible to teach in fact

INSIDE CLASSROOM FACTORS:

1. Planning of lessons

(a) Are you planning your lessons according to your unique circumstances?

Mine are simplified daily reports. It just sets the work to be covered on a particular day and period and a box to tick if planned work was conducted.

(b) Do you use/follow your plans, if you deviate why do you do so?

Yes, lesson plans are used for all classes conducted. Challenge is when maybe some work has to be repeated and/or the previous lesson was not completed. This can disrupt the planned

lesson for the day. Other thing is in rural schools' meetings are generally conducted during tuition time because most educators would want to travel back. This generally has a massive setback in completing the amount of work set out.

2. <u>Availability of teaching resources</u>

(a) What teaching resources do you have? e.g. different textbooks, past papers, computers, photocopiers, projectors etc?

Classroom, chalkboard, chalk and books. My challenge is with apparatus for experiments. Generally, the only experiments I do are those set up for CASS tasks. This in turn deprives learners as to the practicality of the subject. Human resources we are comfortable as when needs be we consult other teachers or subject adviser for assistance.

3. <u>Timetabling requirements</u>

(a) Is the timetable designed as per CAPS requirements?

Our timetable has the prescribed 4 hours per week. We have not had challenges as per that.

(b) If no, why not?

(c) In what way is the timetable designed that ensures you that it(timetable) is CAPS compliant?

We just made sure 4 hours is catered for in our timetable

4. <u>Learners' cognitive abilities (level of understanding, special needs learners etc.)</u>

(a) Are learners with special needs or learning barriers identified?

Yes, the special learners for me are the slow learners who do not have physical challenges.

(b) How many such learners have been identified?

I only have about 4 learners of the 16 in Grade 10 who need special attention.

(c) What provisions are there to cater for these learners?

I cater for these learners by giving them more time. I call them for extra tuition in the afternoon.

5. <u>Completion of class activities by learners and provisions for offering feedback to learners</u>

(a) Are learners completing assigned classwork and activities within the teacher's planned time?

Yes, they are. Thing is homework and tasks are part of the school discipline framework. So mechanisms have been put in place by the school to force learners to comply..

(b) If not, what is a common problem that leads to non-completion? E.g. slow writing, misunderstanding of concepts or general lack of classroom control.

Generally, as a school we have a home work policy that we have been effecting. In terms of submission of the work in the morning time we have had no challenges as learners do their work. Albeit our challenge here is the authenticity of the work, because most of the work is copied from one person. So the whole reason for homework is being eroded by copying, which as a school we have not managed effectively to control it as it requires a lot of labour on the educator

(c) What intervention does the teacher take to ensure timely completion of class activities assigned to learners?

As noted above we don't really have a challenge in terms of homework

6. <u>Conducting of practical work</u>

(a) Do you conduct practical demonstrations for the learners?

Yes, I do demonstrations especially for motions. Challenge is lab equipment and generally all resources to complete practical work

