

DEVELOPMENT AND VALIDATION OF AN INVENTORY FOR WESTERN  
CAPE PRIMARY SCIENCE TEACHERS' CONCEPTIONS OF FORMATIVE  
ASSESSMENT

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by

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### Dedication

Throughout this entire journey, my husband, Dr. Sandeep Ghorpade, has been a constant source of encouragement. I dedicate this dissertation to him as a token of my gratitude and appreciation. Also, I would like to dedicate this research to my children, Aditya and Aarya, who have been wonderful supporters throughout this study.

## Abstract

Across many nations worldwide, formative assessment has become an increasingly important component of education policies. Adopting a formative assessment approach in education can improve learners' academic performance, ultimately leading to enhanced educational outcomes. The current South African assessment policy (DBE, 2011) emphasises using formative assessment in primary schools, highlighting its importance in the educational process. However, studies exploring South African teachers' formative assessment practices have shown the need to improve teachers' understanding and use of formative assessments in classrooms. Therefore, it is important to make South African teachers' conceptions of assessment explicit in order to determine their current understanding of formative assessment and to move them towards implementing appropriate approaches to formative assessment. In South Africa, limited research has been conducted exploring teachers' conceptions of assessment, especially in *Natural Sciences and Technology* at the Intermediate Phase (Grades 4-6) level. Consequently, this study has four objectives - a) to develop an instrument suitable for use with primary school science teachers in the Western Cape, b) to identify practicing primary school science teachers' conceptions of formative assessment, c) to identify the demographic factor(s) that influence the conception of formative assessment of primary school science teachers, and d) to identify the preferred formative assessment practices of such primary school science teachers.

Data were collected using a quantitative research design. The survey instrument used was developed by adapting Brown's (2006) *Abridged Teachers' Conceptions of Assessment (TCoA-III A)* inventory for the Western Cape context. Relevant science

education stakeholders from the Western Cape province evaluated the content validity of the *TCoA-III*A questionnaire by providing feedback on the clarity of instructions and items of the questionnaire. The modifications and adaptation of *TCoA-III*A resulted in the “*Teachers’ Conceptions of Assessment - Western Cape (TCoA-WC)*” questionnaire. To adapt the *TCoA-III*A for use in the Western Cape, rigorous cross-cultural adaptation and back-translation methods were followed. English, Afrikaans, and isiXhosa are the most commonly spoken languages in the Western Cape province. Hence, a pilot test of the *TCoA-WC* was conducted with a group of English, Afrikaans, and isiXhosa teachers. The *TCoA-WC* was then administered online to teachers in 65 schools across four Metro Education districts in the Western Cape. A stratified random sampling method was used as a method of sampling. The selected districts for the study included Metro Central, Metro North, Metro East, and Metro South, which collectively 64% of the province’s teacher population. The data collection stage of the present study coincided with the first year of the COVID-19 pandemic, resulting in a limited response of 157 primary science teachers.

These 157 responses were analysed by conducting three types of statistical analyses. The confirmatory factor analysis (CFA) analysis of data collected using *TCoA-WC* revealed the same factor structure as that of the *TCoA-III*A model, confirming the presence of four main conceptions of assessment (i.e., *Improvement*, *School Accountability*, *Learner Accountability*, and *Irrelevance*) and associated 27 items in the thinking of Western Cape primary science teachers. The *TCoA-WC* model also exhibited well-fitted psychometric properties. The reliability analysis and CFA analysis confirmed that *TCoA-WC* is a valid and reliable measure of Western Cape

primary science teachers' conceptions of formative assessment. Thus, this study resulted in the development of the *TCoA-WC* inventory, which is conceptually, linguistically, and culturally appropriate for use with the teachers in the Western Cape province. The study participants did not explicitly endorse any specific assessment concept identified by the *TCoA-WC* inventory. However, the CFA analysis confirmed that all four conceptions of assessment, that is, *Improvement*, *School Accountability*, *Learner Accountability*, and *Irrelevance*, are present in the thinking of Western Cape primary school science teachers.

It is hoped that the skillful integration of the findings of this study into teacher professional development initiatives will result in the implementation of formative assessment practices in the Western Cape primary classroom as outlined in the Curriculum and Assessment Policy Statement (DBE, 2011), which will lead to significant improvement in the performance of learners.

### Acknowledgment

I would like to express my sincere gratitude to my supervisor, A/Prof. Rudiger Laugksch, for his unwavering support throughout my study. His patience, motivation, and immense knowledge have been invaluable to me.

I would also like to express my gratitude to the schools that took part in this study, as well as to the Natural Sciences and Technology teachers who participated.

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## CHAPTER 1: INTRODUCTION

Western Cape primary school science teachers' conceptions of formative assessment are analysed in this study. To identify the conceptions, the *Abridged Teachers' Conceptions of Assessment (TCoA-III A)* inventory was used and has been adapted and validated to suit the Western Cape context.

### Background and Rationale

Science education is vital for young children to foster their natural curiosity as well as to help them understand and appreciate the world around them (Halverson, 2007). Primary schools are where young children are first exposed to the basic scientific concepts and the wonders of scientific inquiry, and therefore, the primary school level plays a crucial role in developing interest in sciences among young minds (International Council for Science [ICSU], 2011). However, it is worth noting that despite growing attention to science education worldwide, South Africa is yet to give adequate attention to research in *Natural Sciences and Technology*, particularly at the Intermediate Phase level (Grades 4 to 6) (Bantwini, 2017). Even the science teaching and learning approaches in South African primary schools hardly meet the requirement of the current assessment policy, that is, the *Curriculum and Assessment Policy Statement (CAPS)*, which can prove harmful to the successful implementation of the policy (Bantwini, 2017). Thus, it is critical to devote significant attention to teaching and learning approaches, and research in the field of science education in South Africa and identify the specific areas for improvement (Bantwini, 2017). One such area requiring attention is the

implementation of assessment in South African primary schools (Kanjee & Sayed, 2013).

In the field of Education, ‘evaluation’ was traditionally focused on assessing learners using ‘summative assessment’ or assessment *of* learners (The Organisation for Economic Co-operation and Development [OECD], 2013). However, in recent years, there has been a shift towards using ‘formative assessment’ or assessment *for* learners (OECD, 2013). This later enables learners to participate in their learning journey, allowing them to monitor their progress and set their own learning objectives, which makes the learning process more effective and engaging (Green, García-Millán, & Lucendo-Noriega, 2022). Additionally, teachers can use formative assessment methods to reflect on their teaching and adjust instructions to improve learning outcomes for each learner (Green et al., 2022).

Owing to its several benefits, the formative assessment approach is promoted as a fundamental approach to educational reform in several countries worldwide (OECD, 2005). At the international level, many countries have recommended formative assessment or assessment for learning (AFL) in policies and practices (Birenbaum, DeLuca, Earl, Heritage, Klenowski, Looney, Smith, Timperley, Volante, & Wyatt-Smith, 2015). Formative assessment is also called classroom-based or continuous assessment (Browne, 2016). As in the case internationally, several revisions of the assessment policy in South Africa also support a formative use of assessment information (Kanjee & Sayed, 2013) for teaching and learning purposes in this country.

After the victory of the African National Congress in democratic elections in 1994, the South African school curriculum underwent significant reforms related to assessment. During the period 1994-2013, “there were 7 white papers, 3 green papers, 26 bills (of which 17 were amending bills), 35 acts, 11 regulations, 52 government notices and 26 calls for comments that encompassed basic to higher education” (Kanjee & Sayed, 2013, p. 445). The post-apartheid government predominantly focussed on the needs of marginalised people and on the delivery of quality teaching to every South African learner (Beets, 2012). Efforts were made to address the issues of ‘equity’ and ‘quality’ throughout the process of reforms (Kanjee & Sayed, 2013). A key component of this process was the successful implementation of assessment policies in schools (Kanjee & Sayed, 2013). Even though the government made continuous efforts to transform the education system by introducing assessment-related reforms, the policies regarding assessment have remained a continuous issue (Kanjee & Sayed, 2013)

The introduction of continuous assessment (CA) was one of the significant reform in the realm of assessment in South Africa. Continuous assessment and its use for formative purposes was first introduced in the South African curriculum in 1998 through '*Assessment Policy in the General Education and Training Band*' (Beets, 2012). The subsequent assessment policies, that is, the *National Policy on Assessment and Qualifications for Schools in the General Education and Training Band* (Department of Education [DoE], 2007) and *Curriculum and Assessment Policy Statement (CAPS)* (Department of Basic Education [DBE], 2011), have consistently shown an increasing appreciation of the use of formative assessment

(Kanjee & Sayed, 2013; Beets, 2012). The intention of all these revisions of the assessment policy was to implement successful assessment practices at the classroom level. However, in reality, it just remained a measurement system (Kanjee & Sayed, 2013) in South African classrooms.

Beets (2012) asserts that continuous assessments were used for summative purposes for producing final marks in South African schools, which impeded the shift towards the assessment *for* learning approach. While the current assessment policy, that is, *Curriculum and Assessment Policy Statement (CAPS)* (DBE, 2011), encourages teachers to use assessment pedagogically in order to improve learning (Govender, 2019), summative assessments are still used predominantly in South African schools (Berry, 2011; Kanjee, 2009; Kanjee & Sayed, 2013).

In schools, teachers play a pivotal role in setting classroom assessments, with their conceptions of assessment serving as an essential element in determining processes of learning and instructional activities (Azis, 2012). However, teachers hold a variety of conceptions and beliefs, which can impact the quality of their performance (Opre, 2015). The various studies conducted on South African teachers' conceptions of assessment revealed either an inadequate or no understanding of formative assessment (Jane, 2013; Kanjee, 2020; Kanjee & Mthembu, 2016; Schuld, Kanjee & White, 2017; Vandeyar & Killen, 2007), leading to poor implementation of formative assessments in classrooms (Schuld et al., 2017).

