



The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

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DECLARATION

I Effiness Kamanga hereby, declare that this dissertation for the degree *Magister Educationis* in Curriculum Studies at the Potchefstroom Campus of the North-West University is my own independent work and has not previously been submitted by me to any other faculty or university.



A rectangular box containing a handwritten signature in black ink. The signature is stylized and appears to be 'E. Kamanga'.

Signature

Date: 22 November 2019

DEDICATION

I dedicate this dissertation to an outstanding academic, a mentor Prof Kobus Lombard. His humility kindness, and appreciation of his colleagues and students will always be remembered.

Our lives go on without you
But nothing is the same,
We have to hide our heartaches
When someone speaks your name.

Sad are the hearts that love you
Silent he tears that fall,
Living our hearts without you
Is the hardest part of all.

You did so many things for us
Your heart was kind and true,
And when we needed to talk to someone
We could always count on you.

The special years will not return
When we were all together,
But with the love within our hearts
You will walk with us forever

~Unknown Author

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ABSTRACT

Evidence from literature shows that learners who are self-directed in their learning are more effective towards achieving their learning goals, based on their improved academic performance. Therefore, it is crucial that more attention be given to aspects that can enhance learners' self-directed learning behaviours. Aspects such as teachers' assessment beliefs are considered to have an influence on the way teaching and learning is approached. However, studies reporting on the influence of teachers' assessment beliefs on learners' self-directed learning (SDL) behaviour are limited. This apparent research gap prompted the researcher to centre the current study on how grade 9 Natural Sciences (NS) teachers' assessment beliefs may influence learners' SDL behaviour. A qualitative multiple case study approach was utilised to achieve this goal. Face-to-face individual semi-structured interviews were conducted to obtain NS teachers' assessment beliefs, by utilising Brown's (2004) conceptual framework of assessment beliefs, and data on grade 9 learners' SDL behaviours were obtained through focus group interviews. The individual Interviews were conducted with five purposively sampled teachers from five different schools located around the Bojanala school district, and in each school, five randomly selected learners participated in the focus group interviews.

The findings revealed that teachers' assessment beliefs were more focused on the improvement of teaching and learning, learner accountability and less on teacher accountability and irrelevance to teaching and learning. The influence of teachers' assessment beliefs on learners' SDL behaviours were conceptualised based on Weiner's (2000) interpersonal theory of motivation and the findings revealed that the belief that assessment improves teaching and learning has a positive impact on learners' SDL behaviours. Learners' SDL behaviours were influenced by the belief that assessment improves teaching, including willingness to take responsibility for learning; ability to use effective learning strategies; increased motivation; displaying effort attributions; and engaging in self-evaluations.

Key words: self-directed learning, self-directed learning behaviour, belief, assessment, assessment belief

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LIST OF ACRONYMS AND ABBREVIATIONS

CASS	Continuous Assessment
CAPS	Curriculum and Assessment Policy Statement
CHAT	Cultural-historical activity theory
CoA-III	Conceptions of Assessment—III inventory
CTAs	Common Tasks for Assessments
DoE	Department of Education
EMELTEN-REC	Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee
GET	General Education and Training
IK	Indigenous knowledge
NCS	National Curriculum Statement
NS	Natural Sciences
OBE	Outcomes-based education
PCC	person-process-context
RNCS	Revised National Curriculum Statement
SDL	Self-directed learning
SDLI	Self-Directed Learning Instrument
SDLRS	Self-Directed Learning Readiness Scale
SRSSDL	Self-Rating Scale of Self-Directed Learning
WhatsApp	Smartphone communication application
ZPD	Zone of Proximal Development

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION AND RATIONALE

In the past, assessment was regarded as detached from learning as it mainly occurred after the teaching and learning process (Harlen, 2013:4). Over the past couple of years, this view of assessment has changed as assessment is now regarded as a means to help learners become more self-directed to obtain their desired learning goals (Kan'an & Osman, 2015:794; Mumm, Karm & Remmik, 2016:780; Sach, 2012:261). According to Du Toit-Brits (2015:35), self-directed learners are motivated to take more responsibility for their own learning by regulating and monitoring themselves instead of depending solely on teachers to assess their learning. Excessive dependency on teachers to assess learners' learning not only inhibits learners' ability to trust their self-rational, self-reliant and self-thinking capabilities (Harrison, Joe & McNamara, 2015:75) but could also impact negatively on their self-directed learning (SDL) behaviour and consequently on their academic performance (Abubakar & Arshad, 2015:70; Kan'an & Osman, 2015:794; Khiat, 2017:44). Moreover, Boyer, Edmondson, Artis and Fleming (2014:20) assert that learners who are self-directed in their learning develop lifelong learning capabilities that can enable them to adjust and adapt effortlessly to the demands of new situations.

The way in which teachers conduct their assessment practices is largely shaped by the theories and beliefs they have in relation to the purpose of teaching, learning assessment and the curriculum (Barnes, Fives & Dacey, 2015:254; Chien, Wu & Hsu, 2014:198; Uysal & Bardakci, 2014:1). This was underscored by Jane (2013), who utilised Brown's (2002, 2006) framework to establish a group of South African intermediate teachers' conceptions or beliefs of assessment. Jane (2013) confirmed that teachers' assessment beliefs influence their assessment practices. Nevertheless, the assumption that teachers' assessment beliefs may directly or indirectly reflect in their assessment practices – which can either be in support of or in conflict with learners' self-directed behaviour – is a factor that Jane's (2013) research did not consider. Hence, this clear research gap prompted the researcher to centre the current study on how grade 9 Natural Sciences (NS) teachers' assessment beliefs may influence learners' SDL behaviour.

1.2 PURPOSE STATEMENT

The purpose of this study was to explore NS teachers' assessment beliefs and how their beliefs influence learners' SDL behaviour. A qualitative approach was utilised in order to elicit meaning and gain understanding of the said phenomenon. The study focused on NS teachers, teaching grade 9 in the Rustenburg area as, at the time of the study, the researcher resided in this geographical area and taught NS.

1.3 RESEARCH QUESTIONS AND OBJECTIVES

1.3.1 Primary research question

The primary research question was as follows:

How do grade 9 Natural Sciences teachers' assessment beliefs influence learners' self-directed learning behaviour in the Rustenburg area?

1.3.2 Secondary research questions

According to Leedy and Ormrod (2014:144), secondary research questions emanate from the primary research question to refine the primary research question into manageable subquestions. When these subquestions are addressed, they resolve the main research question (Leedy & Ormrod 2014:144). The secondary research questions for this study were as follows:

- How is the concept of beliefs defined and characterised in the literature within the context of assessment?
- How is self-directed learning behaviour defined and described in the literature?
- What are the assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area?
- What is the influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' self-directed learning behaviour in the Rustenburg area?

1.3.3 Objectives of the study

Derived from the secondary research questions, the following objectives were applicable to this study:

- to clarify how the concept of beliefs is defined and characterised in the literature within the context of assessment;
- to explain how self-directed learning behaviour is defined and described in the literature;
- to establish the assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area;
- to determine the influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' self-directed learning behaviour in the Rustenburg area.

1.4 CONCEPTUAL FRAMEWORK

The study was conceptualised in terms of assessment beliefs, SDL behaviour, and assessment related to SDL behaviour. Since the study was positioned within the NS classroom environment, NS as a subject also formed part of the conceptual framework.

1.4.1 Assessment beliefs

Assessment is defined as the “process of gathering and interpreting evidence to make judgements about the quality of learner achievement” (Atjonen, 2014:238). It is also seen as serving multiple purposes, ranging from providing information about learning progress, teaching quality and institutional accountability (Opre, 2015:231). Teacher beliefs are described as individual mental constructs that are subjective and have a strong impact on teachers’ interpretations and contributions in the context of their teaching (Skott, 2015:13).

Researchers who investigate beliefs in relation to assessment, such as Brown (2002:1, 2004:301, 2006:166), use varied terminologies such as “conceptions” to describe beliefs. Conceptions are described as a “framework of mental structures, encompassing beliefs about, knowledge about and affect for assessment” (Thompson, 1992:127). Since the framework of teachers’ assessment conceptions does not consider the concept of beliefs in isolation, studies on teacher assessment conceptions have organised these conceptions into two main purposes of assessment, namely that assessment serves either an administrative or a pedagogical goal (Brown, 2002:1; Brown 2004:301; Remesal, 2007:2). This implies that teachers with strong assessment conceptions related to a pedagogical goal would use assessment to improve teaching and learning, whereas teachers with strong assessment conceptions related to an administrative goal would use assessment to make learners and schools accountable.

1.4.2 Self-directed learning behaviour

The foundations of SDL are described by Knowles (1975) as referring to a process where individuals take initiative, with or without the help of others, in diagnosing their learning goals, identifying resources needed to implement learning strategies and evaluating their own learning. A self-directed learner can control the goals and purposes of learning and assumes ownership of learning (Louws, Meirink, van Veen, & van Driel, 2017:172).

According to Knowles (1975), qualities required by self-directed learners include: the ability to see peers as resources; to work collaboratively with peers; to give help and receive help from peers; and to translate learning needs into learning objectives. Knapper and Cropley (2000:51) further note additional characteristics required by self-directed learners, such as the ability to reflect on and assess their own work; being actively involved during the whole learning process; being able to gather information from a variety of sources; and being able to select and implement different learning strategies in different situations. Based on the mentioned qualities and others cited in the literature, a variety of instruments that measure the level of self-directedness of individuals have been developed (Fisher, King & Tague, 2001:516; Guglielmino, 1978; Williamson, 2007:67).

Williamson's (2007:67) Self-Rating Scale of Self-Directed Learning (SRSSDL) was developed to assess SDL behaviours across five subfactors: awareness (self-evaluation); learning strategies; learning activities; assessment; and interpersonal skills. The researcher in the current study used the framework of Williamson's (2007:67) SRSSDL instrument to identify SDL behaviours of learners. Using the SRSSDL instrument for grade 9 NS learners, however, would have been inappropriate as the instrument was validated based on a population of undergraduate nursing students (Ayyildiz & Tarhan, 2015:665). Therefore, the instrument was used as a framework to generate open-ended questions that were relevant and applicable to grade 9 NS learners. The generated questions were based on Williamson's (2007:67) five SDL subfactors mentioned above.

1.4.3 Assessment related to self-directed learning behaviour

According to Knowles (1975), learners should be assisted in diagnosing their learning goals realistically. Therefore, formative assessment seems to be most appropriate to enable learners' development towards self-directedness. Formative assessment can be defined as a "process through which assessment-elicited evidence of learners' learning is used by teachers to adjust their instructional procedures or used by learners to adjust their current learning" (Cauley & McMillan, 2010:2). Feedback is central to formative assessment and is seen as "information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding" (Brown, Harris & Harnett, 2012:969).

In addition, self- and peer-assessment are formative assessment methods that are regarded as promoting learners' SDL (Harrison *et al.*, 2015:76; Nicol, Thomson & Breslin, 2014:103; Van Zundert, Sluijsmans & Van Merriënboer, 2010:270). Self-assessment is defined as a process where learners "monitor and evaluate the nature of their thinking to identify strategies for improving understanding" (Cauley & McMillan, 2010:3), while peer assessment is defined as a process whereby learners evaluate or are evaluated by their peers (Van Zundert *et al.*, 2010:270).

1.4.4 Natural Sciences as a subject

This study was situated in the context of the subject NS, taught in grade 9 in South African secondary schools. Natural Sciences taught in this grade belongs to the General Education and Training (GET) band. The GET band is divided into three phases: the foundation (grades 1–3), intermediate (grades 4–6) and senior (grades 7–9) phase (Department of Basic Education, 2011:5). The NS content is organised into four knowledge strands, namely: Life and living, taught in term 1; Matter and Materials, taught in term 2; Energy and Change, taught in term 3, and Earth and Beyond, taught in term 4.

The four knowledge strands lay the basis for further studies in more specific science disciplines, such as Life Sciences, Physical Sciences, Earth Sciences, or Agricultural Sciences. Therefore, the NS subject falls under the discipline of Sciences (Department of Basic Education, 2011:9). *Science*

is defined as a systematic way of looking for explanations and connecting the ideas people have by using certain methods of inquiry and investigations (Department of Basic Education, 2011:8). Science across all nations has been shaped by the search to understand the natural world through observations, testing and proving of ideas (Department of Basic Education, 2011:8).

1.4.5 Concept clarification

The following keywords were central to this study and can be described as follows:

- **Assessment:** the process of “gathering and interpreting evidence to make judgements about the quality of learner achievement” (Atjonen, 2014:238).
- **Beliefs:** individual mental constructs that are subjective and have a strong impact on teachers’ interpretations and contributions in the context of their teaching (Skott, 2015:13).
- **Conceptions:** a framework of mental structures, encompassing beliefs and knowledge about and affect for assessment (Thompson, 1992).
- **Feedback:** “information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one’s performance or understanding” (Brown *et al.*, 2012:969).
- **Formative assessment:** a process through which assessment-elicited evidence of learners learning is used by teachers to adjust their ongoing instructional procedures, or used by learners to adjust their current learning procedures in response to feedback (Cauley & McMillian, 2010:2).
- **Natural Sciences (NS):** a subject/discipline shaped by the search to understand the natural world through observations, testing and proving of ideas (Department of Basic Education, 2011:8).
- **Peer assessment:** a process whereby learners evaluate or are evaluated by their peers (Van Zundert *et al.*, 2010:270).
- **Self-assessment:** a process of a learner monitoring and evaluating the nature of his or her thinking to identify strategies that improve understanding (Cauley & McMillian, 2010:3).
- **Self-directed learning (SDL):** learners taking control of the goal and purpose of learning and assuming ownership of learning (Harrison *et al.*, 2015; Louws *et al.*, 2017:172; Saks & Leijen, 2014:190).
- **Self-directed learning behaviour:** actions reflecting SDL skills (Williamson, 2007:67).

- **Summative assessment:** “a process by which teachers gather evidence in a planned and systematic way in order to draw inferences about the learning process at a particular time” (Atjonen, 2014:239).

1.5 THEORETICAL FRAMEWORK

A theoretical framework in research helps to inform, clarify and interpret the research process (Sach, 2012:263). The attribution theory is associated with social psychological theories and is often used in educational concepts (Sach, 2012:263). The attribution theory is “concerned with our constant search for the causes of our successes and failures” (Hunter & Barker, 1987:51). In other words, attribution theory addresses what individuals think is the cause of a certain outcome, known as perceptions of causality. There are three continuums of perceptions of causality – namely, locus, stability, and controllability – which are important because they influence beliefs, emotions and behaviours (Schunk, 2012:367). In this study, the attribution theory applied to learners and teachers and was applied to determine how teachers’ assessment beliefs influence SDL in the classroom.

The assumption is that, in forming perceptions of causality (also known as attributions), people use situational cues of the meanings they have learned through prior experiences (Schunk, 2012:370). These perceptions of causality influence individuals’ self-concept, expectations for future situations, feelings of potency and subsequent motivation to put forth effort (Hunter & Barker, 1987:51). Similarly, teachers can hold core assessment beliefs of the purpose of assessment, influenced by their attributions, which can give rise to feelings of potency and subsequent motivation to put forth the assessment practice. Subsequently, learners can also develop attributions through situational cues obtained from teachers and their environment, which influence their belief system, which, in turn, drives their behaviour (Hunter & Barker, 1987:51).

1.5.1 Association between teacher assessment belief and learner behaviour

The attribution theory has implications in the classroom as the way a teacher responds to a learner’s success or failure could signal the teacher’s beliefs as to whether the learner is in control of success or failure (Hunter & Barker, 1987:53). This could lead to teachers’ actions conveying unintended messages to learners. For example, a teacher’s annoyance with a less-than satisfactory performance could say to a learner that he or she has the ability to perform successfully and his or her lack of effort is responsible for the low performance (Hunter & Barker, 1987:53). In so doing, this convinces a learner of the teacher’s belief that he or she has the ability to be successful when he or she puts forth more effort. Consequently, such beliefs can result in learner behaviour that is proactive and motivated to put forth more effort in order to obtain future success (Hunter & Barker, 1987:53). On the other hand, sympathy and understanding for a less-than satisfactory performance could say to a learner that he or she cannot accomplish the task regardless of how much effort he or she puts

in (Hunter & Barker, 1987:53). In so doing, this convinces a learner of the belief that, even with effort, he or she does not have the ability to meet the expectations. Such beliefs could result in learner behaviour that is reactive to the environment and not motivated to put forth any effort, thereby perpetuating future failure (Hunter & Barker, 1987:53). These beliefs are far more influential than academic knowledge in framing, analysing and solving problems and making decisions. Likewise, teachers' assessment beliefs emanate from attributions formed around their own experiences as both learner and teacher (Pajares, 1992). Figure 1.1 illustrates the theoretical framework used to relate teacher assessment beliefs with learner behaviour.

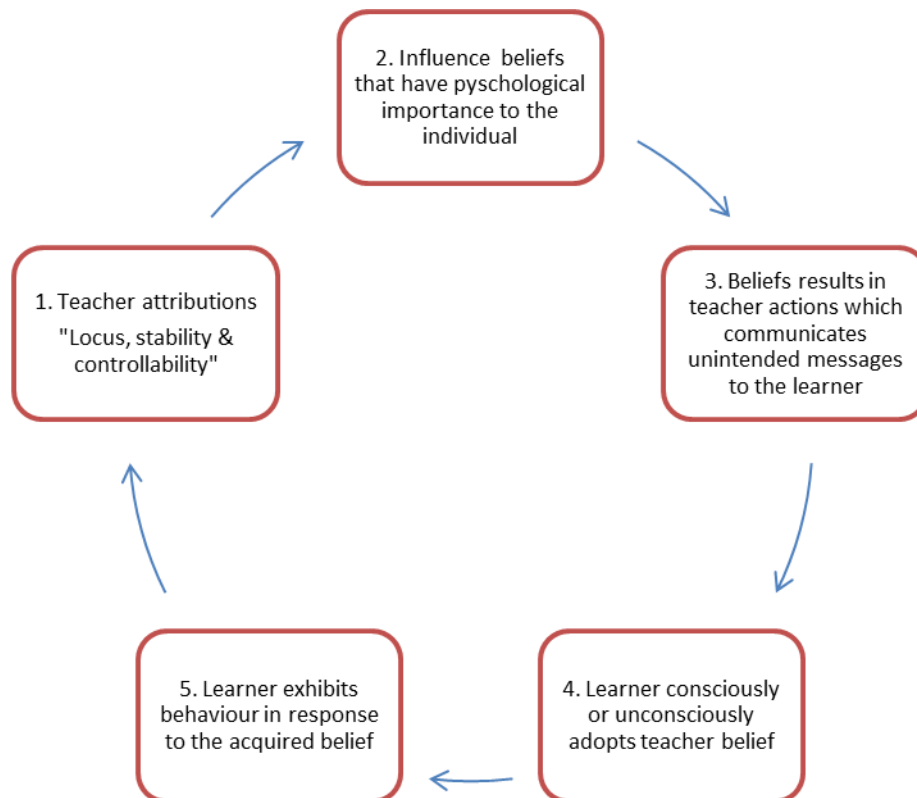


Figure 1.1: Theoretical framework

Source: Author's own

Based on the model, assessment beliefs are causes emanating from the locus, stability and controllability attributions, which give rise to classroom assessment practices. The assessment practice of particular interest to the study is formative practices in the form of self- and peer assessments. Feedback from such formative assessments can convey unintended messages to learners, which can convince them of the teacher's assessment beliefs. These assessment beliefs can induce learner behaviours – such as SDL behaviours – in response to the conveyed belief.

Teachers' conceptions ("beliefs") of the purpose of assessment have been categorised into four categories (Brown, 2002:27, 2004:302, 2006:166). These four categories of assessment conceptions are provided a detailed framework to investigate the nature of assessment practice,

which was conveyed through participating teachers' assessment beliefs. This could provide a better understanding of the nature of subsequent learner behaviours. Table 1.1 provides a description of the four categories associated with teachers' assessment beliefs.

Table 1.1: Brown's (2002:27) categories of teacher assessment conceptions, which include Opre's (2015:229) implications for practice

Assessment conception ("belief")	Implications for classroom practice
<i>Assessment is useful because it can provide information that can improve instruction and learning</i>	Teachers with this belief would attempt to optimise the learners' learning process. They would tend to employ methods that give learners useful feedback through the process of self- or peer assessment (Dayal & Lingam, 2015:8). Teachers would also use feedback to obtain information to optimise their own teaching activities. Therefore, assessment methods are perceived as serving a formative role.
<i>Assessment is a necessary process for making learners accountable for their learning</i>	Teachers with this belief would favour formal summative assessment as the focus is not on learners' learning processes but on the position learners occupy in comparison with other learners who are in the same year of study.
<i>Assessment is a process of making schools and teachers accountable</i>	Teachers would emphasise the generation of marks that can be reported to external agencies.
<i>Assessment is irrelevant to the work of teachers and the lives of learners</i>	Teachers would avoid formative assessment and take a haphazard approach to summative assessment, creating a self-fulfilling prophecy that assessment is a waste of time.

1.6 RESEARCH METHODOLOGY

The research methodology provides an in-depth look into the process of how the research study was carried out. Subsequently, the paradigm, research design, strategy of inquiry, sampling techniques, data collection methods, data analysis procedures and measures to ensure trustworthiness in this study are discussed. Attention is also given to the ethical protocol followed.

1.6.1 Research paradigm

Creswell (2009:6) refers to a paradigm as a philosophical worldview, which is defined as a basic set of beliefs that guides action. The interpretivist paradigm proclaims that social reality is subjective and is constructed based on individuals' interpretations (Mack, 2010:8). Knowledge of the social world in the interpretivist paradigm is gained from understanding the participants' views of the situation being studied (Creswell, 2009:8). The interpretivist paradigm allows the researcher to make sense of the meaning others ascribe to the world through qualitative methods (Creswell, 2009:8). In the case of this study, the researcher made sense of how NS teachers' assessment beliefs may influence grade 9 learners' SDL behaviours by exploring the views of the said teachers and learners. The interpretivist paradigm was therefore suitable for this study.

1.6.2 Research design

According to Creswell (2009:3), there are three major research designs, namely quantitative, qualitative and mixed-methods designs. Quantitative research is defined as a measure of testing objective theories by examining the relationship among variables using numerical data (Creswell, 2009:4), while mixed-methods designs involve the combination of both quantitative and qualitative instruments (Creswell, 2009:4). A qualitative research design is described as a means of exploring and understanding the meaning individuals or groups ascribe to a social phenomenon (Creswell, 2009:4). A qualitative design was employed in this study because the focus was on participants' (NS teachers) views on how assessment beliefs may influence grade 9 learners' SDL behaviour.

1.6.3 Strategy of inquiry

Creswell (2009:11) states that strategies of inquiry are models that provide specific direction for procedures in a research design. Strategies of inquiry associated with qualitative research are ethnography, grounded theory, case studies, phenomenological research and narrative research (Creswell, 2009:13). A qualitative case study is described as an approach to research that facilitates exploration of a phenomenon within its context using a variety of data sources (Baxter & Jack, 2008:544). Furthermore, Miles and Huberman (1994:202) define a case as "a phenomenon of some sort occurring in a bounded context". The phenomenon of interest in this study was the influence of NS teachers' assessment beliefs on grade 9 learners' SDL behaviour.

Yin (2003:5) suggests that a case study design should be used when the focus of the study is to answer “how” and “why” questions. As the main research aim was to understand how NS teachers’ assessment beliefs influence grade 9 learners’ SDL behaviour, a case study design was applied in this study. Teachers’ beliefs are individual mental constructs that are subjective by nature (Skott, 2015:13). A multiple case study approach was more suitable for this study as such an approach ensured that the phenomenon was well explored and understood from several participants’ perspectives. This ensured that the issue was not explored through one lens but a variety of lenses, which allowed for multiple facets of the phenomenon to be revealed and understood (Baxter & Jack, 2008:544).

1.6.4 Sampling procedure and research participants

According to Maree and Pietersen (2010:172), there are two main sampling methods, namely probability and non-probability methods. With probability sampling, the principles of randomness and probability theory are used to accurately generalise samples to the population. However, this is not the case with non-probability sampling methods (Maree & Pietersen, 2010:172). Probability sampling is commonly associated with quantitative research designs, while qualitative research designs are mostly associated with non-probability sampling methods (Grinnell & Unrau, 2005:155).

The selected sampling methods for this study were convenience, purposive and random sampling (Creswell, 2009:178). At the time of the study, the researcher taught in the Rustenburg area in the Bojanala Platinum district, North West province, which comprised 139 secondary schools in total (Department of Education, 2017:230). For convenience sake, the school district in which the researcher taught was selected because it provided easy access to the research sites and participants. According to Sarantakos (2000:139), the main reason for selecting a sample is to ensure that the sampling is feasible enough for the study. Due to the selected research design and strategy of inquiry, five secondary schools in the said district were randomly selected from a list of 139 secondary schools in the district. From the five selected schools, the NS teacher(s) responsible for teaching the grade 9 learners were purposively selected.

The inclusion criteria were based on these teachers’ familiarity with the assessment requirements and policies relevant to NS in the said grade. As an estimate, at least five teachers satisfied the selection criteria. In addition, five learners in each of the sampled teachers’ classrooms were randomly sampled from the respective class lists. This implies that at 25 learners (five learners from five classrooms) participated in this study. These samples served as a guideline to ensure data saturation. When teachers who were well-known to the researcher were selected, other teachers were randomly chosen to ensure objectivity, and exclude any possible bias.

When any of the learners and teachers who were randomly selected did not provide consent to participate in the study, other participants were randomly selected as replacements. An independent teacher at the different schools was asked to facilitate the process of obtaining informed consent.

1.6.5 Data collection strategies

This study sought to obtain in-depth information about grade 9 NS teachers' assessment beliefs as well as the SDL behaviours of the learners they taught. Nieuwenhuis (2016c:78) suggests that in-depth information can be best obtained by asking probing questions as they allow the researcher to elicit participants' views on the topic under investigation. Data in this study were collected by means of face-to-face interviews.

Nieuwenhuis (2016c:78) describes an interview as a two-way conversation in which the interviewer asks the participants questions to collect data and learn about their viewpoints and behaviours. Interviews can be categorised as unstructured, semi-structured and structured. The sampled grade 9 NS teachers were interviewed by means of individual semi-structured interviews, while their grade 9 learners were interviewed by means of focus group interviews. All the interviews were audio-recorded, provided the participants gave their consent, and the interviews were conducted during pre-arranged times with interviewees without interfering with teaching and learning. A room at each school was selected that was well equipped to create a conducive environment for conducting the interviews.

1.6.5.1 Individual semi-structured interviews

Predetermined open-ended questions – which were specified in the interview schedule – were used in the individual semi-structured interviews (Wellington, 2000:95). The open-ended questions required individual participants to answer in their own words. The semi-structured method was selected because the open-ended questions were developed based on Brown's (2006:168) CoA-III A instrument. Moreover, this choice also allowed for questions to be presented in a flexible manner, which permitted further probing and clarification (Gay, Geoffrey & Airasian, 2015:419). Further probing and clarification assisted in obtaining richer information about the participating teachers' assessment beliefs, which would have been otherwise difficult to uncover through other methods like document analysis, observations, or structured questionnaires. This argument was further strengthened by the fact that teachers' assessment beliefs were subjective and internally constructed based on their individual experiences (Harbin & Newton, 2013:539; Pajares, 1992:307).

1.6.5.2 Focus group interviews

During focus group interviews, the researcher interviews participants as a collective in a group (Creswell, 2009:179). The focus group interviews afforded the participants the opportunity to build on each other's points and ideas (Nieuwenhuis, 2016a:108). Learners were interviewed as a collective as some learners may feel less interrogated when part of a group. It was also envisaged that group participation would give other learners more confidence to express their views. In addition, interviewing learners as a collective enabled the researcher to obtain a large amount of data within a short period. Williamson's (2007:67) SRSSDL instrument was used as a framework to generate open-ended questions that were used for the focus group interviews.

1.6.6 Data analysis and interpretation

All recorded interview data were transcribed, and the data were then analysed by means of content analysis. Content analysis is the process of looking at the data from various angles with the goal of identifying keywords in the text that would help one to understand and interpret the raw data (Nieuwenhuis, 2016a:106). Content analysis was chosen as this method follows an inductive process of data analysis. Inductive analysis allows research findings to emerge from frequent, dominant themes inherent in the raw data (Nieuwenhuis, 2016a:106) as opposed to deductive analysis where information required from the data is formulated in advance from the literature.

1.6.7 Quality criteria

It was important to establish the quality and accuracy of the procedures used to generate the research findings and conclusions. In quantitative research, quality and accuracy are achieved by ensuring validity and reliability (Creswell, 2009:149). However, in qualitative research, the quality and accuracy of the findings and conclusions are established through trustworthiness (Guba & Lincoln, 1994:110). Trustworthiness includes credibility, dependability, conformability, and transferability (Guba & Lincoln, 1994:109). These criteria and how they were addressed in this study are briefly discussed.

Credibility

Credibility shows to what extent the data are accurate and appropriate and that the data have been checked through good practice (Denscombe, 2010:299). Credibility in this study was achieved by asking the research participants to check whether their beliefs and opinions had been accurately described. Synthesising several sources of data or different participants' perspectives is known as triangulation, which is believed to add to the credibility of a study (Creswell, 2009:191).

Dependability

Dependability refers to the ability of the research to show as much detail as possible about the line of enquiry which led to a particular conclusion (Flick, 2009:392). The study achieved dependability by keeping an extensive and detailed record of the data collection and interpretation process for others to ascertain the level of dependability.

Conformability

Conformability refers to the degree to which the findings can be confirmed or corroborated by others (Donnelly & Trochim, 2007:149). Conformability in this study was achieved by requesting input from the supervisors and other knowledgeable people in the field of assessment and SDL on the analysis and interpretation of data and the findings and conclusion of the study.

Transferability

Transferability refers the possibility of the research being comparable to other contexts (Denscombe, 2010:299). The researcher did not attempt to generalise findings to the population due to the uniqueness of this case study. However, thick descriptions added to the transferability of the study.

1.6.8 Role of researcher

After an independent person (another teacher at the school) administered the informed consent process, the researcher started with the data collection. The researcher developed the interview questions, conducted the interviews, and transcribed, analysed and interpreted the data. In qualitative research, the assumption is that the researcher's biases and values could affect the outcome of the study (Merriam, 1998:65). Therefore, to ensure trustworthiness, Altheide and Johnson (1994:488) suggest that researchers need to neutralise their biases by explaining them explicitly.

At the time of the study, the researcher had been a secondary school teacher, teaching grade 9 NS and grades 10 and 11 Physical Sciences since 2013. As she was as an NS teacher in the same area in which the research was conducted, she was familiar to other teachers who taught NS, who she met occasionally during workshops and other meetings. However, the researcher ensured that being familiar to some of the participants did not jeopardise the research process or findings – all ethical protocols were ensured, and objectivity was always considered during the research process. When teachers were selected that were well-known to the researcher, another school was selected, and this was done in an attempt to manage conflict of interest that might have emerge.

1.6.9 Ethical considerations

Ethical considerations – such as consent and protecting participants from harm – are important in promoting the integrity of the research (Punch, 2000:56). Ethical considerations also help guard against any misconduct and possible harm towards the participants (Creswell, 2009:87). In this research the researcher was guided by principles such as a respect for the dignity of people, and their safety and well-being. Creswell (2009:87), Punch (2000:56) and Wellington (2000:54) highlight the following ethical protocols, which also applied to the current study:

Informed consent

Informed consent was requested from all potential research participants after obtaining ethical clearance from the North-West University (NWU) as well as the North West Department of Basic Education. The gatekeepers (school principals) were also consulted before collecting the data. Since the participating grade 9 learners were under the age of 18, parental assent was requested. The willing participants (teachers and learners) each received a consent form, which they had read and signed before participating (Creswell, 2009:87; Punch, 2000:56; Wellington, 2000:54). Aspects covered in the consent form included: what the research was about; what was expected of the participants; benefits and risks of participating; assurance of confidentiality and protection of identity; dissemination of findings; and a declaration section.

Voluntary participation

Teachers and learners were not forced nor manipulated to participate in the research. They were informed that they could withdraw from the study at any stage and without facing any consequences.

Confidentiality and privacy

Personal information, records and the identity of participants were protected. The researcher did not use descriptors or names that could lead to the identification of any of the participants during data collection, analysis and interpretation. All information obtained from the participants was treated confidentially and anonymously. After the researcher transcribed the audio-recordings, the recordings were deleted. The transcriptions were stored electronically on a password-protected computer. Only the researcher and her supervisors had access to the data. The focus group participants were also requested to respect each other and to keep the discussions and other participants' identities confidential.

Protection from harm

Participants were treated fairly, with honesty, consideration and respect. Permission to use an audio-recorder was requested before interviews began. Participants were not subjected to any risk of

unusual stress, embarrassment, or loss of self-esteem. Possible harm arose from the inconvenience caused by taking time to participate in the interviews. This was minimised by providing the participants a black pen as a token of appreciation for their participation. The individual interviews lasted about 15 minutes, while the focus group interviews lasted approximately 25 minutes. Communication with the participants as well as the selection of the venue were achieved through mediation with the school principals, who served as the gatekeepers.

Dissemination of the research findings

The data were primarily used for obtaining the Master of Education in Curriculum Studies degree. However, research results could be used for presentation at conferences or for the publication of articles under the same conditions outlined above. Data for this study will be safely stored and kept for a period of seven years. The research findings will be made available to the participants upon request.

Risk-benefit ratio

This study posed minimal risks. Feedback will be provided to teachers after the study on assessment practices, and this might benefit learners in future, due to more effective assessment practices. The benefits therefore outweigh the risks.

Monitoring of research

The student and supervisors had regular meetings to monitor progress, and to ensure compliance to ethical guidelines. Progress reports were submitted as requested to EMELTEN-REC.

1.6.10 POSSIBLE CONTRIBUTION OF THE STUDY

1.6.10.1 Contribution to the area of assessment

The empirical data obtained from the study provided evidence as to whether teachers' assessment beliefs have any influence on learners' SDL behaviour. Understanding the role that teachers' assessment beliefs play in supporting learners' SDL adds to the knowledge base on assessment. According to Bliem and Davinroy (1997:1), if researchers' objectives are to change assessment practices so that they have a more supporting role in teaching and learning, then a clear understanding of the beliefs underlying teachers' ways of evaluating learners is required. Therefore, this study can inform further studies that seek to change or promote assessment practices that can support learners' SDL behaviour.

1.6.10.2 Contribution to the Research Focus Area: Self-directed learning

The most recent study within the South African context by Jane (2013) did not pinpoint teachers' assessment beliefs and their possible influence on learners' SDL behaviour. The researcher in the current study intended to close this gap by adding to the knowledge base of SDL, which could guide and inform future studies.

1.6.11 LIMITATIONS AND CHALLENGES OF THE STUDY

The selected research approach limits attempt to generalise the findings of this research to the whole province or country. However, this was an exploratory study. The study was also limited in that only interviews were used to collect data, which limited the methodological scope of the study. However, the triangulation of data obtained from teachers and learners helped to verify the findings. Time constraint posed a challenge as the researcher was employed full time.

1.7 OUTLINE OF THE STUDY

Chapter 1: Introduction

- The chapter provides an overview of the study by outlining the research problem, research questions, purpose and objectives.

Chapter 2: Literature review

- The chapter provides the theoretical and conceptual frameworks, focusing on assessment beliefs and self-directed learning.

Chapter 3: Research methodology

- The chapter provides an in-depth description of the research methodology applied in the study.

Chapter 4: Data analysis and interpretation

- The chapter presents the qualitative processes and procedures to arrive at the analysis and interpretation of the collected data.

Chapter 5: Conclusion and recommendations

- The chapter presents a detailed summary of the findings, and recommendations are made.

1.8 CHAPTER SUMMARY

This chapter outlined the research study. The research questions and objectives that guided the study were formulated. The study was conceptualised through relevant key concepts so as to provide a theoretical basis. A theoretical framework was further provided to inform, clarify and interpret the study. The research methodology was outlined, after which the contributions and the challenges of the study were highlighted. Finally, a chapter outline was provided.

Literature on SDL and assessment beliefs is presented in Chapter 2.

CHAPTER 2: SELF-DIRECTED LEARNING AND ASSESSMENT BELIEFS

2.1 INTRODUCTION

In this chapter, the literature on self-directed learning (SDL) and assessment beliefs is discussed to provide a conceptual and theoretical framework, which helps to address the main research question as well as the following secondary research questions:

- How is the concept of beliefs defined and characterised in the literature within the context of assessment?
- How is self-directed learning behaviour defined and described in the literature?

The chapter begins with a brief discussion on the conceptualisation of SDL, followed by the learning theories associated with SDL. A theoretical framework for SDL is discussed to provide processes that influence the measures used to frame the concept of SDL behaviour.

Next, SDL in the context of NS as a school subject is discussed. This is followed by a discussion on fostering SDL behaviours in the context of the NS subject. The aforementioned discussion provides a foundation of the prerequisites needed to support SDL in the context of the NS subject. The measures of examining SDL behaviours are then discussed.

The conceptualisation of assessment beliefs, which include how the concept of beliefs is defined within the context of assessment, is also discussed. This is followed by the characterisation of teachers' assessment beliefs, and the factors influencing teachers' assessment beliefs are discussed. Thereafter, the theoretical framework for the development of assessment beliefs is discussed. Next, the link between teachers' assessment beliefs and learners' SDL is discussed by drawing on Weiner's (2000) interpersonal theory of motivation. This may help in providing a better understanding of the interpretations of the research findings to be made. In reviewing literature, it became apparent that teachers' assessment beliefs and learners' SDL behaviours are shaped by sociocultural factors; this prompted the inclusion of the cultural-historical activity theory (CHAT). The researcher therefore deemed it to be necessary to further discuss the theoretical insights into CHAT. Finally, a summary concludes the chapter.

2.2 SELF-DIRECTED LEARNING: CONCEPTUALISATION

The most popular description of self-directed learning (SDL) derives from adult learning. Knowles (1975) defines SDL as "a process in which individuals take the initiative, with or without the help of

others, to diagnose their learning needs, formulate learning goals, identify resources for learning, select and implement appropriate learning strategies, and evaluate learning outcomes". Research on SDL has recently undergone changes due to new developments in information and communication, which have created more personalised learning experiences and connection to information (Abubakar & Arshad, 2015; Candy, 2004). These new advances in development, which are evident in literature, create expectations for various new descriptions of SDL to emerge. For example, Garrison (1997:18) describes SDL as "an approach where learners are motivated to assume personal and collaborative control of the cognitive (self-monitoring) and contextual (self-management) processes in constructing and confirming a meaningful and worthwhile learning outcome". Garrison (1997:19) argues that this description of SDL accommodates the school educational context as it places more focus on internal cognitive processing and learning than the external management of the learning process.

Looking at recent literature (Harrison *et al.*, 2015; Louws *et al.*, 2017:172; Saks & Leijen, 2014:190), SDL is defined as learners taking control of the goal and purpose of learning and assuming ownership of learning. This definition implies that learners plan and manage learning activities, develop solutions and personally pursue knowledge and skills (Louws *et al.*, 2017:172).

In more recent literature (Johnson & Johnson, 2019), SDL is described as a situation in which: (a) the individual is able to define his or her own goals; (b) the goals are related to his or her central needs or values; (c) the individual is able to define the paths (i.e., procedures, strategies, resources) taken to achieve the goals; and (d) the achievement of these goals represents a realistic level of aspiration for the individual that is not too high or too low, but high enough to be challenging.

2.2.1 Learning theories associated with self-directed learning

This section provides interpretations of the learning perspectives associated with SDL. According to Ertmer and Newby (1993:50), the way learning is defined has significant implications for situations in which we want to facilitate change. SDL can be seen as interwoven within the social-constructivist and cognitive perspective (Garrison, 1997). From the cognitive perspective, learning occurs because thought processes and knowledge are viewed as a mental activity that entails internal coding and structuring by the learner (Ertmer & Newby, 1993:54). This learning perspective is applicable when learners are motivated to assume collaborative control of their cognitive processes. Garrison (1997:18) refers to these processes as the self-monitoring aspect of SDL. The social-constructivist perspective is applicable when learners are motivated to assume collaborative control of the contextual process. Garrison (1997:18) refers to these processes as the self-management aspect of SDL.

The idea that everything an individual learns occur within a social context, is based on the work of Lev Vygotsky (1978). He proposed that learning and development take place in the interactions between peers. This theory of learning emphasises the role of the social environment in the learning process. These social interactions develop cognitive changes, which result from using cultural tools like language and from internalising these interactions (Vygotsky, 1978). The cognitive changes occur within the zone of proximal development (ZPD), defined as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978:86). Part of understanding social constructivism afforded by the work of Vygotsky gives theoretical insights into cultural-historical activity theory (CHAT). This theory (CHAT) offers a cross-disciplinary perspective for analysing human practices as development processes in which both individual and social levels are interlinked (Mentz & De Beer, 2017:101). CHAT is therefore a suitable theory as it takes us beyond the constructivist learning theory by recognising the different identities individuals bring to the teaching and learning environment (Dann, 2014:160).

According to Bolhuis (2003:328), in the social-constructivist perspective, learning is regarded as “a social process and knowledge as a social construction”, with mediation as the key mechanism in development and learning. In addition, Vygotsky (1978:86) states that learning occurs on two planes: first, on a social plane and then, on an individual plane where mutually constructed knowledge is internalised. When considering both the social-constructivist and cognitive perspectives, SDL may be regarded as learning how to participate in the social construction and reconstruction of reality, which can be processed internally to lead to certain outcomes. Consequently, this would imply that teachers have a responsibility of ensuring that learners acquire SDL skills through meaningful social interaction during the teaching-learning process.

According to Jossberger, Brand-Gruwel, Boshuizen and Wiel (2010:416), the first step in learning to self-direct one’s learning is developing the “skill to self-regulate learning activities and task performances”. There is an important distinction between SDL and the notion of self-regulated learning as SDL can be regarded as a broader construct encompassing self-regulated learning (Saks & Leijen, 2014:192). According to Bolhuis and Voeten (2001:837), process-oriented instructions foster and facilitate self-regulated learning, an aspect of SDL. Process-oriented teaching is defined as “teaching that facilitates independent learning, supporting learners to become proficient learners in the field concerned and preparing them for lifelong learning” (Bolhuis & Voeten, 2001:837). Thus, process-oriented teaching can be regarded as one of the ways of creating meaningful social interaction, which can foster SDL.

Process-oriented teaching involves four main principles (Bolhuis & Voeten, 2001:849): “one is helping learners to gradually acquire the competences to regulate components in learning; the

second is stimulating the knowledge-building process; the third principle refers to the attention to emotional aspects of learning, including fostering motivation and a positive pattern of attribution, as well as helping students to enlarge their tolerance of uncertainty; and the fourth principle is treating the learning process and results as social phenomena". This means teaching social skills and cooperative learning as well as stimulating learners' collaborative and critical inquiry into knowledge as a social construction of reality (Bolhuis & Voeten, 2001:849).

2.2.2 Theoretical framework for self-directed learning

This section presents relevant research on SDL, with the objective of identifying key trends that help to frame the concept and elements of SDL. The early work of Long (1989) describes three dimensions of SDL: sociological, pedagogical and psychological dimensions. The sociological dimension addresses the isolated learner, which refers to independent task management (Ponton & Carr, 2000:273); the pedagogical dimension addresses learner activities as applied in educational context; and the psychological dimension addresses the cognitive or mental state of a learner during the SDL process (Ponton & Carr, 2000:273).

Since the early work of Long (1989), SDL has gained increased interest over the past years, leading to various researchers developing models for conceptualisations of SDL. Merriam and Caffarella (1999), for example, categorised SDL into two broader categories – the process perspective, and the personality characteristics perspective – based on the work of Long (1989) and Oddi (1987). According to Knowles (1975), in the process perspective, the focus is on learner activities, such as: goal setting, obtaining resources, planning a learning strategy, and monitoring progress. The personality characteristics perspective involves the psychological and sociological dimension, which implies that learning is a self-initiated, self-regulated and self-directed cognitive process (Ponton & Carr, 2000:273).

Long's (1989) model evolved over time based on ongoing investigations, which then emphasised three dimensions of SDL: metacognition, self-regulation and motivation (Long, 2000:11). According to Spruce and Bol (2015:245), metacognition is described as the action of reflecting on one's own thinking. Self-regulation has its origins in school education and is regarded as an active process within task execution during which the learning task can be generated by the teacher (Saks & Leijen, 2014:192). The motivation aspect is described as "the process of instigating and sustaining goal-directed behaviour" (Schunk, 2012: 340).

Garrison (1997:18) proposed a model that explains SDL within the school context and integrated three SDL dimensions: the external management of the learning process (task control); internal monitoring (cognitive responsibility); and motivation (with regard to entering and sustaining a task). Hiemstra and Brockett (2012) formulated the person-process-context (PPC) model, which involves

a dynamic interrelationship between the three elements – person, process, and context – which are regarded as crucial in the learner’s development of SDL. The person element includes individual characteristics, such as motivation, enthusiasm, creativity and critical reflection (Hiemstra & Brockett, 2012:158). The process element involves teaching and learning activities (Hiemstra & Brockett, 2012:158) and the context element refers to the learner’s environmental and socio-political climate (Hiemstra & Brockett, 2012:158).

All the presented models helped to explain the concept of SDL. A theoretical model that integrates all the contributions made by the SDL models presented by the aforementioned researchers (Garrison, 1997; Hiemstra & Brockett, 2012; Long, 1989; Long, 2000; Merriam & Caffarella, 1999) is presented in Figure 2.1.

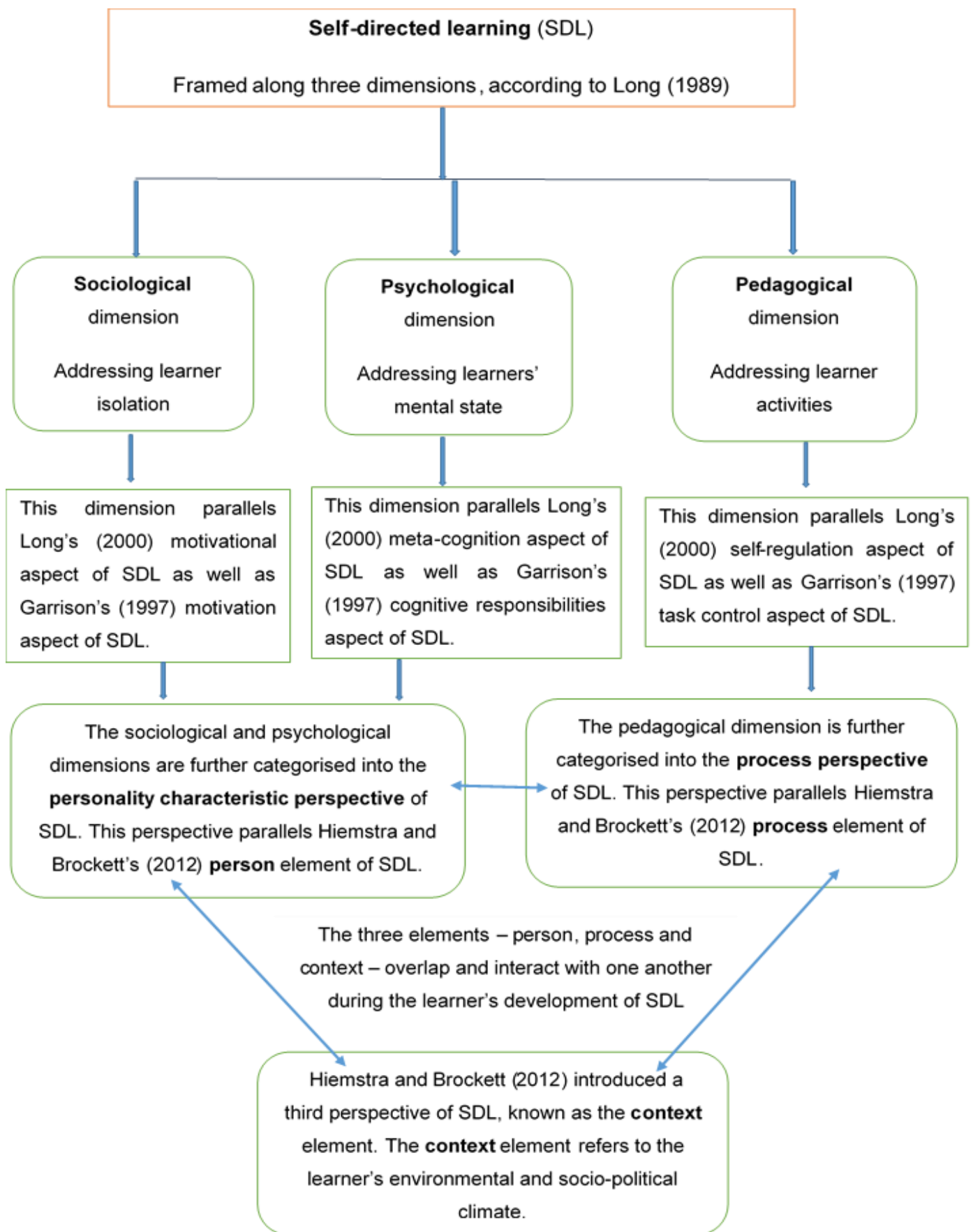


Figure 2.1: A model showing the theoretical framework of self-directed learning

Source: Author's own

The theoretical framework model of SDL (Figure 2.1) depicts a level of conceptual coherence, which intends to clarify and simplify some of the language used from the various SDL models. This helps to enhance our understanding of SDL, for example:

- The external management of the learning process (task control) dimension from Garrison's (1997) SDL model parallels what Long (1989) describes as the pedagogical dimension and what Long (2000) describes as self-regulation, which is associated with the process perspective of SDL as it involves learner activities. This perspective parallels what Hiemstra and Brockett (2012:158) describe as the process element, since it also involves teaching and learning activities.
- The internal monitoring (cognitive responsibility) dimension from Garrison's (1997) SDL model parallels what Long (1989) describes as the psychological dimension and what Long (2000) describes as metacognition, which is associated with the personality characteristics perspective of SDL as it involves the mental state of learners. This perspective parallels what Hiemstra and Brockett (2012:158) describe as the person element, since it also involves individual mental aspects, such as motivation and critical thinking.
- The motivation (with regard to entering and sustaining a task) dimension from Garrison's (1997) SDL model, parallels what Long (1989) describes as the sociological dimension and what Long (2000) describes as the motivational aspect, which is associated with the personality characteristics perspective of SDL, since it involves the individual learner's motivational inducements for the execution of learning activities (Panton & Carr, 2000:273).
- The context element, according to Hiemstra and Brockett (2012:158), encompasses the environmental and socio-political climate, which includes the organisational policies, learning environment, finances, gender, learning climate and the political milieu. The inclusion of the context perspective is regarded as one of the focal points in understanding SDL (Hiemstra & Brockett, 2012:158).