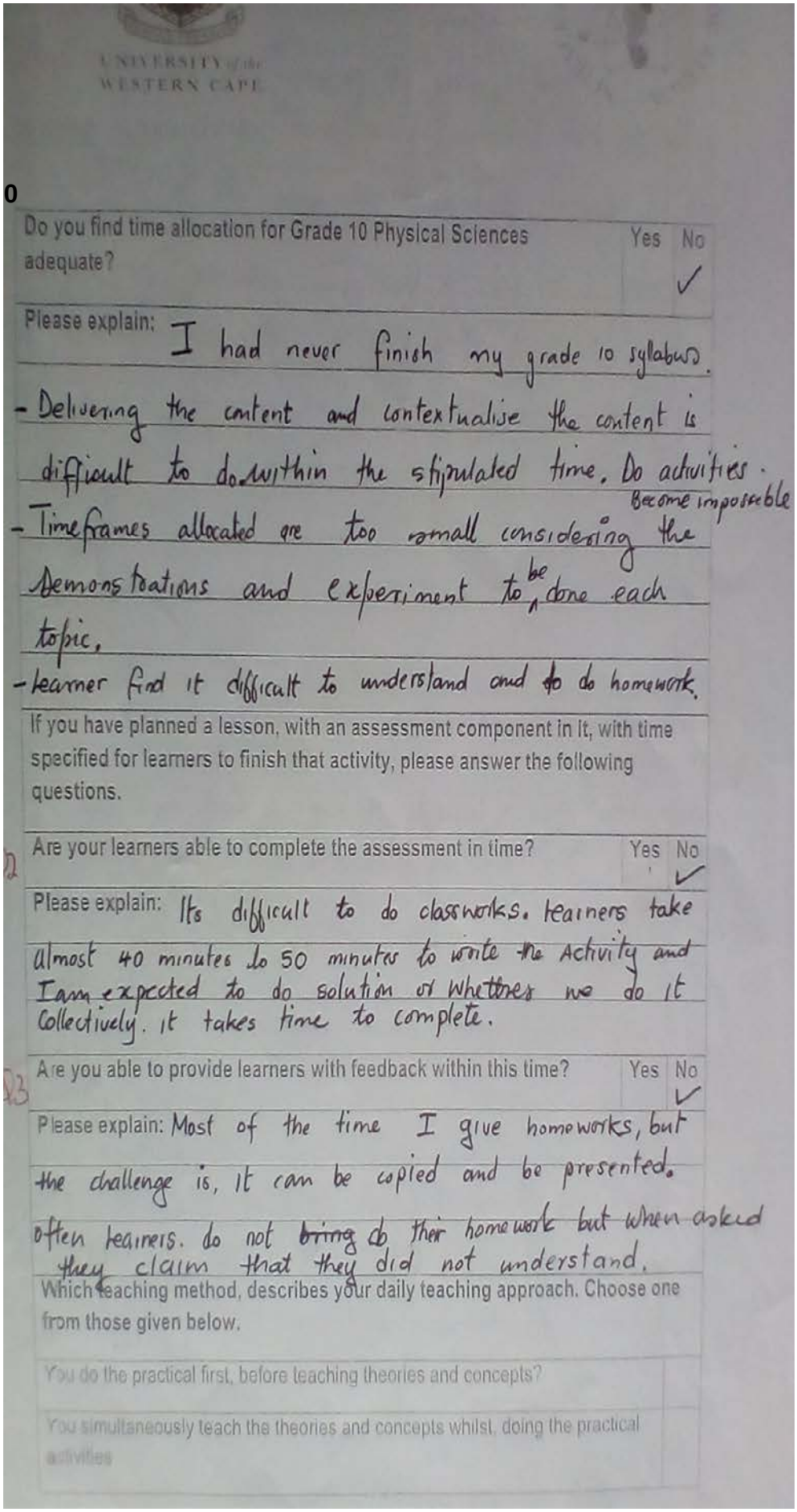
(b) Do you afford learners an opportunity to perform practical work as per curriculum requirements? Why or why not?

Learners only do Cass practical, as that's what resources we get.

(c) Do you perceive failure to perform practical work as syllabus non- completion?

No I have had an opportunity in my previous school to conduct practicals, which we have tried to do on a daily basis, still performance was dismal. So I don't (think) practicals have a negative effect on their knowledge, but I do think it could help for them to understand more……. More easily……. And yes I think it's non-completion if practical work is not covered.

Appendices 4: Extracts from completed teacher questionnaires:



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Do you find time allocation for Grade 10 Physical Sciences adequate?	Yes	No
		✓

Please explain: I had never finish my grade 10 syllabus.

- Delivering the content and contextualise the content is difficult to do within the stipulated time. Do activities become impossible
- Timeframes allocated are too small considering the demonstrations and experiment to be done each topic,
- learner find it difficult to understand and do homework.

If you have planned a lesson, with an assessment component in it, with time specified for learners to finish that activity, please answer the following questions.

Are your learners able to complete the assessment in time?	Yes	No
		✓

Please explain: Its difficult to do classworks. learners take almost 40 minutes to 50 minutes to write the Activity and I am expected to do solution or whether we do it collectively. it takes time to complete.

Are you able to provide learners with feedback within this time?	Yes	No
		✓

Please explain: Most of the time I give homeworks, but the challenge is, it can be copied and be presented. often learners do not ~~bring~~ do their homework but when asked they claim that they did not understand.

Which teaching method, describes your daily teaching approach. Choose one from those given below.

You do the practical first, before teaching theories and concepts?	
You simultaneously teach the theories and concepts whilst doing the practical activities	

You teach theories and concepts first, before doing the practical

Does time allocation affect your decision to choose the teaching approach:	yes

Please explain:
Less time means less teaching. I would like to be cut off during my lesson. The more the smaller the time the smaller the lesson. Unfortunately, time always limits me which lead me into taking afternoon classes. My teaching approach is always direct as I know I dont have much time

	Yes	No
(3) Do you organise extra-classes specifically for Grade 10 Physical Sciences	X	

If your answer is YES, please indicate the amount of time allocated to the extra classes, and why?/ If your answer is NO , what is the key factor(s) that prevents you from organising extra classes

We took 2hours of time afternoon which is also small when you look at experiment preparation and execution. The limit is a transportation which limit time to ONLY 2hrs

	Yes	No
(4) Do you have learners that get external tutoring, organised by them or their parents?		X

Please provide more details:

Learners that I teach does not have tutors (externally) due to the fact that they come from village raised by grandparent who don't have money for tutors and don't understand even extra time besides school time

	Yes	No
(5) Do you always find it easy to adhere to the prescribed times?		X

If no, explain factors that prevent you from adhering to the prescribed times?
More work on my shoulders and responsibilities