Factors such as policy frameworks, teachers' beliefs, teachers' deep-rooted conceptions, the education system within which teachers work, and learners from

different social, racial, or cultural backgrounds have shown significant influence on the South African teachers' conceptions of assessment (Jane, 2013; Vandeyar & Killen, 2007). According to Sayed and Kanjee (2013), it is of utmost importance for South African teachers to cultivate an understanding that formative assessment holds equal weight to summative assessment and further develop their conceptions of assessment accordingly to ensure the successful implementation of new assessment policies. Failing to recognise the importance of formative assessment could put the new assessment policies at risk due to teachers' existing practices (Sayed & Kanjee, 2013).

Furthermore, teachers' 'conceptions of assessment' is a psychological phenomenon (Brown, 2008). Such psychological phenomena can be measured by adopting quantitative methods using a measurement instrument such as inventories or questionnaires (Creswell, 2009; Sukamolson, 2007). Brown (2002) has developed an instrument called *Teachers' Conceptions of Assessment (CoA-III)* inventory in New Zealand to measure teachers' conceptions of assessment. Brown (2006) further validated the *CoIII-A* with Queensland teachers and developed its shorter version called *Abridged Teachers' Conceptions of Assessment (TCoA-III A)*. *CoA-III* and *TCoA-III A* have been used in different countries to measure teachers' conceptions of assessment while modifying them based on demographic requirements of the respective countries.

### **Statement of Problem**

The literature on teachers' conceptions of assessment indicates that the teachers' conceptions of assessment are considered a crucial element in determining

learning and instructional activities and outcomes. Hence, it is essential to understand what teachers think about assessment and what their practices of assessment are. Formative assessment is a key component of South African assessment policy. Despite this, there is very little research on teachers' conceptions of formative assessment in *Natural Sciences and Technology* at the Intermediate Phase level (Grades 4-6) in South Africa. Therefore, this research study will interrogate the conceptions of formative assessment held by *Natural Science and Technology* teachers at the Intermediate Phase level.

### **Aims and Objective**

The objectives of the study are as follows:

- a. To develop an instrument suitable for use with primary school science teachers of the Western Cape by adapting Brown's (2006) *Abridged Teachers' Conceptions of Assessment (TCoA-III A)* inventory.
- b. To identify practicing primary school science teachers' conceptions of formative assessment.
- c. To identify the demographic factor(s) that influence the conception of formative assessment of primary school science teachers in the Western Cape.
- d. To identify the preferred formative assessment practices of the Western Cape primary school science teachers.

### **Research Questions**

This study seeks to address the following research questions:

1. Is the *TCoA-III A* inventory of Brown (2006) valid for use with Western Cape primary school science teachers? (Objective 'a' and 'b')

2. What are the conceptions of formative assessment held by Western Cape primary school science teachers? (Objective 'b')
3. Which demographic variable(s) affect Western Cape primary school science teachers' conceptions of formative assessment? (Objective 'c')
4. What formative assessment practices do primary school science teachers in the Western Cape prefer? (Objective 'd')

### **Significance of the Study**

In light of the current assessment policy's (DBE, 2011) emphasis on formative assessment, the purpose of this study was to provide insight into how science teachers in Western Cape primary schools conceive formative assessment and what their practices are. As a result of providing this information, teachers' thinking about formative assessment in the Western Cape may be better understood. It is essential to consider the complex structure of teachers' conceptions of assessment when implementing any new assessment policy, tool, or practice, whether at the national or local school level (Brown, 2004). Therefore, it is hoped that the findings of this study will benefit teacher developments by providing a comprehensive picture of the conceptions of primary science teachers have about formative assessment. This picture can be a valuable resource for planning effective pre-service or in-service education programs that will equip teachers with the necessary skills and knowledge to succeed while implementing formative assessments in classrooms. Additionally, the findings of this study may prove helpful for future researchers interested in exploring teachers' conceptions of assessment.

## **Clarification of terms**

In this study, key concepts are defined as follows:

### ***Assessment***

Within an educational network, ‘assessment’ refers to “the set of methods and processes by which evidence about student learning is designed, collected, stored, analysed, and interpreted” (Brown, 2017, p. 1).

### ***Summative Assessment (Assessment of Learning)***

The assessment that “identifies the quality of schools, teachers, and learners and holds them to account for their performance is commonly referred to as summative assessment” (Brown, 2017, p. 8).

### ***Formative Assessment (Assessment for Learning)***

“The process used by teachers and students to recognise and respond to student learning in order to enhance that learning, during the learning” (Cowie & Bell, 1999, p. 101).

### ***Assessment Literacy (AL)***

It is described as a person’s understanding of the fundamental concepts of assessment and procedures likely to influence educational decisions (Popham, 2009).

### ***Conception of Assessment***

Conception is a “belief systems, usually arises implicitly from experiences with a phenomenon, that guide persons in responding to or understanding the phenomenon” (Brown, 2017, p. 126). Teachers’ conceptions of assessment shape the use of assessment practices (Harris & Brown, 2009).

***Practices***

The term 'practice' is used to describe teachers' activities in conducting classroom assessments. These activities range from planning of tests to reporting, and the deployment of test results (Gonzales & Fuggan, 2012).

***Primary School Science Teachers***

This study refers to all primary school teachers at public primary schools who teach the subject of *Natural Science and Technology* in Grades 4-7.

***Grade***

Level or part of the educational programme that a learner can complete in one year (*The South African School Act 84 of 1996*, Government Gazette 17579, 1996).

***General Education and Training (GET) and Further Education and Training (FET)***

The South African school curriculum is divided into two major parts - General Education and Training (GET) band, which includes the first nine years of schooling, and Further Education and Training (FET) band, which includes years 10 to 12 (Gibson, Smith, Chamberlain, Falcon, & Gerrans, 1997). *Natural Sciences and Technology* (NST) is taught as one subject in Grades 4 to 6, while in Grades 7 to 9, *Natural Sciences* and *Technology* are taught separately (DBE, 2011).

***Learner Accountability***

In the South African educational context, the Department of Education (DoE, 1997) recommended the use of the term 'learner' instead of 'student' or 'pupil'.

As a result, the term '*Learner Accountability*' is used in this dissertation in place of '*Student Accountability*', as used by Brown (2002, 2004, 2006).

### ***Cross-cultural Adaptation of an instrument***

The adaptation of any existing research instrument to use in a new country or culture requires not only that the instrument items be translated well linguistically, but they also need to be adapted culturally to maintain the conceptual validity of the instrument across cultures (Beaton, Bombardier, Guillemin, & Ferraz, 2000; Borsa, Damásio & Bandeira, 2012).

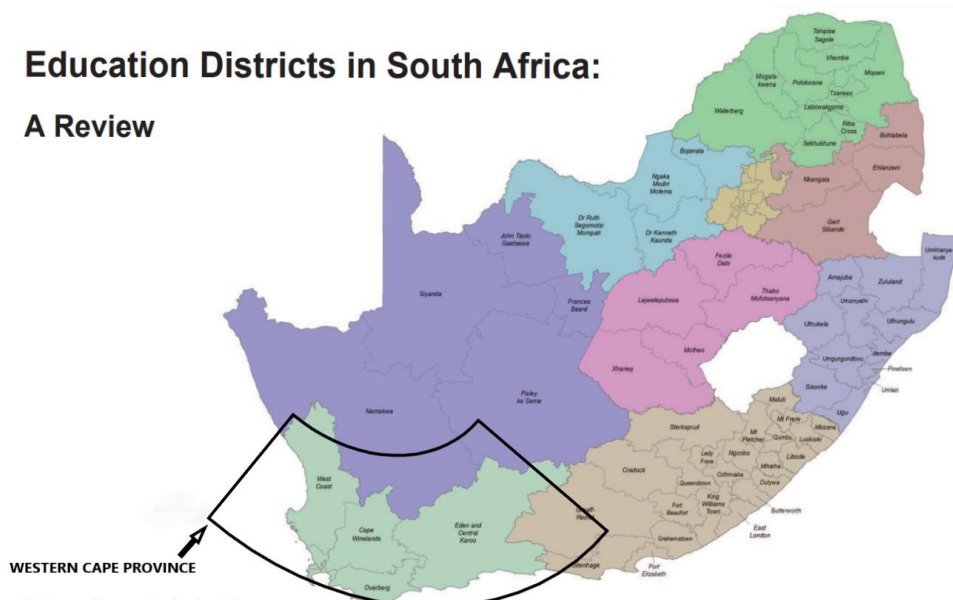
The following section provides contextual information about the Western Cape province, as it serves as the location where the present investigation was conducted.

### **Contextual details of the Western Cape province**

The Western Cape Education Department (WCED) is divided into eight education districts administratively. Among the districts are four rural districts (i.e., West Coast, Cape Winelands, Eden and Karoo, and Overberg), and four urban districts (i.e., Metro North, Metro South, Metro East, and Metro Central). These eight districts are divided into 49 circuits (Western Cape Government, n.d.). Rural district boundaries are determined by municipal boundaries, while urban district boundaries are determined by city wards. Using these boundaries, schools and resources are distributed equitably among education districts and circuits (Western Cape Government, n.d.). In Figures 1.1 and 1.2, the distribution of education districts in South Africa and the spread of education districts in the Western Cape province are indicated, respectively.