This section provided a theoretical framework for SDL. This serves as a theoretical foundation for providing measures used to define and describe the concept of SDL behaviours. The concept of SDL behaviours is discussed next.

2.2.3 Self-directed learning behaviours

Janotha (2016:100) posits that learners can acquire behaviours reflecting SDL skills, which can be referred to as SDL behaviours. According to Knowles (1975), SDL behaviours can be regarded as skills or qualities required by self-directed learners. In addition, Knapper and Cropley (2000:51) state that SDL behaviours can be regarded as characteristics required by self-directed learners.

Furthermore, Guglielmino (1978) asserts that there are clearly identifiable behaviours and abilities associated with SDL. In order to describe and define the concept of SDL behaviours within the school context, the present study draws on Garrison's (1997) SDL model. This model is suitable for defining and describing SDL behaviours, which reflect both the process perspective and the personality characteristic perspectives of SDL within the school context.

According to Garrison (1997), SDL behaviours can be summed up as behaviours reflecting:

- learners being motivated to proactively carry out the learning process by engaging in task-control processes;
- learners taking cognitive responsibility for monitoring and evaluating their progress, which is further mediated through their motivation.

A broader description of SDL behaviours, which is associated with the three SDL dimensions from Garrison's (1997) model, is presented in Table 2.1. This description of SDL behaviours can serve as a behavioural index that could provide a way of elucidating, observing or determining SDL within the school context.

Table 2.1: Description of self-directed learning behaviour based on Garrison's (1997) model of self-directed learning within the school context

Self-directed learning dimension	Corresponding self-directed learning behaviour
<p><u>Process element of SDL</u> Self-management "Pedagogical dimension" <i>Focuses on the social and behavioural implementation of the learning process.</i></p>	<p>Active processes within task execution, such as planning, goal setting and organising. The ability to use learning materials within a context.</p>
<p><u>Person element of SDL</u> Self-monitoring "Psychological dimension" An awareness of and ability to think about our thinking. <i>Involves cognitive and metacognitive responsibilities</i></p>	<p>Plan and modify thinking according to the learning task/goal. Learner takes responsibility for the construction of personal meaning. Assessing the quality of learning outcomes to improve strategies for further learning activities. Learners self-monitor their progress by observing, judging in reaction to their tasks and activities.</p>
<p><u>Person element of SDL</u> Motivation "Sociological dimension" reflects perceived value and anticipated success of learning goals at the time learning is initiated</p>	<p>Willingness to assume responsibility for learning. The tendency to focus on and persist in learning activities and goals. Having a strong belief that a desired outcome can be achieved. Maintenance of attention during the learning process.</p>

2.2.4 Self-directed learning within the context of Natural Sciences

According to Williamson (2007:68), all individuals are capable of SDL, but the degree of development varies due to individual differences. Fundamental to the holistic development of learners' SDL, researchers have shifted focus from self-direction as a personal characteristic (personality perspective) and instructional characteristic (process perspective) to a broader view of the role of social context in developing learners' self-direction in learning (Hiemstra & Brockett, 2012:156). According to Turner and Meyer (2000:70), the concept of social context has varying definitions, depending on whether they are viewed from a psychological, sociological, educational, or anthropological perspective.

However, a well-known social context model formulated by Bronfenbrenner (1977, 1979, 1986), namely the person-process-context-time (PPCT model), examines how four different dimensions in the social context interact in the process of child development. In the person dimension, the focus is on the personal characteristics that individuals bring with them to any social situation, while the process dimension focuses on forms of interactions in an environment (Tudge, Mokrova, Hatfield & Karnik, 2009:200). The context dimension refers to the child's environment, which involves four interrelated systems (microsystem, mesosystem, exosystem, and macrosystem), while the time dimension refers to changes that occur over time as the developing individual is maturing or as the environment changes (Tudge *et al.*, 2009:201).

Important to note is how the person-process-context-time dimensions overlap, interact and influence one another, which, together, helps us gain a holistic understanding of a child's development at any stage of development (Bronfenbrenner, 1977, 1979, 1986). Acknowledging this, Hiemstra and Brockett (2012:158) formulated the person-process-context (PPC) model, which also involves a dynamic interrelationship between the three elements – person, process and context – which are regarded as crucial in a learner's development of SDL. The context element, according to Hiemstra and Brockett (2012:158), is considered as a multidimensional element that encompasses the environmental and socio-political climate.

However, recognising context as a complex phenomenon, the present discussion was limited to a narrower view of context, namely the setting in which learning and development of SDL take place. The description of any educational setting can be addressed by referring to the Curriculum and Assessment Policy Statement (CAPS) document. The CAPS document is relevant because it provides a description of how the educational programme is structured and how decisions are made (Donald, Lazarus & Lolwana, 2006:19). Furthermore, the CAPS document provides a description of processes and methods of teaching and learning together with methods of assessment and evaluation (Donald, Lazarus & Lolwana, 2006:19). This section thus examines the CAPS document for NS so as to describe the context in which SDL can be manifested.

The Natural Sciences CAPS document stipulates that it aims to provide learners with opportunities to make sense of ideas they have about nature through asking questions, research and investigation. To achieve this goal, the teaching-learning process in NS revolves around three specific aims, namely:

Specific Aim 1: Doing Science

- Learners should be able to complete investigations, analyse problems and use practical processes and skills in evaluating solutions (Department of Basic Education, 2011:10);

Specific Aim 2: Knowing the subject content and making connections

- Learners should have a grasp of scientific, technological and environmental knowledge and be able to apply it in new contexts (Department of Basic Education, 2011:10);

Specific Aim 3: Understanding the uses of Science

- Learners should understand the uses of Natural Sciences and indigenous knowledge in society and the environment (Department of Basic Education, 2011:10).

Assessment plays a significant role during the teaching-learning process (Department of Basic Education, 2011:86). According to Sambell, McDowell and Montgomery (2013), assessment is considered as one of the ways in which learners can be helped towards achieving their goals. Assessment, in general, is defined as the ongoing process of gathering, analysing and reflecting on evidence to make informed and consistent judgements to improve learning outcomes (Black & William, 1998:7). Several authors (Harrison *et al.*, 2015:76; Nicol *et al.*, 2014:103; Van Zundert *et al.*, 2010:270) suggest that self- and peer-assessment promote SDL. The Natural Sciences CAPS document advocates that assessment can be done through observation, discussion, practical demonstrations, informal classroom interactions, classwork, investigations, self-assessment and peer-assessment (Department of Basic Education, 2011:86). In addition, the Natural Sciences CAPS recognises that self- and peer-assessment actively involve learners in assessment and a teacher playing an overseeing role (Department of Basic Education, 2011:86). This is important as it allows learners to learn from and reflect on their own performance (Department of Basic Education, 2011:86). Hence, an understanding of assessment in the context of NS is crucial to understand how SDL can be addressed.

Assessment in the context of NS, as stipulated by CAPS, emphasises that classroom assessment should be both formal and informal (Department of Basic Education, 2011:85). Formal assessment is defined as assessments that provide teachers with a systematic way of evaluating learners' progression in a grade and should be recorded (Department of Basic Education, 2011:86). Informal

assessment is defined as daily assessments used for monitoring learners' progress for the purpose of providing developmental support as well as feedback on teaching and learning (Department of Basic Education, 2011:85). The Natural Sciences CAPS advocates that informal "formative" assessment should build towards formal "summative" assessment and therefore teachers should not only focus on the formal "summative" assessments (Department of Basic Education, 2011:86).

Teaching and learning in the NS curriculum involves the development of process skills which may be used in everyday life, the community and the workplace (Department of Basic Education, 2011:8). Assessment in the NS subject should be mapped out against the stipulated process skills associated with the relevant specific aims in both formal and informal assessments (Department of Basic Education, 2011:85). Van Rooyen and De Beer (2010) distinguish between basic process skills and integrated process skills. Basic process skills are simple individual skills used in Science education (Van Rooyen & De Beer, 2010:87). Integrated process skills are more complex and require a combination of several basic skills in order to perform them during Science education (Van Rooyen & De Beer, 2010:87). Table 2.2 presents a summary of the process skills associated with the stipulated specific aim.

Table 2.1: Description of the process skills associated with Natural Sciences Specific Aims

Specific Aims	Process Skills
<p>Specific Aim 1: Doing Science</p>	<p>Basic process skills: Observing Measuring Classifying Inferring Communicating</p> <p>Integrated process skills: Hypothesising Designing experiments Planning and doing investigations Recording information Problem-solving</p>
<p>Specific Aim 2: Knowing the subject content and making connections</p>	<p>Accessing and recalling of information Comparing Sorting and classifying Interpreting information</p>
<p>Specific Aim 3: Understanding the uses of Science</p>	<p>Identifying problems and issues Raising questions Predicting Communicating</p>

This section provided an understanding of how teaching and learning together with assessment in the context of the NS subject are set up. This is based on research (Hiemstra & Brockett, 2012)

which indicates that the inclusion of context should also be a focal point in understanding SDL. The following section addresses ways in which SDL behaviours can be developed in the context of NS.

2.2.5 Fostering self-directed learning behaviours within the context of Natural Sciences

According to Bolhuis (2003:329), SDL cannot be viewed as a self-contained, internally driven individual pursuit. In order to understand the *process* and *personal characteristics* associated with SDL, a discipline-specific *context* is required. This section provides interpretations of the processes associated with SDL behaviours and how these behaviours can be manifested within the context of NS.

In order to examine SDL within the context of NS, this section draws on Du Toit-Brits' (2015) model of domain-specific components associated with SDL. According to Candy (1991), SDL has general domain-specific components that influence the activation of SDL in learners. In addition, Bolhuis (2003:330) asserts that learners would begin to employ adequate strategies when competence in a domain increases, enabling them to work more independently. Moreover, Candy (1991) argues that, since the self-regulation aspect of SDL is closely tied to domain-specific components, teachers need to focus more on fundamental concepts and structures in particular subjects so as to ensure appropriate guidance is provided to learners. Du Toit-Brits (2015:35) asserts that such domains are interconnected and reinforce each other; therefore, she proposes a framework focusing on the interrelated connections between three domains, namely educational, emotional and cultural domains. These domains together with process-oriented teaching provide an overview of ways in which SDL behaviours in learners can be manifested through the aforementioned NS subject specific aims.

2.2.5.1 Educational domain

The educational domain focuses on academic skills and structures of the learning environment (Du Toit-Brits, 2015:40). Teachers need to set standards for learners to apply effective problem-solving, decision-making, metacognition and goal setting in order to enhance the educational domain (Du Toit-Brits, 2015:40). Within the context of NS, this domain can be manifested by Specific Aim 2 (i.e. knowing the subject content and making connections). With this specific aim, the main task of teaching is to build a framework of knowledge for learners and to help them make connections between the ideas and concepts in their minds – this is different to learners just knowing facts (Department of Basic Education, 2011:10). When learners do an activity, questions and discussion must follow and relate to previously acquired knowledge and experience, and connections must be made. This specific aim is also consistent with the process-oriented teaching principle, which focuses on knowledge-building within the subject area by encouraging learners to mobilise and critically

assess their prior knowledge, both on content and process (Bolhuis & Voeten, 2001:837). In so doing, SDL behaviours associated with the psychological dimension (Table 2.1) are encouraged, because this SDL dimension involves learners taking responsibility for the construction of personal meaning (Garrison, 1997).

2.2.5.2 Cultural domain

The cultural domain focuses on cultural diversity of the learner (Du Toit-Brits, 2015:42). Teachers need to cultivate a learning environment that promotes equity, fairness and diversity in teaching (Du Toit-Brits, 2015:42). Within the context of NS, this domain can be established by Specific Aim 3 (i.e. understanding the uses of Science). With this specific aim, the main task is to produce learners who understand that school sciences can be relevant to everyday life (Department of Basic Education, 2011:10) as well as an appreciation of the connections between indigenous knowledge (IK) and different worldviews. The latter is of course a contested issue. Taylor and Cameron (2016) highlight three epistemological perspectives on the relationship between NS and IK: (a) the inclusive perspective where IK is seen as part of science; (b) the exclusive perspective in which science and IK are seen as separate domains of knowledge; and (c) the perspective that IK and science are intersecting domains. This specific aim is also consistent with the process-oriented teaching principle, which treats learning process and results as a social phenomenon by promoting social skills like understanding other people's point of view, relating one's own position to those of others, and working productively together (Bolhuis & Voeten, 2001:837). In so doing, this could encourage SDL behaviours associated with the sociological dimension (Table 2.1) as this SDL dimension involves the motivation of learners in assuming responsibility for their learning (Garrison, 1997).

2.2.5.3 Emotional domain

The emotional domain focuses on learners' purpose of life, self-efficacy, fears, expectations, aspirations and self-awareness (Du Toit-Brits 2015:41). Du Toit-Brits (2015:41) states that self-regulation is part of the emotional domain and is an indicator of the level of SDL. The concept of self-regulation of learning, according to Zimmerman (2002:65), can be defined as the ability to plan, monitor and evaluate learning. Self-regulation depends on continuing feedback of learning effectiveness (Zimmerman, 2002:65). Within the context of NS, this domain can be established by Specific Aim 1 (i.e. doing Science). With this specific aim, learners plan and perform investigations and solve problems that need practical ability (Department of Basic Education, 2011:10). Continuous feedback on learners' efforts should be given, as Tay (2015:169) highlights that formative assessments of learning tasks give learners opportunities to play an active role in exercising self-regulated learning. This is also consistent with the process-oriented teaching principle, which focuses on emotional aspects of learning by providing learners with positive feedback that is task-

oriented rather than directed towards the learner (Bolhuis & Voeten, 2001:837). This can encourage SDL behaviours associated with the pedagogical dimension (Table 2.1) because this SDL dimension involves the active processes within task execution (Garrison, 1997).

2.2.6 Measures for identifying self-directed learning behaviours

Several studies have shown an increasing interest in understanding what factors hinder or facilitate SDL. For example, studies have investigated the role of teachers in support of SDL (Bolhuis & Voeten, 2001; Taylor, 1995; Temple & Rodero, 1995). Several researchers (Abubakar & Arshad, 2015; Loyens, Magda & Rikers, 2008; Malan, Ndlovu & Egelbrecht, 2014) advocate for a situated learning approach to SDL and investigated the influence of problem-based learning on SDL. Saks and Leijen (2014) specifically investigated the influence of e-learning on SDL. Other researchers (Harrison *et al.*, 2015; Nicol *et al.*, 2014; Van Zundert *et al.*, 2010) investigated the influence of self- and peer-assessment on SDL. From these studies, one gets a sense of the prerequisites needed to support SDL. Based on the continuing interest in identifying factors that influence SDL, this study sought to investigate how grade 9 NS teachers' assessment beliefs influence learners' SDL behaviours. The literature search showed that this line of inquiry was unexplored, which prompted the necessity for this study. The concept of SDL has been mentioned in many studies, and instruments have been developed to evaluate this skill. Ayyildiz and Tarhan (2015:665) identified prominent SDL instruments that directly measure SDL, namely:

- the SDL Readiness Scale by Fisher *et al.* (2001), which was utilised for nursing education;
- the SDL Readiness Scale (SDLRS) by Guglielmino (1978) was developed to determine the relationship between readiness for SDL and performance in a professional context;
- the Self-Rating Scale of SDL (SRSSDL) by Williamson (2007) was developed to assess SDL behaviour, which is different from the simple measuring of perceptions and readiness for SDL.

The SDL Instrument (SDLI) developed by Cheng, Kuo, Lin and Lee-Hsieh (2010) is one of the SDL instruments not mentioned by Ayyildiz and Tarhan (2015). The SDLI by Cheng *et al.* (2010) is a valid, reliable instrument with 20 items, which was designed for nursing education. The SDL Skills Scale (SDLSS) by Ayyildiz and Tarhan (2015) was developed to assess high school learners' SDL skills. The SDLSS is, however, criticised for its poor reliability and inability to replicate its factor structure across different cultural groups (Ayyildiz & Tarhan, 2015:676).

The most suitable instrument for this study was Williamson's (2007) SRSSDL, since the aim of this study was not to quantify and measure SDL or to measure perceptions and readiness for SDL; rather, the aim was to ascertain the nature of SDL behaviours in learners. Williamson's (2007) SRSSDL instrument comprises SDL behaviours that are categorised according to five subfactors:

awareness; learning strategies; learning activities; evaluation (assessment); and interpersonal skills. Each of the subfactors is briefly elaborated on next.

In the **awareness** subfactor, items are based on learners' understanding of the factors contributing to becoming self-directed learners (Williamson, 2007:70). This subfactor matches the psychological dimension of SDL as it involves learners' ability to think about their SDL capabilities. In the **learning strategies** subfactor, items are focused strategies that learners adopt to become self-directed in their learning process (Williamson, 2007:70). This subfactor matches the pedagogical dimension of SDL as it involves metacognitive strategies based on controlling of tasks. Items in the **learning activities** subfactor are focused on activities in which learners are engaged so as to become self-directed in their learning (Williamson, 2007:71). This subfactor matches the pedagogical dimension of SDL as it involves the ability to use materials within the context of the learning process.

In the **evaluation** subfactor, items reveal specific attributes in order to help monitor learning activities (Williamson, 2007:71). This subfactor matches the psychological dimension of SDL as learners self-monitor their progress. In the **interpersonal skills** subfactor, items are based on interpersonal relationships (Williamson, 2007:71). This subfactor matches the sociological dimension of SDL as learners can exhibit willingness to assume responsibility for their learning while working collaboratively with peers and teachers. Important to note is how the SDL behaviours associated with the five subfactors correspond with the SDL behaviours associated with the (sociological, pedagogical and psychological) SDL dimensions.

The subfactors in Williamson's (2007) SRSSDL instrument are consistent with Garrison's (1997) descriptors of SDL behaviours depicted in Table 2.1. Hence, the instrument was suitable for formulating questions that would aid in obtaining qualitative data with regard to SDL behaviours of grade 9 NS learners. Examining how such behaviours are influenced by teachers' assessment beliefs would lead to new perspectives on theoretical concepts regarding learners' SDL behaviours.

In the following section, the conceptualisation of assessment beliefs is discussed, which further provides a basis for addressing and understanding the study's research questions.

2.3 CONCEPTUALISATION OF ASSESSMENT BELIEFS

The focus of this section is to outline the conceptual framework of assessment beliefs drawn from the literature study. This is achieved by defining the concept of beliefs within the context of assessment. This is followed by the characterisation of teachers' assessment beliefs. Thereafter, the factors influencing teachers' assessment beliefs are highlighted. The section is concluded by providing the theoretical framework for the development of assessment beliefs.

2.3.1 The concept of beliefs within the assessment context

The term *belief* is regarded as a proposition that may be consciously or unconsciously held and is accepted as true by the individual (Borg, 2001:186). According to Lehrer (1990), knowledge depends upon a “truth condition”. This suggests that a community of people agrees that a proposition is true (Sikula, 1996). However, Alexander, Schallert and Hare (1991:317) describe knowledge as “encompassing all that an individual knows or believes to be true, whether or not it is verified as true”. This description by Alexander *et al.* (1991) equates beliefs and knowledge as a single construct as opposed to Lehrer’s (1990) description of knowledge.

Extending this argument, Kagan (1990) argues that beliefs and knowledge can be equated as a single construct based on the rationale that teachers’ knowledge is subjective just as beliefs are regarded as subjective. Likewise, the term *conceptions* is used synonymously with the term *belief* as both terms are associated with the subjective knowledge aspect (Alexander *et al.*, 1991:317; Barnes *et al.*, 2015:285). This is consistent with Nespor’s (1987) early work, which helped to establish beliefs as a theoretical construct and viewed teacher beliefs as an integration of knowledge and feelings built up chiefly through teaching experience (Evans, Luft, Czerniak, & Pea, 2014:17). In the context of assessment, Nespor’s (1987) concept of beliefs is coherent with Thompson’s (1992) description of conceptions. According to Thompson (1992), assessment conceptions are described as mental structures encompassing beliefs and knowledge about and affect for assessment.

A literature search that was conducted to establish conceptual clarity of the term *assessment belief* showed that *assessment conceptions* is the preferred and frequently used term as the two concepts are used interchangeably (Brown, 2002; Brown, 2004; Brown, 2006; Brown, Harris & Harnett, 2012; Dayal & Lingam, 2015; Delandshere & Jones, 1999; Jane, 2013; Opre, 2015; Remesal, 2007). In the context of this study, the term *conceptions* will also be used synonymously with the term *belief*. This is based on studies that are points of references in the field of assessment, such as Brown (2002, 2004, 2006), who used varied terminologies, such as assessment conceptions, to describe assessment beliefs.

2.3.2 Teachers’ beliefs about assessment

Brown (2002:27, 2004:302, 2006:166) established four distinct teacher conceptions of assessment, which emanates from two main categories for the purpose of assessment, namely assessment seen as serving a pedagogical and administrative purpose. In the pedagogical category, the aim of assessments is to improve instructional procedures in order to enhance teaching and learning, which is associated with formative “informal” assessment (Brown, 2002:1, 2004:301). In the administrative category, the aim of assessments is to rank and certify institutions that target government agencies,

parents and other stakeholders; therefore it is associated with summative “formal” assessment (Brown, 2002:1, 2004:301).

Summative assessment is defined as “the process by which teachers gather evidence in a planned and systematic way in order to draw inferences about the learning process at a particular time” (Atjonen, 2014:239). This is analogous to the concept of *formal assessment* (Department of Basic Education, 2011:86). *Formative assessment* can be defined as a process through which assessment-elicited evidence of learners’ learning is used by teachers to adjust their instructional procedures, or used by learners to adjust their current learning (Cauley & McMillan, 2010:2; Reddy, Le Grange, Beets & Lundie, 2015:47). This is analogous to the concept of *informal assessment* (Department of Basic Education, 2011:86). The interest in research on teachers’ conceptions of assessment comes from the premise that these conceptions significantly influence their assessment decisions (Jane, 2013; Opre, 2015; Uysal & Bardakci, 2014). These assessment decisions can serve either a formative or summative purpose (Brown, 2002, 2004).

The four teacher assessment conceptions established by Brown (2002, 2004, 2006) form the basis of defining and characterising teacher assessment beliefs, namely: a) assessment improves teaching and learning; b) assessment holds learners accountable; c) assessment holds schools and teachers accountable; and d) assessment is irrelevant for teaching and learning (Brown, 2002). Each of these is briefly elaborated upon.

Assessment improves teaching and learning

Assessment is believed to be a process for obtaining information that can assist learners in their learning process (Brown, 2002:29). Assessment is also believed to be evaluative of the effectiveness of teaching (Brown, 2002:29). It is therefore regarded as a process for obtaining information that can be used to improve the learning of learners (Brown, 2002:29). Assessment related to the improvement of teaching and learning is associated with the constructivist perspective (Butterfield, Williams & Marr, 1999:226) as it requires teachers to be actively involved in diagnosing what learners have learned through a wide variety of evaluative techniques, therefore the main focus is on formative assessment practices (Brown, 2002:31). Furthermore, Black and Wiliam (1998:27) argue that the improvement process of learning is enhanced through peer and self-assessment. This is because, for learners to improve, they must be able to develop the capacity to monitor the progress and quality of their own work (Brown, 2002:32). Vandeyar and Killen (2007:102) assert that teachers who regard assessment as improving teaching and learning would attempt to make assessment an integral part of teaching. According to Calveric (2010:17), teachers who regard assessment as improving teaching and learning would frequently use both formal and informal assessment aimed at improving the quality of instruction and learners’ learning.

Assessment holds learners accountable

Assessment is believed to be a process for certification of learners from one grade to the next, or for graduation, or for entry levels of educational opportunity (Brown, 2002:40). This assessment belief is thought to be associated with high-stakes assessment, which is the pressures for accountability for learners' performance and achievement (Brown, 2002:40). According to Delandshere and Jones (1999), teachers with this assessment belief may tend to absolve themselves from the responsibility for learner failure by blaming the learners' lack of ability or socio-economic conditions. The focus is on summative assessment practices because the focus is on determining acquisition of facts and skills to see whether the learner has or has not learned the content (Calveric, 2010:18).

Assessment holds schools and teachers accountable

Assessment is believed to be a process for providing evidence of how well or poorly a teacher, school, or country is doing (Brown, 2002:33). In other words, this assessment belief is associated with high-stakes assessment as the assessment results are used for high-stake evaluations of teachers' and schools' competencies (Brown, 2002:33). The rationale behind this belief is based on the need to provide quality instruction in order to improve the teaching and learning process (Brown, 2002:33). The focus of assessing learners is to convey information to external audiences, like parents' district and state (Delandshere & Jones, 1999:229). Teachers with this assessment belief will favour summative assessment practices that emphasise the generation of marks that can be reported to external agencies (Vandeyar & Killen, 2007:102).

Assessment is irrelevant to teaching and learning

Assessment is believed to have no legitimate place in teaching and learning as it makes teachers, schools and learners accountable, which leads to unnecessary pressure (Brown, 2002:43). Teachers who adopt this assessment belief "reject assessment due to its perceived harmful impact on teacher autonomy and professionalism" (Calveric, 2010:19). The assumption is that assessment is not valid as it is believed that the standards of achievement do not emanate from an external objective curriculum (Brown, 2002:47). Teachers with this view of assessment would probably avoid formative assessment and take a "haphazard approach to summative assessment, thus creating the self-fulfilling prophecy that assessment is a waste of time" (Vandeyar & Killen, 2007:102).

Having identified the four teacher assessment beliefs and how they inform teachers' thinking and planning and consequently shape classroom assessment practices, it would be valuable to examine the potential mediating factors that influence these beliefs.

2.3.3 Factors influencing teachers' assessment beliefs

According to Vandeyar and Killen (2007:103), teachers' assessment beliefs are "unlikely to be immune from the influences of the system within which they work". For example, teachers who operate within an explicit set of pedagogical principles, which reflect that learning should be concerned with developing deep understanding, would be expected to believe that assessment is a means of improving learning and teaching (Vandeyar & Killen, 2007:102).

The common agreement in literature is that teachers' beliefs are expected to be associated with their personal history, especially their professional education (De Vries, Van de Grift & Jansen, 2014; Harris & Brown, 2008; Remesal, 2011; Richardson, 1996). This can be illustrated by Simmons *et al.* (1999), whose research indicated that pre-service teachers' belief systems are disconnected, underdeveloped and unstable. This study built on research by Pajares (1992), who documented that pre-service teachers' belief systems become more robust over time and use. According to Richardson (1996), teachers' belief systems develop through their various past and present experiences, namely: a) personal experience occurring outside school); b) experience with schooling and instruction; and c) experience with the development of formal knowledge. However, Richardson (1996) highlighted that experiences with formal pedagogical knowledge were regarded as the least powerful factor affecting teachers' belief systems.

Calderhead (1996) states that assessment beliefs are strongly influenced by teachers' understanding of the subject content. According to Bright and Joyner (1998), the underlying philosophical values about learners' abilities and the perceptions of what the community expects also greatly influence teachers' assessment beliefs. Faour (2003) believes that contextual factors (social or instructional) may affect teachers' beliefs and practices. The study by Ramnarain and Schuster (2014) confirmed that contextual factors – such as class sizes, teachers' competence and confidence, availability of resources, parents' expectations, and school culture – shape the pedagogical orientation assumed by teachers. These contextual factors shape teacher beliefs systems because beliefs are psychological constructs that are organised internally and are thus situation-specific and not decontextualised (Vandeyar & Killen, 2006:32). In addition, Remesal (2011) highlights that, although resistant to change, beliefs are subject to influences from the social context. Furthermore, Scott (2015) is of the opinion that the culture and context of teachers have a significant bearing on the kind of beliefs they hold.

According to Vandeyar and Killen (2007:103), in post-apartheid South Africa, two issues shape teachers' beliefs of learning, teaching and assessment, namely: 1) curriculum guidelines and departmental policies; and 2) multicultural and multilingual classrooms. Jane (2013) conducted case study research to get a deeper understanding of what assessment means to teachers in the South African context. Jane (2013) used Brown's (2004) conceptual framework of assessment beliefs. The

study revealed that teachers' assessment beliefs were more focused on the improvement of teaching and learning and school accountability and less on learner accountability and irrelevance (Jane, 2013). In addition, Jane's (2013) study revealed that teachers' assessment beliefs were affected by multiple pressures, such as compliance, time management, policy interpretation and implementation, additional administrative workload and paperwork, support from departmental officials, and training (Jane, 2013:20). Considering the mediating factors influencing teacher belief systems, it can be concluded that teachers' assessment beliefs are mutually exclusive. In other words, the extent to which these mediating factors influences teachers' beliefs systems, differs for each individual teacher (Remesal, 2011). However, the pattern of belief obtained from the two teachers in Jane's (2013) study is be consistent with previous studies with teachers from different multicultural environments, phases, levels of schooling, and in different learning areas.

2.3.4 Theoretical framework for the development of assessment beliefs

According to De Vries *et al.* (2014), teachers' beliefs about assessment develop through their school experiences – first as learners, then as pre-service teachers, and as teachers. This section seeks to obtain a holistic understanding of how belief systems develop by drawing on the theory of attribution based on Weiner's (1979) work. This theory describes how individuals interpret events and how such interpretations influence motivation for learning as well as future learning behaviours (Demetriou, 2011:16). The attribution theory can help provide an understanding of teaching behaviours in teachers as well as learning behaviours in learners.

The attribution theory is founded on three continuums of perception of causality, namely: locus, stability, and controllability. These three continuums form the basis of individuals paying selective attention to what they perceive as relevant and ignoring what they see as unimportant (Hunter & Barker, 1987:51). Evidence from survey studies by Haney, Czerniak and Lumpe (1996:985) indicated that teacher beliefs are significant contributors of behavioural intention. Both concepts of beliefs and attributions are concerned with individuals' behavioural intentions and are both psychological constructs. Looking at the attribution theory, this section aims to give an account as to how teachers' assessment beliefs systems can be framed through the continuums of perceptions of causality.

2.3.4.1 Locus attributions

An external locus attribution is when individuals believe that outcomes occur independently of how they behave (Schunk, 2012:367). When individuals believe that outcomes occur due to their behaviour, then the attribution is referred to as an internal locus attribution (Schunk, 2012:367). Internal and external locus attributions are thought to be influenced by affective reactions, such as feelings of self-esteem, shame, or guilt (Hunter & Barker, 1987:51). However, regardless of whether

the locus is internal or external, it is believed to be associated with the individual's self-efficacy (Schunk, 2012:367). Cauley and McMillan (2010:5) define self-efficacy as the belief individuals hold about their ability to perform the task at hand. However, Bandura (1989) argues that individuals can predict their ability to perform a task based on knowledge and experiences.

Based on Nespor's (1987) early work, which helped establish beliefs as a theoretical construct, Evans *et al.* (2014:17) posited that beliefs are made up of the following:

- "episodic knowledge", characterised by remembered stories and events;
- "affective elements", such as feelings about learners;
- "existential presumptions", or beliefs about the existence or nonexistence of categorical entities, such as "brightness," "immaturity," "ability" and "laziness".

It is assumed that the episodic knowledge aspect of belief can be regarded as influenced by the locus attributions, because locus attribution is associated with the notion of self-efficacy, which, according to Bandura (1989), emanates from teachers' knowledge and experiences.

2.3.4.2 Stability attributions

This attribution is thought to influence expectations of future success (Schunk, 2012:368). Expectations for the future can be based on whether the cause is perceived as subject to change (unstable) or as stable (Schunk, 2012:368). Examples of stable causes are effort, ability, teacher bias, and task difficulty (Schunk, 2012:369). Examples of unstable causes are the individual's mood, luck, and help from others (Schunk, 2012:369). If the cause is stable, individuals expect the same results from future success or failures to occur the same way as they occurred in the past (Hunter & Barker, 1987:51). But when the cause is unstable, individuals' expectations can change (Hunter & Barker, 1987:51). The categorical entities postulated by Nespor (1987) – such as brightness, immaturity, ability and laziness – can be regarded as examples of stable and unstable causes based on their similarities. Hence, the stability attributions can be regarded as emanating from the existential presumption aspect of beliefs.

2.3.4.3 Controllability attributions

This attribution is associated with how an individual feels in control of an outcome as well as feelings of potency to engage in a task (Schunk, 2012:368). The controllability attribution has an emotional aspect, so one can regard this attribution as emanating from the affective elements of beliefs postulated by Nespor (1987) as the affective elements of beliefs are also concerned with feelings (Nespor, 1987). Studies by Levitt (2001) and Wallace and Priestley (2011) have shown that, when teachers' beliefs coincided with the philosophy of the proposed reforms, they worked enthusiastically to promote the reforms. This implies that teachers are not likely to be convinced to adopt innovative

teaching strategies based solely on scientific evidence, curriculum guidelines, or departmental policies (Levitt, 2001; Wallace & Priestley, 2011). Rather, teachers would adopt the innovative strategy based on their underlying beliefs about that innovative strategy, which will ultimately determine their level of potency to implement the innovation (Bliem & Davinroy, 1997:1).

The assumption is that the aforementioned attributions form the essential elements of any belief system, including teachers' assessment belief systems. A summary of how attributions can give rise to the four established teacher assessment beliefs is provided in Figure 2.2 below.

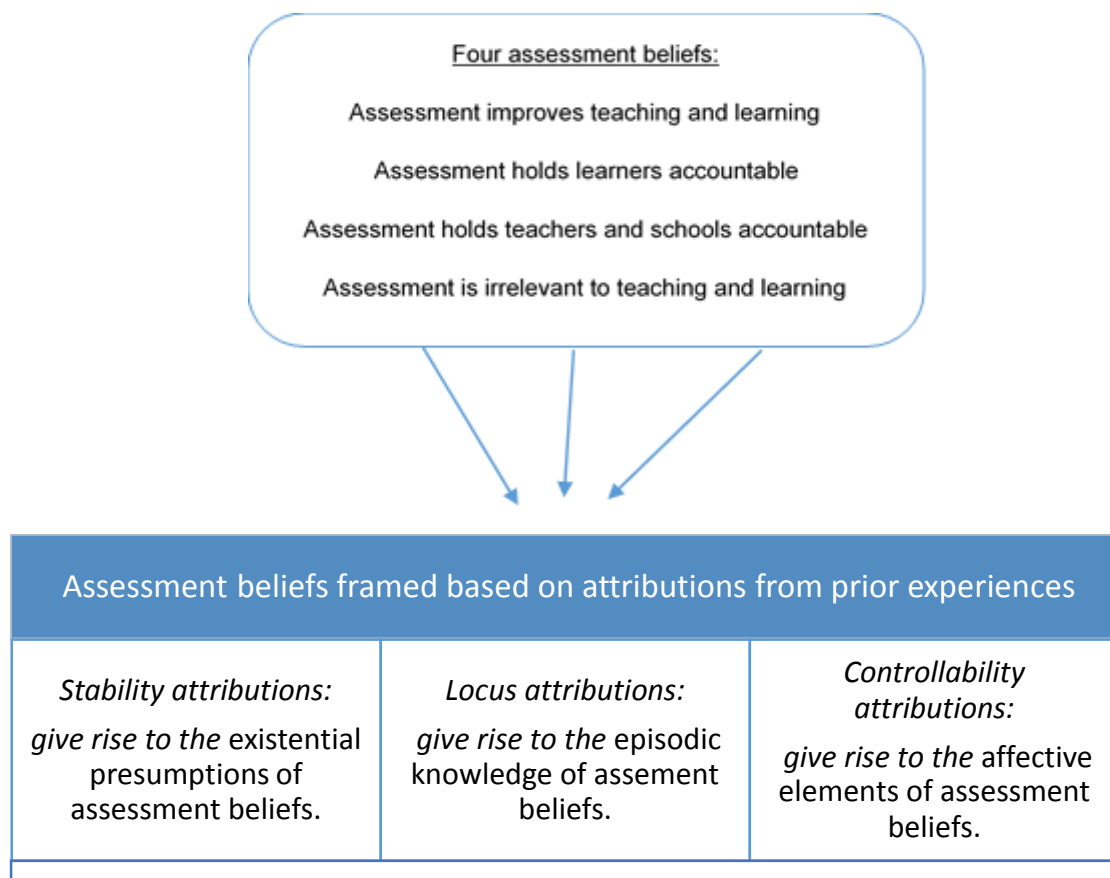


Figure 2.2: A model for understanding how teachers' assessment beliefs develop

Source: Author's own

Figure 2.2 presents the researcher's own depiction of how teacher assessment beliefs can be regarded as beliefs emanating from the locus, stability and controllability attributions. Important to note is that teachers could simultaneously hold multiple interacting assessment beliefs as opposed to just having one assessment belief (Brown, 2004; Opre, 2015:231). Nespor (1987) highlighted that belief systems are static and resistant to change because they are formed from episodically stored

pieces of material composed of personal or collective experiences and events. The development of formal knowledge systems is semantically stored material and can easily change (Nespor, 1987).

The following section relates and links teachers' assessment beliefs to learners' SDL.

2.4 THE LINK BETWEEN ASSESSMENT BELIEFS, ACTUAL ASSESSMENT PRACTICES, AND SELF-DIRECTED LEARNING BEHAVIOUR

The discussion of the link between teachers' assessment beliefs and learners' SDL behaviour will unfold by considering the four step sequential process depicted in Figure 2.3 below.

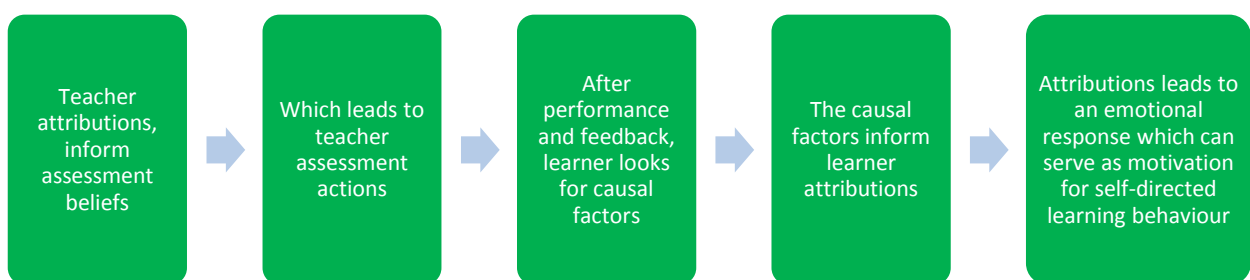


Figure 2.3: The relation between teacher assessment beliefs and learners' self-directed learning behaviour

Source: Author's own

Figure 2.3 illustrates the researcher's own depiction of link between teachers' assessment beliefs and learners' SDL behaviour formulated based on Weiner's (2000) theory of motivation called the *interpersonal theory of motivation*. This theory focuses on the attributions of individuals within a social context. For example, reactions that peers, teachers and parents express towards the performance of others within a social context (Demetriou, 2011:17). The first step shows the link between assessment beliefs and actual assessment practices or actions. Then the second step shows the link between teacher actions and the casual factors learners make. The third step shows how the casual factors inform learner attributions. The last step then shows how the learner attributions informs SDL behaviours.

Step one: The link between assessment beliefs and actual assessment actions

Within the context of this study, the researcher builds upon findings of Vandeyar and Killen (2007) and Jane (2013) which clearly define the relationship between teachers' assessment beliefs and actual assessment actions. Vandeyar and Killen (2007) conducted three ethnographic case studies of Grade 4 educators in multilingual classrooms in South Africa. The data collection consisted of a mix of sustained classroom observations, in-depth interviews and an analysis of key documents

(including marking schemes, learner transcripts, diagnostic tools and teachers' workbooks). The findings revealed that teachers' observed assessment actions appeared to be highly consistent with the assessment beliefs that were expressed during follow-up interviews (Vandeyar & Killen, 2007:110).

In Jane's (2013) study, the findings also revealed that teachers' actual assessment practices were a reflection of their assessment beliefs. The study was conducted in two primary schools in one city in South Africa. The study was qualitative in nature and employed semi-structured interviews, observations and document analyses (Jane, 2013:704). The use of observations and document analysis in the above mentioned studies provides authentic evidence that teachers' assessment beliefs are the most significant factors influencing teachers' assessment practices or actions.

In light of this compelling evidence that assessment beliefs influence assessment practices, the current study elected to focus exclusively on determining teachers' assessment beliefs through engaging in interviews. Since having identified four basic beliefs regarding assessment, researchers have formulated models of assessment beliefs which corresponds to the potential enactment of their assessment practices (see Table 1.1). This new interest in teachers' assessment beliefs represents a shift away from the almost exclusive focus of ascertaining the relationship between assessment beliefs and the actual assessment practices and methods. This provides researchers with a unique perspective of understanding the role that teacher assessment beliefs play on educational outcomes such as learners' SDL behaviour.

The study acknowledges that there could be a variation between what teachers believe and how they act in classroom settings. This fact was observed in Jane's (2013) study, whereby the two teachers' conducted assessments to comply with requirements, and they included practices that went against their personal beliefs. Jane (2013) attributed this variation due to certain contextual factors that were mediating the dynamics between the assessment beliefs and the assessment practice. To this end, different mediating factors that influence teachers' assessment belief systems, such as culture and contextual factors have been identified (see section, 2.3.3). This implies that when examining the issues of assessment beliefs and SDL, there is a need for more explicit discussion and understanding that recognises the interaction of individuals with other people and with their context. Acknowledging this fact, this chapter will draw from CHAT as mentioned earlier, because this theory recognises the social situatedness of learning (Dann, 2014, 160).

Step two: The link between assessment actions and casual factors

According to Weiner's (2000) *interpersonal theory of motivation* after a performance, a learner and observer (teacher, parent or peer) look for causal factors observed from the teachers' subsequent assessment actions. However, an observer's causal factor may not match that of the learner

(Demetriou, 2011:17). The learner then ascribes causal dimensions (locus, stability and controllability) to the factors regarding his/her performance. Subsequently, the learner and observers (teacher, peer or parent) makes an inference about the performance, which leads to an emotional response that serves as motivation for behaviour by the learner (Demetriou, 2011:17).

Step three: The link between casual factors and attributions

Weiner (1979) provided a description of prominent causal factors that learners can acquire within the (locus, stability, and controllability) attributions, which are as follows:

- an example of an internal locus attribution that is stable and controllable, is the learner's typical effort;
- an example of an internal locus attribution that is unstable and controllable, is the learner's immediate effort;
- an example of an internal locus attribution that is stable and uncontrollable, is the learner's ability;
- an example of an internal locus attribution that is unstable and uncontrollable, is the learner's mood.
- an example of an external locus attribution that is stable and controllable, is the teacher's bias.
- an example of an external locus attribution that is unstable and controllable, is obtaining help from others;
- an example of an external locus attribution that is stable and uncontrollable, is the task difficulty;
- an example of an external locus attribution that is unstable and uncontrollable, is luck.

According to Glasgow *et al.* (1997), learners who attribute their failures to low ability (uncontrollable casual factor) demonstrate lower classroom engagement up to a year later (Schunk, 2012:370). This is because learners who believe they have little control over academic outcomes hold low expectations for success and display low motivation to succeed (Demetriou, 2011:18).

Step four: The link between attributions and learner behaviour

According to Demetriou (2011:17), the learner and observers (teacher, peer or parent) makes an inference about the performance, which leads to an emotional response which serves as motivation for behaviour by the learner. The concept of motivation is important because it is intimately linked with learning and subsequent learning behaviour (Schunk, 2012:340). Motivation is described as the process of instigating and sustaining goal directed behaviour (Schunk, 2012: 340). This description implies that learners set goals and employ cognitive processes like monitoring and planning, as well as behaviours like effort and persistence to attain their goals (Schunk, 2012:346).

Thus, motivation can be regarded as an explanatory concept that helps us understand why people behave in a specific manner (Schunk, 2012:346). For example, learners who feel they have little control over academic outcomes have an external locus of causality and believe that the ability to be successful emanates from unstable factors like luck and help from others (Hunter & Barker, 1987:53). Consequently, learners who hold such negative attributions would unlikely be motivated to engage in task-appropriate activities that encourage SDL behaviours. The assumption is that such negative attributions can be promoted by assessment beliefs that emphasise summative assessment practices associated with short-term and surface-level processing strategies (like rehearsal and memorisation). This is because the feedback obtained from summative assessment emphasises current learner achievement and may not highlight the importance of the processes, skills and strategies underlying task completion (Schunk, 2012:376).

Contrariwise, when the factors attributed to their outcomes are regarded as internal, stable and controllable, learners believe that their successes are primarily due to their effort and ability and would therefore have stronger motivation and staying power to complete challenging work (Cauley & McMillan, 2010:5). Such positive attributions can thus be promoted through assessment beliefs that favour formative assessment practices. This assumption is based on the fact that formative assessments inform learners about their own learning and their progress in meeting their goals (Cauley & McMillan, 2010:2). This is important because they allow learners to see concretely how they can improve, which leads to increased motivation and involvement (Cauley & McMillan, 2010:2).

The following section provides a discussion on the theoretical underpinnings of CHAT.

2.5 THE THEORETICAL UNDERPININGS OF CHAT

CHAT is a well-established research tradition that can help researchers to understand the impact of cultural practices and patterns of social interactions. The theory has its roots in the work of Vygotsky, a Russian psychologist. If we consider Figure 2.3, which illustrates how teachers' assessment actions are derived from assessment beliefs, a psychological construct, then CHAT can be used as lens to view NS teachers' classroom assessment decisions that are derived from their assessment beliefs. This would provide a unique perspective for addressing interactions between individual and contextual aspects of an activity. In the case of NS teachers, the activity investigated would be assessment actions, which are strictly derived from assessment beliefs and not from other sources, like classroom observations or document analysis. In the case of grade 9 learners, the activity of interest would be their learning process. The next section discusses CHAT as an applicable research tool for this study.

2.5.1 Background information

The central tenet of CHAT is that it is a conceptual framework for explaining and describing human activity. Human activity refers to what people do together and is shaped by their cultural values and artefacts (Foot, 2014:3). The cultural values and resources are grounded in histories and evolve over time. This implies that analyses of human activity must be viewed in light of the historical trajectories in which actions take place (Foot, 2014:3). The teacher's interactions with the learners are framed by and set within multiple context including culture, social and economic aspects that have been years in the making. Although the NS teacher and grade 9 learners may be alone in the classroom, their interactions in relation to each other are both constrained and enabled by many factors that are beyond their ability to unilaterally change (Foot, 2014).

To better understand the theoretical underpinnings of CHAT, the next section highlights the historical foundations of assessment in the South African context that shape teachers' assessment beliefs. An understanding of how assessment actions evolve over time can shed light on factors that can impede on teachers' assessment decisions. This can be a point of reference when interpreting the empirical data derived from the use of CHAT as a research lens.

2.5.2 A South African historical perspective on assessment

Key assessment moments within the South African context are identified based on the old and new schooling structures. The curriculum in the old schooling structure was in line with the colonial apartheid agenda dating back to the era of pre-1994. In this era, the historically marginalised black population received poor-quality education that prepared them for servitude (Lubisi & Murphy, 2002). The new schooling system, known to as the post-apartheid system, established its curriculum to address equity and quality amongst the marginalised black population. This new system was referred to as outcomes-based education (OBE), which was launched in 1998 (Kanjee & Sayed, 2013). To best understand the complex dynamic interactions and relationships of assessment in the pre- and post-apartheid curriculum, this section draws on the proposed framework by Engeström (1987) called the second-generation CHAT. In this framework, he describes the human activity as mediated by social and material resources that are salient in any activity (Roth & Lee, 2007:6). These resources, which are commonly known as activity system elements, include a subject, object, rules, community, division of labour, and tools (Engeström, 1987). The next section aims at describing assessment as the activity of interest in the new and old curriculum systems.