**Figure 1.1***Education Districts of South Africa*

### Education Districts in South Africa: A Review



*Note.* From Education Districts in South Africa: A review [Map] by Department of Basic Education (DBE), 2013. ([https://gis-solutions.co.za/images/downloads/Review\\_of\\_education\\_districts\\_March\\_2013\\_sample\\_pages.pdf](https://gis-solutions.co.za/images/downloads/Review_of_education_districts_March_2013_sample_pages.pdf))

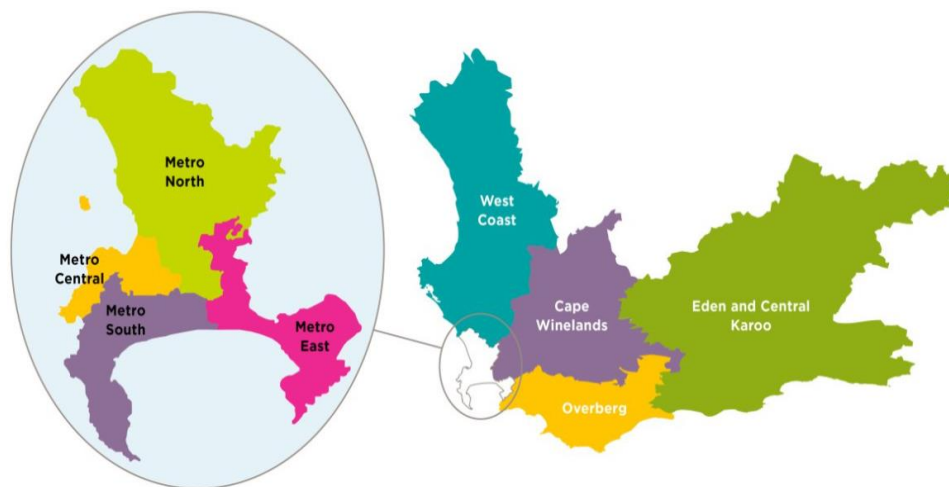
The development of a Western Cape version of the *TCoA-III*A inventory needed to take into account the predominant languages used in Western Cape province. The main languages spoken by Western Cape province inhabitants Afrikaans (46.6%), IsiXhosa (31.1%), and English (19.6%) (DBE, 2018). In light of the language diversity in the province, both parallel and dual-medium education are practiced alongside the single medium education (Plüddemann, Braam, October & Wababa, 2004). In dual-medium schools, teachers use two languages to instruct learners in a lesson. The teacher switches between the two languages equally, with a 50:50 ratio (DBE, 2010). On the other hand, in parallel medium schools teaching

takes place in multiple languages of instruction, in separate classes within the same grade (DBE, 2010).

**Figure 1.2**

*Metro Education Districts of the Western Cape Province*

## WCED Education Districts



*Note.* From WCED Education Districts [Map] by Western Cape Education Department, n.d. (<https://wcedonline.westerncape.gov.za/contact/districts>)

Further, the South African School Act 84 of 1996 (Government Gazette 17579, 1996) recognises two different types of schools, that is, public schools and independent schools. The public schools are owned by the state while the independent schools are either privately governed or aided by state (*The South African School Act 84 of 1996*, Government Gazette 17579, 1996; Loock & Gravett, 2014). The present investigation was focused on the primary science teachers from the public schools of the four Metro Education districts of the Western Cape province. As far as prosperity goes, the Western Cape Province is one of the most

prosperous provinces in South Africa (Phurutse, 2005). Also, it is one of the top-performing provinces within the country in terms of education (Wills, Debra & Kotze, 2016; Western Cape Government, 2015). Thus, it is hoped that the present investigation will provide a comprehensive picture of the conceptions of formative assessment of primary school science teachers from an educationally best-performing, culturally diverse, and prosperous province of South Africa.



## CHAPTER 2: LITERATURE REVIEW

In this chapter, the broad conceptual framework relevant to this study of primary science teachers' conceptions of assessment is outlined and described in detail. As this research aims to uncover conceptions of formative assessment among South African primary school science teachers, a discussion applicable to the South African assessment policies is included. Further, the empirical research on teachers' conceptions of assessment at the international level and in South African schools is reviewed. The need for this research in the subject of *Natural Sciences and Technology* in South Africa at the primary school level (Intermediate Phase, Grades 4-6) is emphasised.

### Conceptions

The term 'conceptions' is generally used to portray an individual's mental constructs (Pajares, 1992; Thompson, 1992) and their approach to a situation they encounter each day (Colapietro, 2006). 'Conception' is a psychological concept (Brown, 2008), and it is the system of beliefs that usually arises tacitly from experiences with a phenomenon (Brown, 2017). While explaining the theory of planned behaviour, Ajzen (2002, 2011) emphasises that people's behaviour, practices, or actions are shaped by their beliefs or conceptions. Hence, conceptions play a crucial role in guiding a person in understanding or reacting to a phenomenon (Brown, 2017).

Conceptions are generally divided into two broad categories, 'systematic' or consistent conceptions and 'atomistic' or inconsistent conceptions (Brown, 2008). In the former category, systematic conceptions align with the prevailing theories

people hold about a particular domain or subject. 'Atomistic' conceptions, the second category, illustrate that different humans may have varied conceptions based on their socio-cultural context. Thus, the existence of two different types of conceptions results in people holding a variety of conceptions. The same holds true in the field of education, where teachers have a range of conceptions, and these conceptions significantly impact their performances and behaviours (Opre, 2015).

Conceptions, according to Marton (1981), are the "filters" through which teachers view, interpret, and interact with the educational environment. Conceptions play a decisive role in educational processes such as curriculum and assessment (Griffiths, Gore, & Ladwig, 2006). Assessment is an essential component of education. A teacher's conception of the assessment can be viewed as a comprehensive reflection of their knowledge and beliefs about assessment (Barnes, Fives, & Dacey, 2015).

### **Assessment**

Assessments in education have been known for centuries (Earl, 2006). A traditional pattern of assessment involved teacher teaching, learners taking the test to assess their knowledge of the learning material, a judgment about each learner was made based on the tests, and the learner moved to the next grade level (Earl, 2006). As a result, assessments were traditionally viewed as activities that were considered in a "gatekeeper" role or provided an "index of learning" (Earl, 2006). Sadler (1989) also viewed assessment as a means of documenting any appraisal (or judgment or evaluation) of a learner's work or performance. Following Sadler

(1989), the assessment experts Wiliam (2017) and Black and Wiliam (2018) perceived assessment as a procedure for making inferences about learning.

However, some assessment experts have recently defined assessment in ways that differ from the conventional definitions. Brown (2017) defines assessment as "a general process of collecting information (e.g., tests, observations, question, and answer, etc.) to describe the characteristics (e.g., strengths or weaknesses) of a product, process, or person" (p. 126), while Remesal (2011) and Harlen (2009) believe that assessment is a tool to promote learning. Edwards (2013) sees assessment as a way for teachers to apply their understanding of how learners develop attitudes, values, skills, and knowledge. Thus, assessment is integral to the learning process (Earl, 2006) and must be carried out appropriately (Harlen, 2005).

In education, assessment serves a variety of purposes. It improves learning outcomes and provides a strong base for certifying that a learner has achieved the necessary standards to be promoted to the next grade level (Brown et al., 2009). Assessment plays a crucial role in enhancing the education system, provided high-quality assessment forms are integrated into the curriculum, curricular materials, teacher training, and planning and support services (Baird, Andrich, Hopfenbeck, & Stobart, 2017; Muskin, 2015).

The assessment system within a classroom, in particular, performs well when using assessment forms that promote learning rather than the forms that are solely designed for the purpose of evaluation and assigning grades (Chappuis & Stiggins, 2008). The literature regarding different forms of assessment reveals that assessments can be summative or formative (Brown et al., 2009; Earl, 2006). A

summative assessment is conducted at the end of the course to determine the learners' achievement against some standard criteria (Bennett, 2011). It is also called the 'assessment of learning' (Looney, 2011; Kibble, 2017). While summative assessment meets some learning progression criteria, there is no claim that summative assessment supports learning effectively (Bennett, 2011). On the other hand, there is substantial literature that indicates the positive effects of formative assessments on teaching practice and learners' outcomes (Black & Wiliam, 1998a; Kulasegaram & Rangachari, 2018; OECD, 2005 & 2007; Trumbull & Lash, 2013; Wiliam & Thompson, 2008).

### ***Formative Assessment***

Education focuses mainly on three competency types including knowledge, skills, and attitudes (Kulasegaram & Rangachari, 2018). Hence, meaningful assessments need to align with these competencies. While explaining the notion of meaningful learning, Kulasegaram and Rangachari (2018) further clarify that it is an "alignment with relevant outcomes for the next stage of a learner's growth" (p.5). Multiple definitions of formative assessments provide clear ideas about how learners can improve and personalise their learning, leading to meaningful learning. Dunn and Mulvenon (2009) opined that there is no "agreed on" definition for formative assessment. The following descriptions encompass different definitions proposed by key experts in the formative assessment field.

A definition by Black and Wiliam (2009) encapsulates many of the definitions found in the literature. It is formulated as "the classroom practices that are formative when the evidence about learner achievement is extracted, interpreted

and further used by teachers, learners and also by their peers to make decisions about subsequent steps in instruction to improve learning" (p. 9). OECD (2005) frames the definition as "assessment is 'formative' when the information gathered is used to alter the student's performance gap" (p. 45). Earl (2006) considers that formative assessment is the assessment that occurs during teaching to make adjustments in teaching. Assessment expert Popham (2006) also supports the definitions of Black and Wiliam (2009) and Earl (2006), as he believes that for an assessment to be formative, both teachers and learners need to have the results of learner achievement in sufficient time to adjust ongoing instruction and learning.

Other definitions of formative assessment are derived from a specific purpose of assessment, a particular manifestation of the assessment form, and a particular educational trend. For Shepard (2009) and Wiliam (2006), formative assessment is defined by its purpose. In their view, assessment is formative when it shapes learning during the learning process. Gipps (1999) and Frohbieter, Greenwald, Stecher, and Schwartz (2011) opined that formative assessment is a process rather than a type of assessment where the assessments are used formatively. Even though the term formative assessment is being used in more specific ways (Bell & Cowie, 2001), its various manifestations, like peer assessment, interim assessment, or self-assessment (Andrade, 2010), are precisely defined by their interim characteristics, and also the way assessment is used (Dunn & Mulvenon, 2009). Based on the different trends in education, Bell and Cowie (2001) define formative assessment as an assessment that provides feedback to

learners and teachers about the learning happening during the teaching and learning process and not later.