2.5.3 Exploring assessment in the pre-apartheid South African context

This section seeks to use the theoretical underpinnings of CHAT to understand the interactions of personal and contextual features that shape and moulded teachers' assessment beliefs through their assessment practices during the pre-apartheid curriculum. The discussion unfolds through the use

of activity system elements. The *subject* involved in the activity system involving assessment, involves a collective examination of teachers' during the pre-apartheid era. The *object* of teachers' assessment practices during the pre-apartheid era was driven by the need to produce marks for certification of learners to the next level of education (Lubisi & Murphy, 2002). The *tools* used to achieve their object comprised of test and examination. There was an unequal distribution of teaching and learning support materials and physical facilities amongst the black population (Swartz, 1992). The rules that informed teachers' assessment practices were informed by a content-based curriculum which "took the form of an elaborate system of tests and examinations by which control of, and entry into, schools and the economy were regulated" (Kanjee & Sayed, 2013:443).

The community that negotiates and mediates the rules and custom was in line with the colonial apartheid agenda, which comprised a separate administrative and schooling structure for people of different colours and ethnic origins (Lubisi & Murphy, 2002). This created a distinction between schools in terms of lower socio-economic strata and higher socio-economic strata (Warnich & Wolhuter, 2010:72). For instance, quintile 1, 2, 3 schools have a high percentage of learners from poor backgrounds and quintile 5 schools cater for learners from upper- and middle class as fees are beyond the means of ordinary South Africans. According to Harber and Mncube (2011:240), schools had a culture of being authoritarian, stressing obedience, conformity and passivity. The division of labour amongst teachers in this regime was limited to teacher-centred learning approaches in which knowledge was presented as deconstructed parts that can be taught, practised and assessed separately (Harber & Mncube, 2011:240). Considering all the activity system elements, the outcome of assessment practices in the pre-apartheid system emphasised content, conformity and high-stakes summative assessments like matriculation.

2.5.4 Assessment beliefs emanating from the pre-apartheid South African context

According to Vandeyar and Killen (2007:103), even after the old schooling regime, it is not surprising that teachers believe that assessment is primarily about learner and school accountability based on summative assessment practices which were established during the pre-apartheid era. The link between assessment practices and SDL lies in the fact that, in an educational setting, often tuned to summative assessments and teacher demands, learners come to view assessment and teachers as controlling (Loyens *et al.*, 2008:415). Consequently, the responsibility, ownership and self-direction in learning by learners are undermined (Loyens *et al.*, 2008:415). Extending this argument, Mumm *et al.* (2016:787) point out that formative practices are driven out when summative assessment practices are dominant, which inhibits maximum growth and possible developments of self-directed learners.

2.5.5 Exploring assessment in the post-apartheid South African context

This section seeks to understand the interactions between personal and contextual features that shape and mould teachers' assessment beliefs through their assessment practices during the post-apartheid curriculum. This will be achieved through the use of activity system elements. The *subject* can be regarded as teachers as a collective engaged in assessment practices in the post-apartheid era. The *object* of teachers' assessment practices in this new schooling system is to provide evidence of learners' progress towards achieving all the outcomes (Department of Basic Education, 1998). The *tools* used to achieve this objective are the assessment policy documents which advocate the use of different methods of collecting assessment evidence. In addition, the outcomes-based National Curriculum Statements (NCS) across all grades presented a curriculum-based CASS framework for supporting teachers to enhance their use of assessment for both summative and formative purposes (Department of Basic Education, 1998), whereas the Revised National Curriculum Statement (RNCS) grades R–9 (Schools) advocates for the use of Common Tasks for Assessments (CTAs) for grade 9, which are noted as external assessments intended to assess learners against the performance standards in all learning areas (Department of Basic Education, 1997b).

The rules that informed teachers' assessment practices were informed by an outcomes-based curriculum known as outcomes-based education (OBE), which was launched in 1998. Assessment in the OBE curriculum requires teachers to use a standard-referenced assessment approach which requires them to distinguish between different levels of achievement by making qualitative decisions using frames of reference (Vandeyar & Killen, 2006). Many curriculum and assessment policy revision have taken place since OBE was introduced. Under the banner of Curriculum 2005, the Department of Education committed itself to completing the implementation of the outcomes-based National Curriculum Statements (NCS) across all grades by the year 2005 (Kanjee & Sayed, 2013:444). The assessment framework of the Revised National Curriculum Statement (RNCS) grades R–9 (Schools) is based on the principles of OBE (Kanjee & Sayed, 2013:452). The "RNCS made several major advances in helping to simplify assessment in South African schools, noting the removal of much of the confusing OBE jargon, making explicit the links to the principles of OBE and providing a workable standards framework" (Kanjee & Sayed, 2013:452).

The *community* that negotiates and mediates the rules and custom was in line with the reform agenda of equality and quality. The new schooling system introduced a new governance structure where parents, teachers and learners are involved in more democratic forms of decision-making and school organisation (Harber & Mncube, 2011:235). Schools were required to develop a school assessment plan to outline how CASS is planned and implemented (Department of Basic Education, 1998:17). The "grade 9 CTAs set at national, provincial, district and cluster level are conducted at school level and are moderated externally" (Kanjee & Sayed, 2013:451).

The division of labour in the post-apartheid era as noted by the Department of Education, under the banner of Curriculum 2005, required teachers to implement the following (Kanjee & Sayed, 2013:444):

- make appropriate decisions regarding what to teach, how to teach, and how to evaluate student achievement (Department of Basic Education, 1997a). This implies that they are to become subject experts, which can be achieved through teacher action research, exposure to current trends in assessment through workshops, in-service training;
- teachers were to accommodate each learner's needs through multiple teaching, learning strategies and assessment tools (Department of Basic Education, 1997a). This implies teachers need to reflect on their teaching practices;
- teachers were to provide each learner with the time and assistance to realise his or her potential (Department of Basic Education, 1997a). This can be achieved when teachers facilitate learning process through scaffolding;
- teachers were expected to demonstrate learner progress based on demonstrated achievement (Department of Basic education, 1997a). This implies that teachers should be assessors of learning;
- with the vast ethnic groups in South Africa, teachers should be knowledgeable and sensitive to the diverse cultural backgrounds of their learners to provide authentic assessments (Warnich & Wolhuter, 2010:66).

The six activity system elements provided a theoretical justification of assessment from the post-apartheid perspective. The outcomes of the assessment practices in this new schooling system aim to prepare learners to acquire knowledge, demonstrate skills and develop values needed by both learner and society (Department of Basic Education, 1997c). According to Jane (2013:14), there has been little improvement in South African classrooms, despite teachers being "exposed to current trends in assessment through workshops, in-service training and an abundant supply of curriculum documents, all in the quest for fast-tracking transformation" and improving the quality of teaching and learning. In 2012, the Minister of Basic Education, Angie Motshekga, introduced the Curriculum and Assessment Policy Statement (CAPS) in the Foundation Phase and grade 10 (Department of Basic Education, 2012). This was based on the assumption that the poor classroom improvement in South African schools was attributed by teachers experiencing challenges in implementing the curriculum. The CAPS framework was implemented in all grades in 2014 and is still functioning to date. The CAPS framework was to address the problems experienced by teachers in implementing the curriculum as it provides a clear and detailed overview of the content and skills to be taught as well as the amount of time to be spent on each topic (Department of Basic Education, 2012).

The CHAT framework is not only useful in exploring the sociocultural factors that influence teachers' assessment beliefs along a historical timeline – it can also be useful in exploring the tensions, or

contradictions, that built up over time (Trust, 2017). This can be achieved by the simultaneous focus on the interactions of the activity system elements. According to Jane (2013), there has been little improvement inside classrooms in South African schools with regard to assessment practices, despite the new political and democratic dispensation. An exploration of tensions and contradictions could provide a systematic and thorough approach to understanding the factors that hamper classroom improvement in South African schools with regard to assessment practices.

The next section provides a description of the contradictions that are salient in the post-apartheid assessment activity system.

2.5.6 Exploring post-apartheid assessment contradictions and tensions

Activity theorists employ an activity triangle to depict and explain the levels of contradictions that the subject might experience in an activity system (Roth & Lee, 2007). Post-apartheid assessment contradictions are discussed based on selected literature. The elements for the activity triangle are outlined from the activity system elements from the previous discussion on the exploration of assessment in the post-apartheid South African context (see section 2.5.5 above).

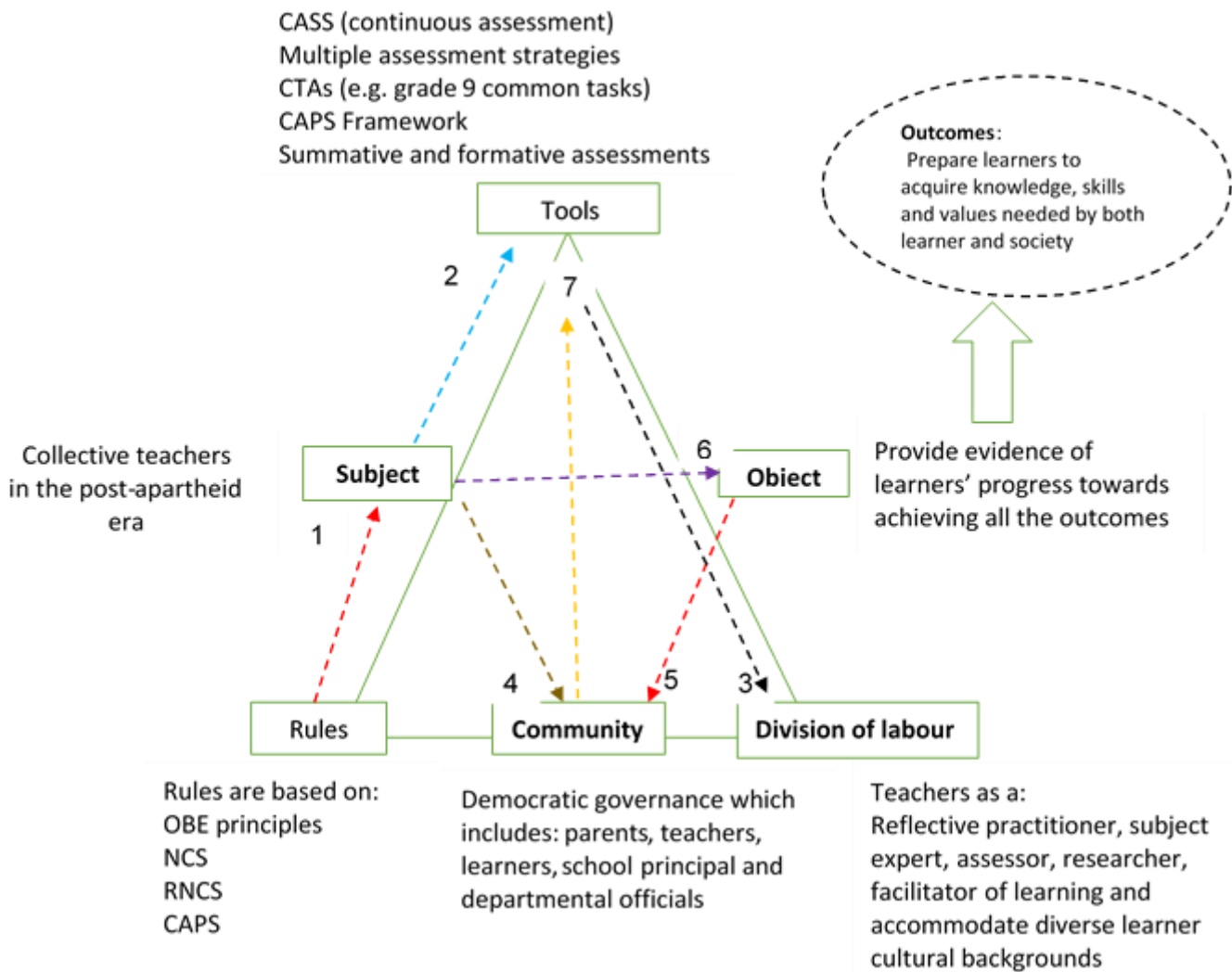


Figure 2.4: Assessment activity system for the post-apartheid SA context

Source: Based on Engeström (2009)

Figure 2.4 presents the researcher's own depiction of the CHAT activity system elements salient in teachers' assessment practices of the post-apartheid South African context. The figure is drawn based on third-generation CHAT developed by Engeström (2009). The numbered dashed-arrow lines inside and alongside the triangle illustrate the tensions that arise between the nodes in two different activity systems elements. The first illustration refers to tensions between the *subject* and *rules*. According to Kanjee and Sayed (2013:453), "the failure to provide teachers with guidelines on the fundamental principles of good assessment practices was one of the major weaknesses of the RNCS". Consequently, some teachers reverted to the traditional teaching and assessment methods as soon as they experienced problems in the implementation of the new curriculum (Warnich & Wolhuter, 2010:67).

The second illustration refers to tensions between the *subject* and *tools*. Teachers regard the marking, processing and preparations of the continuous assessment (CASS) marks as a huge

administrative burden (Warnich & Wolhuter, 2010:74). The adoption of CASS as the “best model” was based on formative assessment practices in which teachers were required to assess and continuously diagnose learner practice and performance, to offer more detailed feedback of the learning process in a timely manner (Department of Basic Education, 1998).

The third illustration refers to tensions between the division of *labour* and *tools*. Teachers still prefer to do assessment themselves rather than involving other assessment forms like peer- and self-assessment; this is largely due to teachers’ viewing themselves as the primary assessor (Warnich & Wolhuter, 2010:74).

The fourth illustration refers to tensions between the *subject* and the *community*. In most South African schools, the learning environments are characterised by overcrowded classrooms, which could threaten discipline. This leads to teachers avoiding using learner-centred activities and formative class discussions because of the fear that they might lead to discipline problems (Warnich & Wolhuter, 2010:74).

The fifth illustration refers to tensions between the *object* and the *community*. In 2006, it was reported that 50 000 children daily did not attend school, 41% of whom spent their time with an adult during their absenteeism. Thus, such dysfunctional parental homes where discipline is lacking contribute to the fact that assessment assignments cannot be done properly (Warnich & Wolhuter, 2010:76). Other illustrations of tensions between the *object* and the *community* that directly influence assessment, include transportation problems, drug abuse, vandalism, theft, language-related problems, late coming, lack of respect for authority and teacher absenteeism (Warnich & Wolhuter, 2010:75).

The sixth illustration refers to tensions between the *subject* and the *object*. Where teachers are unsure, frustrated or incompetent to comply with the varying formal assessment requirements, they fall back to the traditional ways of the need to produce marks for certification of learners to the next level (Warnich & Wolhuter, 2010:75).

The final illustration refers to tensions between the *community* and *tools*. The South African Schools Act (84 of 1996) permits the governing bodies of all state schools to levy fees after a majority vote at a meeting of parents (Harber & Mncube, 2011:236). Consequently, this further perpetuates inequality because schools serving well-off communities can charge high fees to maintain excellent facilities that can support the effective implementation of various assessment strategies, while schools in poorer communities would not be able to do so (Harber & Mncube, 2011:236).

There are many possible contradictions and tensions one can still explore in the assessment activity system of the post-apartheid South African context. However, the limited illustrations have demonstrated how various factors impede teachers’ assessment decisions. The limited illustrations

further demonstrate that the CHAT framework can provide a vast amount of insightful information. Mentz and De Beer (2017:101) say that the CHAT framework, with its cultural diversity, socio-economic challenges and transformation agenda, is a very applicable lens to use in South Africa. Thus, the use of CHAT in this study helped to uncover the tensions and contradictions eminent in the assessment activity system of the purposively selected NS teachers and grade 9 learners. Such contradictions provide a clear picture of the current state of teachers' assessment decisions and the nature of learners' learning in spite of the well-intentioned interventions by government and the new CAPS dispensation.

2.6 CHAPTER SUMMARY

Bolhuis (2003), Candy (1991), Du Toit-Brits (2015), Williamson (2007) and Zimmerman (2002) claim that teachers can have a strong influence in initiating processes that can encourage SDL behaviours. According to Harrison *et al.* (2015:76), Nicol *et al.* (2014:103) and Van Zundert *et al.* (2010:270), formative assessments such as peer and self-assessment promote SDL. Enacting formative assessment that can enhance SDL behaviours require both pedagogical and context area expertise (Nolen, 2011). Moreover, such assessments should fit into the overall teaching and assessment practice in the educational system in which it is embedded (Nolen, 2011:323). However, evidence from literature has since shown that teachers' assessment decisions are based on beliefs formed around their own experiences as both learner and teacher (Barnes *et al.*, 2015; Brown, 2004; Jane, 2013; Pajares, 1992; Vandeyar & Killen, 2007). Thus, a better understanding of how teachers' assessment beliefs influence learners' SDL behaviours is required. This study aimed to achieve this goal by means of an empirical study using Brown's (2004) conceptual framework of assessment beliefs as well as Williamson's (2007) SRSSDL subfactors. Examining issues of motivation through the consequences of attributions offers a valuable lens through which to view and understand the influence of teacher assessment beliefs on learner SDL behaviours. The inclusion of CHAT further ensured that the discussion on issues of motivation did not fall short of offering sufficient explanations of the different identities individuals bring to the teaching and learning environment (Dann, 2014).

As with learning, motivation is not observed directly but rather inferred from behavioural indexes such as: engaging in activities like rehearsing information; relating previously acquired knowledge; asking questions; attending to instruction; expending greater effort; and choosing to work on tasks when they are not required to do so (Schunk, 2012:367). Further behavioural indexes that demonstrate SDL behaviours are provided in Table 2.1.

In conclusion, this chapter defined processes that influence the measures used to frame the concepts of SDL behaviours and assessment beliefs, which aided the interpretation of the research findings. Moreover, this chapter provided a background as to how SDL behaviours can be linked to

teachers' assessment beliefs. An in-depth description of the research methodology, which enabled the researcher to address the main research question, is provided in the following chapter.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter, the research methodology applied in the empirical study is outlined. Considering the aims and objectives of the study, the chapter further outlines the research paradigm, research design, research strategy, data collection methods, the research participants, and the quality criteria applicable to the empirical study. The role of the researcher, data analysis and interpretation, and ethical considerations are also discussed. The data analysis and interpretation, based on the cultural-historical activity theory (CHAT), are then outlined. The chapter is concluded with a summary.

3.2 AIMS AND OBJECTIVES

The overall aim of this study was to gain an understanding of how grade 9 NS teachers' assessment beliefs influence learners' SDL behaviour in schools in the Rustenburg area. The aim was operationalised as follows:

- by clarifying how the concept of beliefs is defined and characterised in the literature within the context of assessment;
- by explaining how self-directed learning behaviour is defined and described in the literature;
- by establishing the assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area;
- by determining the influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' self-directed learning behaviour in the Rustenburg area.

The first two objectives were addressed by means of a literature study, while the last two objectives required an empirical investigation. Furthermore, the literature study in Chapter 2 enabled the researcher to understand the research phenomenon better and provided the theoretical support for the empirical study. This chapter outlines the research design that was applied in order to obtain information that was relevant in the operationalisation of the last two objectives.

3.3 RESEARCH PARADIGM

3.3.1 Definition

Filstead (1979:34) defined a paradigm as a "set of interrelated assumptions about the social world which provides a philosophical and conceptual framework for the organized study of the world". In this regard, Nieuwenhuis (2016b:50) describes a paradigm as a lens or organising principle by which

reality is interpreted. This implies that the adoption of a certain view of reality underpins researchers' thinking about and approach to particular methods of data collection, data analysis and data interpretation (Burton & Bartlett, 2009:18). Creswell (2009:6) uses the terms post-positivism, constructivism, pragmatism and advocacy to describe four different paradigms, which he calls worldviews. Mack (2010) describes three research paradigms, namely positivist, interpretivist and critical paradigms. Drawing from both Creswell (2009) and Mack (2010), the following paradigms are discussed in this section: positivist paradigm; interpretivist or constructivist paradigm; post-positivist paradigm; critical paradigm; and pragmatic paradigm.

Any paradigm has three essential aspects, namely ontology, epistemology and methodology (Guba & Lincoln, 1994:108). According to Mack (2010:4), the researcher's ontological assumptions (the nature and form of reality) inform his or her epistemological assumptions (how things can be known) which then informs the methodology (methods employed to collect data). In the following section, different paradigms are briefly discussed according to their (ontological, epistemological, and methodological) assumptions. These discussions served as a guide in selecting a suitable research paradigm to answer the empirical research questions.

3.3.2 Positivist paradigm

According to Mack (2010:5), the term "*positivism* was first coined by the founder of positivism, Auguste Comte, a French philosopher who believed that reality can be observed". This paradigm embraces a realist ontology, stipulating that the truth is "out there, driven by immutable natural laws" (Cohen, Manion & Morrison, 2007:7). According to Creswell (2009:6), the positivist paradigm is based on an objective reality that can be understood through testing and verification. Therefore, the epistemological assumption stipulates that "knowledge is based on empirical observation and measurement of the objective reality that exists in the world" (Creswell, 2009:6). Based on the ontological and epistemological assumptions, the methodology suitable for this paradigm would be methods that strive to verify *a priori* hypotheses. Such methods include the use of quantitative theorem that can later be conveyed mathematically or statistically to express a certain relationship (Guba & Lincoln, 1994). The role of the researcher is thus to observe the objective reality, and the research participants are not subjectively involved in the research. Furthermore, the information or data are collected objectively in the form of numbers.

3.3.3 Interpretivist or constructivist paradigm

The interpretivist paradigm can also be called the "anti-positivist" paradigm because it was developed as a reaction to positivism (Mack, 2010:5). It is also sometimes referred to as constructivism because it emphasises the ability of the individual to construct meaning (Mack, 2010:5). The interpretivist paradigm adheres to the ontology, where reality is a product of subjective

experience based on the assumption that individuals develop subjective meanings of their experiences (Creswell, 2009:6). The epistemological assumption stipulates that “the social world can only be understood from the point of view of the individuals who are part of the ongoing action being investigated” (Cohen *et al.*, 2007:19). In this paradigm, the researcher uses methods to analyse and describe the meaning arising from interactions with a human community (Creswell, 2009:9). This suggests that the data are generated through qualitative interactions like conversations/interviews. Here, the role of the researcher is to “understand, explain, and demystify social reality through the eyes of different participants” (Cohen *et al.*, 2007:19).

3.3.4 Post-positivist paradigm

Creswell (2009:6) views post-positivism as an extension of the positivist paradigm as it represents the thinking after positivism, challenging the traditional notion of the absolute and objective truth of knowledge in the social sciences. Post-positivism is based on the critical realist ontology, which stipulates that “all knowledge is fallible, but not equally fallible” (Nieuwenhuis, 2016b:59). This means that post-positivists often believe that different variables cannot always be controlled and that positivist research is often difficult and impractical for many forms of social research (Glicken, 2003:27). In addition, “researchers believe in multiple opinions from participants rather than in a single reality” (Creswell, 2009:20). Therefore, post-positivism provides the researcher with more subjective measures for gathering information as it often includes qualitative as well as quantitative methods (Guba & Lincoln, 1994).

3.3.5 Critical paradigm

The critical paradigm emanates from critical theory and the belief that research is conducted for the emancipation of individuals and groups in an equalitarian society (Cohen *et al.*, 2007:26). This paradigm is built on the ontological assumption which sees reality existing beneath the surface of historically specific, oppressive and social structures (Harvey, 1990:1). Knowledge, according to this paradigm, is not neutral and it reflects the power and social relationships within society, and thus the purpose of knowledge construction is to aid people to improve society (Mertens, 2003). With this paradigm, the researcher aims to not only understand or give an account of behaviours in societies but also to change the behaviours (Mack, 2010:9).

3.3.6 Pragmatic paradigm

Tashakkori and Teddlie (1998) assert that researchers following the pragmatic paradigm are not committed to any specific system of (ontological and epistemological) beliefs but are guided by their personal value systems. Researchers “study the topic in a way that is congruent with their value system, including variables and units they feel are the most appropriate for finding an answer to their research question” (Tashakkori & Teddlie, 1998:27). According to Creswell (2009:11), the pragmatic

worldview arises out of actions, situations and consequences rather than antecedent conditions as in positivism. Pragmatists do not see the world as an absolute unity and are thus free to choose procedures that would best answer the research question (Tashakkori & Teddlie, 1998:27). In addition, pragmatists maintain that, rather than focusing on methods, researchers emphasise “the research problem and use pluralistic, quantitative and qualitative approaches to solve a research problem” (Creswell, 2009:11).

The researcher in this study acknowledged that people construct reality; therefore, she had to analyse the research participants’ discourses to gain a deeper understanding of how grade 9 NS teachers’ assessment beliefs influence learners’ SDL behaviours. Furthermore, the researcher focused on interviewing the participants to uncover how they constructed meaning of the phenomenon under study. An interpretivist paradigm was therefore followed as the focus in this paradigm is understanding people (Babbie & Mouton, 2001:28).

The next section focuses on the empirical research design utilised in this study.

3.4 RESEARCH DESIGN

In this study, the researcher utilised a qualitative design. It is, however, essential to first explain what is meant by a quantitative, qualitative and mixed-methods design.

3.4.1 Definition

According to Leedy and Ormrod (2014:144), a research design provides the overall framework in which the research will be conducted and is chosen with the central purpose of addressing the research problem. Three empirical research designs can be distinguished: quantitative-, qualitative- and mixed-methods research designs (Creswell, 2009:3). A brief discussion on the criteria for selecting a research design is provided below in an attempt to clarify how the researcher chose the research design for this study.

3.4.1.1 Quantitative design

The intention of quantitative research is to establish, confirm or validate relationships and to develop generalisations that contribute to existing theories (Leedy & Ormrod, 2014:150). Furthermore, a quantitative research design represents the traditional scientific approach to research where data are collected in the form of numbers and different types of statistical data analysis are used to study phenomena without manipulation (Durrheim, 2010:47). Therefore, a quantitative design is best if the research problem calls for the identification of factors that influence an outcome, the use of an intervention, or understanding the best predictors of outcomes (Creswell, 2009:18).

3.4.1.2 Qualitative design

A qualitative research design is based on the exploration of the meaning individuals ascribe to a social phenomenon by using emerging procedures and inductive data analysis to arrive at an understanding of a phenomenon (Leedy & Ormrod, 2014:165). Moreover, a qualitative research design focuses on the collection of data in the form of written or spoken language so that the data obtained is analysed by identifying and categorising themes (Durrheim, 2010:47). Therefore, a qualitative design is apt if the concept or phenomenon to be investigated needs to be understood because little research has been done on it (Creswell, 2009:18).

3.4.1.3 Mixed-methods design

A mixed-methods design is suitable when either the quantitative or qualitative approach by itself is insufficient to best understand a research problem (Creswell, 2009:18). In addition, a mixed-methods design can also be used when the strengths of both a quantitative and qualitative design can provide the best understanding of the phenomenon (Creswell, 2009:18). According to Johnson and Onwuegbuzie (2004:14), the “goal of mixed-methods research is not to replace either the quantitative or qualitative approach to research, but rather to draw from the strengths of both approaches and to minimise possible weaknesses”.

Considering the above-mentioned criteria for selecting a research design, the researcher selected a qualitative research design for this study. This design is the most suitable approach for responding to the research problem as the researcher sought to explore the unique human interactions between teachers’ assessment beliefs and learners’ SDL behaviours. According to Creswell (2009:18), the researcher is the key data collection instrument in qualitative designs, therefore a suitable research strategy must be selected to provide specific direction for procedures in a research design. A detailed discussion on the research strategy utilised in this study follows in the next section.

3.4.2 Research strategy

A case study was used as the research strategy. The research strategy in this study refers to the specific approach employed in examining how grade 9 NS teachers’ assessment beliefs influence learners’ SDL behaviour (Creswell, 2009:11). It is important to first explain the different research strategies:

- **Phenomenology:** the researcher strives to understand the lived human experiences of participants of a specific phenomenon as described by the participants (Creswell, 2009:11).
- **Narrative research:** the researcher studies the lives of individuals by asking one or more individuals to provide stories about their lives (Creswell, 2009:11).

- **Ethnography:** the researcher studies the lived realities of an intact cultural group in a natural setting over an extended period (Creswell, 2009:11).
- **Case study:** the researcher explores in-depth a bounded system (programme, a process, an event, or an activity) linked to a specific group of people or specific context (Creswell, 2009:11).
- **Grounded theory research:** the researcher develops theory grounded in the views of participants (Creswell, 2009:11).

The focus of this study was not centred on understanding lived human experiences nor did it intend to collect personal narratives. In addition, this study was not focused on discovering lived realities within a set of cultural group(s) nor did it intend to generate or discover new theory. According to Paré (2004:233), case study research is useful in the following instances:

- when a phenomenon is broad and complex;
- when the existing body of knowledge is insufficient to permit the posing of casual questions;
- when a holistic, in-depth investigation is required;
- when a phenomenon cannot be studied outside the context in which it occurs.

Clearly, the case study design was suitable for this study, since the objective was to generate an in-depth understanding of a complex issue within a specific context. Although case studies are the most frequently used research strategies, most researchers do not fully agree on the design and its implementation (Bassegy, 1999:27; Della Porta & Keating, 2008:226; Yazan, 2015:134). This makes it difficult for novice researchers to adequately plan and implement case study designs (Yazan, 2015:134). The discourse used to determine the design and implementation of a specific case study depends on the researcher's understanding of what a case study is (Crowe *et al.*, 2011).

According to Yin (2003:13), "a case study is an empirical inquiry that investigates a phenomenon within its real-life contexts, especially when the boundaries between the phenomenon and context are not evident". Merriam (1998) states that a case study is a rigorous description and analysis of a phenomenon or social unit, such as an individual, community, group, or institution. Creswell, Hanson, Clark Plano and Morales (2007:245) claim that a researcher in qualitative case study research explores a bounded system (a case) or multiple bounded systems (cases) over time through detailed, in-depth data collection. The term *case* also has different meanings for qualitative researchers; hence it is also important to define this term (Luck, Jackson & Usher, 2006:104).

According to Stake (1995), a *case* can be defined as an "integrated system bounded by time and place". According to Bassegy (1999:27), a case is defined as a "bounded system, drawing attention to it as an object rather than a process". As stressed by Creswell *et al.* (2007:245), case study

research can be viewed as a bounded system (case) selected to generate a full understanding of a complex issue within a particular context. Therefore, the bounded system in this study would be the NS classroom as it is spatially bounded in a formal institutional setting with an established space, set schedule and a prescribed curriculum (Wynsberghe Van & Khan, 2007:84). In addition, the complex issue to study was the influence of teachers' assessment beliefs on learners' SDL behaviour within the grade 9 teaching and learning context. Alternatively, this case study research can be viewed as a case of teachers' assessment beliefs, or a case of learners' SDL behaviours, within the bounds of the grade 9 NS setting. In this case, the case is seen as a theoretical construct or a convention (Luck *et al.*, 2006:104). Moreover, the "focus is not on the individual and their stories as in narrative research but on the issue with the individual case selected to understand the issue" (Creswell *et al.*, 2007:245).

Although this case study can be viewed in a variety of ways, the central theme in both viewpoints is the need to explore an issue or phenomenon within its context. As the researcher planned to involve participants from different schools, the strategy of inquiry used in this study could be referred to as a multiple case study (Baxter & Jack, 2008:544). To develop some confidence and competence in carrying out case study methods, the researcher in this study had to become more knowledgeable on case study designs. Therefore, a detailed discussion on the case study research design follows next.

3.4.2.1 Case study design

According to Yin (2003), the case study design must have five components, namely:

- research questions;
- unit of analysis;
- propositions;
- determination of how the data are linked to the propositions;
- criteria to interpret the findings.

Unit of analysis

According to Merriam (1998), the unit of analysis, and not the topic of investigation, characterises a case study. Defining the unit of analysis helps with replication and efforts at case comparison (Zucker, 2009). In addition, the specification of the unit of analysis is key if the study seeks to understand how the case study relates to the broader body of knowledge (Pare, 2004:240). Baxter and Jack (2008:545) claim that the case is the unit of analysis. This claim can be considered if a case is regarded as a phenomenon or an event chosen, conceptualised and analysed empirically as a manifestation of a broader class of phenomena or events (Della Porta & Keating, 2008:226). The unit of analysis can be uncovered by referring to the primary research questions (Baxter & Jack, 2008:545), in this case:

- What are the assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area?
- What is the influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' self-directed learning behaviour in the Rustenburg area?

Considering the phrasing of the above research questions, it is evident that the unit of analysis was based on individuals, namely teachers and learners. As emphasised by Creswell *et al.* (2007:245), the focus is not just on the individual; rather, it is centred on understanding the issue with the individual – in case of this study, teachers' assessment beliefs and learners' SDL behaviours. According to Luck *et al.* (2006:104), each case study has specific boundaries – therefore, the case is a bounded system. The case is bounded by time, location, event, or activity, which is purposively determined (Luck *et al.*, 2006:104). In this study, the case study was restricted to the Rustenburg area within the grade 9 NS context. Luck *et al.* (2006:104) state that such boundaries can assist in limiting data collection, making the study more manageable.

Type of case studies

Once the unit of analysis is known, it is easier to identify the type of case study to be employed. Stake (1995) describes three types of case studies:

- an *intrinsic* case study is used when the researcher has a genuine intent to better understand the case;
- an *instrumental* case study is used to accomplish something other than understanding a particular situation. It provides insight into an issue or helps to refine a theory;
- a *collective* case study enables the researcher to explore differences within and between cases. The goal is to replicate findings across cases.

In addition, Yin (2003) describes the types of case studies as follows:

- *Explanatory* case study is used if one wants to answer a question that seeks to explain the presumed causal links in real-life interventions that are too complex for survey or experimental strategies;
- *Exploratory* case study is used to explore those situations in which the intervention being evaluated has no clear, single set of outcomes;
- *Descriptive* case study is used to describe an intervention or phenomenon and the real-life context in which it occurred.

Considering the descriptions of the different types of case studies presented by Stake (1995) and Yin (2003), the case study research for this study was an “exploratory” or “intrinsic” case study as this study was undertaken to gain a deeper understanding of a case of which little is known.

Propositions

Propositions are statements that help to direct attention to something that should be examined in the case study. They serve to focus the data collection and help to determine the direction and scope of the study (Baxter & Jack, 2008:552). Propositions may come from the literature, personal or professional experience, theories and/or generalisations based on empirical data (Baxter & Jack, 2008:551). The results from the literature search on the influence of teachers' assessment beliefs on learners' SDL showed that this line of inquiry was unexplored. There was thus no information from literature upon which to base propositions; this case study has no propositions for the following research question:

- What is the influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' self-directed learning behaviour in the Rustenburg area?

However, based on the literature search conducted on teachers' assessment beliefs, the following propositions were identified: a) assessment improves teaching and learning; b) assessment holds learners accountable; c) assessment holds schools and teachers accountable; and d) assessment is irrelevant for teaching and learning. These propositions were based on Brown's (2004) study on "[t]eachers' conceptions of assessment: [i]mplications for policy and professional development". Therefore, these propositions were applicable to address the following research question:

- What are the assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area?

How to link the data to the propositions

The proposition can be best linked to the data when multiple case studies are employed. With multiple case studies, one examines several cases to understand the similarities and differences between the cases (Baxter & Jack, 2008:550). Through the responses from different teachers' assessment beliefs, one can identify several patterns to see which ones are closer to the proposition. This can be achieved once all the data from the multiple case studies are converged in an attempt to understand the overall case. It is suggested that, in order not to deviate from the scope of the study, it is best not to attempt to understand the various parts of the case or the contributing factors that influence the case (Baxter & Jack, 2008:555).

Criteria to interpret the findings

According to Baxter and Jack (2008:554), in case study designs, the interpretations of the findings are based on the use of a variety of data sources, such as documentation, physical artefacts, archival records, interviews, artefacts, direct observations and participant observation. The purpose of using these different data sources is to obtain a holistic understanding of the phenomenon when the multiple data sources are converged during the analysis process (Baxter & Jack, 2008:554). In this

case study design, the interpretations of the findings were based on different data sets obtained from participants during the multiple case studies. This is based on the uniqueness of this study – for example, evidence from literature regards teachers' assessment beliefs as being mutually exclusive psychological constructs that develop over time. Therefore, using other data sources, like documentation, observations and artefacts, would not be enough to provide relevant data to address the main research question. Moreover, eliciting views and opinions from participants makes it possible to adequately investigate how teachers' assessment beliefs influence learners' SDL behaviours. This goal can be achieved through interviews to generate the data as the aim this data collection method is to elicit views and opinions from participants (Creswell, 2009:181). The data collection method used in this study is discussed in detail below.

3.4.3 Data collection

According to Onwuegbuzie and Frels (2016:60), qualitative research methods are used to document or examine phenomena in their particular contexts and their interactions therein. Methods of qualitative data collection include interviews, observations, documents, and artefacts (Creswell, 2009:179). King (1994:14) states that the goal of interviews is to see the research topic from the viewpoint of the interviewees and to understand why they have a particular viewpoint. Given that the main focus of this study was to understand the uniqueness of individual participants' perceptions of the phenomenon of interest, interviews were the primary source of data collection. Interviews were further semi-structured.

Semi-structured interviews were conducted to obtain specific data from the participants by means of predetermined questions. Moreover, semi-structured interviews are wonderfully adaptable and flexible as questions are not rigid and have no specific order (Verma & Mallick, 1999:128). A semi-structured interview allows the researcher to respond to new views and ideas that emerge during the interview (Merriam, 1998). The interviews can be conducted one-on-one (i.e. individual interviews), or as a group (i.e. a focus group interview) (Creswell, 2009:179). In the case of this study, both individual and focus group semi-structured interviews were conducted.

3.4.3.1 Individual interviews

Individual interviews were used to collect information about teachers' assessment beliefs. Interviews were conducted with five purposively sampled teachers from five randomly selected schools. Each interview was planned to last between 15 and 20 minutes and took place after school hours at agreed-upon times between the researcher and the participants. Permission was requested to use a tape recorder before conducting the interviews. The use of a tape recorder during interviews ensured that data were available to be transcribed for analysis, interpretation and verification purposes.

Principles considered for developing the individual interview schedule

The three interview questions were developed based on Brown's (2006:168) CoA-III A instrument. The selection of this instrument was informed by a thorough literature study on teachers' assessment beliefs. In phrasing the questions, the following guidelines provided by Bryman (2012:473) were followed:

- the language in which questions were phrased, was comprehensible;
- leading questions were avoided;
- ambiguity and "double-barrelled" questions were avoided.

These guidelines were also applicable for the development of the focus group interview schedule.

Advantages and disadvantages of individual interviews

Individual interviews are useful when participants cannot be directly observed. They allow for the researcher to have control over the line of questioning (Creswell, 2009:179). On the other hand, the limitations of individual interviews are that they can be time-consuming and expensive if one must travel to participants (Leedy & Ormrod, 2014:198). In addition, the researcher's presence may bias responses. Furthermore, not all individuals are equally articulate and perceptive, which implies that not all participants can easily express their viewpoints (Creswell, 2009:179).

3.4.3.2 Focus group interviews

The purpose of the focus interviews was to gather information about learners' SDL behaviours. Five focus group interviews were conducted with learners from five different schools. In each case, five learners participated in the focus group interview. Questions for the focus group interview were formulated in advance and were based on Williamson's (2007:67) Self-Rating Scale of Self-Directed Learning (SRSSDL) instrument. This instrument was developed to assess SDL behaviours across five subfactors. Each subfactor was considered in phrasing the five questions (see Appendix I). The duration of the focus group interviews was between 20 and 30 minutes. These interviews were also tape recorded and were conducted after school hours.

Principles considered for conducting focus group interviews

According to Nieuwenhuis (2016c:95), focus group interviews are based on the dynamic interactions between participants, which must be centred on a carefully planned discussion on a defined area of interest. Therefore, as a novice researcher, I had to become knowledgeable on the guidelines of conducting focus group interviews before trying an interview. I adhered to the following guidelines provided by Nieuwenhuis (2016c:96):

- the size of the group should preferably be five to 12 individuals;
- the interviewer should start with a broad and less-structured set of questions to ease participants into the situation;

- the researcher should encourage full participation and interactions among all members by using probing questions to steer the discussion.

Advantages and disadvantages of focus group interviews

According to Nieuwenhuis (2016c:95), focus group interviews offer an advantage of widening the range of responses, activating forgotten details about experiences. Moreover, they offer the potential of releasing inhibitions that may discourage participants from disclosing information. An additional advantage of focus group interviews is that rich, detailed data are obtained, which may not always be attainable through other data collection methods (Nieuwenhuis, 2016c:95).

However, the disadvantages of focus groups, according to Nieuwenhuis (2016c:95), are: other participants experience focus groups as threatening; focus groups do not guarantee the anonymity of a participant; and, if participants are outspoken, it might be difficult to assess the ideas of less assertive participants and this could lead to bias in the data (Nieuwenhuis, 2016c:96). Therefore, conducting focus group interviews requires a highly skilled researcher. A detailed discussion on the sampling strategy used to recruit participants in this study follows in the section below.

3.4.4 Research participants

According to Walliman (2006:232), a sample is a subset of a larger population from whom information is collected and is chosen for research purposes. In the context of this study, the researcher focused on a non-probability sampling method and chose purposive sampling to draw the sample for the study. According to Nieuwenhuis (2016c:85), purposive sampling implies that participants are selected because of some defining characteristic or criteria that make them the holders of the data needed for the study. In the context of this study, the participants had to be high school teachers who taught NS in grade 9, as well as grade 9 learners who were taught by their NS teacher who was to be interviewed. Therefore, the target population for this study comprised all teachers who taught grade 9 NS and the learners they taught in the Rustenburg area. To maintain the trustworthiness of the data, teachers and learners who were situated at the same school as the researcher were excluded from the research population. Due to time and logistical constraints, the sample comprised five high school teachers who were purposively selected from five conveniently selected high schools in the Bojanala school district of the North West province. The researcher approached five schools that were randomly selected from a list of all high schools in the Rustenburg area.

The researcher asked an independent person to serve as mediator in obtaining consent from the teacher-participants. The researcher then requested that the five learners be randomly selected from a class list. Selected learners were approached to ascertain their willingness to participate mediated by the independent person. Schools and learner participants were randomly selected to ensure that

the selection was fair and neutral and free from any bias. The participants were heterogeneous (in other words, various genders, age, cultures, levels of experience, and from various schools).

A detailed discussion on the quality criteria used to ensure the trustworthiness of the data collection and analysis procedures is provided next.

3.4.5 Quality criteria

According to Guba and Lincoln (1994:110), the key principles of ensuring quality in qualitative research is found in the notion of trustworthiness. The four central aspects of trustworthiness are credibility (truth value), dependability (consistency), conformability (neutral of findings) and transferability (applicability) (Guba & Lincoln, 1994:110). In the case of this study, trustworthiness was established by adhering to the four aforementioned aspects identified by Guba and Lincoln (1994:110).

3.4.5.1 Credibility

In order for research to be credible, it is important that a qualitative researcher demonstrates to what extent the data are accurate and appropriate by ensuring that the data have been checked in accord with good practice (Denscombe, 2010:299). The researcher adhered to the following to enhance the credibility of this study:

- An audio recorder was used to ensure that all participants' verbal responses were accurately captured;
- triangulation of the data was achieved by gathering information from different participants' perspectives.

3.4.5.2 Dependability

For research to be dependable, it is important for a qualitative researcher to show as much detail as possible regarding the line of enquiry that had led to a particular conclusion (Flick, 2009:392). To enhance the dependability of this study, the researcher provided an extensive and detailed record of the data collection and interpretation process, which was submitted to the study supervisors to ascertain the level of accuracy.

3.4.5.3 Conformability

For research to be conformable, it is important that a qualitative researcher determines the degree to which the findings can be confirmed or corroborated by others (Donnelly & Trochim, 2007:149). To enhance the conformability of this study, the researcher adhered to the following:

- input on the analysis, interpretations, findings and conclusions made for this study was requested from the study supervisors and other knowledgeable people in the field of assessment and SDL.

3.4.5.4 Transferability

It is important for a qualitative researcher to determine the extent to which the research findings are comparable to different contexts or with different participants (Denscombe, 2010:299). To enhance the transferability of this study, the researcher adhered to the following:

- the research findings were based on five focus group interviews and five individual interviews. Comparison was achieved through triangulation of data from different participants.

According to Nieuwenhuis (2016c:72), to improve validity and trustworthiness, the limitations of the study need to be presented beforehand. Case studies generally combine multiple data collection methods in order to provide a fuller picture of the phenomenon under study (Baxter & Jack, 2008:554). The researcher acknowledges that only interviews were conducted in this study to generate data. This limits triangulation of multiple data collection sources, which could have been used to build a coherent justification for the themes.

However, it is also important to bear in mind that not all information from different sources are relevant for all case studies (Paré, 2004:247) as case studies are diverse in their objectives, characteristics and results (Della Porta & Keating, 2008:225). Using multiple cases in this study had the advantage of facilitating data triangulation as various participants were likely to offer much more accurate and convincing findings.

According to Altheide and Johnson (1994:488), qualitative researchers must clarify their role as a researcher to remove aspects that could threaten the validity and trustworthiness of the data collection and analysis. Therefore, a detailed discussion on the researcher's role in this study is provided below.

3.5 ROLE OF RESEARCHER

The role of the researcher in qualitative studies is very important, because the researcher is directly involved in the following: deciding what is to be investigated; who will be participating; developing data collection methods; and analysing and interpreting the data (Merriam, 1998:65). Creswell (2009:177) suggests that researchers should explicitly identify aspects that could compromise the collection of trustworthy data. Such aspects include the researcher's personal background,

assumptions and social interactions (Creswell, 2009:177). The following is a description of how each aspect was addressed.

3.5.1 Personal background

The researcher of this study is a black female teacher with over five years of teaching experience. Her passion for teaching began during her undergraduate studies for her bachelor's degree in Chemistry and Biochemistry. During that time, she engaged in mentoring and tutoring programmes, which resulted in her decision to pursue a career in teaching. She later enrolled for a Postgraduate Certificate in Education, which equipped her with the necessary pedagogical content knowledge required to teach Life Sciences and Physical Sciences. Thereafter, she was employed as a NS teacher in the same school district as the research participants in this study. This was advantageous as she was able to access and relate to the participants' experiences and views.

3.5.2 Assumptions

The researcher's passion for teaching stems from the belief that the goal of teaching is ultimately to inspire learners to find their passions, interest and motivate them to continue their journey of personal growth in all aspects of their lives. The researcher is aware that each teacher-participant also has their own underlying belief system that guide or inform their practice. However, of particular interest to this study was uncovering grade 9 teachers' assessment beliefs. It is important that the researcher stated her assumptions about the teachers' beliefs upfront to make sure they did not cloud the interpretations of the findings. Therefore, based on the conducted literature study about assessment beliefs, the researcher assumed that each individual teacher could hold multiple assessment beliefs. Moreover, these multiple assessment beliefs may differ in strength, resulting in the more dominant belief being manifested by the teacher.

3.5.3 Social interactions

According to Creswell (2009:177), the researcher should acknowledge any personal connections to the research site and participants as this could compromise the data collection process. This was important because the researcher in this study taught in the same district as the teacher-participants and she personally knew some of the teachers. Therefore, the researcher tried to not present herself in a superior position or more knowledgeable on the topic as this might have made participants feel inferior or uncomfortable to share their responses. The researcher also had to make sure that all ethical considerations were considered during the entire research process. Participants who taught at the same school as the researcher were excluded from the target population so as to avoid personal connections from interfering with the research process. A discussion on the ethical issues employed in this study is provided next.

3.6 ETHICAL CONSIDERATIONS

Cooper and Schindler (2006:116) view ethics as norms and standards of behaviour that guide moral decisions and our relationships with others. Mustafa (2011:27) highlighted that ethical issues are important in any social study because they often intrude on human private sphere as they are inherently interested in people's personal views and often targets sensitive or intimate matters.

Awareness of ethical concerns in research entails knowing what is wrong and what is right when conducting research. According to Strydom (2012:113), research should be based on developed codes of conduct that involve acceptance, cooperation, mutual respect and well-accepted conventions. To this end, this study adhered to the following ethical aspects:

- Ethical clearance from the North-West University was requested and the study was approved by the EMELTEN-REC Ethics Committee (see Appendix A).
- Permission was granted by the North West Province Department of Basic Education and school principals to conduct research in schools (see Appendix B).
- Consent, permission and approval for the research were obtained from the parents of each learner-participant.
- All the participants received consent forms (Appendices D to G), which provided detailed information about the following: what the research was about; what was expected from participants; benefits and risks of participating; assurance of confidentiality and protection of identity; dissemination of findings; and a declaration section. The consent forms were signed by all participants.
- None of the participants were forced or manipulated to participate in the research. The participants were informed that they were free to withdraw from the study at any stage, without any consequences.
- All information obtained from the participants was treated confidentially and anonymously. The researcher ensured that no descriptors or names that would lead to the identification of any of the participants would be used during data collection, analysis and interpretation.
- Audio-recorded information was treated as confidential and recordings were deleted after being transcribed. Only the researcher and her supervisors had access to the data.
- All participants were treated fairly, with honesty, consideration and respect. Permission to use an audio recorder was requested before the interviews began.
- All participants were not subjected to any risk of unusual stress, embarrassment, or loss of self-esteem.
- The researcher also strived to report all results and findings objectively, with accuracy and without any bias.
- The data collected will be stored safely and will be kept for a period of seven years as per the ethical requirement.