In formative assessments, the notion of 'feedback' plays a crucial role in learning (Black & Wiliam, 1998a; Sadler, 1989). Feedback is categorised into two types - 'specifying' and 'constructing' (Gipps, 1999). Specifying feedback involves teachers acknowledging learners' specific achievements, using models to judge learners' behaviour and work, diagnosing learners using particular criteria, and correcting learners' work. Constructing feedback involves using both sharp and fuzzy criteria, assessing work jointly with learners, discussing the next steps to follow, and using self-regulation strategies. Most of the literature on feedback advocates using the 'constructing' type of feedback where the teacher is more in the role of facilitator of learning than judge or provider (Gipps, 1999).

According to Hattie and Timperley (2007), there are five crucial formative assessment strategies outlined by Wiliam and Thompson (2008) that should be used alongside constructive feedback to improve learning and achievement. These strategies are (a) clarifying and sharing learning intentions and criteria for success, (b) engineering effective classroom discussions, questions, and learning tasks, (c) providing feedback that moves learners forward, (d) activating students as instructional resources for one another, (e) activating students as the owners of their own learning (Wiliam & Thompson, 2008, p.15)

These strategies are applicable across all content areas and grade levels (Leahy, Lyon, Thompson, & Wiliam, 2005). In addition to these strategies, Heritage (2007) enumerates four elements of formative assessment that teachers must

understand before implementing formative assessment in the classroom. These core elements are (a) identifying the "gap" between the learner's current status in learning and the predetermined learning goal, (b) providing "feedback" to the learner at multiple levels of learning, (c) improving learning by "active involvement of learner" in the assessment process, and e) establishing a link between formative assessment and "learning progression".

Further, Heritage (2007) suggests the four key elements of a teacher's knowledge required to implement formative assessment effectively. These elements are the learner's prior learning, domain knowledge, pedagogical content knowledge, and assessment knowledge. Thus, incorporating formative assessment into teachers' professional practices necessitates them to possess knowledge of peculiar strategies and key elements. Therefore, it is imperative to provide adequate training to teachers to ensure the successful integration of formative assessment into their classroom practices (Heritage, 2007).

Thus, correctly structured formative assessment can help learners learn better and can improve their test scores in external ability tests (Popham, 2006). The outcomes from such formative assessments are also helpful in informing learners, teachers, tutors, and parents about what the learning goal is, where the learners are in relation to achieving their learning goal, and what actions are needed to improve learners' performance (Black & Wiliam, 2009; Sadler, 1989). Such information, when collected at the national level, helps inform policy (OECD/CERI, 2008), potentially affecting future evaluation practices, teachers, and learners (Dunn & Mulvenon, 2009). Formative assessment is thus seen as an essential component of

the teaching and learning process, and many countries worldwide now promote it as a critical strategy to achieve the goals of quality, equity, and efficiency in school education (Looney, 2011).

### ***The Importance of Formative Assessment on a Global Scale***

Throughout the past decade, research on formative assessment has evolved along with changes in the methods of instruction and the role of teachers and learners (Green et al., 2022). To align with this transformation, different countries have implemented a variety of formative assessment reforms, with varying degrees of success (Green et al., 2022). The OECD is a global organisation with 38 member countries and more than 50 partner countries. OECD seeks to shape educational policy that promotes equality, opportunity, prosperity, and well-being for all (OECD, 2022). Most of the OECD member countries' national and regional governments endorse formative assessment as a tool to achieve lifelong learning goals due to its promising techniques (OECD, 2007). A number of countries from the Global North region are member countries of the OECD organisation.

The countries like Australia, Canada, Ireland, Israel, New Zealand, Norway, and the USA have incorporated formative assessment into their policies and practices (Birenbaum, et al., 2015). To promote better performance, the *Assessment for Learning* movement (AfL) movement in England and Scotland advocated various forms of feedback in formative assessment (Lucas, Claxton, & Spencer, 2013). This movement has had a favourable impact on the transition to formative assessment methodologies in schools in recent years in England and Scotland (Lucas, et al., 2013). In Australia, formative assessment is an essential aspect of

education policy (Van der Kleij, Cumming & Looney, 2018). The Australian curriculum policy published in 2017 mandated that Australian learners are assessed at different levels and with different purposes using formative assessment (Van der Kleij et al., 2018).

The countries from the Global South region, specifically those in Asia and the Pacific region, have shown a positive reception towards implementing formative assessment in their policies (Green et al., 2022). The Southeast Asian Ministers of Education Organisation (SAEMEO) is an intergovernmental organisation in the Southeast Asia region (SAEMEO, n.d.) for 11 member countries. According to the report from the Southeast Asian Ministry of Education, Innovation and Technology (SAEMEO INNOTECH, 2015), formative assessment is replacing summative assessment in the Southeast Asian region. SAEMEO comprises member countries such as Vietnam, Malaysia, and Indonesia. The national policies of these countries emphasise the importance of adopting a learner-centered approach, which includes using formative assessment methods and school-based assessments (Puad & Ashton, 2021; Sidhu, Kaur, & Chi, 2018; Tien, Anh, Luong, Ngoc, & Vuong, 2020).

The Indian policymakers in the year 2009 noted the adverse effects of summative assessment, including the labelling of learners, unhealthy competition, and general negativity (Raman & Nedungadi, 2010). In response, the Central Board of Secondary Education in India implemented the *Continuous and Comprehensive Evaluation* reform under the Right to Education Act (Mondal & Mete, 2013). This reform made it mandatory for assessments to be formative. Later, the new education

policy introduced in the year 2020 emphasised the “assessment for learning” as a crucial feature of the assessment (National Education Policy, 2020).

In addition to specific countries that promote the use of formative assessment in their policies, various organisations and forums dedicated to enhancing education worldwide also support the implementation of formative assessment in education policies. The ‘World Education Forum’ (WEF, 2015) strongly advocates the formative assessment approach for improving education quality, recommending that this approach be developed based on the learners' context in order to achieve the desired results at specific levels of the education system. According to the ‘World Bank’, improved formative assessment practices are linked to improved results on standardised examinations and increased national prosperity (Clarke, 2012).

Even then, based on their research in various countries around the world, Birenbaum et al., (2015) noted that, while the research base for formative assessment appears to be well established and accepted in multiple countries, education policies have yet to be established in a way that would result in a significant change in teachers' practices. As far as South Africa is concerned, assessment has proved a challenge for teachers since the introduction of new assessment policies immediately after post-apartheid (Kanjee & Sayed, 2013). The introduction of unnecessarily complicated methods of assessment (Dada, Dipholo, Hoadley, Khembo, Muller, & Volmink, 2009) in post-apartheid assessment policies made it difficult for teachers to institute formative assessment practices (Kanjee & Sayed, 2013).

***Position of Formative Assessment in Post-apartheid South African Assessment Policies***

After the democratic elections in 1994, which signaled the end of legislative apartheid, education policies related to curriculum and assessment systems proliferated. Analyses of assessment policies, especially those formulated post-apartheid, reveal a variety of activities and processes aimed at developing national policies (Kanjee & Sayed, 2013; Lubisi & Murphy, 2002). Beets (2012) categorised post-apartheid assessment policy revision into three phases.

**Phase 1- Original Curriculum Assessment Policy Statement (Curriculum 2005 [C2005]).** The assessment policies that were introduced following the conclusion of apartheid persisted with the principles of the apartheid era and focused on limited assessment reforms (Beets, 2012). As a result, the newly introduced policies presented issues to the newly democratically elected government due to conflicting intentions with the apartheid-era policies and their fragmentary nature. Hence, in 1997, Outcome-Based Education (OBE), which was later amended to the 'C2005' curriculum (Naong, 2008), was established with the goal of providing learner-centered education (DoE, 1997; Spreen & Valley, 2010). Unfortunately, some significant problems with C2005 arose during the implementation phase. The complex design of the curriculum, lack of clarity in curriculum content and assessment designs, the use of complex language and terminology, and inadequate support for teachers in implementing the curriculum were some of the issues identified in C2005 (Dada et al., 2009).

Therefore, the Department of Education took further steps concerning the assessment issue (Muller, 2004) and introduced the first official assessment policy, the '*Assessment Policy in the General Education and Training Band*' (Beets, 2012; DoE,1998). This policy introduced the concept of 'continuous assessment' that should be conducted in each of the learning areas (i.e., subjects such as *Natural Sciences, Technology, Mathematical Literacy, Mathematics*, and so forth) in the Senior Phase (Grades 7 to 9) (Muller, 2004). Through this policy, the responsibility and authority to design assessments were placed on provincial authorities (Beets, 2012). Implementing "continuous assessment" brought a significant change to the nature and goals of assessment in this phase (Kanjee & Sayed, 2013). This was because continuous assessment was introduced to replace apartheid's 'authoritarian' approach to assessment with a formative, standards-based, and ongoing approach (Muller, 2004).

However, despite the continuous assessment model's promising possibilities to enhance learning through varied assessment practices (Wilmot, 2003), the overall mechanism of the C2005 assessment proved to be complex (Kanjee & Sayed, 2013). Various interpretations of continuous assessment by teachers and several other problems in C2005 caused the first major revision to C2005, known as the *Revised National Curriculum Statement* (RNCS) (Beets, 2012; Kanjee & Sayed, 2013).

**Phase 2 - Revised National Curriculum Statement (RNCS).** Through RNCS, an attempt was made to provide greater clarity than through C2005 on the content themes of the curriculum and the description of the role of school-based assessments (Beets, 2012). RNCS incorporated design features such as 'critical

outcomes', 'learning outcomes', and 'assessment standards' to improve classroom assessment practices. Yet, the results of the RNCS fell short of expectations in a number of different learning areas, subjects, and grades (Dada et al., 2009). As a result, it was necessary to create supplementary documentation to fill in the gaps (Vandeyar & Killen, 2007).

As a consequence, the next revision of the policy took place in the year 2005, called the *National Protocol on Assessment for Schools in the General Education and Training (GET) and Further Education and Training (FET) bands for Grades R to 12* (DoE, 2005). This protocol aimed to reduce teachers' workload while simultaneously streamlining the recording and reporting of the process of learner progress (DoE, 2005). However, inefficiency and dysfunctionality in the schools prompted a reform of this strategy in the year 2007, and a new policy, the '*National Policy on Assessment and Qualifications*,' was implemented at the GET band level (Beets, 2012).