- The research findings will be made available to the participants upon request.

The next section presents procedures followed to analyse and interpret the interview data.

3.7 DATA ANALYSIS AND INTERPRETATION

In the context of research, data analysis involves “breaking the underlying data into smaller parts to gain a better understanding of the phenomenon represented by these data” (Onwuegbuzie & Frels, 2016:61). The data were analysed by means of inductive content analysis. This data analysis approach enabled the researcher to work backward and forward between the codes or patterns emerging from the data until a wide-ranging theme set was established. This data analysis method was selected because it focuses on examining the gathered data for repeated occurrences to reveal keywords in the text that help the researcher to understand and interpret the phenomenon under investigation (Nieuwenhuis, 2016a:105). Moreover, this data analysis method complements the interpretivist paradigm of this study as both the underpinning paradigm and data analysis method aim to reveal how participants attach meaning to the phenomenon (Nieuwenhuis, 2016a:105).

The data were also analysed and interpreted by using the CHAT framework as recommended in chapter 2. The next section presents a discussion on CHAT as a research lens for analysis.

3.8 DATA ANALYSIS AND INTERPRETATION BASED ON THE CULTURAL-HISTORICAL ACTIVITY THEORY (CHAT)

CHAT is an interdisciplinary approach used to explore a network of activities, premised on the idea that learning is socially situated and mediated by artefacts (Bourke, Mentis & O’Neill, 2013:38). The CHAT has its foundations in the work of the Russian psychologist, Vygotsky, who saw human activity as the dialectic relationship between subject and object (Hasan, 2007:3). The CHAT framework is adaptable and applicable to many disciplines – for instance, when the subject is an individual and the object is the individual’s human need, CHAT can be used as a research lens on a personal plane (Mentz & De Beer, 2017:88). However, when the interactions involve subjects from different stakeholders, CHAT can be used as a research lens on an interpersonal level (Mentz & De Beer, 2017:88). When the subject is a system or a theory, CHAT can be used as a research lens on an institutional or community plane (Mentz & De Beer, 2017:88). In this study, the influence of teachers’ assessment beliefs on learners’ SDL behaviours was investigated – therefore, CHAT was used as a research lens on an interpersonal level as the study involved two different subjects.

According to Nussbaumer (2012:38), CHAT has a growth or development pattern that has been referred to as generational. Historically, the theory has undergone three generations, where each built upon the previous one (Nussbaumer, 2012:38). First-generation CHAT drew on the Vygotskian

sociocultural understanding of learning, which entails influences of individuals and tools to develop understanding (Vygotsky, 1978). Second-generation CHAT is attributed to Engeström (1987) along with Leont’ev (1978) and Luria (1976), who took into account interrelationships between the individual and the community, history, context, and interaction of the situation and activity (Taylor, 2014:98). With third-generation CHAT, Engeström (2001) elaborated on a broader concept of activity to include interacting activity systems to deal with tensions and contradictions that encourage collective learning through change (Nussbaumer, 2012:39). This study focused on third-generation CHAT to analyse the collected data because the theory permits explorations of contradictions or structural tensions, both within and between teacher activity systems and learner activity systems. According to Trust (2017:99), knowing the source of the tensions and contradictions within and between activity systems is important as this might serve as the foundation for further development and change.

3.9 CHAPTER SUMMARY

In this chapter, the research methodology and design for this empirical study were presented. A specific research design was identified to ensure the accomplishment of the study aims. The research paradigm, issues of sampling and data collection and data analysis processes were also discussed. In addition, issues of trustworthiness and ethics were addressed. A summary of the research methodology employed in this study is presented in the Figure 3.1.

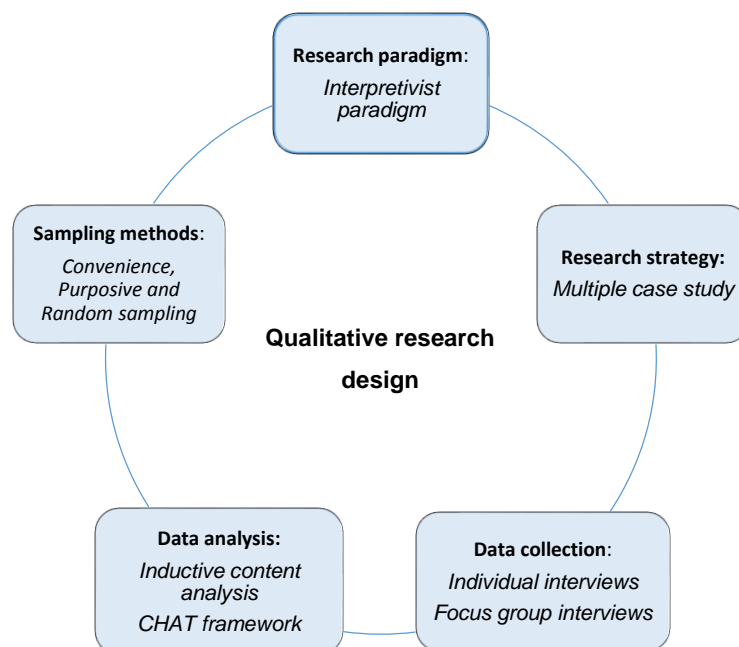


Figure 3.1: A summary of the research methodology

Source: Author's own

Figure 3.1 depicts the researcher's own illustration of how various aspects of this study's research methodology are centered based on the qualitative research design. The analysis and interpretation of the data is presented in Chapter 4.

CHAPTER 4: DATA ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

The primary research question of this study was as follows:

How do grade 9 Natural Sciences teachers' assessment beliefs influence learners' self-directed learning behaviour in the Rustenburg area?

The following secondary research questions are embodied in the primary research question:

- *What are the assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area?*
- *What is the influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' self-directed learning behaviour in the Rustenburg area?*

The data obtained from individual interviews and focus group interviews are presented and analysed in this chapter. The aim of this chapter is to discuss the analysis and interpretation of the empirical data done by means of inductive content analysis and the CHAT framework.

4.2 ANALYSIS AND INTERPRETATION OF INDIVIDUAL INTERVIEWS

4.2.1 Background information

The aim of the individual interviews was to collect information on teachers' assessment beliefs. Five purposively selected Grade 9 NS teachers participated in the semi-structured individual interviews. The teachers were from five randomly selected schools in the Rustenburg area (see section 3.4.4). Cryptograms (e.g. TPA-TPE) were used to code the teacher participants so as to protect their identities.

4.2.2 Analysis and interpretation of the individual interview data

The voice-recorded data were transcribed verbatim; whereafter the data were coded by means of open coding. This type of coding involves dividing transcribed data into meaningful analytical units (Nieuwenhuis, 2016a:116). The codes were then grouped together as categories, which refers to a group of codes that share a commonality (Nieuwenhuis, 2016a:119). Categories were derived inductively based on codes emerging from the interview data. The constructed categories were further scrutinised in terms of their underlying meaning, and themes emerged as a result of this analytical reflection process.

The emerging themes were refined and further categorised into families according to the research aims (Saldana, 2009). To establish these families, the researcher made casual links from the emerging themes to other known propositions of teachers' assessment beliefs taken from literature on "[t]eachers' conceptions of assessment: [v]alidation of an abridged instrument" by Brown (2006). These known propositions of teachers' assessment beliefs include four main assessment beliefs conceptualised based on Brown's (2004) assessment conceptions: a) assessment improves teaching and learning; b) assessment holds learners accountable; c) assessment holds schools and teachers accountable; and d) assessment is irrelevant for teaching and learning. These propositions served as a means to focus the data collection (see section 3.4.2.1) and to determine the direction and scope of the study based on the study's research aims (Baxter & Jack, 2008:552).

In the next section, data collected from the individual interviews are presented and analysed.

4.2.3 Presentation of codes and themes of individual interview data

Derived from the responses of the teacher participants, the raw transcribed data of the individual interviews reflect the coded accounts of the two individual interview questions:

- *In your opinion, what do you think is the purpose of assessment? (Probing for teachers' general assessment beliefs)*
- *So, what do you think is the best way of assessing learners' understanding? (Probing for teachers' beliefs related to specific choice of assessment method)*

The third interview question served as an additional means for eliciting teachers' beliefs regarding the purpose of assessment, namely:

- *Tell me more about your experiences with assessment within the grade 9 Natural Sciences subject. (Probing for any other information)*
- The coded data are presented in Tables 4.1 and 4.3 respectively, and the complete transcribed interviews are provided in Appendix J.

Table 4.1: Themes, codes and quotes associated with teachers' beliefs of the purpose of assessment

Family	Themes	Codes	Some quotes
Assessment improves teaching and learning	Assessment is for the improvement of learning	Testing learners' abilities To improve on learners' understanding	"...you have to actually see what the children can do... "...and then how can you improve on it a bit further".

Table 4.1: Themes, codes and quotes associated with teachers' beliefs of the purpose of assessment (continued)

Family	Themes	Codes	Some quotes
Assessment improves teaching and learning	Assessment is for the improvement of learning	<p>Check understanding</p> <p>Prior knowledge</p> <p>Identifying problem areas</p> <p>Identifying levels of understanding</p> <p>Ability to relate knowledge</p> <p>Getting feedback on understanding</p> <p>Awareness of what is expected</p>	<p>"...it's just to check how much learners know and understand".</p> <p>"...to check what they already know".</p> <p>"...find out where the problems lie so that you can try to fix..."</p> <p>"...find out the different levels that they are not understanding..."</p> <p>"...whether the learners can relate the knowledge that they learned in the classroom with the real-life situation... [sic]"</p> <p>"...to get the feedback from the learners whether they understood the work".</p> <p>"...my learners know what is expected from [sic] them..."</p>
	Assessment is for the improvement of teaching	<p>Re-explaining topics to learners</p> <p>Grouping learners for differential instruction</p> <p>Changing teaching method</p>	<p>"...in the sense that you can either go back to that section or you can re-explain a section..."</p> <p>"...this year we decided that we gonna [sic] take out the weaker learners and put them into one class so that we can basically move much further [sic] and better..."</p> <p>"...if learners don't understand what I'm doing so as to change the method of teaching..."</p>

Table 4.1: Themes, codes and quotes associated with teachers' beliefs of the purpose of assessment (continued)

Family	Themes	Codes	Some quotes
Assessment holds learners accountable	Assessment is for certifying learners	Promoting learners Grading learners	"...to promote learners to the next grade..." "...also, you know with assessment we grade...is for grading..."
	Assessment serves as a way of certifying learning	Testing knowledge acquisition Responsibility of learning rest on learners How much information was acquired Learner must be accountable Learner in control of formal assessment	"...test whether the learner has captured what I taught them". "...a learner is responsible...you are responsible...you must go and read at home..." "...to find out how much a child has learned, has gathered the information from the teacher themselves". "...we cannot keep on accounting for why this person fails exam...no...you get a timetable...you must go and read for that 75%..." "...I am not in control of that 60%...and it comes once...so if a learner does not go and prepare the formal assessment at home, they will be a problem..."
Assessment holds teachers accountable	Assessment provides insight into teacher effectiveness	Teacher self-evaluation Teacher self-monitoring	"...the learner should be exposed to those papers so that I for one can see that I'm doing ok..." "...It is also to test whether I'm on par with what I should do."

Table 4.1: Themes, codes and quotes associated with teachers' beliefs of the purpose of assessment (continued)

Family	Themes	Codes	Some quotes
Assessment is irrelevant to teaching and learning.	Assessment has a negative impact on learners	Unfair to learners Difficult for learners Seen as an enemy Unfair weighting	“...but the volume of work that has been done it weighs less...it’s not fair...I’m saying it’s just not fair.” “...so assessment with [sic] my experience is difficult...” “...the learners their [sic] greatest enemy is the final examination and the formal task...” “...the weighting of the examination is too much...it is 60% especially for the grade 9...”
	Assessment has little impact on teaching and learning	Anybody can do projects Assessment strategies have little impact Does not promote memory	“A project it’s something that anybody can just do you know [sic]...” “...you can come up with all different strategies of assessment of assessing them, but if they can’t read...” “...and then making a learner to build a model does not promote memory...”

The researcher discusses each theme outlined in Table 4.1 in order to depict teachers' beliefs about the purpose of assessment.

4.2.3.1 Assessment is for the improvement of learning

Teacher A, Teacher B, Teacher C and Teacher D believed that the purpose of assessment is to establish what learners know or what they have learned so that they could identify learners' areas of weakness in order to help them improve. It is worrying that teachers, in general, seem to be focused on only the cognitive domain in their assessment. De Beer, Petersen and Brits (2018:173) quote Rotherham and Willingham (2010:17), stating that the teaching of affective outcomes (and the assessment thereof) is “a matter of chance rather than the deliberate design of our school system...”

we cannot afford a system in which receiving a high-quality education is akin to a game of bingo". It is noteworthy that teachers in their assessment practices do not seem to pay much attention to the affective domain.

4.2.3.2 Assessment is for the improvement of teaching

Teacher B and Teacher D believed that the purpose of assessment is to guide or inform teachers' decisions on instruction, with the aim of the advancement of learning during teaching. Teacher B further used assessment results to group learners for differential teaching with the aim of helping learners improve their performance. This implies that the teachers realised how they could alter their teaching to improve the quality of their teaching.

4.2.3.3 Assessment is for certifying learners

Teacher A and Teacher C believed the purpose of assessment is for placing learners into the next grade and assigning grades. This view of assessment is regarded as serving an administrative goal, which targets government agencies, parents and other stakeholders to report the level of learners' work.

4.2.3.4 Assessment serves as a way of certifying learning

Teacher A believed that the purpose of assessment is to determine learning success at the end of a learning experience, with the aim of making learners accountable for their learning. Assessment is thus regarded as a way of establishing what learners have learned.

TPA: "...the problem is exam...this is a problem and we are not in control of it...because a child has to read at home...if he can't read at home...he cannot be disciplined enough to say I am going to study my work at home...they won't fail..."

Teacher E considered assessment as a way to determine how much learners' have learned from teaching, which is depicted in the following quote:

TPE: "...test whether the learner has captured what I taught them."

This seems to suggest that the measurement missions for assessing learners is to establish how well or bad they are doing based on what they have learned. Whether such an emphasis on assessment might be good or bad for learners is an empirical question.

4.2.3.5 Assessment provides insight into teacher effectiveness

Teacher B believed that the purpose of assessment was to provide a personal indicator as to how well she was doing, whereas Teacher E believed that the purpose of assessment is to determine whether she was on a par with the content coverage. This implies that these teachers' made use of assessment results to take accountability for their actions, which could lead to positive pressures to improve on performance.

4.2.3.6 Assessment has a negative impact on learners

Teacher A believed that assessment can be an obstacle to learners based on unfairness regarding the weighting distribution used for grading grade 9 learners. None of the other teachers held the same view as Teacher A on assessments being unfair and being an enemy of learners.

TPA: "...I want to tell you the biggest enemy of all these children is exams and they fail it...all the countries...exams is the problem...learners they don't read...teachers are teaching we are giving them questions that are relevant but the enemy is the examinations..."

Interesting to note is that Teacher A was also of the opinion that assessment could be used to establish that learners have understood the work, yet also believed that assessments could be an enemy to learners. This seems to suggest that the teacher assumed that one assessment is "good" and the other "bad", which could lead to a dysfunctional approach to classroom assessment.

TPA: "The purpose of the assessment...eeh...is to get the understanding from the learners...whether the knowledge has been understood...eeh and whether the learners can relate the knowledge that they learned in the classroom with the real-life situation that they may encounter...so that the most important thing about assessment is to get the feedback from the learners whether they understood the work."

Participants' differing views about the purpose of assessment seem to suggest that these teachers had a naïve understanding of the purpose and principles of assessments.

4.2.3.7 Assessment has little impact on teaching and learning

Teacher A believed assessment practices that involves learners' making models and projects have minor impact on teaching and learning, as they do not help learners develop the necessary memorisation and recalling skills. This teacher's viewpoint is concerning as in the current and future

job market, knowing some basic facts is imperative for learners, but knowing how to think critically, work collaboratively and solving problems are more essential to develop (Rotherham & Willingham, 2010:17). This seems to suggest that this teacher’s teaching approaches focused on emphasising recall and rote memorisation and provided little opportunity for learners to develop structures of knowledge for reasoning and solving problems. This implies that the teacher had insufficient knowledge about learning, the principles of instruction, and the aims and purpose of education.

Derived from the above analysis, the study organised the emerging themes into four families based on their shared characteristics with four known assessment beliefs taken from Brown’s (2006) “[t]eachers’ conceptions of assessment: [v]alidation of an abridged instrument”. In doing so, the researcher tried to answer the question: *What are the assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area?*

The participating grade 9 NS teachers’ beliefs of assessment were as follows: improvement of teaching and learning; learner accountability; teacher accountability; and the irrelevance of assessment (see Table 4.1). These four assessment beliefs can be mapped onto the four major beliefs outlined by Brown (2006); however, the assessment belief of holding schools accountable is absent from this group of teachers. This finding is consistent with studies conducted by Brown (2004), who asserts that the pressures for accountability of teachers and schools show variations in pattern and strength of agreement, which is explained by differences in the assessment context.

Once data relating to assessment beliefs were identified, passages were analysed and interpreted within their contexts by paying attention to selected details from individual responses. The study revealed that teachers held assessment beliefs of varying combinations. A summary of this group of teachers’ assessment beliefs is presented in Table 4.2.

Table 4.2: Summary of Natural Sciences teachers’ assessment beliefs

Natural Science teacher	Assessment beliefs
Teacher A	<p>Assessment improves teaching and learning</p> <p>Assessment holds learners accountable</p> <p>Assessment is irrelevant to teaching and learning</p>
Teacher B	<p>Assessment improves teaching and learning</p> <p>Assessment holds teachers accountable</p>
Teacher C	<p>Assessment improves teaching and learning</p> <p>Assessment holds learners accountable</p>
Teacher D	<p>Assessment improves teaching and learning</p>
Teacher E	<p>Assessment holds learners accountable</p> <p>Assessment holds teachers accountable</p>

Table 4.2 presents assessment beliefs shared by teachers. Each assessment belief is presented in a distinct colour. The assessment belief relating to the improvement of teaching and learning was held by four of the teachers. Three teachers held the assessment belief relating to holding learners accountable. Two teachers held the assessment belief relating to holding teachers accountable, and only one teacher held the assessment belief relating to the irrelevance of assessment. Research on assessment beliefs confirms the finding observed in this group of teachers, who held more than one type of assessment belief. For instance, in Brown’s (2002) view, teachers’ beliefs are not simple and uniform but multifaceted and interconnected. Extending this argument, Remesal (2011:476) highlights that it is crucial to note that these beliefs are mutually exclusive but likely to appear in different combinations.

According to literature, assessment beliefs inform teachers’ thinking and planning, and consequently shape their classroom assessment practices (see section 2.3.2). Therefore, the emerging themes set out in Table 4.3 sought to identify beliefs related to specific assessment practices. The emerging themes in Table 4.3 represent teachers’ assessment practices, which were further organised into two families related to either the formative or summative purpose of assessment. The themes were categorised into formative assessments because the focus was on collecting evidence of learners’ understanding for the purpose of improving their learning (see section 2.3.2). The themes that were categorised into summative assessment focused on assessing the summary effects of instruction and end performance or achievement of the learner (see section 2.3.2).

Table 4.3: Themes, codes and quotes associated with teachers’ beliefs about the best way of assessing learners’ understanding

Family	Themes	Codes	Some quotes
Formative assessment practices	Dialogue with learners as a source of receiving and giving immediate feedback	Oral questioning	“...within the class there’s [sic] oral questions and answers during a lesson...”
		Coaching learners	“...so assessment in the end needs to come from having coached them having trained them”
		Asking questions	“...you ask them about what you’ve been teaching by just raising up their hands you check...”
		Answering questions	“...you assist them in answering the questions to show them how they are supposed to answer the questions together...”
		Oral assessment	“...well understanding, I think oral, like a simple oral assessment...”

Table 4.3: Themes, codes and quotes associated with teachers' beliefs about the best way of assessing learners' understanding (continued)

Family	Themes	Codes	Some quotes
Formative assessment practices	Technology could enhance assessment practices	Assessing through WhatsApp Displaying activities using a projector	"...I mark them through the WhatsApp and then I send it back..." "...you project then underneath your projections they will be checkpoints activities..."
	Collection of written work focuses mainly on lower levels in Bloom's taxonomy	Classwork Classwork book Daily homework Corrections Informal test Question papers Summaries	"...If you are teaching a particular topic... give them work on that day..." "...ask them in their classwork book where they do their cut and paste and then they write the question..." "...then daily homework is given..." "...use learners to come and do corrections..." "...but before that, I give an informal written test... sort of a short test..." "...what we do, we take questions from the question paper, they paste and then they answer the questions there..." "...sometimes, I like making them write summaries..."
Summative assessment practices	Formal and regular testing for understanding is a common practice	Weekly class test Formal test Weekly assessment Formal assessment Common assessment	"...I monitor their understanding by giving them class test every week..." "...at the end, you need to give a formal test..." "...they know that on Friday, we write assessments every Friday..." "...when they are writing the formal one..." "...I'm all for when they do this common assessment..."

Corresponding with the mentioned emerging themes (as set out in Table 4.3), a response such as "you assist them in answering the questions to show them how they are supposed to answer the questions" tells me that preparing learners for the examination (summative assessment) was

considered as of utmost importance. Moreover, this analysis showed that assessment beliefs associated with improving teaching and learning were positively related to a formative approach to assessment, as most teachers believed that the best way of assessing learners' understanding is through formative practices, such as dialogue with learners, using technology, and collecting written work. Teacher E believed that formal testing could provide a true reflection of learners' understanding in situations where learners are shy in class or in situations where learners copy written work from each other. However, the researcher cannot help but wonder if teachers' formative practices in the NS classroom pays sufficient attention to the development of 21st-century skills. For instance, the fact that teachers want to "re-explain" shows that chalk-and-talk approaches are still dominant, which do not enhance SDL. Noteworthy and in line with the aforementioned finding, is the fact that self- and peer-assessment was an almost tacit topic in the data as none of the teachers touched on it in their responses. Similarly, teacher responses only dealt with assessment related to the cognitive domain, and the teachers did not give much thought to the assessment of affective outcomes.

According to literature (see section 2.3.2), teachers who perceive that assessment is for improvement of teaching and learning, adopted a strategically planned formative assessment practice, while the remaining assessment beliefs necessitate the use of a summative assessment practices (see Table 1.1). However, further insights gained from the analysis of the transcribed data revealed that teachers' assessment practices might be driven by other beliefs or a set of beliefs which remain unspoken. This was evident from Teacher C, who favoured the use of innovative technology-based assessment practices but expressed that he preferred using technology-based assessment in grade12 instead of in grade 9.

TPC: "...another method I wanted to try is that WhatsApp method I used in grade 12 I haven't check here but mostly learners will say they don't have cell phones but grade 12 they do have...you create a group and you post class activity on the learners and then you can be able to mark...eeh in a way they will be studying...they will be checking the answers and then they choose the correct answers...and I give them those who sent me their answers...I mark them through the WhatsApp and then I send it back...I was using it also in grade12...grade 9..eeee [signs] not because they will tell me they don't have cell phones...probably work but these are young ...eish [signs] its difficult..."

The above finding confirms the findings of Belo, Van Driel, Van Veen and Verloop (2014:90), which point out that teacher beliefs are not only related to other beliefs but are also linked to cognitive and affective constructs such as self-efficacy, expectations and attitudes. Several researchers argue that teachers' assessment beliefs are strongly interwoven with their views on the broader issues of

learning and teaching (Brown, 2002; Belo *et al.*, 2014; Delandshere & Jones, 1999; Vandeyar & Killen, 2007). This argument is evident in the case of Teacher A – his response revealed that he held a behaviourist view of the nature of knowing. In this behaviourist perspective, knowing is seen as an organised accumulation of associations and components of skill, which is illustrated by the following quote:

TPA: "...you see ma'am...when a learner has to go and write the examinations there is no associations...they can't associate the questions that are in the exams with what they have been doing...all the questions in the examinations they show similarity...isn't that we are teaching according to the policy so the exam also is based on the policy on the topics that have been taught...but the learners they don't show association...their mind cannot associate the things that they have been taught and learning throughout."

Consequently, this idea of learning indicates that teachers' classroom assessment practices generally lean towards the purpose of determining acquisition of facts and skills to determine whether the learner has or has not learned the content. This notion is evident from the following quote:

TPA: "...so assessment with my experience is difficult....I am not negative...I'm telling you the truth as it is...what's happening....assessment is a problem...you see now I wrote corrections there...I give them homework...I'm writing corrections...some came they did not do the homework...and this activity is building...it's another cognitive...I am exercising another cognitive level in them if they don't do that...now tomorrow I am moving on to another cognitive level that they missed this one...I'm I going to keep on asking this cognitive level every day? No...I can't...so exam when it come part of the cognitive level that they did not do as homework they can't associate that with what is simple that I gave them...teaching is difficult...I'm telling you it's difficult...so I don't have any positive remarks that I can think about assessment in grade 9."

In conclusion, from the above findings, it is evident that these teachers' assessment beliefs were multifaceted in nature – this could lead to teachers displaying assessment practices characteristics of both formative and summative practices. This dualist characteristic of both formative and summative practices is clear in the response of Teacher B, whose formative practices were focused on preparing learners for the summative testing:

TPB: "...but before that I give an informal written test... sort of a short test...where similar type of questions...the way in which a test would be structured...I would structure the test in that way...to see can they...If it's an NS diagram...I would give the diagram and they label it...can they give the functions...so that's the basic routine knowledge...and then I would add on questions that are more application type of questions or investigation practical type of questions thing for NS...so that's done before the test so that they can get an idea what the formal test is like and I can get an idea where there are problems and then the formal test will be given thereafter...so it's done over a... quite a period of time."

The analysis and interpretations from the focus group interviews are discussed in the subsequent sections.

4.3 ANALYSIS AND INTERPRETATION OF FOCUS GROUP INTERVIEWS

4.3.1 Background information

The aim of the focus group interviews was to gather information on learners' SDL behaviours. Five randomly selected grade 9 learners participated in five semi-structured focus group interviews. The five learners were from five randomly selected schools in the Rustenburg area (see section 3.4.4). The focus group interviews comprised learners who were taught by the same NS teacher in each of the different schools, who was to be interviewed (see section 3.4.4). In doing so, this would help to determine the influence of grade 9 NS teachers' assessment beliefs on learners' SDL behaviours in the Rustenburg area. For the purpose of data analysis and interpretation, cryptograms (e.g. LP-A1 to LP-A5) were used to identify the respective learner-participants from the five different schools (e.g. Schools A to E).

4.3.2 Analysis and interpretation of focus group interview data

The focus group interviews were also analysed by following the same procedures as for the individual interviews (see section 4.2.2). Figure 4.1 below presents a summary of the data analysis procedures for the focus group interview data.

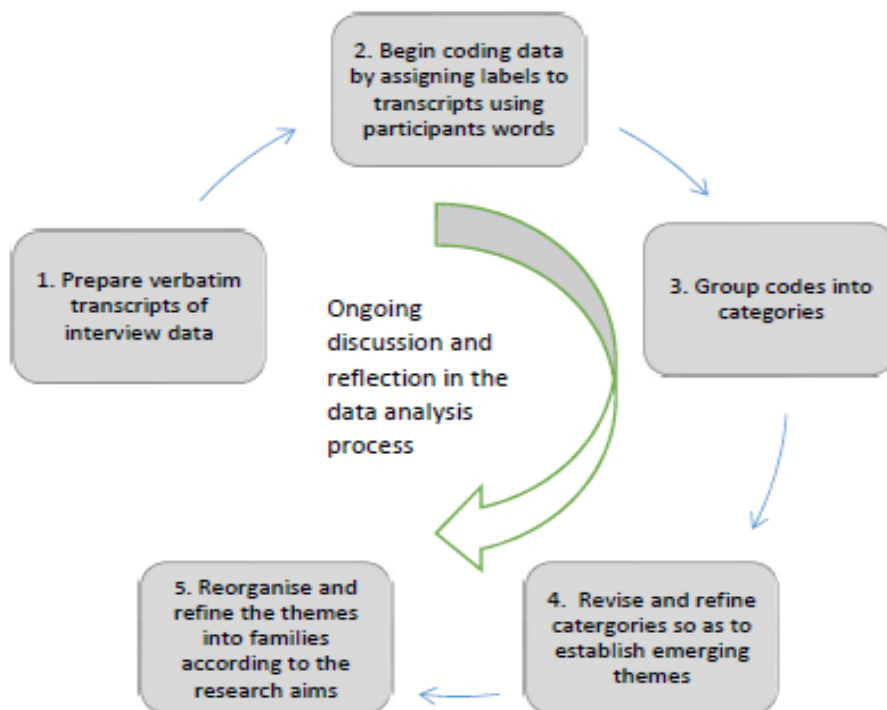


Figure 4.1: The process for analysing the focus group interview data

Source: Author's own

Figure 4.1 illustrates the researcher's own depiction of the overview process utilised while analysing the focus group interviews and depicts a continuing sequence of stages. The ongoing discussions and reflections occur at all stages of the data analysis with the guidance of a knowledgeable peer. By so doing, this helped to verify the accuracy of the analysis and interpretations. To establish the families, the researcher made casual links between the emerging themes and other known aspects of learners' SDL characteristics taken from the literature (see section 2.2).

4.3.3 Presentation of codes and themes of focus group interview data

The raw transcribed data reflect the coded accounts of the following five focus group interview questions:

- *Describe your role as a learner during Natural Sciences lessons?*
- *What are some of the activities which enable you to understand the topics taught in Natural Sciences lessons better?*
- *What type of studying methods help you to perform well in Natural Sciences?*
- *What are your views about assessing your own Natural Sciences activities instead of your teacher assessing your work?*
- *Tell me a bit more of your experiences with assessment within Natural Sciences?*

The aim of these five questions was to ascertain the nature of SDL behaviours from learner participants' views. The coded data are presented in Table 4.4, and the complete transcribed interviews are provided in Appendix K.

Table 4.4: Themes, codes and quotes associated with learners' SDL behaviours

Family	Themes	Codes	Some quotes
SDL process characteristic: Task management	Social skills should be developed in the NS classroom	Communication Expressing feelings Liking/loving the teacher Cooperation and respect Answering questions Listening Concentrating Focusing Doing class work and homework	"...there's nothing that we can know without communicating..." "...to listen and express my feelings with what my teacher has taught me..." "...you can't love to learn NS without loving or liking the person that's teaching you Natural Sciences..." "...to cooperate in class and respect the NS teacher." "...focusing in [sic] answering as many questions as you can." "Must listen" "...to listen and concentrate in class." "Ignore all distractions and focus." "...is to do class works and homeworks [sic] that the teacher give us."
	Learning strategies that foster transmission mode	Reading notes and revising Making notes	"...to read your notes and to study them and revise your classwork." "...I read my notes and make my own notes out of what my teacher as taught me."

Table 4.4: Themes, codes and quotes associated with learners' SDL behaviours (continued)

Family	Themes	Codes	Some quotes
SDL process characteristic: Task management	Learning strategies that foster transmission mode	Using class work and corrections Practising given work Making drawings Recalling information Memorising	"...I go back to my class works [sic] and corrections." "After each lesson, go home practise the work that we did in the class..." "...sometimes I make drawings so that I can remember..." "...you write what you remember, and you refer back to your NS book..." "...every time after each lesson, I go and read it over and over again and that's how it stays..."
	Learning strategies that foster making sense of ideas	Peers are seen as resources Experimenting Help-seeking Researching through phone Researching through library	"...it's good if you work with someone else like your classmates so that you can understand each other." "...For me, the easiest way to learn is to doing [sic] things practically and experimenting..." "...I read, when I don't understand I go to another person to help me." "... I use my phone to research, and it gives me more information one that's even not in the notes and the textbook." "...I get into research; I maybe go to the library and take books for Science [sic]..."

Table 4.4: Themes, codes and quotes associated with learners' SDL behaviours (continued)

Family	Themes	Codes	Some quotes
SDL process characteristic: Task management	Learning strategies that foster making sense of ideas	Self-guided reading Group work	"...so every time when I learn, I want to read things for myself..." "...when working in groups... you help each other to understand more ..."
	Approach to studying is characterised by lack of motivation	Planning using a schedule Planning using a diary Wait for exams Planning using a timetable Focuses on one subject Limited concentration Easily distracted Lack of focus Lazy to read	"My opinion on this is a person needs to make a schedule to study..." "...I write in in my diary book [sic] so that when I get home..." "...I just wait for the exams and I study" "...I would prefer to write a timetable..." "...I pull down [sic], because I'm only focusing on one subject [Natural Sciences]." "...we don't put our full concentration on the studying [sic]." "When I study NS, I get distracted" "...I want to go to play [sic]... instead of studying NS." "...I'm still facing some problems 'cause I'm lazy to read...I don't like reading...it's not my stuff [sic]."

Table 4.4: Themes, codes and quotes associated with learners' SDL behaviours (continued)

Family	Themes	Codes	Some quotes
SDL process characteristic: Task management	Goal-setting is focused on aiming for good results	Career-focused Career goal Future career Pursuing career Improving grades Getting to pass Improving marks Going to the next grade	"...so I heard that to do engineering, you need physics and maths..." "...so I have decided to study electrical engineer and do architecture..." I always read stuff about NS, because when I grow up, I want to do...I want to be a doctor..." "...as we are about to pursue a career...we have to know about certain things..." "...I must like try [sic] to improve my levels of Natural Science." "...and getting to process that information and getting educated and then getting to pass." "...I know next year I am going to do maths and science, so I need to improve my marks..." "...I know grade 9 is a very challenging grade...so many learners must work very hard...to go to the next grade."

Table 4.4: Themes, codes and quotes associated with learners' SDL behaviours (continued)

Family	Themes	Codes	Some quotes
SDL person characteristics: Motivational factors	The tendency of learners to become motivated	Second favourite Fun and interesting Loves the subject Puts effort to achieve career goal More attentive Enjoying lessons	"NS is my second favourite subject..." "...and NS is a very fun and interesting subject..." "...I love it [Natural Sciences subject] very much..." "I always read stuff about NS, because when I grow up, I want to do...I want to be a doctor..." "...in class, we pay more attention to her, listen to what she say [sic] so that it would be easier when we get to the next grade." "...he [their Natural Sciences teacher] makes sure that we enjoy the lesson..."
SDL person characteristic: Cognitive responsibility	Taking responsibility for learning	Reading earlier Preparing own work Taking initiative to assess learning Taking initiative by seeking more information	"...the topics that we are going to talk about next week, I read it earlier..." "...I do my own work personally at home...maybe before the lesson..." "...on my phone, I have the learning application to help me – that's how I assess myself." "... I use my phone to research, and it gives me more information; one that's even not in the notes and the textbook ..."

Table 4.4: Themes, codes and quotes associated with learners' SDL behaviours (continued)

Family	Themes	Codes	Some quotes
SDL person characteristic: Cognitive responsibility	Learners could evaluate their own learning progress	Self-evaluation helps to show mistakes Self-evaluation used for identifying weak points Self-evaluations are more precise Self-evaluation aids in modifying learning Self-evaluations help uncover understanding Self-evaluations to determine progress Self-evaluation of marks	"...we get to assess our activities...we get to see our mistakes better than when the teacher is assessing our activities." "...you can see were your weak points are and strong points are [sic]..." "...assessing yourself, it's much better because you understand yourself more than anybody else." "...when I fail the formal task, I learn from my mistakes from them." "...for example, my class works I use to take them and compare them how am understanding [sic]..." "...I used to take my reports and look from term 1 to term 2 or term 3 how far I am..." "...when it [marks] becomes low, I like [sic] ask myself where I went wrong..."
	Learners have a strong dependency on teachers to evaluate their work	Teacher evaluation to help identify mistakes Teacher evaluations help provide corrections	"...I prefer the teacher to assess my work...so that he or she can explain to me why I went wrong...were I need to fix my mistakes." "...when the teachers assess our books and our work, it would be best because they will be able to correct us and explain to us more things."

Table 4.4: Themes, codes and quotes associated with learners' SDL behaviours (continued)

Family	Themes	Codes	Some quotes
SDL person characteristic: Cognitive responsibility	Learners have a strong dependency on teachers to evaluate their work	Teacher evaluations provides required guidance Need someone to judge your work Self-evaluations are unreliable	"I think it's best for teachers to assess our work, because we need their guidance and they must correct us." "...it's better to have someone who's going to judge you with your work." "Because assessing your work...you can cheat ma'am ... on yourself."
	Attribute success or failure to task difficulty	Find exams difficult Find NS challenging Can fail difficult topics	"...when we write class works in NS, it's not that difficult... but in exams ma'am... it's more difficult and it's like its heavy..." "...what I have experienced, Natural Sciences is a very challenging subject – you can either pass or fail..." "...so you can understand those [topics] who are easy and fail those who are difficult..."
	Attribute success or failure to effort taken towards a task	Able to pass due to reading Getting more understanding Attributes failure to lack of focus	"...I pass them [formal tasks] because I read." "...it was really hard at first ...but then if you get more understanding about it...you see that it's not that hard..." "...when it [marks] becomes low, I like ask myself where did I go wrong...and I start reminding myself like [sic] I wasn't focusing on NS too much..."

Table 4.4 presents emerging themes obtained from the learners' interview data. Interesting to note, the affective outcomes – such as cooperation, expressing feelings – feature in learners' data but not in teachers' data. However, the emphasis on recall and memorisation in the learners' data corresponds with the information from teachers' data. This finding seems to suggest that the connections learners' make during learning not only depend on situational cues obtained from teachers but also include situational cues obtained from their environment, which, in turn, drive learners' behaviour. Thus, one can conclude that the learners' obtained the affective outcomes from the situational cues obtained from their environment, since the emphasis of this domain was absent from the teachers' assessment practices. This finding implies that studies focusing on learners' SDL behaviours should not only consider the influence of teacher actions but should also focus on uncovering the type of environment in which learning takes place.

In the next section, the analysis and interpretation of the data obtained from the focus group interviews (emerging themes presented in Table 4.4) are discussed.

4.3.3 Interpretation of focus group interview data

The coded focus group interview data, corresponding with the emerging themes tabulated in Table 4.4, describe the learners' SDL behaviours. The SDL behaviours described in the literature in Chapter 2 (see Table 2.1) formed the foundation for the thematic coding of the interviews. After data relating to learners' SDL behaviours were identified, passages were analysed and interpreted within their context, paying attention to selected details in individual responses. The following themes with regard to learners' SDL behaviours emerged:

- **Social skills should be developed in the NS classroom**

This theme is concerned with learners' social-behavioural implementation of the learning process. The majority of learners in this study expressed listening as their role during a NS lesson. It may be that learners have developed identities of passively accepting information presented to them. Other social skills identified by some learners included communication, expression of feelings, cooperation and respecting their teacher's authority.

- **Learning strategies that foster transmission mode**

Most of the learners indicated learning strategies that foster basic reproducing surface learning methods like recalling, memorising and revising. This finding suggests that classroom activities are dominated by three modes of learning – reading, writing, and correcting – which do not leave space for SDL. The question should be asked if 21st-century skills are developed and if learners are effectively prepared for a complex 21st century.

- **Learning strategies that foster making sense of ideas**

Very few learners shared learning strategies that foster deep transforming learning methods, including researching, working in groups, experimentation and seeking help from peers or teachers. Such learning strategies are consistent with the social-constructivist view of learning (see section 2.2.1) as cognitive interactions are regarded as being developed through socially supported interactions.

- **Approach to studying is characterised by lack of motivation**

Only a few learners expressed that they planned for their NS work by using schedules, diaries and timetables. This shows that few learners had time management skills. Most learners expressed a lack of motivation for studying as they said that they easily got distracted, felt lazy to read, had limited concentration and preferred play over study. This is cause for concern because low motivation is associated with low levels of learner engagement (see section 2.4), which is evident from this theme. While analysing the data obtained through the interviews with teachers, it became clear that the teachers did not pay attention to the assessment of affective outcomes (such as values and interest). It should therefore not be surprising that learners lack affective skills, as teachers, in Rotherham and Willingham's (2010) parlance, go about teaching the affective domain as if it is a game of bingo.

- **Goal setting is focused on aiming for good results**

This theme entails that learners should think of their own work in terms of goals to develop the capacity to work at a metacognitive level (see section 2.2.5). However, the nature of goal setting in this group of learners was centred on passing to the next grade, improving their grades and largely focused on career pursuits. No learner shared a goal related to achieving a specific NS learning outcome or specific aim. This seems to suggest that teachers do not emphasise or make visible the set learning objectives to the learners.

- **Taking responsibility for learning**

This theme is concerned with learners' capability of taking responsibility for the construction of personal meaning. Only a few learners expressed a capability of taking initiative for the construction of personal meaning. This is not surprising as most learners expressed a passive learning orientation (noted in the social skills theme).

- **Learners could evaluate their own learning progress**

This theme is based on specific attributes involving learners' assessing the quality of learning outcomes to improve strategies for further learning activities. All the interviewed learners from School

B believed learners assessing their own work, instead of the teacher, was a good idea. A few learners from School C, School D and School E were in support of learner self-evaluations. This seems to suggest that these learners had a learning orientation that could be further enhanced by fostering SDL in NS classrooms (see section 2.2.5).

- **Learners have a strong dependency on teachers to evaluate their work**

All the participating learners from School A believed that learners assessing their own activities, instead of the teacher, was a bad idea. Other learners from the other Schools (C, D, and E) held diverse opinions, with some preferring teachers to evaluate their work, whilst others preferring self-evaluations. Some of the learners being against self-evaluations seems to suggest that they believed they were incapable of assessing their own work. A learner emphasised that they needed their teacher's guidance. This suggests that these learners were not active in critiquing their own work as part of learning, hence they did not see the important supporting role that self-assessments could have towards improving their learning. The latter is also supported by the fact that none of the participating teachers made mention of utilising self-assessment methods.

- **Attribute success or failure to task difficulty**

This theme involves how learners interpreted the causes of their successes and failures in reaction to their tasks. In this group of learners, two different types of attributions were identified – one relating to task difficulty, and the other relating to learners' efforts (see section 1.5.1). Learners attributed their failure to the task being difficult and attributed their success to the task being easy. This attribution is evident in the following quote (LP-D2):

LP-D2: "some topics...they are difficult and some there easy...so you can understand those who are easy and fail those who are difficult..."

Such attributions can result in learner behaviour that is reactive to the environment and not motivated to put forth any effort because learners ultimately believe that, regardless of how much effort they put in, they cannot accomplish the task because it is difficult (see section 1.5.1).

- **Attributes success or failure to effort taken towards a task**

With effort attributions, learners attribute their success to the ability to perform a given task successfully and attribute their failures to their lack of effort in a particular task. Consequently, such attributions could result in learner behaviour that is proactive and motivated to put forth more effort to obtain future success or to avoid future failure (see section 1.5.1).

- **The tendency of learners to become motivated**

This theme is based on learners' perceived values, attitudes, feelings and goals towards their learning. Some aspects expressed by learners had the potential to influence their motivation, such as the love for the subject, finding the subject interesting and fun, and their teacher making lessons enjoyable. One learner showed motivation to learn based on the desire to become a doctor. Another learner expressed a tendency to focus and pay attention in learning activities in preparation for the next grade. This shows that this group of learners were intrinsically motivated to learn by other factors that do not involve pursuing learning goals as required from a self-directed learner (see section 2.4).

The themes above depict behaviours associated with both the process and personal SDL elements. From the empirical findings, it is clear that only a few learners were motivated to take responsibility for their own learning, this being a distinct attribute of a self-directed learner (see section 2.2). The literature (Chapter 2) clearly establishes that attributions serve as an important stimulant to motivation, which, in turn, drives learner behaviours (see section 2.4). Therefore, the contributions of teachers' assessment beliefs towards learners' SDL behaviours are discussed based on the motivational consequences arising from the learners' attributions. In doing so, the researcher attempted to answer the question: *What is the influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' self-directed learning behaviour in the Rustenburg area?*

By exploring the motivational consequences of attributions, the empirical research has subsequently led to the recognition of the following learner behaviours which emanated from the situational cues obtained from their teacher's assessment beliefs. These are discussed next.

4.3.3.1 The influence of the belief that assessment improves teaching and learning

From the empirical research findings, the belief that assessment improves teaching and learning is linked to Teacher A, Teacher B, Teacher C and Teacher D. These teachers further believed that the best way of determining learner understanding is through formative assessment practice (see section 4.2.4), such as dialogue with learners, using technology and collecting written work. The feedback obtained from such formative assessments informs learners about their own learning and their progress. Learner LP-B5, who was taught by Teacher B, demonstrated SDL behaviour by evaluating his own work as part of learning.

LP-B5: "By assessing yourself you can see where your weak points are and strong points are so then if the teacher also assess you will get more information on that topic and get better at it."

Evaluating the quality of their learning through formative assessments can influence to what learners attribute their success (Cauley & McMillan, 2010:1). This was demonstrated by learner LP-B4, who was taught by Teacher B, who reported effort attributions, since she recognised that a given task got easier when more effort was made to understand it.

LP-B4: "...it was really hard at first ...but then if you get more understanding about it...you see that it's not that hard..."

Such effort attributions led to learners feeling more in control of learning outcomes. This was also shared by the same learner (LP-B4), who felt the more she read, the more she was in control of her learning.

LP-B4: "I just feel like...I learn more when I read so every time after each lesson I go and read it over and over again and that's how it stays..."

Learners who acquire effort attributions believe they are able to successfully apply strategies and are thus more likely to be motivated to take up more responsibility for their learning (Cauley & McMillan, 2010:2). This is supported by LP-C2, LP-C1 and LP-C4, who were taught by Teacher C, who all reported a tendency to take responsibility for the construction of personal meaning.

LP-C2: "...so every time when I learn, I want to read things for myself...and I understand..."

LP-C1: "I preferred reading a topic before a teacher explains it...because when I read, I gain knowledge and when the teachers read, I understand what I did not understand and I get it better"

LP-C4: "...the topics that we are going to talk about next week, I read it [sic] earlier..."

When learners take up more responsibility for their learning, they are more likely to become more successful in achieving their learning outcomes, which, in turn, leads to increased motivation and involvement (Cauley & McMillan, 2010:2). This is also reflected in the same learners who were taught by Teacher C, who reported more engagement with their learning activities and the subject matter:

LP-C2: "...if I come across something that I don't understand it is then I go to a teacher and ask him or her..."

LP-C1: "...you know as you grow up...we have many myths how the earth was created...the moon is created...so in Natural Science we can prove those myths wrong..."

LP-C4: "I research...I get into research I maybe go to the library and take books for Science...and...I do my own work personally at home...maybe before the lesson..."

Therefore, to ensure an optimal level of motivation, learners need to make facilitated attributions concerning the outcomes of their learning. To this end, more specific principles of classroom assessment require that expectations and intermediate steps for improvement be made visible to learners to enable active involvement in learners' evaluation of their own work (Cauley & McMillan, 2010:4).

4.3.3.2 The influence of the belief that assessment is irrelevant to teaching and learning

From the findings, the belief that assessment is bad for learners is linked to Teacher A, which falls under the category of assessment is irrelevant to teaching and learning. The teacher strongly believed that formal assessments are an enemy of learners.

TPA: "with grade 9 my experiences eeh...the learners their [sic] greatest enemy is the final examination and the formal task..."

Such a belief can provide learners with attribution cues through feedback that has an emotional impact on them, causing them unwarranted worry and anxiety. In the case of LP-A3 and LP-A1, taught by Teacher A, these learners reported levels of anxiety over writing examinations.

LP-A3: "... and it's like its heavy...itjoo [/sighs/] ma'am...exam..."

LP-A1: "[exams] makes us sweat"

These negative emotions can lead to feelings of resentment and great frustrations, which decrease motivation (Brown, 2002:43). This is evident in the case of LP-A3, who was taught by Teacher A, who expressed how she struggled just to study her work.

LP-A3: "...like when I'm studying...I eish...ma'am I feel like....I just open my book and I just look at it...I'll be like ...aaaa I'm tired...then like...like when but no... I'm tired...will be reading things for the sake of studying..."

When learners show a lack of motivation, they are not likely to engage in SDL behaviours like planning, monitoring and evaluating their learning process (see section 2.4). This is evident from the findings, which revealed that all the learners taught by Teacher A did not support the notion of self-evaluations and preferred the teacher to evaluate their work.

4.3.3.3 The influence of the belief that assessment holds learners accountable

From the findings, it is evident that teachers who held the belief that assessment held learners accountable tended to favour summative assessments practices over formative practices, as was the case with Teacher A. Summative assessments promote feedback about current learner achievement and this encourages task-related attributions (Cauley & McMillan, 2010:1). This was evident in learner LP-A3, who was taught by Teacher A, who displayed task-related attributions. This learner believed that the ability to be successful emanates from uncontrollable factors, like the level of difficulty of a given task.