Although this policy had been considered progressive because of its focus on the formative function of assessment (Beets, 2012), it created widespread confusion about several aspects of assessment among teachers and parents (Dada et al., 2009). As a result of the policy's demand on excessive planning requirements from teachers, little progress was made in improving teaching and learning; on the other hand, the administrative burden associated with assessment and planning negatively impacted teaching time (Dada et al., 2009).

**Phase 3 – Curriculum and Assessment Policy Statements (CAPS).**  
*Curriculum and Assessment Policy Statement (CAPS)* policy was announced in

2010 (Beets, 2012) and implemented in 2011 (Kanjee & Sayed, 2013) with the intention to provide clear guidelines to teachers on what they should teach and assess at every grade level (DBE, 2011). In terms of assessment, this policy stressed the elimination of learner portfolio files and common assessment tasks and a reduction in the number of projects (Beets, 2012). The notion of 'formal' and 'informal' assessment was further extended and associated with 'assessment of learning' and 'assessment for learning'. In the policy, school-based assessment (SBA) is described as a compulsory component of progression and promotion at the end of each phase, with clear instructions regarding the percentage of SBA that counts toward learners' end-of-year marks (Kanjee & Sayed, 2013). In this way, the CAPS clarified the test-based criteria for accountability for teachers. A CAPS document (DBE, 2011) also specifies how many formal assessments will be conducted each term and how informal assessments are used (Kanjee, 2013).

The fundamental factor in this policy transformation process was the introduction of new assessment policies and their effective implementation at the national and classroom levels (Kanjee & Sayed, 2013). Yet, the entire process of developing assessment policies and the subsequent discourse on assessment practices failed to consider the significance of offering suitable guidelines and training for teachers to implement policies efficiently (Kanjee & Sayed, 2013; Vandeyar & Killen, 2007). Furthermore, Vandeyar and Killen (2007) opined that this development process of assessment policies also lacked consideration of teachers' 'ingrained conceptions of assessment' as it can be a contributing factor to many South African teachers' reluctance to change their assessment practices based

on new policies and guidelines. Therefore, teachers' conceptions of assessment are discussed in detail in the following section.

### **Teachers' Conceptions of Assessment**

Much research has been conducted so far on teachers' conceptions of assessment. Pratt (1992) considered assessment as a 'lens' through which teachers view the world of teaching and learning. Teachers hold a variety of conceptions (Opre, 2015) that result in developing their convictions about their learners, their status as teachers, teaching or learning content, and various social aspects of teaching (Levin, 2015). A comprehensive definition by Scott (2015) states that teachers' conception is "the term is used to designate individual, subjectively true, value-laden mental constructs that are the relatively stable results of substantial social experiences and that have a significant impact on one's interpretations of and contributions to classroom practice" (pg.19).

Teachers' conceptions are classified in different ways. When teachers are conscious or aware of their conceptions, they are referred to as "explicit," but when teachers unconsciously hold them or are oblivious to them, they are referred to as "implicit" (Fives & Buehl, 2012). Generally, conceptions are made explicit through verbal and written communication (Fives & Buehl, 2012). Opre (2015) further classifies teachers' conceptions as context-dependent and context-independent. Regardless of the classification of the teachers' conceptions, Fives and Buehl (2012) believe that teachers' conceptions are generally influenced by factors such as teachers' subject knowledge, values, classroom context, administrative expectations, and policy demands.

Several researchers have used the term ‘teachers’ conceptions’ in relation to assessment (Barnes et al., 2015; Brown, 2004, 2008; Harris & Brown, 2009). According to Opre (2015), the researchers' interest in this area is relatively new, resulting from a paradigm shift in teaching and learning approaches. Brown has made a significant contribution (Brown, 2002; Brown, 2004; Brown et al., 2011; Brown & Harris, 2009; Brown & Michaelidis, 2011; Harris & Brown, 2009) to the area of teachers’ conceptions of assessment. Brown (2002) has identified three major purposes and one antithesis for these relevant purposes of assessment through his research. These three purposes are (a) assessment is for improving the quality of teaching and learning (i.e., improvement), (b) assessment is for making learners accountable for learning outcomes (i.e., learner accountability), (c) assessment is for demonstration of the quality of teachers and schools (i.e., school accountability). The anti-purpose of assessment is that the assessment should be rejected as it has no purpose in the teaching and learning process (i.e., irrelevance). These conceptions are discussed in detail in the following sections.

### ***Improvement***

Under this conception, the purpose of assessment is to improve learning processes and teachers' instructional skills (Brown, 2008). Hence, a critical caveat to this conception is that it requires, first, that an assessment describes or diagnoses the nature of the learning process and, second, that the information it includes must be a valid, reliable, and accurate description of learners’ performance. Brown (2008) recommends that teachers use a variety of assessment methods, both informal and formal, with the ultimate goal of improving learning and teaching. Thus, this

conception serves as an evaluation tool for both formative and summative purposes (Brown, Kennedy, Fok, Chan, & Yu, 2009).

The improvement in learner achievement depends on consistently implementing appropriate assessment strategies in the classroom (Black & Wiliam, 1998b). This calls for a teacher with a sound fundamental grasp of high- and low-quality assessments and who can apply that understanding to multiple measures of learner progress (Stiggins, 1991). In other words, learner improvement through assessment requires an ‘assessment literate’ (Stiggins, 1991) teacher. Ultimately, ‘assessment literacy’ improves teachers’ knowledge and skills to participate in assessment-related discourse (Jones, 2004). This is especially important as the most challenging task associated with ‘assessment as improvement’ conception is identifying and improving learners' higher-order thinking skills (Brown, 2008). Formative assessment techniques provide deeper insight and evidence of learners' level of understanding and requirements (Ruiz-Primo, 2011), thus identifying the areas for improvement for learners.

### ***Learner Accountability***

This conception is built on the idea that the objective of the assessment is to hold the learners individually responsible for their own learning (Opre, 2015; Brown, 2008). As a general rule, grades on assignments, learner performance measured against specified criteria, placing learners into groups based on performance, reporting on learners’ grades to parents/educators or future employers, and the selection of secondary learners for graduation or higher education are some

of the forms that are considered as forms of making learners responsible for their own learning (Brown, 2004; Brown, 2008).

In the context of assessment, there is a distinction between the accountability and responsibility of learners. When it comes to holding learners accountable for achievement in assessment, their progress is often measured by standardised tests created by teachers, whereas responsibility refers to the learner's actions (i.e., performance in assessment) and answerability to oneself and others (Cook-Sather, 2010). Contemporary assessment practices, such as formative assessments, involve learners playing a more active role in setting attainable goals that are marked by assessments (Brown, 2008). Therefore, adopting formative assessments in schools may lead to an understanding of assessment as a means of holding learners accountable (Brown, 2008). This is concerning as such assessment practices unintentionally may highlight the role of assessment as a mechanism to hold learners responsible. On the other hand, Zarei, Bagheri, and Sadighi (2021) emphasise that holding learners accountable for any educational activity is crucial in addressing the issues of independent learning. Thus, this conception generates a mixture of responses about the use of assessment.

### ***School Accountability***

The 'assessment as school accountability' conception chiefly focuses on institutional goals, societal perspectives, and interests (Azis, 2012). Society expects schools to implement a curriculum that cultivates specific skills, capacities, knowledge, and attitudes in learners that contribute to society in a positive way (Ndawi & Peasuh, 2005). Hence, this conception is built upon the idea that

assessment is the indicator of whether academic institutions and teachers are doing a fair job in ensuring learners can do what is expected from them by society (Brown, 2017).

The idea of using assessment to hold schools accountable can be demonstrated through improved learner test scores, school completion rates, and parent and learner satisfaction surveys (Brown, 2008). Hence, this conception is based on two well-defined and potentially interconnected rationales (Brown, 2008). The first rationale emphasises the demonstration and delivery of quality instruction by teachers and public schools to taxpayers, the government, and the public (Smith & Fey, 2000). The second rationale emphasises 'schooling improvement' (Linn, 2000) or the systematic improvement of the quality of the instructional results (Brown, 2011).

### ***Irrelevance***

The conception 'assessment as an irrelevant process' asserts that assessments do not have a legitimised place in teaching and learning (Brown, 2008). According to the literature (Opre, 2015; Brown, 2004; Brown, 2008), there can be various convincing reasons for teachers to view assessment as a pernicious process. For example, teachers may consider assessment to be irrelevant if it interferes with their teaching styles (Muñoz, Palacio, & Escobar, 2012), which can affect their autonomy and professional independence and cause them to deviate from the real purpose of teaching (Dixon, 1999). From the learners' perspective, assessment involves testing the learners' knowledge and determining the learners' performance based on the test results (Brown, 2008; Earl, 2006). Thus, assessment is considered

synonymous with testing, and testing is often regarded as bad for learners as it may be flawed, ignore learners' abilities, or cause anxiety (Opre, 2015). Therefore, this conception is considered the "anti-purpose" of the assessment (Brown, 2008).

The above conceptions identified by Brown (2008) in his research lie along the continuum that flows from the pedagogical perspective (i.e., improvement conception) to the accountability perspective (i.e., learner and school accountability conceptions) (Brown, 2008; Remesal, 2007). However, the literature on assessment reveals that teachers may conceptualise assessments ranging from predominantly pedagogical to high-stakes accountability perspectives (Darmody, Lysaght & O'Leary, 2020). As teachers hold different conceptions, they may use assessment information relatively differently (Dayal, 2021). The various conceptions of teachers across the globe may be influenced by factors such as growing competition in the global economy, performativity, and modern learning theories, among others (Darmody et al., 2020). The studies carried out on teachers' conceptions of formative assessment in various countries are presented in the following section.

### **International Studies on Teachers' Conceptions of Formative Assessment**

Studies examining teachers' conceptions of assessment in different countries vary in the level of education (Delandshere & Jones, 1999; Crichton & McDaid, 2015), number of participants (Winterbottom, Brindley, Taber, Fisher, Finney, & Riga, 2008), and contexts (Moss, Bookhart, & Long, 2013). The following studies focus on different factors and the way those factors affect teachers' conceptions of assessment.

The traditional practices of summative assessment were found to have a significant impact on teachers' conceptions of assessment. The primary teachers in the study conducted by Delandshere and Jones (1999) in the United States considered assessment a means to convey assessment information to audiences such as parents, state, district, or other teachers. The teachers in this study viewed assessment as summative and for the fulfilment of their organisational functions. Their assessment practices did not provide evidence about how and why learning happens but focused on what learners know and do not know. Another recent investigation at the primary school level by Almeida, Rosistolato, and Cerdeira (2022) in Rio de Janeiro, Brazil, explored teachers' conceptions of and practices related to formative assessment through interviews and observations. Almeida et al. (2022) noted that while respondents' statements supported the theoretical concepts of formative assessment, their classroom practices were predominantly summative.

The adoption of the formative assessment approach is relatively recent in countries like Brunei Darussalam (Rashid & Jaidin, 2014) and Kosovo, Southern Europe (Ahmedi, 2019). In Brunei Darussalam (Rashid & Jaidin, 2014), formative assessment was only introduced in 2007, and, prior to that, the country's education system was highly examination-oriented. The results of the study conducted in Brunei Darussalam by Rashid and Jaidin (2014) revealed that primary school teachers had different levels of understanding of formative assessment. Some teachers lacked confidence in integrating these techniques due to uncertainty and confusion. Similarly, the formative assessment approaches began to be applied in Kosovo, Southern Europe, from the 2016-2017 school year (Thaci, Janusheva, &

Talevski, 2020). The study conducted by Ahmedi (2019) with primary school teachers in Kosovo, revealed that most teachers agreed with the theoretical importance of formative assessment but were hesitant to implement it in their classrooms. Although efforts have been made to replace traditional education practices with contemporary ones, the pace of change appears slow (Ahmedi, 2019).

In Quebec, Canada, a curricular reform began in the year 2001 (Thomas, Deaudelin, Desjardins & Dezutter, 2011). A qualitative investigation in Canada with primary school teachers revealed that the teachers conceptualised formative assessment as a teacher-centered process (Thomas et al., 2011). Even though teachers followed a few formative assessment practices, they used them informally and spontaneously. Researchers indicated several possible reasons for these findings, including the relatively new introduction of formative assessment in primary schools in Quebec, the lack of study materials available to French-speaking teachers, and the lack of financial incentives for teachers to pursue graduate degrees.

Box, Skoog, and Dabbs (2015) investigated conceptions of assessment of three biology teachers in Texas, United States. The researchers examined the internal and external contextual components that either hindered or facilitated the adoption of formative assessments in participant teachers' classrooms. All three participants in the study noted the lack of time due to too much curriculum content to cover as a limiting factor to using formative assessments in their classrooms. In addition, other factors that influenced teachers' conceptions of formative assessment included teachers' content knowledge, expectations from their learners, and dispositions of learners.

School policies and school support are also found to be the factors that affect teachers' conception and implementation of formative assessment. In a study by Crichton and McDaid (2015) at the secondary school level in Scotland, many teachers conceptualised formative assessment as a valuable tool for teaching and learning. However, their implementation of formative assessment practices in classrooms was random due to an inadequate understanding of formative assessment. Teachers implemented formative assessment as a part of school policy, but they lacked sufficient training and supportive measures from the school. Consequently, teachers were reluctant to implement formative assessment because they felt unprepared.

An effective learning environment can be created when school leaders recognise the importance of formative assessment and support teachers (Yan, Li, Panadero, Yang, Yang, & Lao, 2021). Moss et al., (2013) examined two years of data from a professional development project to improve school administrators' knowledge and leadership in formative assessment in a rural Pennsylvania school district in the USA. According to the study's findings, school administrators who participated in professional development programs better understood how to assist teachers by considering their individual needs. The trained school administrators became more supporting leaders in developing positive conceptions of formative assessment among their teachers to assess learners.

Winterbottom et al., (2008) conducted a study with 220 trainee teachers studying for a Postgraduate Certificate in Education at the University of Cambridge, United Kingdom. The study results showed that the trainee teachers conceived

assessments for the purposes of making learning explicit, performance orientation, and promoting learning autonomy. The findings also highlighted a gap between trainee teachers' conceptions and their classroom practices. Their conceptions were associated with the purpose of 'promoting learning autonomy' but implemented practices related to 'performance orientation'. Trainee teachers were likely to exhibit such conceptions due to their high-stakes training environment involving external curriculum and assessment demands (Winterbottom et al., 2008).

It should be noted that all of the above investigations are relatively small-scale, involved a limited number of participants, and were conducted within each respective country. Studies that evaluate teachers' conceptions of assessment with large samples are critical for determining the success of assessment reforms (Brown, 2004), understanding the cultural and societal factors (Brown, 2011), or the effect of the examination system and policy demands (Remesal, 2011) on teachers' conceptions of assessment. The assessment expert Brown (2002, 2004, 2006), along with his research team, developed a conceptual framework involving four purposes of assessment (i.e., improvement, school accountability, learner accountability, and irrelevance) and a *Teachers' Conceptions of Assessment Inventory (CoA-III)* based on that framework. The shorter version of *CoA-III* is known as the *Abridged Teachers' Conceptions of Assessment (TCoA-III)* inventory. *Teachers' Conceptions of Assessment* inventory can be used to determine the conceptions of assessment of a large sample of respondents, whether they are part of national or international surveys or cross-cultural ones (Brown, 2002). The

description of the development of Teachers' Conceptions of Inventory developed by Brown (2002, 2004, 2006) is presented in the following section.

### ***Teachers' Conceptions of Assessment Inventory Developed by Brown***

At the outset of Brown's (2002) research, two independent studies were conducted. The first study was conducted with secondary school teachers from seven schools in New Zealand to examine teachers' instructional beliefs (Brown, 2002, p. 60). For this study, Brown (2002) developed a six-point rating scale to measure educational process conceptions based on a study by Cheung and Na (2002). Brown's first study was crucial in demonstrating the effectiveness of a six-point scale in measuring adequate variance in teachers' responses and identifying the strengths of their conceptions.

The second study was conducted with practicing teachers from primary schools in New Zealand (Brown, 2002, p. 83). The purpose of this second study was to assess teachers' understanding of assessment, to evaluate the adequacy of four assessment conceptions or 'factors' (i.e., *Improvement*, *School Accountability*, *Learner Accountability*, and *Irrelevance*) derived from literature, and to elicit conceptions that were not discovered by the literature review. The results of the second study revealed that all four conceptions existed in teachers' thinking to various degrees. In addition to the four conceptions, teachers' responses also exhibited conceptions related to teaching and learning. The teachers in this sample held two main conceptions of assessment, *Improvement*, and *Irrelevance*. However, the lack of a cohesive framework for conceptions of assessment and low sample sizes in these two initial studies prompted the need for further research, leading to

four additional studies. During these four studies, Brown developed four inventories to evaluate the four conceptions of assessment. Participants in these studies had varying levels of endorsement for the different purposes of assessment. In Table 2.1, the details of all the six studies conducted by Brown (2002, 2004, & 2006) are summarised.

The statistical analyses performed during study 5 (Table 2.1) using *Teachers' Conceptions of Assessment-III (CoA-III)* resulted in a measurement model with good psychometric properties that included 50 items. Using this longer version (50 items) of *CoA-III*, a shorter version with 27 items was derived using the confirmatory factor approach (Brown, 2006). This shorter version is known as the *Abridged Teachers' Conceptions of Assessment (TCoA-IIIa)* inventory. The adoption of a confirmatory approach during the analysis ensured the reliable measurement of the theoretical framework used for the 50-item version of the inventory. Based on the teachers' responses to the instrument with 50 items, the three strongest loading statements for each conception that were not highly repetitive in content were selected for re-analysis (Brown, 2006). The resulting inventory (i.e., *TCoA-IIIa*) was found to have four main factors, that is, *Improvement, School Accountability, Learner Accountability, and Irrelevance*, and 27 items. The relationship between the four factors and 27 items from *TCoA-IIIa* followed the same theoretical pattern with the fours identified as the 50-item version of the inventory.

Later, with the intention to validate the factor-scale scores derived from *TCoA-IIIa*, Brown (2006) conducted a multi-group independent confirmatory study

using *TCoA-III*A with a sample of 1398 teachers from Queensland that included teachers from primary (692), secondary (525), and teaching both primary and secondary (181). The quality of confirmatory factor analyses obtained from New Zealand teachers using *CoA-III* (Brown, 2004) with 50 items was compared with the quality of confirmatory factor analyses obtained from Queensland teachers (Brown, 2006).

**Table 2.1**

*Studies Conducted by Brown During the Development of the TCoA-III*A Inventory

Study	Associated Reference	Group	Number of Statements	Factors Identified
Study 1	Brown (2002), pg. 60	<i>There is no development of inventory</i> In-service Secondary	-	-
Study 2	Brown (2002), pg. 83	<i>There is no development of inventory</i> In-service primary	-	-
Study 3	Brown (2002), pg. 98	<i>Teachers Trainee's Conceptions of Assessment (CoA-I)</i> Teacher trainees	115	<i>Improvement</i> <i>School Accountability</i> <i>Irrelevance</i>
Study 4	Brown (2002), pg. 104	<i>Students' And Practicing Teachers' Conceptions of Assessment (CoA-II)</i> Undergraduate Students and In-service primary	105	<i>Improvement</i> <i>Accountability</i> <i>Irrelevance</i>
Study 5	Brown (2002), pg.114; Brown, 2004	<i>Teachers' Conceptions of Assessment -III (CoA-III)</i> In-Service primary	65	<i>Improvement</i> <i>School Accountability</i> <i>Learner</i> <i>accountability</i> <i>Irrelevance</i>
Study 6	Brown (2006)	<i>Teachers' Conceptions of Assessment -III (CoA-III)</i> In-service Primary	27	<i>Improvement</i> <i>School Accountability</i> <i>Learner</i> <i>accountability</i> <i>Irrelevance</i>

The six-point, positively packed response scale was used to collect teachers' responses. The results of the *TCoA-III*A with a multi-group study with 1398 teachers statistically exhibited good psychometric properties. The results of the *TCoA-III*A with just 692 primary teachers also had a sufficient statistical fit, and the 27 items sufficiently loaded onto the expected conceptions of assessment. Based on these statistical analyses, Brown (2006) concluded that the *TCoA-III*A is an efficient and valid measure of teachers' conceptions of assessment and may thus be used in assessment-related teacher professional development and research programmes. The *TCoA-III*A, previously validated in the Queensland context, has been used in the present study for adaptation and validation purposes. The adaptation and validation of *TCoA-III*A in the Western Cape context are detailed in Chapter 3 (p.54).