LP-A3: "...when we write class works in NS it's not that difficult...but in exams ma'am...it's more difficult and it's like its heavy..."

Such task attributions promote low expectations for success, as learners believe that they are not in control of outcomes, which results in low levels of motivation (Cauley & McMillan, 2010:1). Low levels in motivation were more prevalent among learners taught by Teacher A, which is depicted in the following quotes:

LP-A4: "...we don't put our full concentration on the studying... 'cause we just like... nah it's just for the test nothing more nothing less."

LP-A5: "When I study NS, I get distracted"

LP-A1: "...that's why most of us fail...we just read for the sake of studying."

These low levels of motivation displayed by the learners negatively impacted the actualisation of meaningful SDL behaviours (see section 2.4). This is evident from the findings, which showed that none of the learners taught by Teacher A expressed capabilities of taking up more responsibility for their own learning.

Vandeyar and Killen (2007:102) state that teachers who hold the belief that assessment holds learners' accountable have a tendency of absolving themselves from the responsibility for learner failure. This is evident from the quotation below.

TPA: "...the problem is exam...no we must face reality...is it fair?...that somebody must go home and read for exam and he comes back and he did not read the exam and he fails exam now I must stand there and explain why this person..."

This tendency of absolving themselves from the responsibility for learner failure seems to suggest that this teacher regarded the success and failures of learners as occurring independently of how he behaved or taught, since he believed that he was not in control of learners' success and failures.

TPA: "...this is a problem and we are not in control of it...because a child has to read at home...if he can't read at home...he cannot be disciplined enough to say I am going to study my work at home...they won't fail..."

Teacher A attributed learner failure to a lack of effort in studying for exams; hence it is not surprising that he viewed exams as learners' greatest enemy. Such type of attributions reinforces the belief that assessments holds learners accountable.

4.3.3.4 The influence of the belief that assessment holds teachers' accountable

From the findings, the belief that assessment holds teachers accountable is linked to Teacher B and Teacher E. In this belief set, the purpose of assessment can be classified as summative as it serves to evaluate teacher effectiveness. Consequences attached to such summative assessment involve high stakes testing for evaluating teachers' and schools' competencies. Consequently, this puts pressure on teachers, who then feel compelled to teach the test content and train students on how to pass tests instead of developing real understanding. However, in the case of these teachers, the summative assessments were serving a different measurement mission than simply indicating how well or bad the teacher was doing. This is evident from their responses, which suggest that the

summative assessment is used to make inferences about the summary effects of instruction at the end performance of the learner for the purpose of promoting further learning and teaching.

TPB: "...so it [common assessments] must be properly set...and the learner should be exposed to those papers so that I for one can see that I'm doing ok my learners know what is expected from them."

TPB: "...you know you have to actually see what the children can do and then how can you improve on it a bit further."

TPE: "The one that is giving me the exact of what is happening in class is when they are writing the formal one, whereby they are sitting alone in their tables."

TPE: "I assess so as to change the...if learners don't understand what I'm doing so as to change the method of teaching."

When teachers use summative assessment to make inferences about learning improvement, unintended messages to learners can be conveyed which can convince them of the teacher's assessment belief. Learner LP-E3, who was taught by Teacher E, made use of her summative results to evaluate her own progress, which led to positive pressure to improve performance.

LP-E3: "...I use to take my reports and look from term 1 to term 2 or term 3 how far I am...for example my marks...I use to take my marks how far I am...If I'm low I start to improve my marks in the class..."

In the case of LP-E3, the summative results encouraged the SDL behavioural processes related to learner self-evaluation, whereas in the case of LP-E4, the summative results encouraged effort-related attributions as the learner attributed her low performance to a lack of effort.

LP-E4: "...when we are writing assessments or formal, the marks become low...when it becomes low, I like [sic] ask myself where did I go wrong...and I start reminding myself like I wasn't focusing on NS too much..."

However, according to Loyens *et al.* (2008:415), the link between assessment practices and SDL lies in the fact that, in an educational setting, where learning is often tuned to summative assessment,

learners come to view assessment and teachers as controlling. Consequently, the responsibility of ownership and self-direction in learning by learners are undermined (Loyens *et al.*, 2008:415). Extending this argument, Mumm *et al.* (2016:787) assert that formative practices are driven out when summative assessment practices are dominant, which inhibits maximum growth and possible development of self-directed learners. Results obtained in this study confirm that summative assessment practices can offer little support in fostering SDL behaviours when such practices are dominant, since they emphasise current learner achievement and may not highlight the importance of the processes, skills and strategies underlying task completion (Schunk, 2012:376). Therefore, the belief that assessment holds teachers' accountable has no place in SDL due to its reliance on summative assessment practices.

In conclusion, by examining the motivational consequences of attributions, this study revealed that teachers' belief that assessment holds learners accountable and assessment is irrelevant to teaching and learning promotes learner behaviours that are at odds with SDL. These learner behaviours include low levels of motivation, lack of engagement in learning activities, frustration and anxiety, and task-related attributions. This is in contrast to the teacher belief that assessment improves teaching and learning, which fosters learner SDL behaviours such as learners displaying their own willingness to take responsibility for learning, displaying an ability to use effective learning strategies, displaying an increased motivation, displaying effort attributions, and engaging in self-evaluations.

The CHAT framework was used to further analyse and interpret the interview data. This is discussed in the subsequent sections.

4.4 ANALYSIS AND INTERPRETATION BASED ON CULTURAL-HISTORICAL ACTIVITY THEORY (CHAT)

4.4.1 Background information

SDL is both a learner characteristic (process and personality perspectives) and a design feature of the learning environment (social context). This section focuses on the role of *social context* in understanding the influences of teachers' assessment beliefs on learners' self-direction. Although the impact of the social context is discussed separately, in practice, the three elements (process, person, and context) overlap and interact with one another during learners' development of SDL behaviours, according to Hiemstra and Brockett's (2012) person-process-context (PPC) model. The inclusion of the social context was achieved by analysing and interpreting the individual interview and focus group interview data by means of third-generation CHAT at an interpersonal level. In this CHAT framework, the activity system is the primary unit of analysis, which comprises the following

sociocultural elements: subject, object, outcomes, tools, rules, community and division of labour (Engeström, 2009).

Table 4.5 gives a brief description of the activity system elements.

Table 4.5: Description of activity system elements (Engeström, 2009; Murphy & Rodriguez-Manzanares, 2008)

Activity system element	Activity system element descriptor
Subject	The “subject” is described as the individual or group of individuals whose viewpoint is adopted; the subject is the protagonist who works towards the achievement of the “object”.
Tools	The tools element is described as mediating artefacts that take part in the transformation of the object into an outcome, which can be desired or unexpected. In the context of this study, assessment was one of the major tools.
Object	The object is described as the problem at which the activity is directed and which is moulded and transformed into “outcomes” with the help of tools.
Rules	Rules are explicit and implicit norms that regulate actions and interactions within the system. In the context of this study, the focus was on “rules” that guide assessment.
Community	The community element refers to the participants of an activity system who share the same object. In the context of this study, the community included learners, teachers, parents, the principal and Department of Education.
Division of labour	The division of labour involves the division of tasks and roles among members of the community and the divisions of power and status.

4.4.2 Presentation of the third-generation activity system elements

To establish the third-generation activity system, two interdependent activity systems were used: teachers’ views on assessment as one activity system, and learners’ experience of assessment in NS as the second activity system. These two activity systems were juxtaposed with a central activity involving assessment as the activity of interest to see if there is any “contradiction of control”, which is depicted in Figure 4.2. The separate activity system elements of the two activity systems were then derived by making casual links from the emerging themes obtained from the individual interview data and focus group interview data (see sections 4.2.3 and 4.3.3) to the activity system elements

descriptors provided by Engeström (2009) and Murphy and Rodriguez-Manzanares (2008:443). After the interview data were read several times, utterances related to the activity system elements descriptors were included. By so doing, the researcher attempted to present the assessment and learning activity system elements emerging from the data as opposed to imposing existing activity system elements taken from previous research.

The two interdependent activity systems (using CHAT on an interpersonal plane) are discussed as follows: a) teachers' beliefs and assessment practices; and b) learners' experiences of assessment in the NS class.

4.4.2.1 Natural Sciences teachers' assessment practices (and beliefs) as activity system

The *subject* involved in the assessment activity system were the grade 9 NS teachers. The *object* of teachers' assessment practices was established from the interview data and it involved assessing learners for the following central purposes: a) improvement of teaching and learning; b) accountability of learners; c) accountability of teachers; and d) irrelevance of assessment to teaching and learning (see section 4.2.4).

The *tools* used by this group of teachers to achieve their assessment objectives were extracted from the interview data and included the following: dialogue with learners; informal class test; formal class test; examinations; common assessments; and collection of written work in the form of classwork and homework (see section 4.2.4).

The *rules* that informed this group of teachers' assessment practices included the CAPS policy, school assessment programme, Bloom's taxonomy, pace setters, and classroom rules. The rules were noted in the following quotes:

TPA: "...isn't that we are teaching according to the policy, so the exam also is based on the policy on the topics that have been taught..."

TPE: "...they know that on Friday, we write assessments every Friday...we teach for four days and then the fifth day is assessments."

TPA: "...we give them like, maybe, for an example, according to the Bloom's taxonomy [sic]..."

TPD: "...the way this content that we must cover is too much..."

TPB: "... so discipline can be an issue in the class..."

The *community* that negotiates and mediates the rules and customs in this activity system includes the environment in which the school is situated, parents, other teachers, departmental officials, the principal, and the classroom environment. The community is clear in the following quotes:

TPA: "...but I want to tell you that the environment also where the school is [sic]...and where the learners live..."

TPB: "...we normally have parent meetings termly..."

TPA: "...this year they were taught by a particular teacher...they are adapted to that teaching style..."

TPC: "...problem is that we don't go to the workshops where they workshop us to [sic], you know."

TPE: "...in overcrowded classes ..."

The *division of labour* amongst this group of teachers ranged from being assessors of learning, facilitating learner understanding, and being a reflective practitioner. This is illustrated with the following quotes:

TPA: "...you can come up with all different strategies of assessment of assessing them..."

TPC: "...it's just to check how much learners know and understand."

TPB: "...the learner should be exposed to those papers so that I, for one, can see that I'm doing ok..."

4.4.2.2 Learners' experiences of assessment in the Natural Sciences class as activity system

The *subject* in the learning activity system were the grade 9 learners. The *object* of this group of learners' learning approaches centred around obtaining good grades, passing to the next grade and being career driven. This is illustrated with the following quotes:

LP-E4: "...I must like try to improve my levels of Natural Science."

LP-D1: "...I know grade 9 is a very challenging grade...so many learners must work very hard...to go to the next grade."

LP-B1: "I always read stuff about NS because when I grow up, I want to do...I want to be a doctor..."

The *tools* used to achieve their objectives corresponded with activities established within the learning strategies theme (see section 4.3.3). From the findings of the focus group interviews, it was found that the majority of learners made use of tools accustomed to the reproduction of surface learning approaches, and few learners made use of deep transforming learning approaches (see section 4.3.3).

The *rules* that informed this group of learners' learning strategies included classroom rules and the tenets of the nature of science. This is illustrated with the following learner quotes.

LP-A1: "...to cooperate in class and respect the NS teacher."

LP-C1: "...so in Natural Science, we can prove those myths wrong..."

LP-B2: "...so Natural Sciences has all those branches that introduce or tells [sic]..."

The *community* involved in this group of learners' activity system included fellow classmates, teachers and parents. This is illustrated with the following quotes:

LP-B2: "...it's good if you work with someone else like your classmates so that you can understand each other."

LP-D2: "...you can ask your teachers for help if you don't understand..."

LP-E5: "...my mom is always helping me..."

The *division of labour* amongst this group of learners included learners being self-directed in their learning; learners making sense of ideas and the real world; learners being reflective and assessors of their own learning. This is illustrated with the following quotes:

LP-E5: "... I use my phone to research, and it gives me more information one that's even not [sic] in the notes and the textbook."

LP-E4: "...for example, my class works I use to take them and compare them how I'm I understanding [sic]..."

LP-D2: "...on my phone I have the learning application to help me that's how I assess myself."

LP-C2: "...so in Natural Science we can prove those myths wrong..."

In the third-generation CHAT framework, Engeström (2001) expanded CHAT to include a networking of interacting systems with shared objectives resulting in a potentially shared *outcome*. Applying this explanation, the potentially shared outcome of NS teachers' assessment activity system and the grade 9 learners' learning activity system is getting learners ready for the next grade. This is evident from the following teacher and learner quotes:

TPC: "...to check whether they ready for the next grade by that assessment."

TPB: "...assessment basically...it's as I said it's coached a lot more for this group of learners to try and let them progress into the next grade..."

LP-D2: "...in class we pay more attention to her, listen to what she say [sic] so that it would be easier when we get to the next grade."

LP-B4: "...and getting to process that information and getting educated and then getting to pass."

The next section deals with tensions and contradictions that are salient in the interacting networks involving the assessment and learning activity systems.

4.4.3 Interpretations arising from the third-generation CHAT framework

The interpretations arising from the third-generation CHAT framework were achieved by examining contradictions, intentionality and the relationships among and between the learning activity system and assessment activity system elements. In order to depict these levels of contradictions, the researcher employed an activity triangle in conjunction with the identified activity system elements (see section 4.4.2). The figure is drawn based on third-generation CHAT, as developed by Mentz and De Beer (2017), based on the work of Engeström (2009).

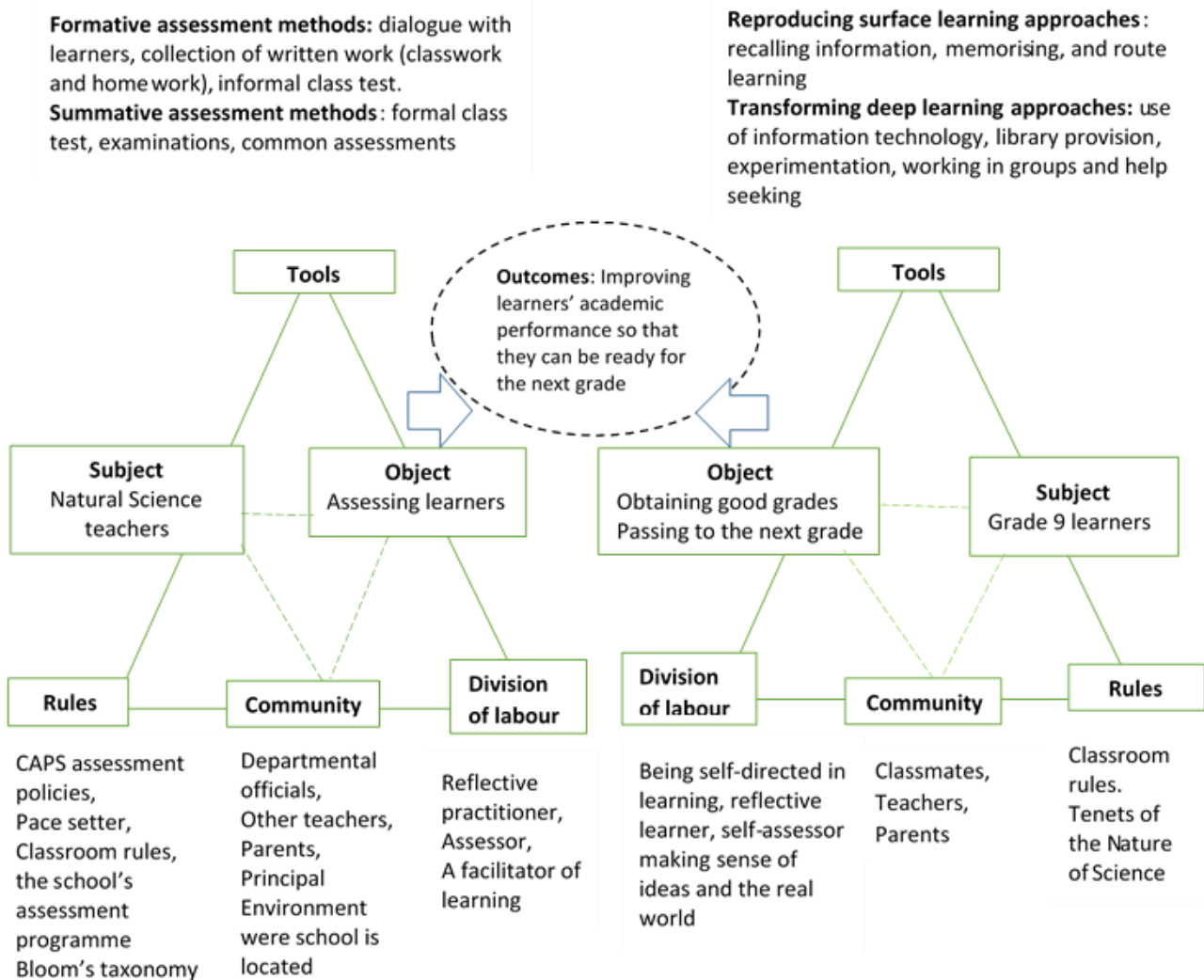


Figure 4.2: Third-generation CHAT on an interpersonal plane (based on Mentz & De Beer, 2017)

Figure 4.2 depicts the activity system elements involved when analysing the third-generation CHAT framework of teachers' and learners' activity systems. By utilising the third-generation CHAT framework at an interpersonal level, the study sought to understand the social context, namely what people do in a context, interpersonal relationships and the physical context. The discussion unfolds through identifying tensions, contradictions and "deviant cases" within and between activity systems elements in conjunction with the SDL environmental design features established in the literature Chapter 2 (see sections 2.2.1 and 2.2.5).

- A contradiction existed between the *outcome* of the activity systems and the *division of labour* in regard to the learners' role of being self-directed.

The outcome of preparing learners to pass summative assessment opportunities (examinations) is not compatible with learners' developing identities as self-directed learners. To effectively address this role of learners being self-directed, the outcome for formal education should be centred on equipping learners with the cognitive abilities, self-regulatory capabilities and self-beliefs to educate themselves throughout their lifetime (Anthony, 2015:18).

- A contradiction existed between the *object* in regard to learners obtaining good grades and the *division of labour* in regard to the learners' role of being self-directed.

When the learners' objective centres around obtaining good grades, it does not necessitate the development of cognitive processes like monitoring and planning their learning process as required from a self-directed learner (see section 2.2.5). The SDL design feature in regard to the object entails that learners should see their tasks as objectives so that they can apply standards that define quality work in NS (Du Toit-Brits, 2015:40). This would necessitate the development of learners' cognitive abilities. In addition to developing cognitive abilities, setting tasks as goals can foster important dispositions (affective outcomes), such as learners' willingness to persist in trying to solve challenging problems and their identities as capable learners (Shepard, 2000:43).

- A contradiction existed between the *tools* of the assessment activity systems and the *division of labour* in regard to learners' role of being self-assessor in the learning activity system.

Findings from the individual interviews revealed that teachers were not using teaching methods that allowed learners' to naturally seek feedback and critique their own work as part of learning through tools like self-assessment (see section 4.2.4). This finding is also supported by evidence obtained from the learner focus group interviews, which revealed that the majority of learners were not aware of the important supporting role of assessments towards improving their learning as most of the learners were not in support of the idea of assessing their own work (see section 4.3.4).

- A contradiction existed between the *tools* within the assessment activity system and the *rules* in regard to the CAPS policy.

The Natural Sciences CAPS framework, which is being used by this group of teachers, provides a clear and detailed overview of the content and skills to be taught, which revolves around three specific aims (Department of Basic education, 2012). These specific aims are focused on developing the cognitive, affective and psychomotor domains. However, the findings from the individual interviews revealed that teachers' formative practices were centred on coaching and preparing learners for examinations through tools such as classwork, homework and informal testing (see section 4.2.4). These tools focus on lower cognitive outcomes as opposed to tools like guided discovery and scientific inquiry that focus on higher cognitive outcomes. However, tools that focus on higher cognitive outcomes did not feature in the teachers' responses (see section 4.2.4). There is also a vacuum in terms of teaching for and assessment of affective outcomes.

- A contradiction existed between the *division of labour* in regard to teachers' role as a facilitator of understanding in the assessment activity system and the *subject* in the learning activity system.

When examining learners' responses, it was clear that the learning communities were characterised by teacher-centred approaches in which learners were passively receiving information provided by their teacher. This was the case of learners taught by Teacher A, Teacher D, Teacher B and Teacher E. Such an approach to teaching does not facilitate learner understanding of thinking and reasoning processes but necessitates mere recall of information. The claim that teachers employ mainly teacher-centred approaches can be further supported by considering the learners' responses who were taught by Teacher E.

LP-E3: "...when Miss TPE write the notes in the chalk board, I take them to my notebook."

LP-E1: "...she shows us that if she's talking about the digestive system, she draws it on the board and then she labels it...that's how I understand my topics."

LP-E2: "What makes me to understand all the topics in natural Science is ma'am TPE always try to make us learners to understand by showing things on chalk board so that we can all understand..."

LP-E5: "...helps me understand the topics that ma'am gives us is that whenever

we start a new topic, she will write notes on the black board and also makes examples about things in real life...”

It was not surprising that some of the learners displayed more reproducing surface learning approaches as their tools for learning the information were passively acquired from their teacher.

LP-E1: “I get home I open my textbook that she gave us and read it again so that I can understand the topic.”

LP-E2: “When ma’am TPE gave us some home works I do my home works and she wrote some notes on the board and then we re-write them in our books so that we can study at home....”

LP-E3: “I take lots off my time practising and studying Natural Science so that I can understand well...”

- A contradiction existed between the *subject* in the learning activity system and the *tools* in the assessment activity systems.

The tools that were mainly used by teachers focused on lower cognitive outcomes. Such tools fail to cognitively stimulate learners. Consequently, such tools may contribute to the learners’ lack of cooperation and poor engagement in class as the evidence from learners’ responses revealed that NS lessons were characterised by learners’ being noisy in class and not respecting their teacher.

- A contradiction existed between the *tools* and the *division of labour* in regard to learners being self-directed within the learning activity system.

It is necessary that learners employ deep transforming learning approaches in order to develop thinking and reasoning skills that would enable them to take up more responsibility for their learning and make sense of ideas and the real world (see section 2.2.5). However, when examining the data, it was found that most learners made use of basic reproducing surface learning approaches (see section 4.3.4). For learners to use deep transforming learning approaches depends upon the nature of tasks given to them, as well as the level of control over learning given to them. In addition, for learners to plan and perform investigations and solve problems that need practical ability, they require well-equipped learning environments. Teacher D reported that there was lack of resources in their school, which was an obstacle for teaching and learning. Furthermore, Teacher C, Teacher D and Teacher E reported that large classroom sizes hampered their classroom interactions. The

lack of resources compelled Teacher D to teach in ways that best suited her circumstance, leading to learners' having limited opportunities to learn. This is illustrated with the following quote:

TPD: "...so we don't have those things the opportunity to really go more practical and then when we do have practical's there are more like demonstrations...so I will be demonstrating I'd get one or two to kind of touch the apparatus but I feel like that's still not enough..."

- A contradiction existed between the *object* of assessing learners' in the assessment activity system and the *rules* in regard to the nature of Science in the learning activity system.

Examining Teacher A's response, it became clear that his assessment practices in NS leaned towards assessing knowledge learned through practising, drilling and memorisation.

TPA: "...assessing them with formal assessment it becomes a real problem because they can't memorize...they cannot recall information...eeh...they cannot...their memory is so poor to grasp the information..."

This approach to assessment revealed the teacher's perception of the nature of Science, which he regarded as constituting of factual knowledge that could be broken into disconnected facts and skills that could be learned through practising, drilling and memorisation. This is in direct contrast with the tenets of the nature of science, which assumes that science knowledge is distributed among people, therefore learning involves learners building their own understanding through collaboration with peers, experimentations and making sense of science ideas and the real world (Bartos & Lederman, 2014). The SDL design feature in regard to the nature of science would therefore require that, social skills – like understanding other people's point of view, relating one's own position to those of others and working productively – be promoted together (Du Toit-Brits, 2015:40).

- A contradiction existed between the *rules* of Bloom's taxonomy and the *object* of assessing learners within the assessment activity system.

Examining Teacher A's responses, it became clear that the teacher's classroom instruction emphasised structured drill and practise of factual knowledge as he put focus on teaching different levels of cognitive complexities as a way of building up to higher cognitive levels. This is evident in the following quotes:

TPA: "...we are teaching according to the Blooms taxonomy according to the

levels we give them multiple choice questions...”

TPA: “...you see now I wrote corrections there...I give them homework...I’m writing corrections...some came they did not do the homework...and this activity is building...it’s another cognitive...I am exercising another cognitive level in them if they don’t do that...now tomorrow I am moving on to another cognitive level that they missed this one...”

However, Teacher A’s approach to teaching is considered as an ineffective approach to teaching, since the cognitive perspective regards meaningful learning as reflective, self-regulated and constructive (Dietel, Herman & Knuth, 1991:3). Therefore, learning isolated facts and skills is regarded as being more difficult without ways to organise the information and make it easier to remember in preparation for assessment (Dietel *et al.*, 1991:4).

- A contradiction existed between the *subject* (grade 9 learners’) and the *object* regarding obtaining good grades within the learning activity system.

Most of the learners in School A showed a tendency to procrastinate and a low motivation to engage in studying (see section 4.3.4). This works against the learners achieving their set objective of obtaining good grades and passing to the next grade. According to Fitzgerald (2013), if learners do not find science motivational, they are not likely to engage with science related activities. This seems to suggest that Teachers A’s perceptions and approaches towards the nature of science failed to motivate learners to engage with the NS subject matter.

- Tensions existed between the *subject* (grade 9 learners’) and the *community* in terms of the social learning environment within the learning activity system.

School B as a *community* in the assessment activity system decided to group the grade 9 learners (the *subjects* in the learning activity system) according to marks. This grouping was done for the low-performing learners to receive differential instruction for the purpose of helping them improve their performance.

TPB: “...but this year we decided that we gonna take out the weaker learners and put them into one class so that we can basically move much further and better like other classes and the weaker class we wanted to help them cope...”

This grouping led to an unintended consequence that gave rise to a classroom setting characterised by learners having identities as low achievers, which could have influenced their engagement and interpersonal relationships in class. This is illustrated with the following quote:

LP-B2: "...there is a problem because I can't ask Madam TPB ...because sometimes I feel scared to ask her cause some people they say NS is easy and it will look stupid if you ask and that staff...so I don't usually ask her...I just do it for myself..."

The above response is an indication of how the learner's perceptions of being a weaker learner influences the level of engagement that learners are willing to put in as they are unable to seek help from the teacher out of fear of being labelled or seen as a weaker learner by his or her peers. It also questions the predominant focus on examination-driven practices in our schools, instead of focusing on 21st-century skills development and enhancing SDL.

- Tensions existed between the *rules* in regard to the pace setter and the *object* of assessing learners within the assessment activity system.

Teacher D's response indicates that the NS syllabus was too much for the grade 9 learners. This resulted in the teacher conveying basic cognitive skills like knowledge and comprehension as opposed to higher level-thinking skills like analysis, evaluation and synthesis.

TPD: "...when are you going to analyse stuff, when are you going to apply stuff, when are you going to solve a problem using...there is not a lot of time...there's just too many things..."

In conclusion, the analysis based on the CHAT framework centred on the importance of social aspects of learning. From the above interpretations, it became clear as to how the features of the social context impacts on the level of opportunities given to learners to develop SDL capabilities. There is no "contradiction of control" (McNeil, 2013) in the envisaged objects of respectively the teachers (teaching and assessing with the aim that learners should perform well in examinations) and the learners (wanting to obtain good marks in assessment opportunities). The contradiction of control would emerge if one would juxtapose the assessment practices in the NS classroom with the guidelines of the CAPS curriculum. Implicit in the CAPS document is a focus on the development of 21st-century skills, higher-order cognitive skills and affective outcome aspects, which are often marginalised in assessment practices in the NS classroom.

4.5 CHAPTER SUMMARY

This chapter was guided by the two secondary research questions (see section 4.1). The qualitative data – obtained by means of individual interviews and focus group interviews – were presented, analysed and interpreted. This was achieved by using inductive content analysis and the CHAT framework. The results revealed that the focus on teaching and assessing learners in the NS classroom provides learners with limited opportunities to develop SDL behaviours; this is largely due to the focus on preparing learners to pass their examinations. In the next chapter, the final findings of the research are discussed and recommendations, based on the findings, are made.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The purpose of this study was to investigate how Natural Sciences (NS) teachers' assessment beliefs influence learners' SDL behaviours. In addition, secondary research questions were formulated (see section 1.3.2). These were addressed by means of a literature and empirical study.

Firstly, a brief overview of the study is provided, whereafter a detailed summary of the research findings is presented. Next, recommendations are made. The limitations and contributions of this research are also discussed, and suggestions are made for further research.

5.2 AN OVERVIEW OF THE STUDY

This section presents a synopsis of the study against the background of the purpose and the objectives of the study.

5.2.1 Chapter 1

The aim of this chapter was to provide an orientation to the study. The study was justified based on the interest in identifying factors that influence SDL, since literature has shown a positive correlation between SDL and learner academic achievement. This study therefore sought to explore how grade 9 NS teachers' assessment beliefs influence learners' SDL behaviours. An outline of the research methodology was provided, after which the significance of the study and possible contributions were discussed. This was followed by the limitations and possible challenges of the study.

5.2.2 Chapter 2

Two secondary research questions, based on a literature study, guided the discussion in this chapter:

- *How is self-directed learning behaviour defined and described in the literature?*
- *How is the concept of beliefs defined and characterised in the literature within the context of assessment?*

The discussion commenced with a conceptualisation of SDL, followed by the learning theories associated with SDL. Thereafter, the concept of beliefs was defined within the context of

assessment, after which teachers' assessment beliefs were discussed. Teachers' assessment beliefs were further related and linked to learners' SDL by drawing on Weiner's (2000) interpersonal theory of motivation. The rest of the chapter was devoted to discussing the theoretical insights into CHAT and concluded with a chapter summary.

5.2.3 Chapter 3

Chapter 3 provided an overview of the empirical study regarding the processes and procedures that were followed to collect evidence so as to answer the following two secondary research questions:

- *What are the assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area?*
- *What is the influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' self-directed learning behaviour in the Rustenburg area?*

The study was founded on a qualitative research design and a multiple case study as strategy of inquiry. A detailed discussion on the data collection methods was provided. This was followed by expounding on the ethical considerations that guided the research. A brief discussion on the data analysis procedure and interpretation was presented. Thereafter, a more elaborate discussion on the use of CHAT as a research lens for data analysis and interpretation was provided.

5.2.4 Chapter 4

Based on the empirical processes and procedures outlined in Chapter 3, Chapter 4 focused on the analysis and interpretation of the collected data in order to address the primary research question: *How do grade 9 Natural Sciences teachers' assessment beliefs influence learners' self-directed learning behaviour in the Rustenburg area?*

The last two secondary research questions were infused with the primary question (see section 5.2.3).

A detailed discussion was provided on the analysis and interpretation of data obtained by means of inductive content analysis. Next, the individual interview data and focus group interview data were analysed and interpreted based on the CHAT framework. This was intended to provide a more explicit understanding of the tensions and contradictions eminent in the assessment and learning activity system. Knowing the source of the tensions and contradictions is important because it provides traces of critical social resources and indirect relationships that influence teachers' assessment practices and learners' SDL behaviours that might not otherwise have been considered.

5.3 CONCLUSIONS

The overall aim of this study was to gain an understanding of how grade 9 NS teachers' assessment beliefs influence learners' SDL behaviours in schools in the Rustenburg area. To answer the aim, the researcher identified the following objectives:

- to clarify how the concept of beliefs is defined and characterised in the literature within the context of assessment;
- to explain how self-directed learning behaviour is defined and described in the literature;
- to establish the assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area;
- to determine the influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' self-directed learning behaviour in the Rustenburg area.

The findings of each objective are discussed below. Additional findings emanating from CHAT are also included.

5.3.1 Defining and characterising the concept of beliefs within the context of assessment

The concept of beliefs was defined as an integration of knowledge and feelings built up largely through experience (see section 2.3.1). Within the context of assessment, the concept of *assessment belief* is used synonymously with the concept of *assessment conceptions*, which is described as mental structures encompassing beliefs about, knowledge about and affect for assessment (Thompson, 1992). These assessment beliefs were categorised into four main assessment beliefs systems (see section 2.3.2), namely: a) assessment improves teaching and learning; b) assessment holds learners accountable; c) assessment holds schools and teachers accountable; and d) assessment is irrelevant for teaching and learning (Brown 2002). Each of these assessment beliefs were briefly elaborated on in Chapter 2 (see section 2.3.2). These assessment belief systems were regarded as being shaped and influenced by socio-cultural factors developed from previous experiences (see section 2.3.3). For instance, the pre-apartheid education system emphasised content conformity and high stakes summative assessment (see section 2.5.2), which reinforced the belief that assessment is about learner and school accountability (see section 2.5.4). Other factors influencing teacher assessment beliefs were highlighted, such as teachers' understanding of the subject content; the underlying philosophical values about learners' abilities and the perceptions of what the community expects; contextual factors; curriculum guidelines and departmental policies; and multicultural and multilingual classrooms (see section 2.3.3).

5.3.2 Defining and describing self-directed learning behaviour

The aim of the literature study was to provide a theoretical framework to define and describe SDL behaviours, and to achieve this goal, the theoretical framework was organised based on various researchers' contributions of SDL models (see section 2.2.2). From the theoretical framework (see Figure 2.1), the attributes of a successful self-directed learner, who possesses the person and process characteristics of SDL, situated within a conducive SDL environment, were drawn (see section 2.2.2). SDL behaviours were defined as behaviours reflecting SDL skills and were described and characterised within the process and person elements of SDL (see section 2.2.3). The SDL behaviours were presented in Table 2.1 and they served as behavioural indexes that can be used as a way of elucidating, observing or determining SDL within the school context (see section 2.2.3). Further evidence from the literature showed that learner SDL behaviours could be fostered by considering the interconnected domain-specific components of SDL (see section 2.2.5), which can be activated through process-oriented teaching (see section 2.2.1). This implies that teachers should have a thorough understanding of these SDL domain-specific components as well as what process-oriented teaching entails in order to effectively foster SDL behaviours within the context of assessment.

5.3.3 Assessment beliefs of grade 9 Natural Sciences teachers in the Rustenburg area

Most of the NS teachers believed that assessment was to improve teaching and learning and holding learners accountable for learning (see section 4.2.3). Another assessment belief held by this group of teachers was accountability of teachers. Only one teacher held the belief that assessment was irrelevant to teaching and learning. The pattern of beliefs obtained from this empirical study showed that teachers held multiple beliefs and, at times, contradictory beliefs, which can be attributed to the fact that assessment serves multiple purposes. For instance, seven major purposes of assessment were abstracted from the interview data, namely: a) assessment for improving learning; b) assessment for improving teaching; c) assessment for certification of learners; d) assessment for certification of learning; e) assessment provides insight into teacher effectiveness; f) assessment has a negative impact on learners; and g) assessment has little impact on teaching and learning.

From the literature study, it was established that teachers' assessment beliefs are critical in understanding a teacher's assessment practice (see section 2.3.2). The empirical results showed that the belief that assessment was for improvement of teaching and learning was positively related to formative assessments. The teachers' responses indicated that they wanted to assess learners' understanding through oral questioning, collection of written work, hands-on activities and using technology. However, most teachers showed a tendency for examination-driven

practices. It was further revealed that teachers' assessment practices put emphasis on assessing the cognitive knowledge domain only, while the affective domain was not considered. This finding suggests that more needs to be done to convince teachers of the benefits of assessing the affective outcomes, which links up with the educational aims of producing learners who not only have knowledge but also skills, attitudes and values to be competent, responsible thinking citizens (Van Rooyen & De Beer, 2010:12). Also, the tenets of the NS and the syntactical nature of Science should be assessed.

5.3.4 The influence of grade 9 Natural Sciences teachers' assessment beliefs on learners' SDL behaviours in the Rustenburg area

Chapter 2 established that, through understanding the motivational consequences of attributions, it is possible to understand the implications teachers' assessment beliefs have on learners' SDL behaviours (see section 2.4). The link between teachers' assessment beliefs and learners' SDL was explained through Weiner's (2000) interpersonal theory of motivation (see section 2.4). This theory established that assessment beliefs that promote summative assessment practices encourage learner dependency and superficial understanding and fail to encourage reflection and self-direction (see section 2.4), while SDL behaviours are encouraged by assessment beliefs that promote formative assessment practices. The findings revealed that the belief that assessment improves teaching and learning has shown to have a positive impact on learners' SDL behaviours (see section 4.3.4.1), while the assessment belief of holding learners accountable and irrelevance of assessment to teaching and learning impede the development of learners' SDL behaviours (see sections 4.3.4.3 and 4.3.4.2).

SDL behaviours that were supported by the improvement of the teaching and learning assessment belief were: a willingness to take responsibility for learning; ability to use effective learning strategies; show increased motivation; showing effort attributions; and engaging in self-evaluations. The belief that assessment holds learners' accountable and is irrelevant to teaching and learning has shown to influence the following learner behaviours: low levels of motivation; strong dependency for teachers to evaluate their work; lack of engagement with learning activities; frustration and anxiety; and task-related attributions.

Although the assessment belief of holding teachers accountable encourages SDL behaviours associated with effort attributions and self-evaluations amongst learners, it is at odds with this study's standpoint that SDL, assessment as well as teaching and learning are integrated (see section 4.3.4.4). The results revealed that this belief set emphasises the use of summative assessments, which leads to classroom cultures in which learners focus more on performing well on the test as an end separate from real learning, instead of learners and teachers focusing on formative assessments to identify individualised learning needs. It is agreed upon in literature that

such a focus on formative assessments would help learners understand better and improve on their learning (Black & Wiliam, 1998).

5.3.5 Findings emanating from third-generation CHAT

In reviewing literature, it came apparent that CHAT can provide a useful lens for understanding the learning context in the study of learners' SDL behaviours and assessment beliefs. Considering that teachers' assessment beliefs are unlikely to be immune from the influences of the system in which they work (see section 2.3.3), the empirical research has led to the recognition of the following factors that impede learners' SDL:

5.3.5.1 Emphasis by teachers was on preparing learners for examinations

The outcome of teachers' assessment and learners' learning does not take precedence over the importance of SDL. The findings revealed that teachers' assessments were not focused on developing 21st-century skills to cope in a complex society (see section 4.4.3) but rather on preparing learners to pass their exams. Furthermore, the findings revealed that assessment was considered in terms of the cognitive domain with no consideration for the affective or psychomotor domains (see section 4.2.3). This results in most learners showing a lack of motivation due to the absence of positive values, like interest, which develop as result of affective domain outcomes (see section 4.3.4).

5.3.5.2 Emphasis by learners was on obtaining good grades

The learners' *object* of learning, i.e. being able to obtain good grades, was congruent with that of teachers, i.e. focusing on preparing learners for examinations (see section 4.4.3). Other learner objectives for learning were driven by career goals, which seemed to have an impact on their ability to motivate themselves to engage in the learning processes (see section 4.3.4). This conceptualisation is contrary to the more conventional notion that learners should see their tasks as objectives so as to develop cognitive processes like monitoring and planning their learning process as required from a self-directed learner (see section 2.2.5). The findings revealed that learners put more emphasis on recall and memorisation (see section 4.3.4), which are low-order cognitive skills and do not form part of a meaningful SDL approach.

5.3.5.3 Absence of assessment tools like self- and peer-assessment

The tools used by teachers to assess learners did not include assessment tools like self- and peer-assessments (see section 4.2.3). If learners need to be authors of their own understanding and assessors of their own learning, then self- and peer-assessments need to be incorporated

(Atjonen, 2014; McMillan & Hearn, 2008). This implies that extensive efforts must be made to raise awareness of the important role that self- and peer-assessment has in fostering SDL. Evidence from literature reveals that self- and peer-assessment promote SDL (see section 2.2.4). Studies by McMillan and Hearn (2008) provide a detailed account on how to implement self-assessment practices that are conducive for the optimal development of learners' SDL skills.

5.3.5.4 Dominance of teacher-centred approaches

When examining the division of labour amongst learners and teachers, it was evident that teachers did not engage with SDL in the learning environment as they relied heavily on teacher-centred approaches (see section 4.4.3). Evidence from the findings revealed that such teaching approaches led to most learners' classroom social skills being characterised by learners as being passive listeners (see section 4.3.4), which does not reflect a meaningful approach to SDL. However, interesting to note is how the learners' social skills reflected affective outcomes – such as expressing one's feelings and cooperation in class – which were missing from the teachers' interview data. This finding implies that consideration should be given to understanding the type of connections learners make from their learning environment. This information can be of great interest towards designing learning environments that enhance SDL.

5.3.5.5 Threatening learning environments

The findings revealed that grouping low-performing learners to receive differential instruction for the purpose of helping them improve their performance has limited effectiveness in supporting meaningful classroom engagement. It was learned from the empirical study that such a grouping leads to a threatening learning environment as a learner was not free to ask questions in class (see section 4.4.3). In order for SDL to thrive in classrooms, the learning environment must change into a supportive and a non-threatening environment because teaching and learning are deeply embedded in interpersonal processes (see section 2.2.1).

5.3.5.6 Contextual factors that hinder learning

Teachers reported the following factors as barriers that impacted on teaching, learning and assessment routines within the learning community: large classroom sizes; learner discipline issues; syllabus coverage; inadequate parental involvement; poor learner engagement; and lack of resources (see section 4.4.3). The insights gained from this study revealed that such factors compel teachers to teach in ways that best suit their circumstances (see section 4.4.3), which leads to a watering down of the prescribed syllabus and emphasising minimum competencies that provide learners with limited opportunities to learn.

5.3.5.7 Inadequate implementation of the assessment policy

When considering the social aspect of rules, it was revealed that the goals of CAPS have not materialised in NS classrooms, especially when it comes to the development of 21st-century skills, high-order cognitive thinking and affective outcomes (Department of Basic Education, 2011:4). Teachers do not focus on encouraging an active and critical approach to learning but focus on rote and uncritical learning of given truths instead (see section 4.4.3). The evidence obtained from learners' responses revealed that such approaches to teaching science not only fails to promote the development of thinking and reasoning processes but necessitates mere recall of information (see section 4.4.3). In addition, the lack of teachers' consideration for affective learning outcomes results in learners' not developing positive values and interest towards engaging in their NS activities (see section 4.3.4). This finding suggests that teachers still struggle to meet the demands of the assessment policy and thus would continue to be ineffective in supporting SDL behaviours. Thus, a challenge lies in how best to assist teachers to implement the assessment policy.

5.3.6 Final conclusions arising from the literature study and the empirical study

Figure 5.1 below aims to provide a brief overview of the contributions made by the literature and empirical study by drawing on key constructs that formed this study's line of inquiry, namely teachers' assessment beliefs, learners' SDL, and the NS subject.

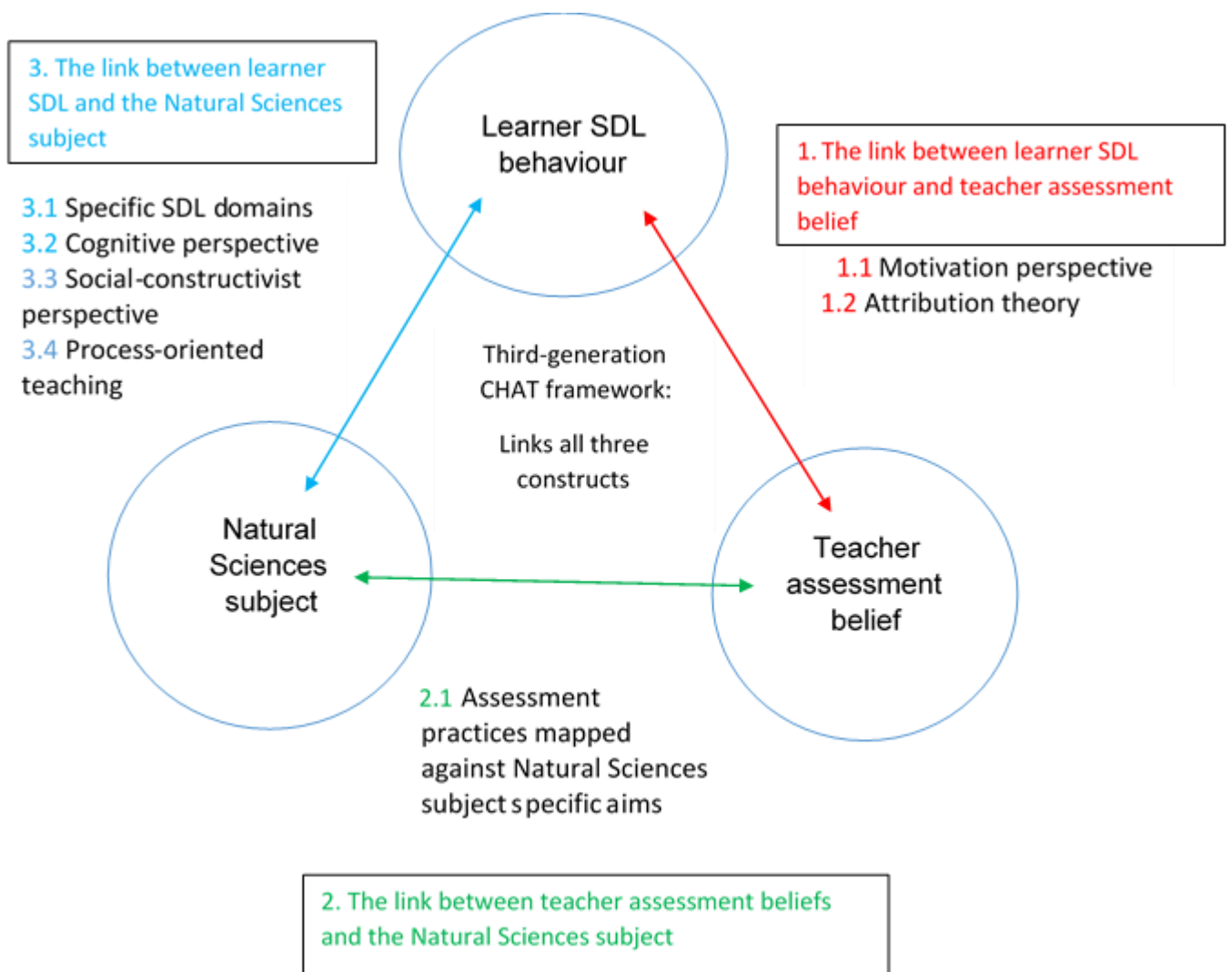


Figure 5.1: Theoretical-conceptual framework derived from the literature and empirical study

Source: Author's own

Figure 5.1 illustrates the researcher's own depiction of the theoretical-conceptual framework derived from the literature and empirical study. The figure depicts three key constructs (placed in circles) that are connected to each other (by means of arrows to show the interconnected relationships between them). The overall summary of the contributions obtained from this study unfolds by considering the links between these interconnected key constructs.

5.3.6.1 The link between learner SDL behaviours and teacher assessment beliefs

The educational goals stipulated by the Natural Sciences CAPS aim to ensure that learners can (Department of Basic Education, 2011:5):

- identify and solve problems and make decisions using critical and creative thinking;
- work effectively as individuals and together with others as members of a team;

- organise and manage themselves and their activities responsibly and effectively;
- collect, analyse, organise and critically evaluate information;
- communicate effectively using visual, symbolic and/or language skills in various modes;
- use science and technology effectively and critically showing responsibility towards the environment and the health of others; and
- demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

In studying the literature, it was discovered that the advancement of the above-mentioned educational outcomes can be actualised through SDL (Harrison *et al.*, 2015; Louws *et al.*, 2017:172; Saks & Leijen, 2014:190). According to Williamson (2007:67), teachers can have a strong influence in initiating processes that can encourage SDL behaviours; of particular interest to this study was uncovering how teachers' assessment beliefs influence learner SDL behaviours. The link between assessment beliefs and learner SDL behaviours was conceptualised from a motivational perspective based on the attribution theory (see section 2.4). The empirical findings confirmed that the belief that assessment improves teaching and learning has shown to have positive impact on learner SDL behaviours (see section 4.3.4.1). Conversely, specific assessment beliefs that have a negative outcome on SDL behaviours have been identified. This finding contributes to the body of knowledge on SDL as this line of inquiry is unexplored. This implies that future studies on SDL should be cognisant of the assessment beliefs that have shaped teachers' classrooms assessment practice if the intention is to foster more deep-rooted changes.