A number of studies have been conducted in different countries to investigate teachers' conceptions of assessment using the longer 50 and shorter 27-item versions of *Conceptions of Assessment Inventory III*, primarily due to the paradigm shift from traditional teaching and learning approaches towards more contemporary ones (Opre, 2015). These studies mainly found that teachers' conceptions of assessment aligned with their country's examination system or policy context. Studies conducted using Brown's (2004, 2006) *CoA-III* and *TCoA-III*A inventory are discussed in the following section.

Brown (2004) conducted a study with 525 primary school teachers in New Zealand to investigate teachers' conceptions of assessment. In New Zealand's examination-oriented system, the teacher respondents strongly supported

assessment as a means of enhancing teaching and learning. They somewhat accepted the learner accountability purpose but completely rejected the purpose of assessment as school accountability. Hence, Brown (2004) recommended prioritising teachers' dedication to enhancing their teaching and learners' learning over learner accountability in policy design.

Calveric (2010) conducted a study that analysed the conceptions of assessment and practices of 79 primary school teachers in Virginia Commonwealth to explore the effect of teachers' educational attainment on teachers' conceptions of assessment. Calveric (2010) reported that teachers holding higher qualifications, such as postgraduate certificates and Master's degrees, rated the importance of authentic assessments significantly higher than those who only had Bachelor's degrees. The teachers who did not hold Bachelor's degrees serve the purpose of assessment for learner accountability. According to the researcher, these results could be attributed to teachers' inadequate levels of assessment literacy and professional development related to assessment.

A qualitative study by Remesal (2011) in Spain involved 50 primary and secondary school teachers. Remesal (2011) used a slightly different conceptual framework compared to Brown (2004, 2006). The framework used in Remesal's (2011) study divided the *Improvement* factor into two parts and omitted the *Irrelevance* factor entirely. Based on the results of the study, Remesal (2011) identified two 'poles' or 'continuums' of teachers' conceptions of assessment. In the first category, the 'pedagogical' pole, the conceptions of assessment were aligned with formative assessment, while in the second category, the 'societal' pole,

conceptions were aligned with summative assessment. Moreover, 66 percent of teachers who were surveyed expressed 'mixed conceptions' of assessment, placing them somewhere between two opposing viewpoints. Remesal (2011) indicated a possible correlation between the way teachers conceive the functions of assessment and the educational system in Spain in which teachers operate.

Brown et al., (2011) explored the conceptions of 1,464 primary and secondary teachers in Hong Kong and Guangzhou, South China, by adapting the *TCoA-III*A in the Chinese context. The theoretical model that emerged from the study conducted by Brown et al. (2011) was distinct from that of Brown's (2004, 2006) study. The model consisted of three factors that were derived from teachers' responses regarding their conceptions of assessment. These factors were assessment for improvement, assessment for accountability, and assessment is irrelevant. Despite Chinese teachers' positive views of assisting learners in their learning and overall development, they viewed examination and control effects of accountability with suspicion. These results were attributed to the high-stakes examination system in China and variations in cultures and societies.

Brown et al., (2011) conducted a multi-group study that involved primary and lower secondary teachers from Queensland, Australia, using *TCoA-III*A. Results of the study revealed that primary teachers were more in agreement that assessment improves teaching and learning, whereas secondary teachers appeared to agree more that holding learners accountable through assessment. Also, teachers' assessment practices reflected differences according to the level of schooling, leading to the conclusion that teachers at varying education levels hold different

conceptions of assessment, and their assessment practices differ depending on the assessment purpose they work with.

Segers and Tillema (2011) conducted a study with 351 secondary school teachers in the Netherlands using *TCoA-III*A. The Dutch teachers' model of conceptions of assessment differed from Brown's (2006) model. Segers and Tillema (2011) identified four conceptions, namely (a) informing performance and learning, (b) school accountability, (c) assessment is perceived to be of bad quality, and (d) assessment leads to the adaptation of the teaching practice and measures higher order thinking skills. Interestingly, teacher participants were unable to discern formative from summative assessments. Segers and Tillema (2011) attributed this finding to the Dutch secondary education system, in which classroom assessment is used for formative as well as summative purposes.

It is important to note that among the four conceptions identified by Brown (2006) in the *TCoA-III*A inventory, the first conception, *Improvement*, suggests that assessment serves as a tool for teaching and learning (Brown, 2008). This conception clearly leans towards the use of formative assessment methods (Remesal, 2007). On the other hand, the conceptions related to accountability lie towards the opposite pole of the *Improvement* conception, where assessment is seen as a tool of social control or a way to certify learners' final results (Remesal, 2007). Therefore, the conceptions concerning accountability lean towards summative assessments (Azis, 2015; Remesal, 2007). As the *TCoA-III*A contains conceptions related to 'improvement' as well as 'accountability', it presents an appropriate tool to analyse teachers' conceptions of formative as well as summative assessments. In

the following section, the four studies that have effectively used the *TCoA-III*A inventory to analyse formative and/or summative assessments are reviewed. The purpose of this review is to emphasise the potential of the *TCoA-III*A inventory in analysing teachers' conceptions of both formative and summative assessment.

The *TCoA-III*A inventory has been effectively used to measure teachers' conceptions of assessment in countries that aim to increase the use of formative assessment rather than rely on summative assessments, similarly to South Africa. One example is Hong Kong, where Brown et al. (2009) made modifications to the *TCoA-III*A inventory suitable to the Hong Kong context. The modified *TCoA-III*A was then used to investigate the balance between formative and summative assessment in school policy and practice by exploring primary and secondary teachers' conceptions of assessment. The goal here was to understand how these two approaches to assessment can be combined into a single approach that promotes productive learning. The results highlighted that Hong Kong teachers' conceptions of assessment were supportive of formative assessment.

The *TCoA-III*A inventory validated by Brown et al. (2009) with Hong Kong teachers was further used by Azis (2015) with 107 secondary school English teachers in Indonesia to investigate how and why teachers believed in a particular conception of assessment. It was found that Indonesian teachers superficially showed interest in formative assessment in their classroom practices, but their conceptions were closely aligned with summative assessment.

Further, Gebril and Brown (2014) explored the conceptions of assessment of 170 pre-service and in-service English language teachers using *TCoA-III*A in

Egypt, which has a predominant high-stakes, test-driven educational culture. The results revealed that the in-service teachers preferred using a combination of formative and summative assessment practices in their classrooms. On the other hand, pre-service English teachers preferred summative assessments because they align with their specific educational and cultural needs. Gebril and Brown (2014) attributed the findings concerning in-service teachers' conceptions to the nature of pre-university teaching, highlighting the significant amount of time teachers invest in closely working with their learners.

Brown and Remesal (2017) conducted a study similar to Brown et al. (2009) in Ecuador, using a *TCoA-III*A in conjunction with an additional instrument to analyse how 360 secondary mathematics and history teachers conceptualise classroom assessment. As the teachers in this study strongly associated formative assessment with the *Irrelevance* conception, Brown and Remesal (2017) stressed the importance of reducing the dominance of high-stakes assessments to allow formative assessment initiatives to succeed.

Thus, considering the ability of the *TCoA-III*A inventory to analyse teachers' conceptions of summative as well as formative assessment, it was deemed appropriate to use this inventory to explore teachers' conceptions of formative assessment in the present study.

As previously mentioned, studies on teachers' conceptions of assessment were conducted worldwide mainly due to the shift from conventional summative to more modern formative assessment methods (Opre, 2015). The South African assessment policy revisions also underwent changes related to the shift towards

formative assessment through assessment policy revisions (Chapter 2, p.25). As a result, the studies conducted on teachers' conceptions of assessment in South African schools are reviewed in the following section.

### **South African Teachers' Conceptions of Formative Assessment**

To provide a comprehensive analysis of South African teachers' conceptions of assessment and related practices, it is essential to acknowledge Professor. Anil Kanjee's significant contributions in this field of formative assessment in South Africa. Professor. Kanjee's research is primarily focused on understanding the complex relationship between the development and implementation of education policies across the different levels of the education system and how this relationship can be optimised to achieve national and international development goals aimed at poverty, equity, and quality (Laboratory of International Assessment Studies, 2018). His research has also delved deeply into the area of formative assessment, extensive assessment surveys, and strategies aimed at narrowing the gap between policy intentions and actual outcomes with a particular focus on schools that serve marginalised and underprivileged learners through teacher professional development (Laboratory of International Assessment Studies, 2018). The studies conducted by Professor. Kanjee and his colleagues on formative assessment are summarised in the following paragraph.

Kanjee and Mthembu (2015) conducted an exploratory study at Tshwane University of Technology as a part of a larger professional development project. The participants of the study were teachers from first, second, and third grade levels who worked in schools serving communities with varying socio-economic statuses.

The results of this study exposed the teachers' impotency regarding the effective use of assessment in supporting and addressing their learners' learning needs and improving their own practices. All the teachers exhibited a significantly limited understanding of formative assessment. Similar results were found in the Schuld et al., (2017) study conducted with 227 Grade two primary school teachers in two Gauteng districts with the purpose of planning and implementing a large-scale development program on formative assessment. Around 67 percent of teachers' responses revealed that teachers did not know about formative assessment approaches. They often connected formative assessment with formal assessment.