5.3.6.2 The link between teacher assessment beliefs and the Natural Sciences subject

In the light of compelling evidence from the literature that beliefs influence practice (Barnes *et al.*, 2015:254; Chien *et al.*, 2014:198; Uysal & Bardakci, 2014:1), the findings from the literature established that different teacher assessment beliefs can give rise to varying assessment practices associated with either the pedagogical role or the administrative role of assessment (see section 2.3.2). The link between assessment beliefs and the NS subject was obtained from the empirical findings, which revealed that summative assessment practices still dominate in NS classrooms (see section 4.2.3), even in this present era of new advancement in information, communications and understanding of the benefits of formative assessment practices. Further evidence from the findings showed that teachers' assessment practices are shaped by their individualistic beliefs about how learners learn, perceptions of the nature of science, beliefs about learners, and how they attribute the success and failures of the learners they teach (see sections 4.2.3, 4.3.4, and 4.4.3). This finding contributes towards the body of knowledge on assessment literature. This information on specific factors that shape teachers' assessment beliefs is of great

importance when trying to develop teacher professional development programmes that seek to change negative assessment belief systems.

5.3.6.3 The link between learner SDL behaviours and the Natural Sciences subject

The literature chapter established that enacting teaching and assessment practices that can enhance SDL behaviours in classrooms require process-oriented teaching, which is believed to facilitate self-regulated learning (Smerdon, Burkam & Lee, 1999). Process-oriented teaching is embedded in the social-constructivist perspective and the cognitive perspective (see section 2.2.1). The model of SDL domain-specific components by Du Toit-Brits (2015) revealed ways in which learners' SDL behaviours can be cultivated (see section 2.2.5). The empirical findings revealed that only a few learners displayed SDL behaviours, whereas teachers relied heavily on teacher-centred approaches (see section 4.3.4). Noteworthy, and in line with the aforementioned finding, some learners displayed social skills associated with the affective outcomes despite teachers' teaching and assessment practices only emphasising cognitive outcomes (see section 4.3.4). This finding confirms that learners can develop SDL behaviours from the situational cues obtained from their learning environment. This has implications on future SDL studies which need to explore the kinds of connections learners make from their learning environment that promote SDL behaviours. Such studies offer the promise of discovering ways of designing learning environments that can facilitate the development of learners' SDL behaviours.

5.3.6.4 The link between learner SDL behaviour, teacher assessment beliefs, and the Natural Sciences subject

Third-generation CHAT provided a suitable research lens to view the bigger picture that connects aspects of teachers' assessment beliefs and learner SDL behaviours within the NS (NS) subject. From the literature study, it was discovered that the CHAT framework can provide a starting point for researchers to view critical social elements that influence educational practices (see section 2.5). By exploring the social elements from teachers' views on assessment as one activity system and learners' experience of assessment in NS as the second activity system (see section 4.4.3), the empirical research has subsequently led to the recognition of the following critical issues:

- emphasis by teachers is on preparing learners for examinations;
- emphasis by learners is on obtaining good grades;
- absence of assessment tools like peer- and self-assessment;
- dominance of teacher-centred approaches;
- threatening learning environments;
- contextual factors that hinder learning;
- inadequate implementation of the assessment policy.

This finding contributes to the body of knowledge on NS as the identification of these critical issues reveal the current status of assessment and learning in grade 9 NS. These critical issues serve as a point of reflection on where we are now in terms of SDL and where we are headed in terms of the successful implementation of SDL in grade 9 NS. A challenge is how to overcome these critical issues. Recommendations, based on the findings of this study, are made next.

5.4 RECOMMENDATIONS

5.4.1 Recommendations for Natural Sciences teachers

Based on the findings obtained from the literature and empirical study, the following recommendations may be useful for teachers:

- Teachers need to recognise that the predominant focus on examination-driven practices in our schools is not effective for developing 21st-century skills and enhancing SDL. Therefore, teachers need to change their teaching approaches so that learners apply their knowledge and work with others (e.g. cooperative learning) in problem-solving as opposed to learners just knowing basic facts. It is recommended that teachers engage in individual teacher action research and reflection over a long period of time, which may assist in fostering deep-rooted changes.
- Teachers must set goals that refer to specific performance standards for learners to apply effective problem-solving, decision-making, metacognition and goal setting in order to enhance learning (Du Toit-Brits, 2015). These goals must be made visible to learners for them to see how they are progressing towards achieving the set goal. According to Ponton and Carr (2000:275), teachers can facilitate goal-directedness by helping learners understand the positive correlation between specific learning goals and the outcomes that the learners desire from formal education.
- Teachers must provide learners with opportunities to make meaning and build their own mental constructs rather than passively receive information. This can be achieved when teachers' build their classroom instruction and assessments around scientific inquiry approaches by engaging learners in active exploration of and reasoning about science-related problems.
- Teachers should also emphasise affective outcomes in their teaching and assessments by providing learners with opportunities to work collaboratively in groups so that learners can develop social skills like understanding other people's points of view, relating one's own position to that of others, and working productively together.
- Teachers need to show an active approach to their teaching by being self-directed learners themselves and directing their own learning to enhance their content mastery and pedagogical skills. This would assist them in better planning for and managing methods

like inquiry-base teaching, which can foster SDL. Moreover, teachers must also be self-directed in finding ways of overcoming contextual factors that hinder their teaching and learning.

5.4.2 Recommendations for grade 9 learners'

Learners must engage in self-assessment not only to take responsibility for their own learning but also to develop metacognitive skills by learning to apply the standards that define quality work in NS to their own work (Shepard, 2000:67). To correctly implement self-assessments, it is crucial that learners take performance standards into account, since they provide criteria for good performance (McMillan & Hearn, 2008). Self-assessment involves much more than simply checking answers; rather, it should be implemented as a process of learners monitoring and evaluating the nature of their thinking so as to identify strategies that improve their understanding (McMillan & Hearn, 2008). This would require that learners must develop a broad understanding and an appreciation of self-assessments to actively engage in self-assessment procedures.

The researcher realises that, before learners can be expected to engage in SDL, all the relevant stakeholders, like parents, policymakers, subject specialist, principals, and teachers must strive to support learners by creating an environment conducive for this endeavour. Teachers play a central role in providing learners with opportunities to develop self-assessment skills and raising awareness of the value and effectiveness of such skills (Boud & Soler, 2016:405). In addition, teachers need to convey to learners that it is their responsibility to show an active approach to their learning by being self-directed in their learning, reserving time dedicated solely to learning activities and creating urgency in their learning (Ponton & Carr, 2000:276).

5.4.3 Recommendations for the Department of Education

The Department of Education must consider initiating meaningful teacher professional development programmes for practicing NS teachers, aimed at the following:

- providing teachers with adequate knowledge of SDL as this would help in raising awareness of the importance of fostering SDL in classrooms. A teacher who believes in the importance of SDL is more likely to design learning environments that foster learners' SDL;
- training teachers on the importance of the affective domain, and they should be assisted in assessing the affective outcomes as these are not often easy to assess.
- proving teachers with a sophisticated understanding of NS so that they can translate this knowledge into their classroom assessment practices.
- training teachers on how to effectively use and implement self- and peer-assessments.

The Department of Education must conduct a needs-analysis audit at schools so as to see how learners and teachers might be best assisted in dealing with challenges regarding prominent contextual factors like lack of resources and overcrowded classrooms, which were indicated by teachers as factors hindering their classroom practices.

5.4.4 Recommendations with regard to fostering SDL behaviours in the Natural Sciences classroom

It is recommended that the types of learning and assessment opportunities that teachers' can effectively use when planning lessons aimed at supporting the development of learners' SDL be considered. This could result in a different configuration of activities in NS classrooms. In this chapter, the researcher considered how classroom activities in NS can be reconfigured to serve as a guide for teachers to use in providing opportunities for learners to develop SDL behaviours. Three models are proposed (see Figures 5.2, 5.3, and 5.4) of how the NS specific aims can be reconfigured with the aim of supporting the learners' development of SDL behaviours.

The three proposed models were structured in such a way to show containment relationships depicting three levels to emphasise the link between information contained in three interconnected frameworks. The first level in the proposed models shows this study's theoretical framework of SDL (see section 2.2.2), which served as a theoretical foundation for defining and describing learner SDL behaviours. The second level in the proposed models shows specific SDL behaviours that can be promoted by considering the domain-specific components associated with SDL, such as cultural, emotional and educational factors, adapted from Du Toit-Brits' (2015) framework (see section 2.2.5). The researcher included Du Toit-Brits' (2015) domain framework because the framework presents a guide on creating an appropriate engaging SDL environment. The emphasis on the learning environment together with the process and personal elements of SDL provide a holistic approach to SDL towards fostering learner SDL behaviours.

The last level in the proposed models shows process-oriented teaching (see section 2.2.1) as the appropriate instructive approach in supporting self-directed teaching and learning, based on research by Bolhuis and Voeten (2001). In this last level, there is a crucial distinction between three teaching and learning goals, namely: learning science content (Specific Aim 2), which addresses the cognitive learning domain; learning about the uses of science (Specific Aim 3), which addresses the affective domain; and doing science (Specific Aim 1), which addresses the psychomotor learning domain. These separate teaching and learning goals are embedded in the process-oriented teaching framework. To be compatible with and to support SDL, classroom assessments must be congruent with the selected learning or performance goals.

Although each model (see Figures 5.2, 5.3 and 5.4) depicts the specific aims as separate learning goals, in practice, the three specific aims overlap and interact with one another during teaching and learning. However, the emphasis of these three separate models is to make the nature of learning clear to learners by presenting them with clearly articulated expectations of the specific learning or performance goals associated within a given specific aim. The aim is not to attempt to reach too many diverse goals simultaneously, or being overly rigid and prescriptive, but to provide a systematic structure for selecting the content prescribed by the NS syllabus to address the development of learners' SDL behaviours.

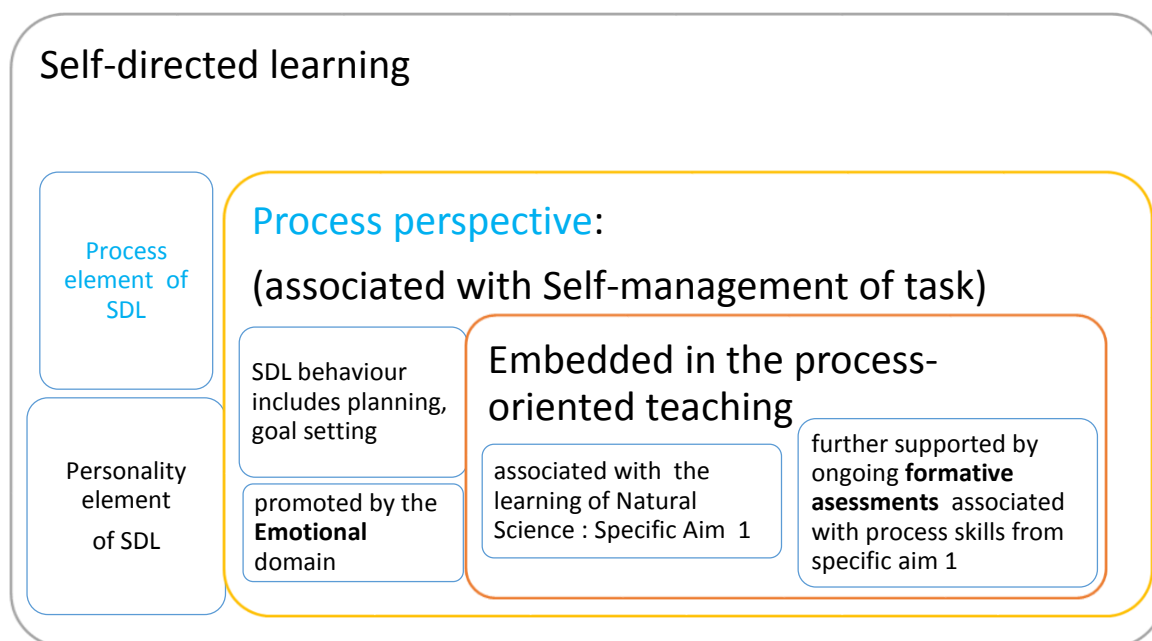


Figure 5.2: Model for supporting SDL behaviours associated with the self-management of task

Source: Author's own

Figure 5.2 illustrates the researcher's own depiction of a guide that can serve as a way of fostering learners' SDL behaviours in the NS subject. For instance, Figure 5.2 provides a guide for teachers who want to develop learners' SDL behaviours associated with self-management of task, which includes the ability to plan, use learning materials, organise and set goals. The teacher then needs to facilitate the learners to set the learning targets associated with the Specific Aim 1 (Doing Science), secure resources and act as a facilitator of learning by using different amounts of scaffolding for different learner needs. By so doing, self-efficacy, an aspect of learners' SDL emotional domain, is substantiated as learners observe their progress towards the goal (see section 2.2.5). For classroom assessment activities to be congruent with this specific aim, it calls for assessment to lean towards assessing performance goals (solving a certain problem).

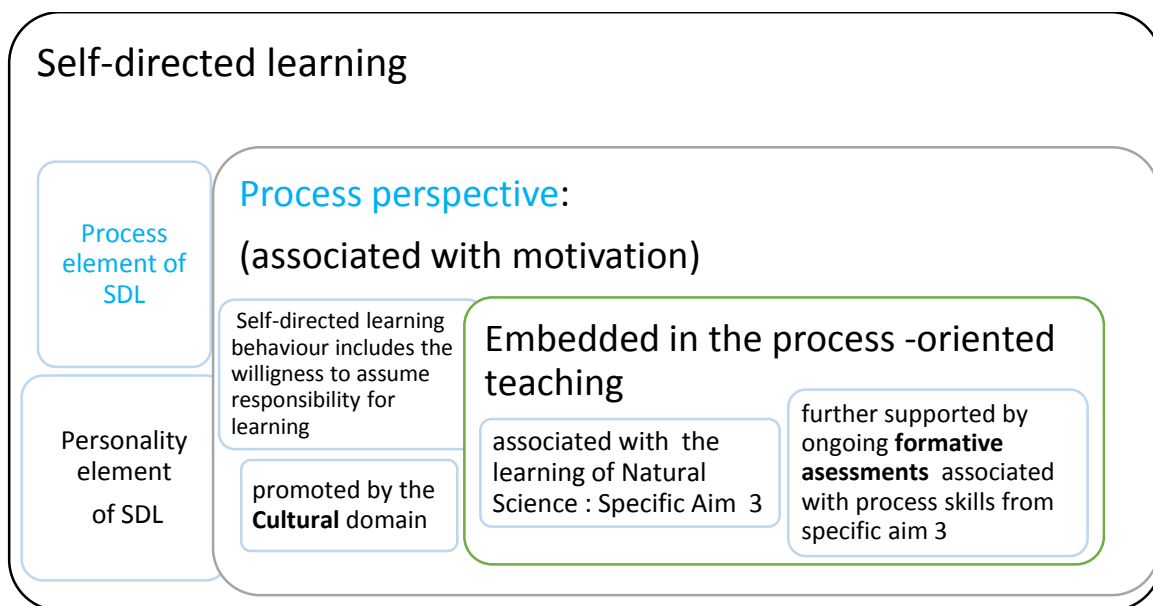


Figure 5.3: Model for supporting SDL behaviours associated with learner motivation

Source: Author's own

Figure 5.3 illustrates the researcher's own depiction of a guide that can serve as a way of fostering learners' SDL behaviours in the NS subject. Figure 5.3 provides a guide for teachers who want to develop learners' SDL behaviours associated with enhancing learner motivation, which includes the willingness to assume responsibility for learning, the tendency to focus on and persist in learning activities and goals. The teacher then needs to provide clear learning targets associated with Specific Aim 3 (learning about the uses of science) and provide learners with opportunities to work collaboratively with their peers in classrooms that consist of learners with different values, beliefs and different ways of thinking and relating science knowledge. This would help assist low-performing learners to identify any flawed reasoning and missing information as they observe successful strategies from more knowledgeable peers. These collaborations serve as a way of sensitising learners to different cultural and social classroom diversity, which enhances learners' SDL cultural domain (see section 2.2.5). For classroom assessment activities to be congruent with this specific aim, assessment should lean towards assessing affective outcomes, such as perseverance, respect, enthusiasm, cooperation, sensitivity and objectivity.

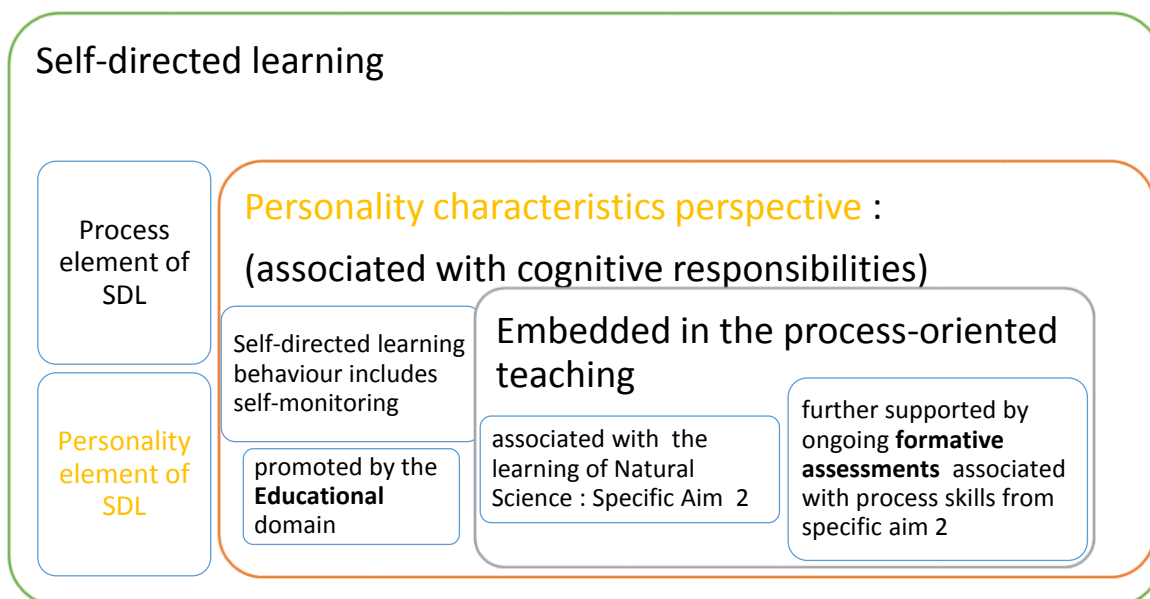


Figure 5.4: Mode for supporting SDL behaviours associated with learners’ cognitive responsibilities

Source: Author’s own

Figure 5.4 illustrates the researcher’s own depiction of a guide that can serve as a way of fostering learners’ SDL behaviours in the NS subject. Figure 5.4 provides a guide for teachers who want to develop learners’ SDL behaviours associated with learners’ cognitive responsibilities, which include the ability of learners to self-monitor, evaluate and assess the quality of their learning outcomes. The teacher then first needs to provide clear learning targets associated with Specific Aim 2 (learning science content) and use strategic questions that elicit learner thinking to uncover prior knowledge as a means of building on learners’ knowledge. For classroom assessment activities to be congruent with this specific aim calls for assessment to lean towards assessing learning goals (involves knowledge, behaviour, skill or strategy as to how to solve certain problems). It is crucial that teaching learning skills – such as summarising, applying effective problem-solving, predicting, decision-making, questioning, clarifying – should be integrated with teaching content. This would enhance learners’ SDL educational domain (see section 2.2.5).

Assessment approaches, such as self- and peer-assessment, should be actively incorporated when addressing any of the three NS specific aims as a way of fostering learners’ abilities to evaluate their own progress towards achieving the set standards. According to Cauley and McMillan (2010:4), formative assessments, like self-assessment, work in a three-step process in which “learners judge their own work (self-monitor), identify discrepancies between current and desired performance (self-evaluation) and identify and implement further learning activities to enhance their skills or understanding”.

Self-assessment promotes the behavioural processes exhibited by self-regulated learners, who select, structure and create environments that optimise learning (Zimmerman, 2002:65). On the other hand, according to Nicol *et al.* (2014:103), peer assessments increase the quality and variety of feedback, sensitising learners to different perspectives, which increase their evaluative judgment. To effectively implement self- and peer-assessments calls for a wide-ranging use of varied assessment tools that would enable learners to establish adequate goals for task and grading these accordingly. Such appropriate assessment tools, according to Panadero and Romeo (2014:133), must have three features, namely: 1) assessment criteria; 2) grading strategy; and 3) standards definitions. Examples of such assessment tools can include rubrics, checklists and detailed rating scales.

5.5 CONTRIBUTIONS OF THE STUDY

The study elected to engage in an interview process to obtain teachers' assessment beliefs, and this approach represents a shift away from the almost exclusive focus of teachers' observable behaviours and their correlation with learner behaviours. Collecting observable data may be useful to determine the translation of beliefs into practice. However, the use of interviews provided the study access to deep-seated views that direct teachers' assessment practices. It was anticipated that uncovering NS teachers' assessment beliefs would provide the current status of classroom assessment in order to establish areas for development, which have been clearly established in this study's recommendations.

In addition, gauging the learners' SDL behaviours through interviews yielded rich information that revealed the learners' thinking process, which would have otherwise been difficult to obtain through the use of the popular pen-and-pencil self-rating scale approaches. The inclusion of the social context, according to Hiemstra and Brockett (2012), which is necessary in providing a holistic approach to SDL, has been missing in many SDL studies. Therefore, by integrating the social context through the use of sociocultural elements from the CHAT framework provided this study with ways of identifying and addressing social elements that need to be overcome in order to support SDL in NS classrooms.

The findings presented and recommendations offered in this chapter provide ways in which current classroom practices in NS can be changed in order to become more compatible with SDL. In light of this purpose, the study sought to develop a framework that could serve as a guide for teachers on how to foster SDL behaviours in the NS classroom through the process-orientation teaching approach (see section 5.4.5).

5.6 LIMITATIONS OF THE STUDY

The following limitations were identified in this study:

- The study did not gather any other data in the form of observations and document analysis, in order to validate whether the teachers' assessment beliefs were consistent with their actual assessment practices. These observations could have provided a more holistic understanding of the link between teachers' assessment beliefs and actual assessment practices. The empirical evidence from this study has showed that teachers can endorse multiple assessment beliefs that can have a varied impact on their actual assessment practices.
- The differences in experiences and background of the participants posed limitations to the generalisability of findings to other settings and environments.
- At the time of this study, the researcher working full time made accessing the participants challenging.
- Some of the learner participants were not proficient in English and thus struggled to present their views and opinions. This was overcome by giving participants more time to respond and allowing participants to respond in their home language.
- Some of the schools were not responsive to the researcher's request to conduct research, which prolonged the data collection process as the researcher had to travel great distances to locate schools who were willing to participate.
- During the study, my original supervisor (Prof Kobus Lombard) passed away, and I was assigned a new supervisor (Prof Josef de Beer). Luckily, my co-supervisor, Ms Anita Lubbe, provided much-needed stability during this period of transition. However, the passing away of my original supervisor was an emotionally taxing experience.

5.7 RECOMMENDATIONS FOR FURTHER STUDY

The evidence obtained from the literature showed how the knowledge of teachers' assessment beliefs is of significant importance in understanding their assessment preferences that drive their assessment actions. Moreover, the empirical findings provided supporting evidence of how such beliefs influence learners SDL behaviours. Thus, future studies can look into ways of overcoming the challenges of low expectations and negative teacher belief systems which are at odds with SDL. Such studies would serve to advance teachers' professional development regarding their understanding of the purpose and process of SDL.

In an effort to create substantial changes in NS classrooms, this chapter proposed models of how SDL behaviours can be fostered in the NS curriculum. Thus, future studies can be aimed towards developing methods to inform and guide the process of aligning the curriculum, instruction and

assessment in the NS subject with the processes involved in fostering learners' SDL behaviours. Such studies would serve as a basis for implementing SDL in NS classrooms to increase SDL readiness and behaviours amongst learners.

5.8 FINAL CONCLUSION

The practice of SDL is important to school learning because it holds positive outcomes for learners, such as being motivated, independent, persistent, self-confident, goal oriented and self-disciplined (Davis, 2015:27). Thus, an important goal for formal education should be centred on developing learners with learning skills, cognitive abilities and self-regulatory capabilities so that they can educate themselves throughout their lifetime (Anthony, 2015:18). It is in this regard that NS teachers need to understand the purpose and strength of supporting learners' SDL so as to foster SDL behaviours. Most importantly, teachers' assessment beliefs need to change as they have a significant influence on learners' SDL behaviours, as seen from the empirical findings. Therefore, teachers' assessment belief systems must shift from the current focus of preparing learners for examinations by emphasising summative practices as a way of improving grades and shift towards more authentic assessments that require learners to develop structures of knowledge for reasoning and solving problems.

It is anticipated that this shift towards authentic assessment may prove difficult to achieve based on considerable evidence that highlights that beliefs may be resistant to change, since they are shaped by personal history and experiences (Pajares, 1992; Richardson, 1996). This creates a challenge as to how best to facilitate changes in teachers' beliefs systems with regard to SDL. The current study serves as a first step towards creating an awareness of the importance of exploring teacher belief systems related to educational practices, such as SDL and assessment, in future studies. The second step towards addressing this challenge would be to make teachers' beliefs systems the object of reflection through forums that support them to "make their beliefs explicit to confront the potential inadequacy of their beliefs and allow provision of new information they can examine and integrate into their existing belief systems" (De Vries *et al.*, 2014:352).

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APPENDIX A: ETHICAL APPROVAL FROM THE NORTH-WEST UNIVERSITY



Private Bag X6001, Potchefstroom
South Africa 2520

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Web: <http://www.nwu.ac.za>

North-West University Education, Management
and Economic Sciences, Law, Theology,
Engineering and Natural Sciences Research
Ethics Office (NWU-EMELTEN-REC)
Tel: +27 18 299 4707
Email: lukas.meyer@nwu.ac.za

10 September 2019

Dear Prof JJJ De Beer

NOTIFICATION: APPROVAL OF YOUR APPLICATION BY THE NWU-EMELTEN-REC

Ethics number: NWU-00533-NWU-19-S2

Kindly use the ethics reference number provided above in all correspondence or documents submitted to the NWU-EMELTEN-REC secretariat.

Study title: The influence of Natural Science teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

Study leader/supervisor: Prof JJJ de Beer

Student: Ms. E Kamanga

Application type: Single study

Risk level: Greater than minimal with no prospect of direct benefit

You are kindly informed that your application was reviewed by the NWU-EMELTEN-REC and approved on 28 August 2019.

The commencement date for this study is 28 August 2019 dependent on fulfilling the conditions indicated below. Continuation of the study is dependent on receipt of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation up to a maximum period of one year when extension will be facilitated during the monitoring process.

After ethical review:

Translation of the informed consent document to the languages applicable to the study participants should be submitted to the NWU-EMELTEN-REC (if applicable).

The NWU-EMELTEN-REC requires immediate reporting of any aspects that warrants a change of ethical approval. Any amendments, extensions or other modifications to the proposal or other associated documentation must be submitted to the NWU-EMELTEN-REC prior to implementing these changes. Any adverse/unexpected/unforeseen events or incidents must be reported on either an adverse event report form or incident report form.

A monitoring report should be submitted within one year of approval of this study (or as otherwise stipulated) and before the year has expired, to ensure timely renewal of the study. A final report must be provided at completion of the study or the NWU-EMELTEN-REC must be notified if the study is temporarily suspended or terminated. The monitoring report template is obtainable from the NWU-EMELTEN-REC Office at Ethics-EMELTEN-mon@nwu.ac.za. Annually a number of studies may be randomly selected for an external audit.

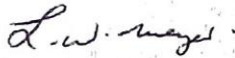
Please note that the NWU-EMELTEN-REC has the prerogative and authority to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process.

Please note that for any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the NWU-EMELTEN-REC Office. Ethics approval is required BEFORE approval can be obtained from these authorities.

The NWU-EMELTEN-REC complies with the South African National Health Act 61 (2003), the Regulations on Research with Human Participants (2014), the Ethics in Health Research: Principles, Structures and Processes (2015), the Belmont Report and the Declaration of Helsinki (2013).

We wish you the best as you conduct your research. If you have any questions or need further assistance, please contact the NWU-EMELTEN-REC Office at Ethics-EMELTEN@nwu.ac.za.

Yours sincerely



Prof Lukas Meyer
Chairperson NWU-EMELTEN-REC

Original details C:\Users\22135530\Google Drive\9. Research and postgrad education\9.1.5 Ethics\NWU-00533-19-SZ\Final\9.1.5.4 1_Approval notification

Date: 10 September 2019

File Reference: 9.1.5.4.1

APPENDIX B: APPROVAL LETTER FROM NWDOE RUSTENBURG SUBDISTRICT



education

Lefapha la Thuto la Bokone Bophirima
Noord-Wes Onderwys Departement
North West Education Department
NORTH WEST PROVINCE

McGregor Street
Rustenburg 0299
Private Bag X82103
Rustenburg 0300
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e-mail: mpaledi.nwpg.gov.za

OFFICE OF THE SUB-DISTRICT MANAGER: RUSTENBURG SUB-DISTRICT BOJANALA DISTRICT

To : Ms Effiness Kamanga
North West University
Potchefstroom

From : Ms LES Kotsedi
Acting Circuit Manager- Areaganeng Circuit

Date : 30 July 2019

Subject : Request to conduct a research Project in our schools

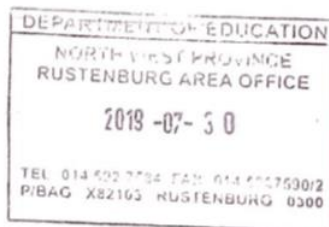
The above matter bears reference.

This communiqué serves to acknowledge receipt of the request made on 8 July 2019, which was on conducting a research in our schools on the topic; 'The influence of Natural Sciences teachers' assessment beliefs on Grade 9 learners' self-directed learning behaviour'.

Permission is hereby granted to conduct the research in Sub-district schools and beyond. May the outcome bear fruits to education in Bojanala district.

Hope you find this in order,

Ms LES Kotsedi
Acting Circuit Manager- Areaganeng Circuit



"Towards Excellence in Education"

APPENDIX C: LETTER TO PRINCIPALS



Private Bag X1290, Potchefstroom
South Africa 2520
Tel: +2718 299-1111/2222
Fax: +2718 299-4910
Web: <http://www.nwu.ac.za>

Faculty of Education

Project supervisor: Prof Josef De Beer

Co-supervisor: Ms Anita Lubbe

Tel: 018 285 2626

E-mail: josef.debeer@nwu.ac.za

MEd-Student: Ms Effiness Kamanga

Tel: 071 050 8764

E-mail: efkamanga@yahoo.com

2019

Dear Principal

REQUEST FOR PERMISSION OF GRADE 9 LEARNERS' AND THEIR NATURAL SCIENCES TEACHER TO PARTICIPATE IN RESEARCH:

RESEARCH TITLE: The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

My name is Effiness Kamanga, and I am studying for a Master's degree in Curriculum studies at the North-West University (Potchefstroom campus). I am conducting research on the above-mentioned topic under the supervision of Prof Josef De Beer and Ms Anita Lubbe. I will appreciate it, if you give permission for your grade 9 learners and their Natural Science to participate in this research. Based on the evidence obtained from literature which proves that, learners who are self-directed in their learning are more effective towards achieving their learning goals, based on their improved academic performance. However, studies reporting on the influence of teachers' assessment beliefs on learners' self-directed learning behaviour are limited. Therefore, I hope the knowledge gained from this research study can inform further studies which seek to change or promote assessment practices which can support learners' self-directed learning behaviour.

The objective of this research is to establish the assessment belief of the grade 9 Natural Sciences teacher through an interview process which is estimated to take 15 minutes. Secondly, to determine the influence of such teacher assessment beliefs on learners' self-directed learning behaviour by interviewing 5 grade 9 learners as a group which is estimated to take 25 minutes. The interviews will be recorded on a voice recorder and the information obtained will be kept confidential. The name of your school, teacher and learners concerned will not be disclosed during the research or publication of the research findings.

Participation in this research is voluntary and you are further requested for, the learner group interview and the individual teacher interview, be conducted within your school premises at a place and time designated by you, as to ensure comfort and further security of your grade 9 learners' and their Natural Sciences teacher. If you have any further questions or have any problems regarding this study, you are welcome to contact me or my supervisor at the number or email address shown above.

Thank you for your time and consideration in this matter. Please kindly complete the attached permission form to indicate that you are willing to let your 5 grade 9 learners' and their Natural Sciences teacher participate in this research. Research findings will be made available to the school upon completion of the study.

Yours sincerely

Signature of researcher

Ms E.H Kamanga

PERMISSION BY PRINCIPAL FOR NATURAL SCIENCES TEACHER AND 5 GRADE 9 LEARNERS' TO PARTICIPATE IN RESEARCH: The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

I (*please write your full names and surname*): _____

have read and understood the content of this letter and hereby give permission to the researcher Effiness Kamanga to interview 5 grade 9 learners as a group. As well as interviewing their Natural Sciences teacher individually. In addition, I give my permission for these interviews to be conducted within the school premises. Please provide the date/dates that would best suite you for the research to be conducted: _____

Signature: _____

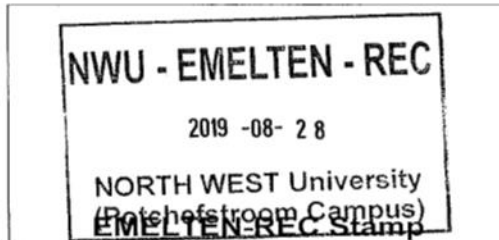
Date: _____

Contact details: _____

APPENDIX D: INFORMED CONSENT FORM: TEACHERS



Private Bag X1290, Potchefstroom
South Africa 2520
Tel: +2718 299-1111/2222
Fax: +2718 299-4910
Web: <http://www.nwu.ac.za>
Faculty of Education



INFORMED CONSENT DOCUMENTATION FOR TEACHER INTERVIEW PARTICIPATION

TITLE OF THE RESEARCH:

The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

ETHICS REFERENCE NUMBER: NWU-00533-19-S2

PROJECT SUPERVISOR: Prof Josef De Beer

CO-SUPERVISOR: Ms Anita Lubbe

ADDRESS: Potchefstroom Campus, Building B10, Room G51

CONTACT NUMBER: 018 285 2626

MEd-STUDENT: Ms Effiness Kamanga

ADDRESS: 21 Benoni Street, Rustenburg North, 0299

CONTACT NUMBER: 071 050 8764

You are being invited to take part in a **research study** that forms part of a Masters study. Please take some time to read the information presented here, which will explain the details of this study. Please ask the researcher or person explaining the research to you any questions about any part of this study that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research is about and how you might be involved. Also, your participation is **entirely voluntary** and you are free to say no to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part now.

This study has been approved by the Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee of the North-West University (NWU.....) and will be conducted according to the ethical guidelines and

principles of Ethics in Health Research: Principles, Processes and Structures (DoH, 2015) and other international ethical guidelines applicable to this study. It might be necessary for the research ethics committee members or other relevant people to inspect the research records. Permission has also been approved by the Provincial Department of Basic Education as well as the school principal.

What is this research study all about?

This study is designed to examine teachers' assessment beliefs in Natural Sciences and to link these beliefs with grade 9 learners' self-directed learning behaviour, in order to understand the relationship between them. This study will be conducted by Effiness Kamanga who is a Masters student at the North-West University, Potchefstroom campus and is supervised by experienced researchers' trained in the field of assessment to support self-directed learning. An expected number of 5 high schools which includes 1 Natural Sciences teacher and 5 grade 9 learners' per school will be participating in this study.

Why have you been invited to participate?

You have been invited to be part of this research because your school was randomly selected amongst schools located in the Rustenburg area in the Bojanala Platinum district and you teach Natural Science in grade 9. The reason behind this selection is based on the following:

- The researcher of this study is well experienced in grade 9 Natural Sciences subject which is crucial in understanding your assessment beliefs within the context of Natural Sciences.
- Secondly the researcher is based around the Rustenburg area which makes it easier and possible to conduct the research.
- Lastly the random selection of schools to participate, will ensure that a fair and just selection which is neutral and free from bias is maintained.

You will unfortunately not be able to take part in this research if you also teach Natural Sciences in grade 9 at the school where the researcher teaches at, because you would be familiar with the researcher which might jeopardise the integrity of the study.

What will be expected of you?

You will be interviewed individually in a quiet setting within the school premises. Please feel free to express your own opinion during the interview which should take about 15 minutes.

Will you gain anything from taking part in this research?

The results of this study may not directly benefit you today but I hope it will be beneficial by contributing to our knowledge base of assessment and self-directed learning. Also it may benefit future teachers, curriculum developers and researchers, because the knowledge gained from the study can inform further studies which seek to change or promote assessment practices which can support learners' self-directed learning behaviour.

Are there risks involved in you taking part in this research and what will be done to prevent them?

No intentional risks or harm are anticipated as a result of your participation. The researcher will treat all participants fairly, with honesty, with consideration and with respect. However, the possible harm may arise from the inconvenience caused by taking your spare-time during the interview session. This, will be minimized by providing you with a black pen as a token of appreciation for participating.

How will we protect your confidentiality and who will see your findings?

Confidentiality and anonymity will be ensured by not using any descriptors or names that could lead to your identification during data collection, analysis and interpretation. Furthermore, anonymity of the information collected from the tape-recorder will be further protected by deleting the recordings once they have been transcribed. The transcribed text will be stored electronically and will be password protected as well as the hard copies. The researcher, as well as her supervisors will be the only individuals who will have access to the data which will be stored for a period of seven years.

What will happen with the findings?

The findings collected will primarily be used by the researcher for obtaining the Master of Education in Curriculum studies degree. However, research results could be used for presentation at conferences or for the publication of articles. The researcher will still maintain your confidentiality and protection of identity by not using any descriptors or names that could lead to your identification

How will you know about the results of this research?

Would you like the researcher to send you a short summary of the study's results when it is finished around: 30 November 2019? *Yes or No. (Make a circle on your choice)*

If selected yes, please provide an address where you would like us to send it to:

Address: _____

Email: _____

If you selected no, and you later on, change your mind, you can still contact the researcher at 071 050 8764 or efkamanga@yahoo.com and request that a summary be sent to you.

Will you be paid to take part in this study and are there any costs for you?

No participant will receive any payment to participate in this research project, because the study is based on voluntary participation which is free from coercion or inappropriate incentives in order to ensure integrity of the study. In addition, the researcher will not receive any payment for conducting this research, because the study does not have a sponsor. However, reimbursement of travel cost are provided when participants are requested to be interviewed at a particular selected site, but this is not the case with this study because all interviews are conducted within your school were you will be more secure and comfortable.

Is there anything else that you should know or do?

- You can contact Prof Josef De Beer at 018 285 2626 or josef.debeer@nwu.ac.za if you have any further questions or have any problems.
- You can also contact the Health Research Ethics Committee via Mrs Marlize Bisschoff at 018 299 4707 or marlize.bisschoff@nwu.ac.za if you have any concerns that were not answered about the research or if you have complaints about the research.
- You will receive a copy of this information and consent form for your own purposes.

Declaration by participant

By signing below, I
agree to take part in the research study titled: The influence of Natural Science teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

I declare that:

- I have read this information/it was explained to me by a trusted person in a language with which I am fluent and comfortable.
- The research was clearly explained to me.
- I have had a chance to ask questions to both the person getting the consent from me, as well as the researcher and all my questions have been answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be handled in a negative way if I do so.
- I may be asked to leave the study before it has finished, if the researcher feels it is in the best interest, or if I do not follow the study plan, as agreed to.

Signed at (*place*) on (*date*) 20...

.....
Signature of participant

Declaration by person obtaining consent: Researcher

I (*name*) declare that:

- ❖ I clearly and in detail explained the information in this document to
.....
- ❖ I did/did not use an interpreter.
- ❖ I encouraged him/her to ask questions and took adequate time to answer them.
- ❖ I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- ❖ I gave him/her time to discuss it with others if he/she wished to do so.

Signed at (*place*) on (*date*) 20....

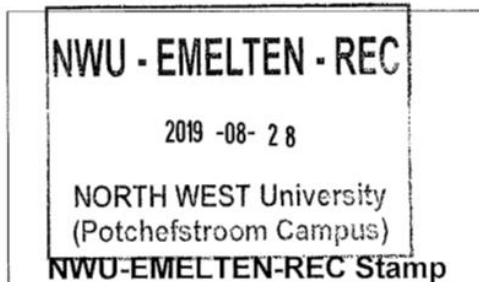
.....
Signature of person obtaining consent: Researcher

APPENDIX E: INFORMED CONSENT FORM: PARENTS



Private Bag X1290, Potchefstroom
South Africa 2520
Tel: +2718 299-1111/2222
Fax: +2718 299-4910
Web: <http://www.nwu.ac.za>

The Faculty of Health Sciences Ethics Office of the North-West University is acknowledged for the use of their document with minor adjustments made by the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee (NWU-EMELTEN-REC).



Dear Parent

RE: PERMISSION TO CONDUCT RESEARCH IN WHICH YOUR CHILD IS INVOLVED

TITLE OF THE RESEARCH STUDY: The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

ETHICS REFERENCE NUMBER: NWU-00533-19-S2

PRINCIPAL INVESTIGATOR: Prof Josef de Beer

POST GRADUATE STUDENT: Effiness Kamanga

ADDRESS: G51, B10 Building, Faculty of Education, North-West University, Potchefstroom

CONTACT NUMBER: Cell: 082 923-2865/ Office: (018) 285-2626.

Your child is being invited to take part in a research study that forms part of a Masters study. Please take some time to read the information presented here, which will explain the details of this study before you give permission. Please contact the researcher about any part of this study that you do not fully understand. Your child's participation is **entirely**

voluntary and he/she is free to refuse to participate. Also your child is free to **withdraw** at any point during the research and he/she will not be affected negatively in any way whatsoever if he/she does not want to participate anymore.

This study has been approved by the Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee of the North-West University (NWU-00533-19-S2) and will be conducted according to the ethical guidelines and principles of Ethics in Health Research: Principles, Processes and Structures (DoH, 2015) and other international ethical guidelines applicable to this study. It might be necessary for the research ethics committee members or other relevant people to inspect the research records. Permission has also been given by the Provincial Department of Basic Education as well as the school principal to conduct the research.

What is this research study all about?

We plan to examine teachers' assessment beliefs in Natural Sciences and to link these beliefs with grade 9 learners' self-directed learning behaviour. Due to the nature of the study I hope to interview, 5 Grade 9 learners and their Natural Sciences teacher per school, in the Rustenburg area. Your child has been selected as one of the five learners who will participate in the focus group interview.

Why has your child been invited to participate?

Five schools in the district were randomly selected, and your child's school is one of the selected schools. The Natural Sciences teacher will be asked to participate in this research, and five Natural Sciences learners (including your child) will also be asked to participate in a focus group interview. Participation in this research is voluntary and the names of the schools, teachers and learners' involved will not be disclosed during the research or publication of the research findings. Your child has been invited to be part of this research because his/her name was **randomly** selected from the grade 9 class list and because he/she is attending a school which was also **randomly** selected amongst schools located in the Rustenburg area in the Bojanala Platinum district. The random selection of the school and your child will ensure a fair and just selection which is neutral and free from research bias.

What will be expected of the participants?

Your child will be involved in a focus group interview with four other learners, and they will share their experiences of assessment practices. Therefore, he/she is expected, to respect the other group members and treat the contents of the discussion as well as other participants' identities confidentially. Your child should feel free to express his/her own opinions during the interview which should take about 25 minutes.

Will participants gain anything from taking part in this research?

Feedback on the research data will be given to teachers after the research. (This will be in the form of a short workshop/ seminar). This feedback might assist teachers in changing their views on assessment practices, and it might hold benefits for both the

teacher's professional development, and for learners who might be subjected to better assessment opportunities in the classroom.

Are there risks involved for the participants taking part in this research and what will be done to prevent them?

There are minimal risks involved in the study. Participants will be asked to sacrifice time participating in interviews, but these interviews will be kept as short as possible, and refreshments will be provided. There are more gains for participants in joining this study than there are risks. Taking part in the group interview will take up some of your child's spare-time and as a small token of appreciation a pen will be given to your child.

How will we protect the confidentiality and who will see the findings?

External confidentiality and anonymity will be ensured by not using any descriptors or names that could lead to participants' identification during data collection, analysis and interpretation. In the dissertation, and any other publications, pseudonyms will be used, when referring to participant responses. Only the researchers will be able to look at the findings. Findings will be kept safe by locking hard copies in locked cupboards in the researcher's office and for electronic data it will be password protected. (As soon as data has been transcribed it will be deleted from the recorders.) Data will be stored for seven years.

What will happen with the findings or samples?

The findings of this study will only be used for this study. The data and findings will be published in a NWU dissertation, as well as in two journal articles.

How will you know about the results of this research?

Research findings will be made available to the Department of Education, and to your school, upon completion of the study. A seminar will be conducted with teacher participants, to share the findings with them.

Would you like the researcher to send you a short summary of the study's results when it is completed? *Yes, or No. (Please make a circle around your choice)*

If you have selected yes, please provide an address where a summary of the results can be sent to:

Address: _____

Email: _____

Will participants be paid to take part in this study and are there any costs for them?

This study is funded by the researchers. There is no remuneration involved, but participants will receive a token of appreciation. If participants incur any expenses (e.g. transport costs to participate in the interviews) they will be remunerated. Refreshments will be served during the interviews. There will be no costs involved for participants taking part in this study.

Is there anything else that you should know or do?

- You can contact Prof Josef de Beer at (018) 285-2626 if you have any further questions or have any problems.
- You can also contact the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee via Mrs Marlize Bisschoff at 018 299 4707 or marlize.bisschoff@nwu.ac.za if you have any concerns that were not answered about the research or if you have complaints about the research.
- You will receive a copy of this information and consent form for your own purposes.

Declaration by parent/ guardian

By signing below, I provide permission that my child may be approached to take part in the research study titled 'The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour'.

I declare that:

- I have read this information/it was explained to me by a trusted person in a language with which I am fluent and comfortable.
- The research was clearly explained to me.
- I have had a chance to ask questions to both the person getting the consent from me, as well as the researcher and all my questions have been answered.
- I understand that taking part in this study is **voluntary** and my child will not be pressurised to take part.
- My child may choose to leave the study at any time and will not be handled in a negative way if he/she does so.
- Participants may be asked to leave the study before it has finished, if the researcher feels it is in the best interest, or if they do not follow the study plan, as agreed to.

Signed at (*place*) on (*date*) 20....

.....
Parent/ guardian

.....
Signature of witness

Declaration by person obtaining consent

I (*name*) declare that:

- I clearly and in detail explained the information in this document to

.....

- I did/did not use an interpreter.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I gave him/her time to discuss it with others if he/she wished to do so.

Signed at (*place*) on (*date*) 20....

.....
Signature of person obtaining consent

Declaration by researcher

I (*name*) declare that:

- I explained the information in this document to
- I did/did not use an interpreter.
- I encouraged him/her to ask questions and took adequate time to answer them.
- The informed consent was obtained by an independent person.
- I am satisfied that he/she adequately understands all aspects of the research, as described above.
- I am satisfied that he/she had time to discuss it with others if he/she wished to do so.

Signed at (*place*) on (*date*) 20....

.....
Signature of researcher

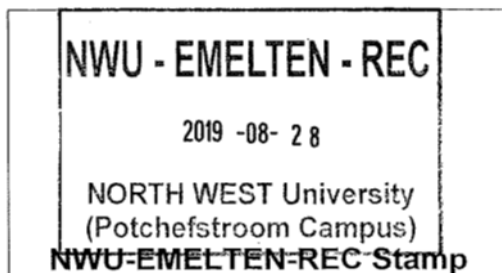
Ms E.H Kamanga

APPENDIX F: INFORMED CONSENT FORM: SCHOOL GOVERNING BODY



Private Bag X1290, Potchefstroom
South Africa 2520
Tel: +2718 299-1111/2222
Fax: +2718 299-4910
Web: <http://www.nwu.ac.za>

The Faculty of Health Sciences Ethics Office of the North-West University is acknowledged for the use of their document with minor adjustments made by the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee (NWU-EMELTEN-REC).



TO: The Chairperson
School Governing Body
(NAME OF SCHOOL)
RUSTENBURG

RE: PERMISSION TO CONDUCT RESEARCH IN YOUR SCHOOL FOR CHAIRPERSON OF SGB

TITLE OF THE RESEARCH STUDY: The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

ETHICS REFERENCE NUMBER: NWU-00533-19-S2

PRINCIPAL INVESTIGATOR: Prof Josef de Beer

POST GRADUATE STUDENT: Effiness Kamanga

ADDRESS: G51, B10 Building, Faculty of Education, North-West University, Potchefstroom

CONTACT NUMBER: Cell: 082 923-2865/ Office: (018) 285-2626.

Teachers and learners in your school will be invited to take part in a **research study** that forms part of Ms Effiness Kamanga's M.Ed study. Please take some time to read the information presented here, which will explain the details of this study. Please ask the

researcher or person explaining the research to you any questions about any part of this study that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research is about and how teachers and learners might be involved. Also, their participation is **entirely voluntary** and they will be free to say no to participate. If they say no, this will not affect them negatively in any way whatsoever. they are also free to withdraw from the study at any point, even if they initially agree to take part.

This study has been approved by the **North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee (NWU-00533-19-S2)** and will be conducted according to the ethical guidelines and principles of Ethics in Health Research: Principles, Processes and Structures (DoH, 2015) and other international ethical guidelines applicable to this study. It might be necessary for the research ethics committee members or other relevant people to inspect the research records.

What is this research study all about?

We plan to examine teachers' assessment beliefs in Natural Sciences and to link these beliefs with grade 9 learners' self-directed learning behaviour. Due to the nature of the study I hope to interview, 5 Grade 9 learners and their Natural Sciences teacher per school, in the Rustenburg area. Once your permission is given arrangements will be made with concerned parties, to participate in interviews after school hours.

Why have teachers/ learners in your school been invited to participate?

Five schools in the district were randomly selected, and your school is one of the selected schools. The Natural Sciences teacher will be asked to participate in this research, and five Natural Sciences learners will also be asked to participate in a focus group interview. Participation in this research is voluntary and the names of the schools, teachers and learners' involved will not be disclosed during the research or publication of the research findings.

What will be expected of the participants?

The Natural Sciences teacher will be engaged in a personal interview, and the five learners in a focus group interview.

Will participants gain anything from taking part in this research?

Feedback on the research data will be given to teachers after the research. (This will be in the form of a short workshop/ seminar). This feedback might assist teachers in changing their views on assessment practices, and it might hold benefits for both the teacher's professional development, and for learners who might be subjected to better assessment opportunities in the classroom.

Are there risks involved for the participants taking part in this research and what will be done to prevent them?

There are minimal risks involved in the study. Participants will be asked to sacrifice time participating in interviews, but these interviews will be kept as short as possible, and refreshments will be provided. There are more gains for participants in joining this study than there are risks.

How will we protect the confidentiality and who will see the findings?

External confidentiality and anonymity will be ensured by not using any descriptors or names that could lead to participants' identification during data collection, analysis and interpretation. In the dissertation, and any other publications, pseudonyms will be used, when referring to participant responses. Only the researchers will be able to look at the findings. Findings will be kept safe by locking hard copies in locked cupboards in the researcher's office and for electronic data it will be password protected. (As soon as data has been transcribed it will be deleted from the recorders.) Data will be stored for seven years.

What will happen with the findings or samples?

The findings of this study will only be used for this study. The data and findings will be published in a NWU dissertation, as well as in two journal articles.

How will you know about the results of this research?

Research findings will be made available to the Department of Education, and to your school, upon completion of the study. A seminar will be conducted with teacher participants, to share the findings with them.

Will participants be paid to take part in this study and are there any costs for them?

This study is funded by the researchers. There is no remuneration involved, but participants will receive a token of appreciation. If participants incur any expenses (e.g. transport costs to participate in the interviews) they will be remunerated. Refreshments will be served during the interviews. There will be no costs involved for participants taking part in this study.

Is there anything else that you should know or do?

- You can contact Prof Josef de Beer at (018) 285-2626 if you have any further questions or have any problems.
- You can also contact the North-West University Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee via Mrs Marlize Bisschoff at 018 299 4707 or marlize.bisschoff@nwu.ac.za if you have any concerns that were not answered about the research or if you have complaints about the research.
- You will receive a copy of this information and consent form for your own purposes.

Declaration by Chairperson of SGB

By signing below, I provide permission that teachers and learners in my school may be approached to take part in the research study titled 'The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour'.

I declare that:

- I have read this information/it was explained to me by a trusted person in a language with which I am fluent and comfortable.
- The research was clearly explained to me.
- I have had a chance to ask questions to both the person getting the consent from me, as well as the researcher and all my questions have been answered.
- I understand that taking part in this study is **voluntary** and participants have not been pressurised to take part.
- Participants may choose to leave the study at any time and will not be handled in a negative way if they do so.
- Participants may be asked to leave the study before it has finished, if the researcher feels it is in the best interest, or if they do not follow the study plan, as agreed to.

Signed at (*place*) on (*date*) 20....

.....
Signature of Chairperson of SGB

.....
Signature of witness

Declaration by person obtaining consent

I (*name*) declare that:

- I clearly and in detail explained the information in this document to
.....
- I did/did not use an interpreter.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I gave him/her time to discuss it with others if he/she wished to do so.

Signed at (*place*) on (*date*) 20....

.....
Signature of person obtaining consent

Declaration by researcher

I (*name*) declare that:

- I explained the information in this document to
- I did/did not use an interpreter.
- I encouraged him/her to ask questions and took adequate time to answer them.
- The informed consent was obtained by an independent person.
- I am satisfied that he/she adequately understands all aspects of the research, as described above.
- I am satisfied that he/she had time to discuss it with others if he/she wished to do so.

Signed at (*place*) on (*date*) 20....

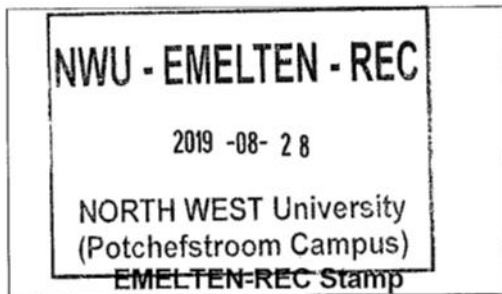
.....
Signature of researcher

Ms E.H Kamanga

APPENDIX G: INFORMED CONSENT FORM: LEARNERS



Private Bag X1290, Potchefstroom
South Africa 2520
Tel: +2718 299-1111/2222
Fax: +2718 299-4910
Web: <http://www.nwu.ac.za>
Faculty of education



INFORMED CONSENT DOCUMENTATION FOR LEARNER INTERVIEW PARTICIPATION

TITLE OF THE RESEARCH:

The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

ETHICS REFERENCE NUMBER: NWU-00533-19-S2

PROJECT SUPERVISOR: Prof Josef De Beer
CO-SUPERVISOR: Ms Anita Lubbe
ADDRESS: Potchefstroom Campus, Building B10, Room G51
CONTACT NUMBER: 018 285 2626

MEd-Student: Ms Effiness Kamanga
ADDRESS: 21 Benoni Street, Rustenburg North, 0299
CONTACT NUMBER: 071 050 8764

You are being invited to take part in a **research study** that forms part of a Masters study. Please take some time to read the information presented here, which will explain the details of this study. Please ask the researcher or person explaining the research to you any questions about any part of this study that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research is about and how you might be involved. Also, your participation is **entirely voluntary** and you are free to say no to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part now.

This study has been approved by the Education, Management and Economic Sciences, Law, Theology, Engineering and Natural Sciences Research Ethics Committee of the North-West University (NWU.....) and will be conducted according to the ethical guidelines and principles of Ethics in Health Research: Principles, Processes and Structures (DoH, 2015) and other international ethical guidelines applicable to this study. It might be necessary for the research ethics committee members or other relevant people to inspect the research records. Permission has also been approved by the Provincial Department of Basic Education as well as the school principal and parent/guardian.

What is this research study all about?

This study is designed to examine teachers' assessment beliefs in Natural Sciences and to link these beliefs with grade 9 learners' self-directed learning behaviour, in order to understand the relationship between them. This study will be conducted by Effiness Kamanga who is a Masters student at the North-West University, Potchefstroom campus and is supervised by experienced researchers' trained in the field of assessment to support self-directed learning. An expected number of 5 high schools which includes 1 Natural Sciences teacher and 5 grade 9 learners' per school will be participating in this study.

Why have you been invited to participate?

You have been invited to be part of this research because you attend Grade 9 in a school which was randomly selected amongst schools located in the Rustenburg area in the Bojanala Platinum district. Secondly, your name was also randomly selected from the Grade 9 class list so that we can have a fair selection of participants. The reason behind the above mentioned selections is based on the following:

- The researcher of this study is well experienced in grade 9 Natural Sciences subject which is crucial in understanding your self-directed learning behaviour within the context of Natural Sciences.
- Secondly the researcher is based around the Rustenburg area which makes it easier and possible to conduct the research.
- Lastly, the random selection of schools will ensure that a fair and just selection which is neutral and free from bias is maintained.

You will unfortunately not be able to take part in this research if you were a grade 9 learner attending at the same school where the researcher teaches at, because you would be familiar with the researcher which might jeopardise the integrity of the study.

What will be expected of you?

You will be interviewed together with other four learners in a group interview. Therefore, you are expected to respect each other and treat the material discussed as well as other participant's identities with confidentiality. You should feel free to express your own opinion during the interview which should take about 25 minutes.

Will you gain anything from taking part in this research?

The results of this study may not directly benefit you today but I hope it will be beneficial by contributing to our knowledge base of assessment and self-directed learning. Also it may benefit future teachers, curriculum developers and researchers, because the knowledge

gained from the study can inform further studies which seek to change or promote assessment practices which can support learners' self-directed learning behaviour.

Are there risks involved in you taking part in this research and what will be done to prevent them?

No intentional risks or harm are anticipated as a result of your participation. The researcher will treat all participants fairly, with honesty, with consideration and with respect. However, the possible harm may arise from the inconvenience caused by taking your spare-time during the interview session. This, will be minimized by providing refreshments during the interview. You will be given a pen as a small token of appreciation for participating.

How will we protect your confidentiality and who will see your findings?

A possible violation of privacy by other members in the group interview might occur when other group members tell others about the interview, therefore anonymity is limited with no internal confidentiality. However, external confidentiality and anonymity will be ensured by not using any descriptors or names that could lead to your identification during data collection, analysis and interpretation. Furthermore, the information collected from the tape-recorder will be protected by deleting the recordings once they have been transcribed. The transcribed text will be stored electronically and will be password protected as well as the hard copies. The researcher, as well as her supervisors will be the only individuals who will have access to the data which will be stored for a period of seven years.

What will happen with the findings?

The findings collected will primarily be used by the researcher for obtaining the Master of Education in Curriculum studies degree. However, research results could be used for presentation at conferences or for the publication of articles. The researcher will still maintain your confidentiality and protection of identity by not using any descriptors or names that could lead to your identification

How will you know about the results of this research?

Would you like the researcher to send you a short summary of the study's results when it is finished around: 30 November 2019? *Yes or No. (Make a circle on your choice)*

If selected yes, please provide an address where you would like us to send it to:

Address: _____

Email: _____

If you selected no, and you later on, change your mind, you can still contact the researcher at 071 050 8764 or efkamanga@yahoo.com and request that a summary be sent to you.

Will you be paid to take part in this study and are there any costs for you?

No participant will receive any payment to participate in this research project, because the study is based on voluntary participation which is free from coercion or inappropriate incentives in order to ensure integrity of the study. In addition, the researcher will not receive any payment for conducting this research, because the study does not have a sponsor. However, reimbursement of travel cost are provided when participants are requested to be interviewed at a particular selected site, but this is not the case with this study because all interviews are conducted within your school were you will be more secure and comfortable.

Is there anything else that you should know or do?

- You can contact Prof Josef De Beer at 018 285 2626 or josef.debeer@nwu.ac.za if you have any further questions or have any problems.
- You can also contact the Health Research Ethics Committee via Mrs Marlize Bisschoff at 018 299 4707 or marlize.bisschoff@nwu.ac.za if you have any concerns that were not answered about the research or if you have complaints about the research.
- You will receive a copy of this information and consent form for your own purposes.

Declaration by participant

By signing below, I
agree to take part in the research study titled: The influence of Natural Science teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

I declare that:

- I have read this information/it was explained to me by a trusted person in a language with which I am fluent and comfortable.
- The research was clearly explained to me.
- I have had a chance to ask questions to both the person getting the consent from me, as well as the researcher and all my questions have been answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be handled in a negative way if I do so.
- I may be asked to leave the study before it has finished, if the researcher feels it is in the best interest, or if I do not follow the study plan, as agreed to.

Signed at (*place*) on (*date*) 20....

.....
Signature of participant

Declaration by person obtaining consent: Researcher

I (*name*) **declare that:**

- I clearly and in detail explained the information in this document to
.....
- I did/did not use an interpreter.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I gave him/her time to discuss it with others if he/she wished to do so.

Signed at (*place*)on (*date*) 20....

.....
Signature of person obtaining consent: (Researcher)

APPENDIX H: INDIVIDUAL INTERVIEW PROTOCOL

Interview protocol

The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

Teacher interview

Opening statements

Good morning (afternoon). My name is Effiness Kamanga a master's student from the North-West University, Potchefstroom campus. Thank you for coming. The purpose for our conversation is to get your perceptions of your assessment beliefs. There are no right or wrong or desirable or undesirable answers. I would like you to feel comfortable with saying what you really think and how you really feel.

If it is okay with you, I will be tape-recording our conversation. The purpose of this is so that I can get all the details but at the same time be able to carry on an attentive conversation with you. I assure you that all your comments will remain confidential. All of the reports that result from this interview, will be written in a manner that no individual comment can be attributed to you. The tape recordings will be eventually deleted from the voice recorder after they are transcribed.

Your participation is voluntary and you may stop at any time if you feel uncomfortable. If you are willing to take part in the interview, please sign the informed consent form. If you wish not to participate, you are welcome to do so without any consequences. I have planned this interview to last no longer than 15 minutes.

Thank you for your agreeing to participate. Do you have any questions before we begin?

Questions to be asked

Note: [I will use phrases such as "Tell me more", "Could you give me an example?", "Could you explain that?" as prompts to solicit more detailed information when needed].

1. In your opinion what do you think is the purpose of assessment?
2. What do you think is the best way of assessing learner' understanding?
3. Tell me a bit more of your experiences with assessment within the grade 9 Natural Sciences subject.

Thank you for your time!

Reflective notes and comments

Note: [After the participants leave the room, I will take a couple of minutes to indicate my reflections and comments about the interview].

Participant's name: _____

School name: _____

Date: _____

Duration: _____

Please describe the participant's attitude toward you and the interview	
Please describe any unusual circumstances and/ or events that had any bearing on the interview such as interruptions, language difficulty, etc.:	
Please describe anything else that happened during the interview that has any bearings on the study's objectives:	
Additional comments:	

APPENDIX I: FOCUS GROUP INTERVIEW PROTOCOL

Interview protocol

The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour

Learner focus group interview

Opening statements

Good morning (afternoon). My name is Effiness Kamanga a master's student from the North-West University, Potchefstroom campus. Thank you for coming. The purpose for our conversation is to better understand your self-directed learning behaviours. There are no right or wrong answers but rather differing points of view. Please feel free to share your point of view even if it differs from what others have said.

If it is okay with you, I will be tape-recording our conversation. The purpose of this is so that I can get all the details but at the same time be able to carry on an attentive conversation with you. I assure you that all your comments will remain confidential. All of the reports that result from this interview, will be written in a manner that no individual comment can be attributed to a particular person. The tape recordings will be eventually deleted from the voice recorder after they are transcribed.

You are kindly requested not to talk about what will be discussed in the interview as well as names of the group members so as to ensure confidentiality and respect for each other's privacy. Your participation is voluntary and you may stop at any time if you feel uncomfortable. If you are willing to take part in the interview, please sign the informed consent form. If you wish not to participate, you are welcome to do so without any consequences. I have planned this interview to last no longer than 25 minutes.

Thank you for your agreeing to participate. Do you have any questions before we begin?

Questions to be asked

Note: [I will use phrases such as "Tell me more", "Could you give me an example?", "Could you explain that?" as prompts to solicit more detailed information when needed].

1. Describe your role as a learner during Natural Sciences lessons?
2. What are some of the activities, which enables you to understand the topics taught in Natural Sciences lessons better?
3. What type of studying methods help you to perform well in Natural Sciences
4. What are your views about assessing your own Natural Sciences activities instead of your teacher assessing your work?
5. Tell me a bit more of your experiences with assessment within Natural Sciences?

Thank you for your time!

Reflective notes and comments

Note: [After the participants leave the room, I will take a couple of minutes to indicate my reflections and comments about the interview].

Group interviewed (school name):

Date: _____

Duration: _____

Total number: _____

Please describe the participant's attitude toward you and the interview	
Please describe any unusual circumstances and/ or events that had any bearing on the interview such as interruptions, language difficulty, etc.:	
Please describe anything else that happened during the interview that has any bearings on the study's objectives:	
Additional comments:	

APPENDIX J: INDIVIDUAL INTERVIEW TRANSCRIPTS

INDIVIDUAL INTERVIEW TRANSCRIPTS

Conventions used for transcribing voice recordings

I: Interviewer	TPD: Teacher participant from school D
TPA: Teacher participant from school A	TPE: Teacher participant from school E
TPB: Teacher participant from school B	(...): Short pause
TPC: Teacher participant from school C	[/word/]: Translated word or text

School A- Individual interview transcript

I: In your opinion what do you think is the purpose of assessment?

TPA: The purpose of the assessment...eeh...is to get the understanding from the learners...whether the knowledge has been understood...eeh and whether the learners can relate the knowledge that they learned in the classroom with the real life situation that they may encounter...so that the most important thing about assessment is to get the feedback from the learners whether they understood the work.

I: Okay

TPA ...and then also you know with assessment we grade...is for grading...eeh...basically is to making learners to understand.

I: Okay

I: So what do you think is the best way of assessing learner's understanding?

TPA: The best way to make sure learners will understand what you been teaching them eeh...is to assess them weekly...is to assess them every day...whatever that you are explaining. If you are teaching a particular topic... give them work on that day...I guess it will assist them to understand better...and also it will improve the levels of assessment from baseline to informal assessment to formal assessment.

I: Tell me more about your experiences with assessment within the grade 9 Natural Sciences subject

TPA: Ja with grade 9 my experiences eeh...the learners their greatest enemy is the final examination and the formal task...eeh...especially... I'm not talking about the practicals and I'm not talking about the projects. Their own problem is when they are assessed based on the content...you know content is to do with them reading at home...but they don't read...so...so...assessing them with formal assessment it becomes a real problem because they can't memorize...they cannot recall information...eeh...they cannot...their memory is so poor to grasp the information...so see even right now as I was listing to them...they can't concentrate...we are not talking about the classroom...we are talking about you as a learner at home are you able to sit down and prepare for the formal examination.

A project it's something that anybody can just do you know....but it has to do with creativity...but I don't want to talk about those practical's...I'm talking about the formal assessments is the biggest problems....learners don't prepare for it at all...at all but the cause of it all is the work given in the informal task... given on daily basis they don't concentrate on them...they don't do them...the activities are always incomplete and all those informal activities that are given in the classroom they build onto the formal task...so if there have not been doing those questions...how will they cope with the formal task....we are teaching according to the blooms taxonomy according to the levels we give them multiple choice questions...we give them matching...we give them all different types of cognitive levels in the classrooms...but those questions we give them as Informal's they don't do them.

I: mmmm

TPA: you see ma'am...when a learner has to go and write the examinations there is no associations...they can't associate the questions that are in the exams with what they have been doing...all the questions in the examinations they show similarity...isn't that we are teaching according to the policy so the exam also is based on the policy on the topics that have been taught...but the learners they don't show association...their mind cannot associate the things that they have been taught and learning throughout.

I: so how do you think you can overcome that?

TPA: This one I am saying we are overcoming that by giving them the questions that are in the levels of ...the cognitive levels...we give them like maybe for an example according to the bloom's taxonomy...you must give them multiple choice questions...we do that in the class test that I'm giving them...they are informal... I monitor their understanding by giving them class test every week...

I: (short pause)

TPA: Now if I am doing that...I realise that if I am doing all this...when I look at the examinations...the questions papers...I realize that...this questions that I have been giving them they have similarities...so the problem is they don't prepare...they don't read at home...you see now...and then...for example if you look at the weighting of the examinations...the weighting of the examination is too much...it is too much... it is 60% especially for the grade 9...you understand?...I am not in control of that 60 %...and it comes once...so if a learner does not go and prepare the formal assessment at home they will be a problem...and that problem it is not 100% leaned to what was happening in the classrooms...No...if you can take out their books and you compare with the question paper...you will realize that these learners they have the similar questions that are there in the examinations...all the cognitive levels have been assessed...but what is the problem...they don't do it...so this is what I have encountered throughout the assessment of these learners inside the classrooms...is that they don't read...even if you would use baseline assessment, you use informal assessment...they will come at school work is not done...and the same question that they were supposed to do...is the same question that could have helped them to associate with other questions that will come in the examinations...but then if they keep on not doing all this work...they come to school...the work is incomplete...the brain cannot build the associations...you know associations has to do with...when I am having a question paper...oh I remember this question is similar...no I remember this question is like that question...I did it like this...this topic is like this but they don't have that because of the is a gap...they don't do their homework...they don't read...and you cannot force them...it's not possible...I can't force them...I can't...we are really frustrated...eeh... by the behaviours of the learners at school...and it's a world problem...learners they don't pass well in the examinations...they don't and one of the cause is the exam it weighs more marks...more percentage...than what they been doing throughout the year....and what these learners are saying the formal tasks, the practical's...the projects there are easy for us...this is

what they are saying...but then the problem is when they have to write exams it becomes difficult. It means the skill of memorizing...of recalling information is not there...you see...so then this is the problem I have encountered with assessment throughout the years that I have been teaching these learners...the problem is not other activities. The problem is the formal assessment that learners are in control off...you know a June exam, November examinations...learners are in control of that because they are at home...but if they were to write my test ...if I give them a formal test and they did not perform well...I can go and do revision again and make them write the test again....but with exam is not possible...it's something that is fixed...if they fail it they cannot be re-assessed on that yet it weighs more marks...so there is also...eeh...I can't say the is unfairness with assessment....I'm trying to say that learners are not reading...and the ways of helping them we are trying to give them more informal task...informal tasks they don't do them...they don't do their homework...they don't even read for the class test that we give them...and all these small activities they are building for exams...so if somebody did not try to attempt to answer all these questions...it means that they will be some gaps in the cognitive levels in the examinations...they won't be able to draw a graph because when he was given a graph inside the classroom.. he did not do it...he won't be able to discuss questions in the exam because when he was given questions to discuss...he did not discuss it...they won't be able to know how to write a multiple choice question when they have to choose the correct biological term...when we give them terminologies in classrooms they don't do them...so all these things they build gaps...they build serious gaps...and then tomorrow if I keep on checking their work...there is no work...eeh what are you going to do...that is the problem with assessment but I want to assure you if these learners were able to do the work every day...the small work that we give them they do it...and tomorrow we do corrections with them...I don't see a need for them to fail...so they fail because of that reason....they don't do their work.

I: But why do you think learners they don't do they work? What is the problem?

TPA: I think the problem is the perception...because the perceptions of learners of children is not the same as according to the communities...you know the...for an example the community were the school is also plays a role in the attitude of learners...where the learners are coming from...the community were they are coming from also plays a role in them taking their school work very seriously...that is the problem...the perception...I can do lot of examples...even if you can also do a research on how learners perform according

to the geographical location of where the school is you will see that...there assessment also.. is it affected by that...learners who are coming from...Hoerskool...eeh that community and the type of parents that are there also it has an impact on their school performance of the learners performance...but it's not the case.....I'm just trying to say that these are the factors...even one learner who is in the village area there....he can also out perform a learner who is here... I don't dispute that...but I want to tell you that the environment also where the school is...and where the learners live also it plays a very big role...so but I don't know....and also there is politics also that affect the school performance, the learners performance...you find that there is a racial undisclosed eeh issues...there are politics but there are not said...they are said to the learners when they come to school they see teachers in a different way....these are the things that affect eeh...learners not to take certain subject well...they look at...they concentrate on racial...you are not coming from here...so we are not going to listen to you...but it's not always the case...because you might be a foreigner teaching them and they are performing...but also if ... even if you can try to do research on why the learners are performing in your subject you find that you are a favourite to their parents.....you understand what I am saying

I: mmmmm

TPA: you find that you are a favourite in their parents...they favour you...the parents they don't say anything negative about you that could also make learners to have a negative perception...so assessment it is so broad...it has politics that affect the learners performance...politics in the sense in a community they don't want this teacher...they want to remove this teacher so the make the learners not to be interested in that subject that the teacher is teaching...eeh... you understand?

I: Ja...ja

TPA: There are facets' that works in the mind of a child...and if a child would hear a certain rumour about you that is a lie...obviously he is not going to concentrate... even when his studying at home...he's not going to see the essence of taking your subject serious...and also besides this these are...I am not accurate with what I'm saying but I'm telling you what could be the other factors....other factors that could lead to children not...eeh...not taking the assessment seriously...is eeh...you would find that eeh.....this year they were taught by a particular teacher...they are adapted to that teaching style...the following year

that teacher leave them now you have to take them...now it becomes difficult and the teacher is around the school...now it becomes difficult...they compare you with that teacher...they struggle to adjust to you...it becomes a nightmare to them...you see...so there are a lot of factors that disturbs the assessment especially for a particular subject...eeh... Ja... this is my experience of assessment in school system...that there are learners who are adapted to a particular teacher and then when that teacher goes the new one comes the learners are not interested even if you are a good teacher it becomes difficult for them to change...eeh.. to adjust to the method that a new teacher is coming...you see...it becomes a problem...like the learners also believe about...belief has to do with...to some extent with a certain perception about that teacher...and the one who was not teaching us...so there are a lot of things...there are a lot of things...

I: What about positive experiences with assessment?

TPA: No...me I had never had any positive experiences with assessment...I cannot lie...I have never had any positive experiences...I have never....no no no...I have never... I am not negative.

I: no no...you are being honest

TPA: Ja... I am honest I have never had any positive experiences with assessment particularly with the grade 9...never...it's a struggle and I wonder why...I can change and can bring different strategies. I can go to ITC...I can bring laptop and projectors...I can go outside with them...but the thing became the same...behaviour is still not changing.

I: Which behaviour is that?

TPA: The behaviour of learners towards the assessment that I am using...towards the strategies that I am using to help them understand

I: So there isn't any particular strategy that they like?

TPA: No....I have use many strategies...in fact I was using the projector...I was using the laptop there...eeh... to try to check whether they learned through visual but I realized that it's not the case...ITC is not the case in the classroom...this is what I realized...then I move now...let me use the board, the chalk... let me teach now...let me really teach in a traditional way...maybe they will get understanding...then I realized that all these things they are not working...they are not working...you can come up with all different strategies of assessment of assessing them but if they can't read....our worry is the examinations

because some of the task we give them they are not memory orientated. Our learners there are not memory orientated....they don't have that...they can't memorize, they can't recall information, they cannot read they can't...and then making a learner to build a model does not promote memory...it does not promote memory...it does not promote memory.....ja...so assessment truly speaking...this...its interesting assessment versus the belief of the self-directed learning of the learners is a problem...it's a problem...you see? And we cannot eeh keep on explaining while somebody did not read 60 % of the exam at home....we cannot keep on accounting for why this person fails exam...no...you get a timetable...you must go and read for that 75% ...go home and read...you come back and you are not reading and I must be asked why you failed.....is it fair (laughs).

I: Laughs

TPA: no we must face reality...is it fair?...that somebody must go home and read for exam and he comes back and he did not read the exam and he fails exam now I must stand there and explain why this person...I was not at home...but I can tell you about the practical task, I can tell you about the project, I can tell you about the classwork books...I can give an account...I can tell you...no I assess this learner like this...he did not read...he did not do the work...I gave them projects I said submit...he did not submit...that's where you must question me...you cannot question me about exam...you can't...you can't...eeh a learner is responsible...you are responsible...you must go and read at home...how you read...it is based on what I have been explaining here inside the classroom...what I have been giving you...if you don't go through these things you can't pass...so teaching it has become very difficult ...assessment is very difficult...it's very difficult...and but also I realize that assessment also its unfair...the level of grading in assessment is unfair..

I: How so?

TPA: eeh... if you say ehh...you are going to make the weighting of all the work the learner has been doing from January until November to be 40 % and then you make exams to be 60 %...do you thing that its fair?

I: mmmmm...perhaps there is a gap there

TPA: No... I am saying do you think it's fair...the learner has been doing a lot of work...coming to school every morning doing the work every day...every week...piling a lot of work and

then the June exam now is the one...exam must be the one...not only the June exam the final examinations must be the one that must decide for these kids...with more weighting...something that will be written on one day and decided somebodys child to be credited or not to be credited...but the volume of work that has been done it weighs less...it's not fair.....I'm saying it's just not fair.

I: no... it's your opinion its ok

TPA: Ja...but it's not fair....me if I was on the highest level of authority I was not going to make assessment in that way...assessment...whatever we give learners it must matter...every piece of work which I give learners must matter...it must matter...you understand what I'm saying? It must matter not the final examination....so assessment is unfair in a school system...it's unfair...this is what I want to tell you....assessment is unfair...ja...it's unfair...assessment is unfair...it's unfair on certain task that how is it possible that the examination must weigh more...but the learner has done volume of work that will be weighed less...and then in the whole world...I want to tell you the biggest enemy of all these children is exams and they fail it...all the countries...exams is the problem...learners they don't read...teachers are teaching we are giving them questions that are relevant but the enemy is the examinations...is the assessment particularly is the examination....is the biggest...even if you would do research about the Natural Science how it is performed worldwide according to country to country, mathematics, English...you will find that, what is the problem...the problem is exam...this is a problem and we are not in control of it...because a child has to read at home...if he can't read at home...he cannot be disciplined enough to say I am going to study my work at home...they won't fail...so...eeh...the perspective of a child towards schooling matters...the level of interest...a personal interest of a child and the parent towards school it matters in assessment...so this is what I want to tell you...these are the factors that disturb the level of interest...and in most cases we cannot...I cannot make a child be interested...me I'm telling you...an interest of something comes from within a child...I can teach...if I can teach in a way...I bring videos, I bring all models inside the classroom...the issue is to make you...to stimulate that interest...but if it does not come...if it's not coming out is a problem....if I take you outside and I say I'm teaching about force...push the wall, push each other...I'm building the interest...I'm activating the interest in you...if it's not coming...is it my fault...

I: Ja... I hear you

TPA: It's not my fault...is the general personal interest of a child towards school...what the child wants to do...you see...ja...so assessment with my experience is difficult...I am not negative...I'm telling you the truth as it is...what's happening...assessment is a problem...you see now I wrote corrections there...I give them homework...I'm writing corrections...some came they did not do the homework...and this activity is building...it's another cognitive...I am exercising another cognitive level in them if they don't do that...now tomorrow I am moving on to another cognitive level that they missed this one...I'm I going to keep on asking this cognitive level every day?No...I can't...so exam when it come part of the cognitive level that they did not do as homework they can't associate that with what is simple that I gave them...teaching is difficult...I'm telling you it's difficult...so I don't have any positive remarks that I can think about assessment in grade 9...I don't have...it's a problem...sometimes you may wish that they must bring maybe a white person or and Indian to see the difference....(Laughs)...you understand?...ja...but the learners do well in projects and practical's...exams its hard in all the subjects not only NS in all the subjects...I'm telling you the truth...they do well in the CASS and not the assessment...formal...especially examinations...it's hard.

I: Ok if there is nothing more those are the only questions that I have for you

TPA: oh... we are done...(laughs)...no thank you so much...you know I can say a lot of things about assessments.

END OF INTERVIEW

School B- Individual interview transcript

I: In your opinion what do you think is the purpose of assessment?

TPB: I think assessment is basically...ahm...to find out how much a child has learned has gathered the information from the teacher themselves and then to also find out where the problems lie so that you can try to fix those problem areas in the sense that you can either go back to that section or you can re-explain a section...ahm...find out the different levels that they are not understanding cause some children will basically know normal knowledge...routine knowledge they will know that...but as soon as you give an

application question they can't... relate the two...so it's a way of finding out how much your child knows so that you can progress further...I would think.

I: What do you think is the best way of assessing learner understanding?

TPB: Ok...I don't know if it's the best way but the way I would do it basically I...within the class the is oral questions and answers during a lesson... the next few days is recapping of what you know and what they don't know...so basically that's a more of an informal oral type of testing thing...then daily homework is given so that by the time they come back the next day...now because I'm a Maths and Science teacher I would do corrections with them and then on the board as well...okay... so that they...I can see and use learners to come and do corrections...I ask them so I can find out if there were problems where the problems might been find common mistakes...so all this is the informal testing that I'm doing and then overall at the end you need to give a formal test...but before that I give and informal written test... sort of a short test...where similar type of questions...the way in which a test would be structured...I would structure the test in that way...to see can they...If it's an NS diagram...I would give the diagram and they label it...can they give the functions...so that's the basic routine knowledge...and then I would add on questions that are more application type of questions or investigation practical type of questions thing for NS...so that's done before the test so that they can get an idea what the formal test is like and I can get an idea where there is problems and then the formal test will be given thereafter...so it's done over a... quite a period of time.

I: So tell me more of your experiences with assessment within the grade 9 Natural Sciences subject.

TPB: ahm...let me just put you in the picture of our classes how they are structured for this year that we've tried...ahm because usually it was just randomly selected to go into grade 9A, 9B, 9C...right were we've...not randomly in the sense different forms of learning in each class but this year we decided that we gonna take out the weaker learners and put them into one class so that we can basically move much further and better like other classes and the weaker class we wanted to help them cope...we wanted to structure them you know...so that's in testing year this year...it's the first time we doing it...so I've got the weaker class...now they were based weaker on the sense of Maths and English cause that's the problems for the eights and nines they can't progress cause they can't pass Maths and English... so that was identified in that way...so I've got 9C which is basically

considered the weaker class...so in the sense we wanted...I teach differently as the other teacher would teach 9A and 9B in the sense that...I coach them...I help them out a lot...we reiterate a lot...and so on...okay...so..eeh what was your question actually ?

I: Your experiences with assessment ...

TPB: Ok, so with them... it... would be more sort of in the sense spoon feed but also to the point where they would have to answer in the end...so if I do activities with them I explain the activity exactly what is required from them and they would answer the questions and then we would mark it together...we'd do the corrections... for a test when we busy in class...I would say this is a question most commonly asked so you need to concentrate on this type of question...if it's is a table form I'd say to them tabulate means table... you need to draw a table ...it needs to be very much more detail to be said to them...you will find out when you see my learners also...however in my class I do have ones that progress I think for June the highest was above 60 % but there are some that are under 30%...I think the lowest was about a 24...so for me to get them to a 30 I need to work on those few...but there are some that are doing ok in the subject...ahm so assessment basically...aah...its' as I said its coached a lot more for this group of learners to try and let them progress into the next grade...now if you compare it with 9A and B there's many more application questions...they've left to work on their own...the activities given they'd come back having it done..9C you give them homework they wouldn't have done it...so in the sense its worked differently compared to the other two grades but now in that class there is also because there are the weaker there is also more problematic learners... so discipline can be an issue in the class...if you'll see even if you came to class and you visited it takes very long for them to settle down...you have to tell them take out your books take out your stationery... we ready to work that kind of thing and their concentration span is also so limited ...so you would do a certain amount give them opportunity to work with an exercise but not meaning that they would do it...Okay...so assessment in the end needs to come from having coached them having trained them as I said I give them the informal testing and so on which to a certain extent is working except for a few weaker learners that are having a problem.

I: So how do you overcome the challenges of learners not having to do the work?

TPB: What I have tried this year so far...we had...we normally have parent meetings termly...where I explain to the parents some of these learners are problematic...I didn't

improve...what we did most recently was amongst the grade nines' teachers we picked out those who are problematic in the class and had one on one parent consultations here...you know in office with the principal were we said to them that they are affecting other peoples work and this is what needs to be done...unfortunately one or two have improved but have not completely turn around and there are some that haven't...so I've tried now the strategies this term I said to them I'm not wanting to fight I'm actually being quite sort of nice in a way.. in the sense that I'm speaking...basically I don't speak to them in a harsh way but there comes a point where you get tired of it you know...so...so far it's still the chatting's, the talking I still have to wait I can't send them out of the class because it becomes more disruptive. You speak to them try to tell them the works need to be done inform the parents but they still no improvement in the sense...I just had parent consultation last week were I said to the parents this is the issues not all the parents pitched up...yeah...so it's not overcome its being dealt with ...you know you deal with the situation but it's not the perfect situation...yeah...yeah.

I: So tell me again what your opinion on activities like self-assessment and peer assessment...would you consider it?

TPB: I would consider it...it does work but it doesn't work for all like in this group I have there are some that would do what you tell them they would do it but there are some who just won't...if you do self-assessment the work might be done but it meant it copied from this person...or unless you do it under very very strict conditions to do self-assessment but it shouldn't be...It should be that it's like your own assessment...peer assessment should be were there working with the person next to them...eeh ...I would say it's about let's say 80% of it would work for 80% of the learners you'll get the 20% of learners that just won't work or just won't...or they'd do it but through copying...but it can work if a child is honest it can work...yeah...because if you do it with the 9A they do it...you do it with most of the 9B they do it... so it just depends on the learner...yeah...it depends on what type of learner you have... I think it come down to that...yeah

I: So any negative experience with assessment?

TPB: No I wouldn't say...it needs to be there you need an indication of what it is...however...ahm...I would say I'm all for when they do this common assessment...I'm for that because I would like to see if my children can cope with any other papers set by anybody else because I know I'm covering the content...I would ask it in a particular way

someone else would ask it differently...so I would actually want them to be exposed to that where...but obviously that paper that is set must be set in a fair way...that a weak child can get at least the minimum of 40% and you know the routine knowledge and that and then move further away for the brighter learner...we don't want everybody to get 100% also...so it must be properly set...and the learner should be exposed to those papers so that I for one can see that I'm doing ok my learners know what is expected from them and not just in isolation to one particular teacher all the time...because you obviously get used to that teacher...and I might set ok...I want all my children to pass so I'm just gonna give them label this diagram and that's not what's supposed to be done ...you know you have to actually see what the children can do and then how can you improve on it a bit further.

I: No...thank you if there is no other comment those are the only question I have

TPB: No there's no other...not really...just...so you basically more concerned with assessment...so your study is to find out?

I: the connection between teacher's assessments beliefs with the learner's self-directed learning behaviours...because...research...we don't have enough information on how they relate to each other so this research will uncover more...If any.

TPB: This is basically...cause I'm only doing science class for one class...I'm generally a Maths teacher though what I actually tried to do this term with my grade eleven's is to actually do more self-learning in the sense that you go research what the topic is about and then we come back with...because our children are becoming too used to listening to what the teacher says and can only apply what that is...and then when they live the school they cannot really cope with...they don't have that ability to critically think...to critically analyse...so I do grade eleven's and twelve...but twelve's now...it's a bit too...there already going into prep exams.

I: So how about starting it in grade 9?

TPB: I...you could...but I don't know whether I would cope with this 9C class...to do it...if it was...as I say the 9A class...I won't think that yes...my eleven's actually came to the front to teach the class and I just basically listened directed them...probed questions...so I'm also doing a little bit of research in my class to see did you learn better this way or you learn better with me there in the front...do you feel like you had to do a lot more work...so

I think they mature enough...more mature to handle something like this...not yet in grade 9...but it depends again with the learner...so I'm only doing it with the classes I teach but I said to the grade 11 now because you going to grade 12 quite soon you need to have a way of thinking...because some of them are so to I come in the front and I teach...I show them this...I direct them...I said we need to change that way of thinking...ja so it can work self-directed learning can work...but again it depends on our learner...and the other thing is there is lack of parental involvement in our homes...If I just had a parents meeting the other day many of the parents we saying the children come home...I say to them the problem in 9C is that a lot of them sleep a lot...they very tired all the time...so the parent I spoke to say...my child comes home and they sleep in the afternoon...they do a little bit of work by eight o'clock they sleeping again...which means they have ample amount of sleep they shouldn't be tired the next day in class...but children are tired our parents can't seem to get them to do work...they just tell them that there are tired and the parents leave them...so there's a lot of issues that play a role in what our earners are like at school...yeah...

I: So those are some of the factors...

TPB: Ja...you would think that it's only here at school they have discipline problems, or they have lack of interest...but our parents are saying that my child wants to sleep and there's nothing I can do to get them up to get going...I said do you give them chores...yes we give them chores but they don't wanna do it... and then they live them... so there's also other issues...we need to look at parents role in this...and...there's a lot that goes on...you would think it's just the learner...there's lot of circumstances around it...

I: Tell me more about those circumstances?

TPB: Like I say... you don't ...we need to know a lot about the environment that they live in...and we also don't know all that all the time, we only get to know when we speak to the parents and now I was shocked with these parents the other day...when they would say my child does sleep...but even if I tell them to do it they don't wanna do it...now how is a teacher going to be able to give an instruction and them follow it...if there not used to following instructions at home...you know. There others that might be tired and sleeping because there is a drug problem and children are exposed to it...I can say whether they are taking it or not...or what they taking...so obviously it plays a role in their activities in the class...they could be other environmental factors...don't know what's

happening...one of the matriculant was away for quite some few days because the parents were going through a divorce...and nobody informs us of that you know...there's social factors that play a role...at school just the other day there was a fight...I don't know what was going on between the two boys...now there's peer pressure in that sense...so kids are dealing with a lot...yeah...so although we expect them to perform academically there is a lot of other issues that there are going through...I don't know if it relates to your topic...but you can give an assessment and see whether the learner performs but you don't know whether they studied... and parents they don't know that they writing a test tomorrow...cause as much as you can try to inform them the parents might not get that message...you know...so a lot depends on the learner...the individual...yeah

END OF INTERVIEW

School C- Individual interview transcript

I: In your opinion what do you think is the purpose of assessment?

TPC:To check whether what you've been teaching in class learners have understand that...and then also it's actually to promote learners to the next grade if they were doing grade nine so you assess them to check whether they ready for the next grade by that assessment.

I: So what do you think is the best way of assessing learner's understanding?

TPC:I was saying we use technology if you project your lesson...you can be able to put the question underneath your lesson what you've been teaching then you can project questions just after your lesson...you ask them about what you've been teaching by just raising up their hands you check...eeh if they have understand and if they don't understand you can assist them to answer the question show them how the questions are supposed to be answered...I'm saying I was using that method in grade 12 neh... and it was working so now in grade 9 I'm not using the method because of technology and with this one that I'm using were learners cut the question and paste they tend to forget...I can't do that because of time but now if it's a projector you cannot write questions and then once you ask the questions you know verbally so...if it's a long question they will miss the first part so it's difficult for me to do it in grade 9...but you project then underneath your projections they will be checkpoints activities...what is stratosphere what

is what and what you ask them those questions and they can be able to answer you and then you assist them in answering the questions to show them how they are supposed to answer the questions together...after that you take the very same class work activity you ask them in their classwork book where they do their cut and paste and then they write the question and then you can repeat again the question and check in their class test or control test you use the very same questions...then I think it works...

I: So for grade 9 what's been working so far?

TPC: So far eeh...I'm using activities...we developed class activities from the textbook just cut and paste and now I'm getting question papers....what we do we take questions from the question paper they paste and then they answer the questions there...but eeh it doesn't work because they are failing...I think that one I was using in grade 12 works probably means maybe it's because these ones are younger and the grade twelves' are...they've grown up...but you cut questions they paste and then they answer the questions and then what you do...you do the corrections together...but still even if you have asked them they are still failing so I think...I don't know you can still check the best method maybe go to this one... but I can't because of electricity...I haven't check that one but this one... out of hundred an...two hundred and thirty five they won't even make fifty those who pass you see it's a very serious problem.

I: So tell me more about your experiences with assessment within the grade 9 Natural Sciences subject

TPC: Eeh...you know I haven't been teaching grade 9...when I came here I was actually employed for grade 12...for Life Sciences...not Natural Sciences so I can say I'm still new in the Natural Sciences but so far that is my experiences that this method I was using is not working at all at all...so I have to come up with a new method...problem is that we don't go to the workshops where they workshop us to you know...how to give assessment...eeh last time we went to...what is that...eeh...school net...where they teach us to... assess learners using cell phones using Google net those kind of things...using Google where learners sign in and then you can be able to send them the class activities...on their...at home on their emails and then you can be able to check if they have answered the questions maybe that one can try...so I'm still going to...you see we have the gadgets here...we still going to use the gadgets and check if we ask it that way it can work...another method I wanted to try is that WhatsApp method I used in grade

12 I haven't check here but mostly learners will say they don't have cell phones but grade 12 they do have...you create a group and you post class activity on the learners and then you can be able to mark...eeh in a way they will be studying...they will be checking the answers and then they choose the correct answers...and I give them those who sent me their answers...I mark them through the WhatsApp and then I send it back...I was using it also in grade12...grade 9..eeee[/signs/] not because they will tell me they don't have cell phones...probably work but these are young ...eish [/signs/] its difficult...

I: It's a challenge...okay...so any other factors that affect you negative during assessments in grade 9...besides...

TPC:Learners are not writing...grade nine's it's a very very serious problem that is... they don't write so it's difficult for you to assess them...you teach them about how lightning is formed like now I was in class I was teaching them about how lightning is formed...what is a cloud...mixture of water ice you know...and explain that after that you give them the assessment...and then if you stand up they don't write...they will start borrowing glue...borrowing this and that...cutting until until the end of the period they don't write...that is a problem so you can be able to assess you can't be able to see whether you've been teaching they understand or not...but mostly is like they are not concentrating...lack of concentration...big classes also it's an issue...if you are managing a class of 53 learners and then you got to that row...if you live this row you go to this row...another row...those ones are now leaving...even now the class work that I've given them on one learners wrote...one line five questions...so in grade 12 what I use to do...that I also you know eeh...did it in grade nine's even through I'm not through in that...what I do is when you assess class activities... what you do for them to write...you write the minutes...saying this activity if its 6 marks...you know ...if it means its 6 minutes...you have to do it in 6 minutes to avoid learners who will always take the entire forty five minutes writing five questions...so what I do I write times like the way they writing examinations...start time is six past...when you going to finish it takes only six minutes...six seven eight nine ten eleven...by twelve past you have to be done with the activity...If you don't have a glue just create space you will paste and learners start writing if that six minutes elapses I say stop...you can stop writing now we can answer the questions together because if they don't know the answer they can't even try and then you are wasting your time...that is a problem...so they don't write.

I: They don't write...okay...on my side those are the only questions...that I have for you so I don't know if you have any other comment before we close.

TPC: No I don't have any...nothing at all.

END OF INTERVIEW

School D- Individual interview transcript

I: In your opinion what do you think is the purpose of assessment?

TPD: There's different purposes I mean...sometimes it's just to check how much learners know and understand...so it can be like an informal assessment...sometimes it can be to check what they already know...like when they come from primary school...what they know about NS so it's more diagnostic akere[/isn't it/]...and then sometimes it can be...I mean to make sure gore...ok you have to know this by now...so just to check if they know that and how well they know that...so just to evaluate how much they already know...so ja...there's a different one...so...what else...we assess...maybe sometimes we assess because like today...they don't understand what we've been doing...so I was like teach yourselves...here's the textbook...sit down and teach yourselves because when I was assessing their knowledge it was not there...there's lots of different reasons.

I: So what do you think is the best way of assessing learner's understanding?

TPD: mmm...well understanding I think oral like a simple oral assessment...to check maybe for definitions do they understand what this definition means... you know on the spot can they...even if though know something can they explain to somebody else what for example what that concept is...ja...so it can be oral...sometimes I like making them write summaries to see if okay we've done this we've read this we should understand so they would write maybe a ten point summary about that thing or a paragraph...like I will maybe explain...like the other day I was explaining different...different factors that affect resistance neh...I explained what affects high resistance then I said they should write what would then affect low resistance in a paragraph...so understanding for me is more oral and writing...writing summaries or paragraphs...ja stuff like that.

I: So tell me more about your experiences with assessment within the grade 9 Natural Sciences subject

TPD: Eish...you know...oh in grade 9...I wish I could...more of it it's just writing neh and reading and stuff...I wish we could have more resources for like...if I could give each one their little electricity pack or something do to a practical you know... do a practical...if I want to see if they can connect series... you know...then just be like okay everybody now is the time to...so we don't have those things the opportunity to really go more practical and then when we do have practical's there are more like demonstrations...so I will be demonstrating I'd get one or two to kind of touch the apparatus but I feel like that's still not enough...we need...as you can see at our school we don't have a lab...then I try to collect a few things to make sure...I wish when learners get stationary things like that are also part of the school stationary...like ok every year we know kids are getting books and blaah-blaah-blaah...let's make sure the school has batteries what-what-what... or whatever that grade nines will be doing for that year...if it doesn't go...it doesn't have to be every year but I wish the department had that...so we can do more practical stuff...I wish we could do more excursions...I wish there was more time actually for like going out experiencing the science and not just seeing it in the books and stuff like that and my class is very big so...like my grade nines...wa bona [/you see/] I don't even have space (pointing at her desk by the corner)...my grade nines are about...eeh fifty something in a class...I lose some of them because they are not getting you know the interest like ok they hear me talking and reading...but maybe if we went out they did that thing or they saw somebody doing that...or they did it in class it would be different...so assessment for NS I think it can be much better... more practical's more tangible things for them to do...the ones that normally pass...ke ba[/these are/]...learners' that are very good in reading and writing...and we are all not good in reading and writing and it doesn't mean...I mean a reading and writing learner maybe... may not be able to connect the stuff but she can write for me and tell me a series is a connection blaah blaah blaah...but that learner that cannot write series is what...if I say connect them in series wa itse[/ she knows/] oh ma'am like this...so it's bad...its really bad...but we are doing what we can with what we have...

I: so I don't know on your side is there anything else that comes into mind...other factors that affect your assessments negatively...in grade 9

TPD: I feel like the syllabus is a lot...I feel like...(stands up and collects grade 9 NS textbook)...I wish that these things could be changed...as this is just a research they are going to look at it and aag[/signs/]...

I: you never know...

TPD:...(paging through the textbook)...I feel like it's a lot for example...considering my learners' level of understanding and... nka reng[/what can I say/] language sophistication...language proficiency neh...something that they say must take me a week...for example it's going to take me more...like I have been explaining these things (pointing at series and parallel activities)...I'm going out of my mind because they are not getting it coz...it's the language it's the definitions...the technical side of it...it takes longer than a week...mara [/but/] department they want you to finish the syllabus...on top of that there other topics in there...so I feel like there's too many topics all at once...there's too much to do...and if they...I mean it's doesn't even give us a chance to go deeper into the content...its very superficial...gore[/like/] okay this what...like you know in terms of that thing ya[/of/] knowledge, understanding, analysis, what what what...the way content e re tshwanetse re e covare e ntseng ka teng[/the way this content that we must cover is too much/]...you only do one and two...

I: you can't go deep...

TPD:you can't...when are you going to analyse stuff, when are you going to apply stuff, when are you going to solve a problem using...there is not a lot of time...there's just too many things...too many things to cover very little time...so I wish somebody could just say you know what force is not a must but if you can cover...some schools can cover it...it's not a must this term...but if you can cover it do it...or if it was more like our focus is electricity...make sure they know everything there...this one just knowledge and understanding, this one synthesis and what and what and what...you know what I mean...and then you kind of know gore[/that/] my learners' probably won't even get to synthesis ko[/on/] force but its ok still I don't have to hammer it in...and focus on the that's majority...you understand...so I just feel like there's too much to learn...some of my kids can't even understand English...like I code switch a lot...and okay I can code switch for them to understand but when they have to write I want the proper language that they don't have...ammm...so everything takes longer...language is a big problem...maybe one day will have a...an indigenous textbook (laughs)...le teng [/even so/] I don't think it would be that useful because at the end of the day they must still write in English.

I: So on my side those are the only questions I have on my side...I don't know if you have any other comments...

TPD:none...

END OF INTERVIEW

School E-Individual interview transcript

I: In your opinion what do you think is the purpose of assessment?

TPE: The purpose of assessment is to test whether the learner has captured what I taught them. It is also to test whether I'm on par with what I should do...eeh...gape le eng [/and what again/]...

I: your opinion...

TPE: My opinion why do I assess...yes I assess so as to change the...if learners don't understand what I'm doing so as to change the method of teaching...I think that's all.

I: So what do you think is the best way of assessing learner's understanding?

TPE: The best way is individually because when I assess in group there will be some who are shy...so the best way is to assess them individually in...through writing... class works and tests.

I: So tell me more about your experiences with assessment within the grade 9 Natural Sciences subject

TPE: mmm...my experience....(long pause)

I: It can be negative things, positive things that you have encountered in Natural Science...especially in grade 9 with assessments.

TPE: mmm...the challenges are sometimes the overcrowded...in overcrowded classes neh...if they write they may copy from others and then I will be assuming that majority of them understood what I'm teaching of which some they assisted other learners...but when they are writing a test a formal one whereby they sit in their own table alone...its where it becomes positive and so their marks there will be varying as compared to when they were writing in the class and when they are writing for a formal task.

I: So which assessments work best for you?

TPE: The one that is giving me the exact of what is happening in class is when they are writing the formal one whereby they are sitting alone in their tables.

I: So what other factors do you think affect your assessments in class?

TPE: Overcrowding...I think its overcrowding...and then learners they write without preparing themselves...they don't read at home...so it is also affecting it...even those who are assisting one another also it is becoming a problem...

I: so learners they tend to copy neh?

TPE: mmm...some they come to the class they are having something...they call it...a mofago nya na [/scrib notes/]...so they come... they will be writing on a paper and the will enter the class...so you won't know...but nah [/me/] up to now I have seen that one... I'm having two classes...the other one class their marks will vary more so I don't know whether they are having that...they are copying...because when I teach... they are the noisy class but when I assess they are the ones who passing...I don't know whether they can learn under the situation where there is noise in the class because of that I don't know.

I: so is there any other comment...because those are the only questions.

TPE: It's only the three questions...

I: Is there anything that comes to mind

TPE: eish... nothing for now maybe later

(After some few minutes later)

TPE: The other experience with assessments is that learners don't like to be assessed so the will be complaining when you say today we are going to write classwork "hey...you didn't tell us"...so that is a problem...they don't like it at all

I: so how do you overcome that challenge?

TPE: You just force them...you don't listen to them...you force them...eish...they will come with lots of excuses "oh...we didn't read...no you didn't tell us" but they know that on Friday we write assessments every Friday...we teach for four days and then the fifth day is assessments...even though you forgot to tell them...they know.

I: but they complain still...

TPE: eey...they complain...and they need to be given a scope “where are we going to write”
...that’s all.

I: Thank you

END OF INTERVIEW

APPENDIX K: FOCUS GROUP INTERVIEW TRANSCRIPTS

FOCUS GROUP INTERVIEW TRANSCRIPTS

Conventions used for transcribing voice recordings

I: Interviewer	LP4: Learner participant four
LP1: Learner participant one	LP5: Learner participant five
LP2: Learner participant two	(...): Short pause
LP3: Learner participant three	[/word/]: Translated word or text

School A - Focus group interview transcript

I: Describe your role as a learner during Natural Science lessons?

LP1: Eish ma'am to have knowledge about the things we been...are being taught and.....

LP2: Is to listen and concentrate in class.

LP3: ahmm my role is that ahmm... in...when is Natural Science I have to understand...like what's going on...I have to know...like...(long pause)... like ja ma'am I have to understand like to know more about Natural Science

LP4: I have to listen and... I have to make sure that I understand everything that sir says

LP5: I have to co-operate in class and respect the NS teacher.

I: So you all mentioning. Your role is to understand. How do you think is the best way that you can understand.

LP1: By listening and respecting Sir while his teaching

LP2: Pardon your question is?

I: you were mentioning your role is to understand...so I was asking you... what you can do to understand....what do you think you need to do to understand.

LP2: To listen

LP3: (nods head in agreement to LP2) and also to participate...like to know more about it...so that you understand...and also to listen

LP4: Ignore all distractions and focus

LP5: Must listen

I: Ok. What type of studying methods help you to perform well in Natural Sciences? ...the study methods.

LP1: Let me think ma'am...by reading the notes....doing your classwork...ja.

LP2: ahmm...to read your notes and to study them and revise your classwork

LP3: ahmm...I think working in groups....cause like...when working in groups... you help each other to understand more about the subject.

LP4: ahmm...is to go back to my notes and read them...and then I like...I go back to my classwork and revise them.

LP5: I read my notes....I go back to my classwork's and corrections.

I: What are some of the activities, which enables you to understand the topics taught in Natural Science lessons better?....(question was repeated three times for clarity)

LP2: Practical's

LP1: Concentrating

LP3: Some of the classwork's

LP4: Practising your work....and...when I write the classwork...I can feel it that I understood...cause when I am writing it's correct.

LP5: I think practical's.

I: What do you think...what are your views about assessing your own Natural science activities instead of your teacher assessing your work?

LP2: Please explain it again

I: Assessing...you know when teachers check you work to see that you understand.....yes so...the question is about... do you prefer it being teachers or yourself

LP1: teacher

I: What are your opinions about assessing your own work instead of your teacher?

LP3: Because assessing your work...you can cheat ma'am ... on yourself

LP1: Yes ma'am (agrees with LP3)

LP4: You would cheat

LP5: Yes mam...you would cheat...ma'am

LP2: You would cheat

LP3: and mam...also ma'am you would not understand...cause like you will be given an activity and we would be assessing ourselves...and then...we wouldn't understand what is going on... then... it's like cheating.

LP4: and...akere [/isn't]...we gonna think what we wrote is correct...so without the teacher assessing us we wouldn't know which is correct and which is wrong

I: Tell me more about your experiences with assessment within Natural Sciences?...by experiences I mean...the challenges and the positive things...so we can start with the challenges...the challenges you experience with assessment in Natural Science.

(Long pause with no response)

LP3: ma'am...like challenges how do you mean?

I: by challenges I mean...negative experiences with assessments...any negative thing that you ever encountered with assessments in Natural sciences

(Long pause with no response)

LP2: ma'am is it assignments only or like test?

I: assessments covers everything whether it's formal or informal its still assessments....I just made it broad so that you can tell me about any problems

LP2: If it's informal we don't understand it but if it's formal we understand it

I: So the challenges you are experiencing are with.....

LP1: Formal

I: What about formal?

LP1: Formal test...there are very hard

I: another person's view

(Long pause with no response)

I: can I have different opinion

(No response)

I: Ok let us go to the positive experiences regarding your assessments in Natural Sciences...positive experiences that you feel like this has been a good experience

(Long pause with no response)

I: or maybe you don't like been assessed at all

LP1: on practical's it is easy to understand but when we write test and exams...eish... go thata ma'am [/its tough ma'am/].

LP3: ah ma'am...when we write class works in NS it's not that difficult...but in exams ma'am....it's more difficult and it's like its heavy...itjoo [/sighs/] ma'am...exam...

LP1: makes us sweat

I: So according to you what do... you think can be done to make it balanced ...so that it should not be so hard...or what do you think you as a learner can do....

LP1: To study...and concentrate

LP3: Some of the things we don't cover when we are studying

I: so you are not satisfied with how you are studying? Or the amount of time you re studying

(Long pause with no response)

LP3: aah ma'am...when you are studying...like when I'm studying...I eish...ma'am I feel like....I just open my book and I just look at it...I'll be like ...aaaa I'm tired...then like...like when but no... I'm tired...will be reading things for the sake of studying...not like....

LP1: understanding them

LP3: yes...understanding them

LP1: that's why most of us fail...we just read for the sake of studying

I: any other comment...because we have reached our conclusion

LP4: yes ma'am we don't put our full concentration on the studying....cause we just like...nah it's just for the test nothing more nothing less.

LP2: I don't know what to say cause NS is my second favourite subject...so like when I am studying it....I study it like I am practicing math....putting more effort on it because I know next year I am going to do maths and science so I need to improve my marks...so...yeah

I: any other comments

LP5: When I study NS I get distracted

I: Okay, how so?

LP5: TV at home...and sometimes I....I want to go to play... instead of studying NS

LP3: ahmm...ma'am...and when I'm studying NS...like sometimes I don't understand the topics and there are also bombastic words...I don't understand....and when we are in class...sir is teaching...there are some kids that distract...distract....disrupt..

LP1: disturbing the lesson

LP3: yes....so like you don't understand...and like Sir is talented....very talented

LP4: He comes with a marker to class...note book

LP1: but they don't listen to sir...they don't respect him

I: I think we have cover everybody's opinions...if nobody else has something.

END OF INTERVIEW

School B- Focus group interview transcript

I: Describe your role as a learner during Natural Science lessons?

LP1: Is to learn new stuff and keep quite in the class...and focus.

LP2: Yeah...you know it's about learning news tuff in the class paying attention and achieving your goals that we want to achieve

LP3: ahmm...learning...new stuff in the class...ahmm....eish

LP4: I think it's about learning new stuff in the class...and getting to process that information and getting educated and then getting to pass.

LP5: It's about learning new things everyday...focusing in answering as many questions as you can

I: I noticed something interested from your response...you said achieving your goals...can you explain further what you mean by those goals...what are those goals

LP2: should I explain my goals

I: yes

LP2: aah...the goals...since it's the Natural Science class...yeah there is aah...the is physics neh...so I heard that to do engineering you need physics and maths...so I want to do engineering...chemical or mechanical engineering...so I need physics...I can't learn cause of the class...the class is not stable...its always noisy...so it's hard to learn the things I want to learn.

I: What type of studying methods help you to perform well in Natural Science?

LP1: After each lesson go home practice the work that we did in the class...eeh...then I...that's how I learn...eeh...that's how I study.

LP2: To be honest I don't really go back and check the things...I just wait for the exams and I study...that's how I learn.

LP3: Same applies...with LP2...eeh...

I: you wait for the exams?

LP3: Ja...same thing

LP4: I just feel like...I learn more when I read so every time after each lesson I go and read it over and over again and that's how it stays...it gets to come over again when I'm writing the test.

LP5: I have a book that I use every weekend...you write what you remember and you refer back to your NS book...and if they right then you know you are improving on what you learned.

I: So is it like a diary sort off?

LP5: Yes...it's like a study guide.

I: What are some of the activities which enables you to understand the topics taught in Natural Science lessons better?

LP1: She puts up videos for us to understand better...like eeh...she puts videos in the projector...then we physically see what she was trying to explain verbally

LP2: yeah...what she said is true...she also gives us activities to write to understand more about the thing she was trying to explain

I: ok...what about you any other activities that help you to understand the topics better (directed at LP3).

LP3: (long pause)...mmm...

I: or it can be activities that maybe you do...that can help you to understand the lesson better ...and not always by your teacher

LP2: also...the extra class teachers...nah...I go for extra class teachers...they also help me to understand the topics better

LP4: She does practical's in class and then she ask us to go find some research at home and come with whatever information we found then we discuss it in class

LP5: When she asks us questions and like everybody in the class and then we get to answer...and when somebody is answering in a different way and then someone comes up with another different answer...it gets more in because it's someone different and not you or the teacher

I: So tell me about your views about assessing your own Natural Science activities instead of your teacher assessing your work? ...by assessing I mean making judgements about your learning...so what is your opinion about you assessing your own work instead of the teacher assessing it.

LP1: eeh... it's very good because when we get to assess our activities...we get to see our mistakes better than when the teacher is assessing our activities

LP2: yes...that's why they say it's good if you work with someone else like your classmates so that you can understand each other neh...by doing ah...correcting each other...it's not

like you are competing but you just helping each other in doing corrections...they say that a friend is better than a teacher in explaining...maybe is easy for you to understand the information

LP3: The same thing applies...when you learn something from...eish...(long pause)

LP5: By assessing yourself you can see where you weak points are and strong points are so then if the teacher also assess you will get more information on that topic and get better at it.

LP4: I think if you are assessing yourself it's much better because you understand yourself more than anybody else, so it's easy because you know what you doing when you get to see your mistakes and then you correct them and you can always refer to the teacher if you don't understand anything.

LP3: aah...I don't know...it's very good because aah(long pause)

I: If you don't agree with them its fine...it's your own opinion (directed at LP3)

LP3: ...Its fine ma'am...

I: its fine...okay...to assess your own work is fine? Is that what you are saying (directed at LP3).

LP3: Ja

I: Okay...alright

I: Tell me more about your experiences with assessment within Natural Sciences?

(Long pause)

I: by experiences I mean your challenges or any positive thing about your assessments...that you might have encountered in Natural Science

LP2: Can you like give examples

LP5: Can you please repeat the question?

I: The question is...I want to know more about your experiences in general with assessments in Natural Sciences...by experiences I mean the good experiences...negative experiences that you encountered...by negative I mean problems...by positive I mean good things about assessment

LP5: well there is a topic we did in class about balancing equations...it gave me a problem but I'm good with it now...and there was also a project that we were given about the Science expo...I thought I'm gonna do it in a week but it took a longer period cause I had to find research and do practical activities to make sure my project is correct...and yeah..

I: so did you manage...

LP5: yes I did

LP4: Well the topic in balancing the equations...it was really hard at first ...but then if you get more understanding about it...you see that it's not that hard...and also the... electrons one whereby it was electrons and protons it can get hard because it's hard to understand sometimes but then as it goes it gets easier.

I: So what did you do...so that it was finally easier?

LP4: I went to madam and then I ask her if she could explain it more in a clearer way because sometimes in class people are making noise and you can't hear properly...so I went to her after class...and can I can second break and she can help me with the topic.

(Long pause)

LP3: Is the same as here's...amm...this topic of neutrons and ...ja...like...

I: it was challenging

LP3: Ja

I: so how did you overcome that challenge?

LP3: I went for...for...extra classes...so...now I'm average with it.

LP2: To be honest in Natural Science as the only guy who failed here... I'm repeating the same class...so last year it wasn't good for me especially when it came to Natural Science...I wasn't good...but this year I'm still facing some problems cause I'm lazy to read...I don't like reading...it's not my stuff...but I'm realizing some stuff...I'm getting some question papers from the library...I'm trying to read them every day...my mom is always helping me...but it's still the same...so I'm still looking from some extra class teachers for NS so that they can help me...and there is a problem because I can't ask Madam TPB ...because sometimes I feel scared to ask her cause some people they say NS is easy

and it will look stupid if you ask and that staff...so I don't usually ask her...I just do it for myself...I just help myself... to learn the staff...but I'm coping...so I'm learning.

LP1: I haven't had any problems with NS...eeh...NS has always been my thing...eeh...I have no complaint

I: Can you share with us what's your secret...how do you manage to cope?

LP1: I always read stuff about NS because when I grow up I want to do...I want to be a doctor...so in fact these things are in my blood...they run through my veins...I know them by my head

(LP4 and LP5 laughs)

LP1: Like I said earlier...after every activity...when I get home I always read...read the staff that we did in the class...that's how I cope.

I: So if you have friend who is struggling how would you advise him...so that he can cope

LP1: I would advise him to always walk with me so I can help him

I: Okay...so is there any other comment that maybe you have...Okay...any positive things that you have experienced with assessments in Natural Science.

LP4: Yes...ahmm...It's because NS made me realize that there are things that I wanna do in NS and is part of the Life Science part...cause I feel like it's easy and its more educating than the other one and it's exciting to learn about it every day.

I: Any other positive experience

LP2: yes there is...you know the teacher that we have here is really special...she really wants us to pass...but it's so hard to pass...because of the learners we have there always noisy and there is some in this class...there are lot of them and it's hard for us to learn.

I: What do you think makes them to be so noisy?

LP2: I don't know...I don't know what they taking

LP5: It's the hormones...they running very high

LP2: It's the hormones but some of them I don't know what they taking...

I: Okay....any other comments before we close

(Long pause)

I: Okay thank you very much boys and girls that's it on my side

END OF INTERVIEW

School C- Focus group interview transcript

I: Describe your role as a learner during Natural Science lessons?

LP1: During the lesson we learn things that we never know...that we never knew by ourselves...so is to...open our minds and just...to learn new things about ourselves cause you know as we are about to pursue a career...we have to know about certain things...so...wena...you are interested in learning more...cause grade 9 you get more things that we never learn and there is more work...we have too...(long pause).

LP2: For my opinion...I think my role is to open my ears listen attentively because obviously Natural Science is all about nature and a person...so if I'm interested in like a career that contains...that talks about pets and all...ehmm nature...everything I can learn about it...and maybe I can be a person who specializes with pets and all...or if I want to be a doctor...I get more and more information...because obviously Natural Sciences it talks about the human body so my duty and my role is to listen and hear what the teacher has to says

LP3: My opinion on this...first I can say Natural Sciences is a very important subject, whereby we learn about what is happening in real life...first what I have mostly experienced in Natural Science is that we learn ourselves...we know how we are created in the real life...so my duty is to listen in class and make sure you understand what the topic is about...why...because many of us don't know what's the process of a human being during daily basis...so Natural Sciences has all those branches that introduce or tells...how does a person reacts and mostly there are things that we can see and there are things that we can't see...so Natural Science can introduce that to us...we can see what is happening...mostly as you can see Natural Sciences is where we learn how...especially mostly about the nature...because many people learn from things that come from natural things...for an example let's see...as Natural Sciences can help for motivational speaker...why...because for example a river is a natural thing...so its light,

it's a daily, its afternoon, anytime a river is always moving... whereby if someone needs a motivation for not stopping during his life...just telling him that...him or her that...as the river flows...each and every second...that means a person doesn't have to give up during his life...no matter how hard it is...people have to proceed with their decisions and goals during their daily basis.

I: So your goals what are those?

LP3: There are people who gets so many challenges during their goals...

I: I mean your personal goals?

LP3: As I am a School C learner, I decided to come here in School C, because I love too much to work using technology...secondly many subjects are related with technology in School C...so I have decided to study electrical engineer and do architecture...why...because I want to make people's lives easier in daily basis whereby we can create mechanisms to make people live easier that way and create good technology...that can always work during daily basis.

I: What are your roles in Natural Sciences?

LP4: For me ma'am...as a Natural Sciences learner I have to listen to my teacher...and take part in class...and make sure that I study everything that we learn in class...and gather enough information about it all.

I: So how do you gather information?

LP4: by doing research...getting into the internet...searching about all the topics that you have done in class...at home.

LP5: My roles are listening to my teachers co-operating with them and interacting with them...and always do my work...and NS is a very fun and interesting subject...I love it very much and...I know grade 9 is a very challenging grade...so many learners must work very hard...to go to the next grade...so that is my role.

LP3: This is what I want to add...as a learner in class first we must look after our concentration...you can't love to learn NS without loving or liking the person that's teaching you Natural Sciences...first you must look after that...because if you don't like the person who's teaching Natural Science...how will that person understand what you are talking about inside the class...and secondly we must communicate...eeh...there's

nothing that we can know without communicating...because during communication is where that process happens whereby ...everything that we were talking about in the Natural Science...can stay in our minds...and can make us think better about Natural Sciences...what I know is that Natural Science is just a way to show us to the real life.

LP1: I like to add something...you know as you grow up...we have many myths how the earth was created...the moon is created...so in Natural Science we can prove those myths wrong...like we can know gore [/that/] it was wrong the earth was not created like this and that...cause during the old age we were taught stories and all that...here in Science...it proves gore [/that/]...no things were not created like this and so on...so we can tell these people no things were like this and that.

I: What type of studying methods help you to perform well in Natural Science?

LP5: By re-practising what you were taught in class at home.

LP1: Ma'am na I preferred reading a topic before a teacher explains it...because when I read I gain knowledge and when the teachers read I understand what I did not understand and I get it better

LP2: Well I'm not that person who loves to listen to teachers when they teach...because usually when I listen to them I don't hear the at all...so every time when I learn I want to read things for myself...and I understand if something ...if I come across something that I don't understand it is then I go to a teacher and ask him or her...what is this and that and he or she explains that thing to me...that is how I learn.

LP3: My opinion on this is a person needs to make a schedule to study...why...because let's say during class time ...school time...you can't read when the teacher is teaching in front of you...during school time we have so many things to do...why...because every thirty minutes or an hour subjects are changing so each and every subject has its chance...so if there's more challenge in Natural Science or in other subjects...just make a schedule that this time when I get home I bath I do this and this then I go for my books.

LP4: I research...I get into research I maybe go to the library and take books for Science...and...I do my own work personally at home...maybe before the lesson...the topics that we are going to talk about next week I read it earlier...so that I can know what we are going to talk about.

I: What are some of the activities which enables you to understand the topics taught in Natural Science lessons better?

LP2: You know our teacher who always teaches us Natural Sciences...when he talks about something...you know he likes to make actions for us to understand so that thing it always makes me to understand...he makes things easier for us to understand so that when we write...let's say we are writing an exam and then you come up with this question which talks about what he was doing and that practical activity he was making in class...it makes us easier to understand that thing.

LP1: Na I prefer a practical activity and then...If my teacher maybe like compare a lesson to a life situation I understand more better...ja... that's it...a practical activity and comparing a situation with a topic.

LP3: Nowadays...school learners understand easier by learning things practically not only by reading...yes...first what our teacher do when he's teaching ... first point is that he makes sure that we enjoy the lesson...how...during the lesson...the time that people have to...the time people are enjoying is when the teacher is showing those types of actions what's happening while his reading...secondly as I was talking about technology...sometimes as...we have labs here at school C neh...is there were we can see those things happening...seeing them using our own eyes...ja...that's how learners learn and that's the easy way to learn.

LP4: For me the easiest way to learn is to doing things practically and experimenting so that when you're writing exam or a test you have a vision of what you're going to write about.

LP5: I think the best method is having practical test and doing all the experiments in the lab

I: So what is opinion about assessing your own Natural Science activities instead of your teacher assessing your work? ...by assessing we mean to make judgements about your learning...so what is your opinion about you assessing your own work instead of the teacher assessing it.

LP3: as you can see...can I get a little bit from this neh...when child is born neh...the child cannot walk...she or he needs an assistant whereby he can learn how to walk...everyone came here without knowing anything that's why nowadays children of now have teachers who can teach them how to do this and this. So my opinion on this is that... yes we need a teacher you can't learn alone you need assistant...why...because there are so many

opinions outside there... whereby if you learn alone there are things that you will take in your own way...but you can't think what other people are thinking that's why when a normal person has so many opinions on many things... you can't stay with just one opinion for the rest on your life...that's why if a learner comes with an opinion the teacher comes with more whereby the learner will choose on them which opinion is the best.

I: So meaning you're saying its ok for the teacher assessing your work

LP3: yes...yes... the teacher assessing the work

LP2: Ma'am may you please repeat the question

I: So what is opinion about assessing your own Natural Science activities instead of your teacher assessing your work? ...by assessing we mean to make judgements about your learning...so what is your opinion about you assessing your own work instead of the teacher assessing it.

LP2: well assessing my own work...I can say it helps with...because you know sometimes you can write some other things...whereby you were just writing for the sake of writing...you didn't understand the question...you were writing so fast because the teacher wanted to take the books and sign them...so sometimes assessing your own work...like checking you were busy writing and all those things it helps as you will see that this thing I wrote when I was in a hurry and I wrote totally nonsense so that is why I have to assess my work before the teacher does...because if I go and give the teacher that work without even checking or doing anything with the book...she or he is gonna see that this child is not focused in her work...she doesn't check her work...she just gives us her book and she don't care...so the best way is to assess your work before the teacher do.

LP1: Na I prefer the teacher to assess my work...so that he or she can explain to me why I went wrong...were I need to fix my mistakes and all of that...coz ja I read I write what I understand...he gonna see gore [/that/] she wrote what she understood but this was wrong so she will tell me...no girl you went wrong in this and this and she will fix the mistakes for me.

LP5: I think it's best for teachers to assess our work because we need their guidance and they must correct us.

I: its fine...okay...to assess your own work is fine? Is that what you are saying (directed at LP3).

LP4: aah...I think that...when the teachers assess our books and our work it would be best because they will be able to correct us and explain to us more things that we didn't understand by ourselves.

I: Tell me more about your experiences with assessment within Natural Sciences? by experiences I mean your challenges or any positive things about your assessments...that you might have encountered in Natural Science

(Long pause)

LP5: Can you please repeat the question?

I: The question is...I want to know more about your experiences in general with assessments in Natural Sciences...by experiences I mean the good experiences...negative experiences that you encountered...by negative I mean problems...by positive I mean good things about assessment

LP5: well there is a topic we did in class about balancing equations...it gave me a problem but I'm good with it now...and there was also a project that we were given about the Science expo...I thought I'm gonna do it in a week but it took a longer period cause I had to find research and do practical activities to make sure my project is correct...and yeah..

I: so did you manage...

LP5: yes I did

LP4: Well the topic in balancing the equations...it was really hard at first ...but then if you get more understanding about it...you see that it's not that hard...and also the... electrons one whereby it was electrons and protons it can get hard because it's hard to understand sometimes but then as it goes it gets easier.

I: So what did you do...so that it was finally easier?

LP4: I went to madam and then I ask her if she could explain it more in a clearer way because sometimes in class people are making noise and you can't hear properly...so I went to her after class...and can I can second break and she can help me with the topic.

(Long pause)

LP2: Ma'am I want to know when you say assessments what do you really mean

I: assessments can be broad it covers formal or informal task there are all in one umbrella assessments...external, internal...so what are your experiences with assessments in Natural Sciences

LP2: eeh...ok...according to that...as grade nine's there are so such lessons that we learn and there are so different from those lessons in grade eight downwards...for an example let's see...there's that section that whereby the subject gets at the place where we learn the organisms of a person...and that has a positive impact and a negative impact...why because as further we go during the process of knowing the organisms of a person's...eeh...many learners...there are learners who don't concentrate in class...those things who for play just goes to school for fun they start to experience things that we are learning in grade nine without the need...why...because let's say the teacher is teaching us how to live...what happens for an example a male with female...because there are things that happen to ...with a male and a female so that a baby can be produced that's what we learn in grade nine during our term one and two...so people who don't understand they just do that practically...they want to see what is happening practically without any guidance they don't know what will happen...why...because they didn't concentrate in class they just look at the snax [/inappropriate/] things out of everything that the teacher has taught...the main thing was not to encourage us to do those things that he was talking about he was just teaching us because a person grows...we must know when we get in this level how we must perform...we must know when we talk with elders...when we talk with the younger ones so that...especially when we talk about a person...people are different so there are things that we must tolerate from those people that...there are things that we must not tolerate but as a normal person we can see that this thing I can tolerate or not...yeah so the disadvantage is that school learners when coming to Natural Science activities...they don't take it very seriously...why because they take that as something that happens and stops there...Natural Sciences is something that happens each and every day...especially on what I have talked about...the female and the male processes...yes...so that's what it's about.

LP2: Well I think that assessment in Natural Sciences are the best because obviously as well all know assessments helps us...or they boost us in our exam marks so that we can have better or great marks...so I think that assessments have both negative and positive impacts because obviously if you are making an assessment you have too research and

know more about that thing...sometimes it happens that you are using textbooks...or ja...you are using textbooks whereby you don't know what topics to look for and if you keep on searching on that textbook you don't find that topic that is there in the assessment and your work becomes totally difficult...sometimes you go to research and then they give you wrong information it becomes difficult for you to know more about that thing...because you obviously can't go to the teacher and ask him or her answers...as he won't give you because that is the formal thing and you have to do it individually...so I think that it is great but also have a negative impact...oh...positives as I have said...the assessments helps you to boost your marks that you can go to the higher levels...it also helps in learning more things like for instances you have to keep on looking for some other things that aren't there and that teachers didn't teach you...so it is fun and is also great...ja

LP1: Natural Science have positive things...you know there are some...especially in the body system there are these diseases that you never knew what cause them like ok you're having stomach cramps you know what cause the stomach cramps cause they taught you gore [/that/] because you eat certain things...so because of this I'm not going to eat this and that...the negativities like I think it gives a lot of exposure like some other people they don't wanna expose themselves like in the lesson the teacher will be asking you...so which of you started menstruating already...you'd be like you exposing yourself...but its life you have to expose yourself as everybody is learning about it...you have to know but there are those people bare gore [/they say that/] they don't wanna expose themselves they wanna stay secretive...challenges are like as I said before Natural Sciences It has a lot of work so there are those children in the class gore [/that/] they will disturb you and you won't be able to focus in class...so most of us you learn things that you never knew the reason for it so it comes with a lot of benefits

LP4: for me I have only experienced positive things because when they give us assessments I get to know more and understand better...I understand the topics better than doing class works because I get to research and practice more...for the exams and for the formal tasks.

LP5: My challenges are when we are in a class and learning the teacher is teaching us some learners make noise and I cannot learn in a noisy area...so that has a negative impact on my work...ja and when we are about to write...like I did not understand anything and

what the teacher said I did not understand what he taught us so it has a negative impact on my work when we are about to write I don't know anything...I remember some of the things that we were taught but some of them I don't remember them.

I: so how do you overcome that challenge?

LP5: I go to the library and find out more information...ja and read

I: Any other comments

LP3: they people who spend more time without using media for googling especially in Natural Sciences...Natural Science maybe in assessments we need to use goggle...why...because assessments is that they are trying your mind...you must take off everything you know about that assessment...secondly it is where we practice how to use a Google yes because as they are schools that when you get there the teacher is only teaching not showing practical's so how to solve that...the advantage is that when you have an assessment you get home and do it alone using your own cell phone or a laptop or anything whereby you can know what is this and this and then you can see it practically happening so that's the advantage of assessment because you can spend time using your cell phone searching for things that you don't know...if there is a problem the teacher is there to help.

I: If there is no other comments thank you boys and girls

END OF INTERVIEW

School D- Focus group interview transcript

I: Describe your role as a learner during Natural Science lessons?

LP1: So my role as a Natural Science learner is to do class works and home works that the teacher give us and answer in class when the teacher asks us questions

LP2: and my role is to listen while the teacher is teaching and take notes while she is teaching

LP3: My role in Natural Science we suppose to keep quite in class so that we can understand what the teacher is saying

LP4: My role in Natural Sciences class is to listen and express my feelings with what my teacher has taught me

LP5: while in the classroom other learners they don't listen a teacher when they ask him question and they bully other learners in the class...

I: So what is your role? (Directed at LP5)

LP5: My role is listen a teacher when they ask me

I: What type of studying methods help you to perform well in Natural Science?

LP1: usually what I do to perform well in Natural Science is...when I'm at home I usually do revisions from what the teacher has taught me to understand better.

LP4: With myself I prefer learning with practicals

I: So study methods that you use (Directed at LP4)

LP4: mmm...I read my notes and make my own notes out of what my teacher as taught me

LP3: In my own method when I get to my room I open my books and I take a paper so that I can revise the classwork that we've been done or sometimes...I take the notes...sometimes I take the notes so that I can study...sometimes I make drawings so that I can remember what my teacher has been teach me.

LP2: I'm a visual learner I also like to read and write...so every day or...actually the night before I'm going to write the exam I...I highlight the key points and read it I write the notes about that key points...that's how I work or revise.

LP5: I study my book and I read when I don't understand I go to another person to help me

I: Which other person do you go to? ... (Directed at LP5)

LP5: My friend

I: and they help you to understand...

LP5: yes... they help me to understand when I don't understand the teacher

I: What are some of the activities which enables you to understand the topics taught in Natural Science lessons better?

LP1: usually the activities ...I prefer learning using videos because I can understand better and practical's...we can examine how well we understand the stuff that the teacher has taught us.

LP5: I understand videos and photo

LP4: In Natural Science class we do practical's so that we can understand well

LP3: On my side when...my teacher makes drawings on the board...so that some of us can see what she's talking about.

LP2: When the teacher has taught us...and then we don't understand she actually like to make experiments so that we can understand carefully and we make sure that we understand what she taught us.

I: So what is opinion about assessing your own Natural Science activities instead of your teacher assessing your work?

(Long pause)

LP1: I prefer the teacher assessing my work because in most cases she can help me understand better and help me improve on my Natural Science.

(Long pause)

I: by assessing we mean checking your work to make judgements about your learning...so what is your opinion about you assessing your own work instead of the teacher assessing it.

LP4: I prefer checking my own work because...when I see something wrong...I can go ask help from my teacher

LP3: I prefer...because of sometimes when I check my work by myself I do mistakes now I prefer the teacher to check my work because sometimes I can forget to do some stuff...now it's better to have someone whose going to judge you with your work.

LP5: I prefer because is the one person who can tell me something when I don't understand

I: You prefer.... (Directed at LP5)

LP5: I prefer the teacher...because is the one who can tell me when I don't understand...or ask other person.

LP2: I don't prefer the teacher to assess my work...I don't know why...maybe I'm afraid...I have a fright or something...so my opinion...on my phone I have the learning application to help me that's how I assess myself.

I: So how did you get this learning application? (Directed at LP2)

LP2: I downloaded it to google

I: so tell me a bit more about this learning application...how does it work?

LP2: you...like...they are teaching you and you practice and you make the test...they teach you...you read the notes and understand and practise ...after practising...they ask you questions...multiple choice questions...

I: interesting....so what is it called?

LP2: Its ...extra...extra...extra marks app...and it's for grade 6 up to grade 12

I: Tell me more about your experiences with assessment within Natural Sciences? by experiences I mean your challenges or any positive things about your assessments...that you might have encountered in Natural Science

(Long pause)

LP3: According to me it's easy because the teacher when is teaching me during the school time... sometimes I...when the time is up for period so that we can go to another class...when the time is up I go straight to the teacher so that she can help to...nna ke tlhaloganya[/I understand/]....o nthusa gore ke kgonne go tlhaloganya[/she helps me understand/].

(Long pause)

LP1: May you please repeat the question

I: The question is...I want to know more about your experiences in general with assessments in Natural Sciences...by experiences I mean the good experiences...negative experiences that you encountered...by negative I mean problems...by positive I mean good things about assessment

LP1: So from what I have experienced Natural Sciences is a very challenging subject you can either pass or fail...so from this I've learned that sometimes when you listen in class you can really pass and when you do your class works and ask your teacher when you don't understand... but it comes to that when you don't understand you can really fail...cause sometimes it fails sometimes it pass...but our teacher helps us to improve in Natural Science...so from my side of the point...its very challenging

I: you find the assessments very challenging?

LP5: ya...there very challenging

I: so what can you do to overcome that challenge?

LP5: well...it's easy you can ask your teachers for help if you don't understand...maybe language...you can ask someone who understand better in class.

LP2: Can I speak in Setswana Ma'am

I: Yes

LP2: NS e swak bothata ba yona ke gore ge ma'am a le ko classing ga ke kgone go tlhloganya[/ NS is easy...the problem with it is I cannot understand ma'am in class/] ...ke tlhloganya ga ken a le ene fela...[/I can only understand when she explains to me alone/]...after school...

I: why can't you understand during class lesson?

LP2: mo classing o fitlhela ba rasa [/you may find them making noise in class]...ba bangwe gaba utlwelle ma'am[others don't listen to ma'am/]....ga ke ntse le ma'am ga gona motho yo o tlhodiang...ke kgona go tlhloganya[/when I'm alone with ma'am there's no one making noise...I can then understand/].

LP4: whispers ...can I also speak in Setswana

LP4: Natural Sciences ke e bona e le easy...ka gore diformal task nna ka di phasa[/Natural Sciences I find it easy... because the formal task I pass them/]...ke di phasa ka gore ke a bala[/I pass them because I read/]...ga ke feitse mo di formal tasking ke a kgona go ithuta go tswa mo go tsona[/when I fail the formal task, I learn from my mistakes from them/]...and ma'am le ene a be a nthusa fa ke fositseng teng[/ma'am helps me also where I went wrong/].

LP2:As she has said they very challenging because there not difficult and there not easy because some topics...they are difficult difficult and some there easy...so you can understand those who are easy and fail those who are difficult...Mara you can also improve to those who are difficult on you...mara[/but/] how?...ask teacher and friends...mara[/but/] I said before I don't like to ask teachers...I don't know why.

I: you don't know why....so if you ask friends you understand better?

LP2: mmmm...yes

I: Is there any other comments before we close...

(Long pause)

I: If there is no other comments...thank you very much.

END OF INTERVIEW

School E- Focus group interview transcript

I: Describe your role as a learner during Natural Science lessons?

LP1: My role to be in Natural Sciences class is that...eeh when I grow up I wanted to be a doctor...so TPE who teaches us Natural Science said that I must do Natural Science if I want to be a Doctor starting from grade 4 I must Do Natural Science and when I get to grade 10 I must do Life Science Physical Science...Ja...so that I can be a Doctor when I grow up.

I: So what do you this is your role as a learner in the Natural Science class?

LP1: In Natural Science class I must listen to TPE when she teaches us.

LP2: My role in Natural Sciences class is to understand what the teacher is saying and listen when my teacher is teaching in the class I must listen to her and when asking questions and answer her questions

LP3: I want to understand everything when she teach us...and... like I have to understand more parts of our bodies so that I can for fill my dreams of being a doctor...ja...so when she's in the class I have to listen to her...I have to give her more of my time to...when she teach I have to listen to her...I have to understand what she's talking about...I have to write her class works ...I have to write her home works and many more.

LP4: As my duty as a learner in Natural Science...I must like try to improve my levels of Natural Science so that when I go to grade 10 I can usually know the parts of the body because TPE always teaches about body parts of a person...so we must get to understand...and If don't understand we must ask her to help us in which ever we don't understand so that we understand to listen to her and to make class works and home works she gives us and...ja...

LP5: My duty is...my role as a Natural Science learner...it's more like...all the things we learn are not just things we are imagining ...there also things out there that we face every day...so learning Natural Science helps us experience life outside and inside as well so that we understand and also ma'am TPE makes it much easier by explain us making difficult things easier for us to understand...so I would say that while the teacher is in class we pay more attention to her listen to what she say so that it would be easier when we get to the next grade

I: What type of studying methods help you to perform well in Natural Science?

LP1: aah...when Mrs TPE is in class and tell us the topics of...the topic that we gonna do...I write in in my diary book so that when I get home I open my textbook that she gave us and read it again so that I can understand the topic.

LP2: When ma'am TPE gave us some home works I do my home works and she wrote some notes on the board and then we re-write them in our books so that we can study at home...so that makes me to understand everything that she teach us.

LP3: aah...when miss TPE write the notes in the chalk board I take them to my note book and when I get home I take more of my time while reading those notes so that I can understand because when a teacher teaches in front of me I can't understand more off the works that I have to do so I take lots off my time practising and studying Natural Science so that I can understand well.

I: So you say when she teaches you don't understand...

LP3: I don't understand very well but I do understand

I: What do you think is the problem why you don't understand?

LP3: ahmm...sometimes I don't understand her because...when she's talking she talks so slowly...ja and she talks so softly...that's why.

LP4: I would prefer to write a time table...a home time table that contains all the dates even when its Saturday to...so when a teacher gives us...at home we don't have a lot of time to study...as she gives us ehh...a topic at school then when we get home we must open our books to understand what it means and to write all those things that she have to ask tomorrow and prepare for the next formal assessment or informal assessment and to also understand all the topics too open the book even for what we are not there to open and to understand...so that when she ask us questions we can answer him...I mean her in...ja... words.

LP5: I prefer more of social media when it comes to Natural Science because when she gives us homework... I use my phone to research and it gives me more information one that's even not in the notes and the text book so it makes my understanding much easier and my school works also at the same level so...understanding natural Science its quite hard at times but when ma'am gives us notes as well as NS text books we use both of them as well as our phones for more information and to understand our work.

I: What are some of the activities which enables you to understand the topics taught in Natural Science lessons better?

LP1: Please repeat the question...

I: What are some of the activities which enables you to understand the topics taught in Natural Science lessons better?

LP1: I understand those topics because when Mrs TPE is teaching us...like when she tells us...she teaches us about there...our bodies...yes...she shows us that if she's talking about the digestive system she draw it on the board and then she labels it...that's how I understand my topics.

LP2: What makes me to understand all the topics in natural Science is ma'am TPE always try to make us learners to understand by showing things on chalk board so that we can all understand...so that's how I understand my duties in Natural Science.

LP3: I... when she explains some things for us...like when she label the parts of the body she tries to make us to understand by giving us the example of our body so that we understand and move fast and she really explains it and draw it on the chalk board so that we can understand and she always tell us that take the notes from the chalk board to your books

so that when you are at home you can try to remind yourself about everything...so that's how it makes me understand.

LP4: I understand because Mrs TPE always when she gives us a topic she always like try to give us example of living things out there even though there are not there in class even the things we do every day at home she tries like if you do like digestive system you always do that at home you always eat she shows us that the food goes where and where and always gives us examples of real life things though we are not aware of it out there and she always tells us if we don't understand we can ask her too so that she can explain things to us...ja...that's how I understand.

LP5: Please repeat the question

I: What are some of the activities which enables you to understand the topics taught in Natural Science lessons better?

LP5: okay...well most of the activities that helps me understand the topics that ma'am gives us is that whenever we start a new topic she will write notes on the black board and also makes examples about things in real life like the things we use at home and also maybe illustrate with other learners like showing us examples pointing at parts of the bodies making it much easier for us to understand and know well...like on the digestive system like she said the...ma'am when she shows us the digestive system she showed us that while chewing using...illustrating with another learner she pointed by which part and also made copies for us of the inside body on the part of the digestive system...with more points about that...so it was much easier for us to understand.

I: So what is opinion about assessing your own Natural Sciences activities instead of your teacher assessing your work?

LP1: My opinion is that...I use a Natural Sciences textbook and my cell phone I go to internet asking questions on internet and they answer me and that's how I do it and with textbooks.

I: So how...ohh...you assess your work through using the textbooks... instead of the teacher

LP1: yes ma'am... I do that

LP2: ehh...my opinion is I can't be able to assess my work without a teacher giving me some assessment so that if a teacher can't give me some assessment I can't see if my levels

are...I'm improving myself in some subjects so that I can see how far I am or I'm I pulling down or I'm I pulling up...that's how I'm putting my opinion.

LP3: aamm...I use to watch on my books...for example my class works I use to take them and compare them how I'm I understanding so I use to take my reports and look from term 1 to term 2 or term 3 how far I am...for example my marks...I use to take my marks how far I am...If I'm low I start to improve my marks in the class...I use to take more of my time listening to her and understanding her well...so that's how I give my opinion.

LP4: I'd rather do that... if ma'am gives us some notes or classwork rather go through them at home and if we don't answer we must look at textbooks after that if we answer correctly then and she gives us corrections we may understand and when she gives us another topic we may go at home and we may open our classwork book and our textbooks and ask ourselves some questions and must look in the textbooks and see if we answer it ourselves if I write question for myself I must answer them myself again and when I come to school I come to ask my teacher if these answers are correct and if there are not correct then she can correct me in those things and to read more NS more like if my marks are too low I may improve them.

LP5: I'm not that really off self-assessor so most of the time when ma'am doesn't give us any activities to do...when I get home I ask my mom to help me test my knowledge and my understanding...so that makes it much easier for me...also looking for some information from my books and comparing my report cards looking at my marks and comparing them if I'm increasing or...if my marks are decreasing so it's quite hard for me to assess myself most of the time I ask for help from my brothers or my mom.

I: Why do you think you find it hard?

LP5: well...I'm always around my phone if not my phone I'm watching TV so mom sometimes hides the remote or hides my phone so that I could focus more on my studies than social media.

I: Tell me more about your experiences with assessment within Natural Sciences?

(Long pause)

LP1: My experience...emm...I perform well in Natural Sciences because I have a time table at home to practice Natural Sciences...I study Natural Science ...so my experience is high...it's on level...ja

LP1: your experiences in general in assessments

(Long pause)

I: any challenges...

LP1: ja...ja...when Mrs TPE is in class she teaches but I don't hear her well because she talks slow...ja she talks slow and some learners in my classroom take advantage of her then they make noise when she's in class...so I don't hear her well.

LP2: My experiences are ...I'm not focusing well in other subjects because I want to...what I want is to follow my career so that because I want to study a Natural Sciences is hard because what I want to do in future is all about Natural Sciences ...that's how I experience that challenges because in other subjects.. I pull down because I'm only focusing on one subject

I: you struggling to balance...so how do you think you can overcome that challenge.

LP2: Is that I have to have a time table so that I can give other subjects some time to study.

LP3: I experience more form Natural Science by keep on learning every day and my challenges...I have more challenges but through my challenges I have to like settle down and try to make them rights and try to like...take my challenges and keep them away and just keep on focusing on my studies...ja...and most off...when its coming to exam time I struggle more to understand a Natural things because I keep on forgetting some topics that we have done...but when we are in a day to write a Natural Science...Mrs TPE mostly takes us and tell us maybe she give us the examples that today we are going to write about this topics and this...so before you start writing just take your books and revise a little bit so that you can't forget...I have to do like that...mostly I do like that when its exam time...ja..so .

LP4: Can you repeat the question

I: your experiences with assessment in Natural Sciences?

LP4: My experience in assessment is that like...when we are writing assessments or formal the marks become low...when it becomes low I like ask myself where did I go wrong...ja.. and I start reminding myself like I wasn't focusing on NS too much...so I must like I was saying like maybe I forgot some things and I wrote the wrong things so I go to the teacher

ask her ma'am where did I go wrong here...she tells me this is not right...she tells me the answers correctly and corrects me where I did go wrong and after that I will write them on my notebook to note them already and after if she gives us class works or assessment so that... when she tell us tomorrow we are going to write about this and this we're going to go to the class work book or note book and to revise more and more to keep in the mind and when tomorrow we are writing so that we can remember as well cause ma'am TPE always teaches us and give us example and we really understand in class yeah...

LP5: well my experience...like my career is based on Natural Science so it's much it's much easier for me to understand it cause at home I have help like my mom is a nurse she studied...she has passed through what I'm going through write now...so my experience in Natural Science class is that I've learned a lot especially since this semester so it's been quite rough at the beginning it was quite rough cause all this was new...some of it was new some of it we knew back in lower grades by ma'am TPE made it much easier for us to understand and it was getting much easier until now so she...always makes us understand in every way like making examples drawing on the board and giving us notes for us to read.

I: Is there any other comment....maybe that you remembered?

LP4: Ja...I'd rather say like as she said that ma'am TPE makes it easy for us to understand because I experienced a lot of things in NS because like almost everything that she taught us I can also remember it very well...and I can answer in the class works without looking at the note books because when she teaches...she teaches with much confidently and she teaches us so that we can understand better and to know it and like she always tell us go and read at home we also experience good marks in class works and good marks in formal as well but as we went low in the exams because like the was questions we didn't understand very well...ja that was very challenging in the exam.

LP2: Some challenges are she is so specific than other teachers but some of other teachers because some teachers can't even give us some notes but her always...her always give us some notes so that we can study at home some things and make some examples so that we can be specific...ja

I: any other comments

(Long pause)

I: Thank you boys and girls

END OF INTERVIEW


APPENDIX L: LETTER FROM LANGUAGE EDITOR


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EDITING

21 November 2019

To whom it may concern

This letter serves to confirm that the following dissertation was edited:

"The influence of Natural Sciences teachers' assessment beliefs on grade 9 learners' self-directed learning behaviour"

The onus is on the client(s) to work through the document before submitting. Clients might make changes to the content after the editing process. Clients should also make certain that all sources/references have been cited.