Even a recent investigation by Kanjee (2020) involving 96 Foundation and Intermediate Phase teachers selected from 54 fee- and no-fee-paying schools yielded similar results to his previous research. Upon analysing the comparison of the implementation of five key assessment strategies from fee- and no-fee-paying schools, no discernible differences were found in the formative assessment strategies used by teachers in both types of schools and those teaching at the Foundation and Intermediate Phase levels. The study also noted that participant teachers had a difficult time implementing formative assessment strategies that addressed the specific learning needs of their learners. In all three studies (Kanjee, 2020; Kanjee & Mthembu, 2015; Schuld et al., 2017), researchers advised improving teachers' understanding of formative assessment through professional development programmes.

Among the other researchers exploring South African teachers' conceptions of assessment included Vandeyar and Killen (2007), Kuze and Shumba (2011), and

Jane (2013). Vandeyar and Killen (2007) conducted a study in Grade Four multilingual mathematics classrooms. While exploring teachers' conceptions of assessment and practices related to the post-apartheid OBE curriculum, the researchers found that teachers had firm conceptions of teacher-centered pedagogy and preferred summative assessment practices inherited from the pre-apartheid curriculum.

Kuze and Shumba (2011) investigated formative assessment practices of five Grade Nine *Technology* teachers in the Fort Beaufort district, Eastern Cape. The teachers in this study lacked the knowledge to conduct a formative assessment. Teachers' feedback was often delayed, causing learners to forget the task. Schools in rural areas were found to be more disadvantaged regarding necessary formative assessment skills and training. Formative assessment practices are negatively viewed by teachers due to a lack of knowledge of policy requirements and a lack of commitment to implementing principles (Kuze & Shumba, 2011).

Jane (2013) conducted a study with two teachers from two different primary schools (Grades Five and Six), which included the school's head of department and deputy principal. The location of the study is unknown. Interestingly, Brown's (2004) conceptual framework was used to examine participants' conceptions of assessment. The teachers conceived that assessment was primarily meant to improve the quality of teaching and learning and to ensure school accountability. The teachers' conceptions were found to be in line with the current (DBE, 2011) South African assessment policy expectations. The study results also identified multiple factors affecting teachers' conceptions of assessment including

compliance, time management, interpretation and implementation of policy, additional administrative tasks and documentation, departmental support, and training.

Overall, the above review of South African teachers' conceptions of assessment shows teachers' limited understanding of formative assessment, which ultimately led to teachers' limited use of formative assessments. Despite this, it's worth noting that only a limited number of studies have been conducted in South Africa in the domain of teachers' conceptions of assessment. These studies have been carried out with teachers of subjects such as *Mathematics* (Vandeyar & Killen, 2007) and *Technology* (Kuze & Shumba, 2011). However, no study has been focused on *Natural Sciences and Technology* at the Intermediate Phase level.

### **Summary**

This chapter highlighted that in many countries across the globe, formative assessment has become a critical component of education policies due to its potential to enhance learners' academic performance. One such example is South Africa, where efforts were made to include formative assessments in its assessment policy, especially in the post-apartheid era. However, the studies exploring the implementation and conceptions of formative assessment of South African teachers have uncovered teachers' limited understanding and restricted practices of formative assessment. Considering such conceptions of assessment held by teachers, implementation of the current assessment policy may have negative consequences. Consequently, in this chapter, the need for a deeper exploration of

the conceptions of formative assessment among South African primary school teachers in the subject of *Natural Science and Technology* is emphasised.

## CHAPTER 3: METHODOLOGY

In this chapter, the research design and data collection strategy used for implementing the quantitative approach using an online survey as a data collection tool is described. The steps involved in adopting, adapting, and validating the inventory are outlined to establish a valid and reliable version of the *Abridged Teachers' Conceptions of Assessment Inventory (TCoA-III)* for use with primary school science teachers in the Western Cape. In addition, the data-cleaning process and analytical framework used are described.

### **An Overview of Research Design**

Developing the research design for the present study involved three main steps, namely, the adoption of a quantitative research methodology, the adoption of the research instrument, and the adoption of a survey as a data collection tool. These steps are now described in the following sections.

#### ***Adoption of Quantitative Research Methodology***

Quantitative methods involving numerical representations can be used to characterise different social phenomena (Creswell, 2009; Sukamolson, 2007). Quantitative techniques provide a wide range of information by analysing data from a large number of units. In addition to these features, quantitative research methods concern themselves with researching and understanding how and why variables are related (Punch, 2003). Thus, quantitative analysis in the social sciences is focused on examining the relationship between variables. The purpose of the study was to explore teachers' conceptions of formative assessment. Teachers' conception of assessment is a social phenomenon (Brown, 2008). In light of the advantages

quantitative research methods offer (Creswell, 2009; Punch, 2003; Sukamolson, 2007), these approaches and methods were considered appropriate for determining Western Cape primary school science teachers' conceptions of formative assessment.

### ***Adoption of the Survey as a Data Collection Tool***

In quantitative research, surveys are one of the major data collection methods as they involve the systematic collection of information from a large number of individuals using standardised procedures (Stockemer, Stockemer & Glaeser, 2019). In social science research, surveys allow one to study opinions (Nardi, 2018), attitudes, and social behaviours across countries (Stockemer et al., 2019). Further, the survey method is ideal for gathering data due to its anonymity, ability to collect responses on multiple topics within one questionnaire, cost-effectiveness, suitability for probability sampling, and ability to produce more accurate results (Nardi, 2018). Hence, a survey was adopted as a data collection method in this study.

### ***Adoption of the Research Instrument for the Research Study***

In survey research, a questionnaire and a scientific sampling method are used to measure the characteristics of the population to obtain the statistical precision of the results (Sukamolson, 2007). In order to obtain valid and reliable information from survey research, well-written and manageable questionnaires and interview schedules are essential (Nardi, 2018). Collecting data using a self-administrative questionnaire is one of the most popular survey research methods due to its advantages (Nardi, 2018). The most appropriate use of self-administered

questionnaires is to study attitudes and opinions that are not usually observable, to describe the demographic characteristics of a large population, and to study behaviours that are difficult to convey in person (Nardi, 2018). A teacher is a unit of analysis in this study. Considering the exploration of the social phenomenon of conceptions of assessment with a large number of teachers, a self-administered questionnaire was adopted as a data collection tool.

Brown (2002, 2004, 2006) and his colleagues developed a self-administering questionnaire, which was successfully used to measure teachers' conceptions of assessment at various levels of education and in different countries (Chapter 2, p.42). This inventory has had three trial versions developed by testing the inventory with varying populations of education-profession (Table 2.1, p.41). Following further research in 2006, Brown and co-researchers developed the fourth version of the inventory popularly known as the *Abridged Teachers' Conceptions of Assessment (TCoA-III A)*. This self-administered *TCoA-III A* was adopted, adapted, and validated for use with Western Cape primary teachers. The developmental process of *TCoA-III A*, which was performed by Brown (2006), is described in Chapter 2 (p.41). In the following paragraph, the contents of *TCoA-III A* (Brown, 2006) are described.

The *TCoA-III A* inventory (Brown, 2006) has three sections (Annex -III; p.39). Within the first section, 12 different assessment practices are listed. In terms of assessment, participating teachers are asked to choose the practices they use in their classrooms. The second section of the inventory has 27 items, and it measures four main conceptions of assessment – *Improvement* (12 items), *Learner*

*Accountability* (3 items), *School Accountability* (3 items), and *Irrelevance* (9 items). Allowing teachers to express their opinions about the four conceptions simultaneously makes it possible to analyse how teachers relate them to each other and how strongly they endorse each conception (Brown, 2011). The study participants were expected to show their agreement with these conceptions using a six-point agreement scale. These six points are (a) strongly disagree, (b) mostly disagree, (c) slightly agree, (d) moderately agree, (e) mostly agree, and (f) strongly agree. This agreement scale is also referred to as a 'positively-packed scale' (Brown, 2006). This scale is useful for effectively generating significant variations in responses, making it ideal for accurately measuring the psychological phenomenon of conceptions of assessment (Brown, 2006).

Aside from gathering data on teachers' assessment practices and conceptions of assessment, the *TCoA-III*A also features a third questionnaire section that inquired about the respondents' educational background, gender, years of teaching experience, and training in educational assessment, among other things.

### **Adoption, Adaptation, and Validation of the *TCoA-III*A Inventory in the Western Cape Context**

The *TCoA-III*A has proved a valid and reliable measure of teachers' conceptions of assessment in several countries and diverse educational contexts (e.g., Brown et al., 2009; Brown et al., 2011; Brown & Michaelides, 2011; Brown & Remesal, 2012; Gebril & Brown, 2014; Segers & Tillema, 2011; Yates & Johnston, 2018). However, as *TCoA-III*A was being used in an unexplored

educational context (i.e., primary schools in Western Cape province, South Africa), its validity for use in this new context needed to be established.

“Validity is an integrative evaluative judgment of a degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of inferences and actions based on test scores or other modes of assessment” (Messik, 1993, p. 13). Before collecting research data through a survey instrument, it is necessary to conduct an assessment of the questionnaire items to ensure their validity (Churchil, 1979; Farrell & Rudd, 2009). This assessment can involve assessing either face validity or content validity of questionnaire items (Babbie, 2016; Oluwatayo, 2012). The term ‘face validity’ pertains to the researcher's subjective assessment of the presentation and relevance of the measuring instrument as to whether the items in the instrument appear to be relevant, reasonable, unambiguous, and clear (Oluwatayo, 2012). Face validity can be attained by consulting the experts in the subject of research to assess the suitability of the research instrument for its intended use (Oluwatayo, 2012). Content validity refers to an item's ability to capture various meanings within a concept (Babbie, 2016). The experts in the field of interest are often consulted to determine the content validity evidence (Oluwatayo, 2012). Therefore, the following steps were followed to ensure the face and content validity of *TCoA-III*A in the Western Cape context before administering the questionnaire to Western Cape primary school science teachers.

### ***Making Initial Changes to TCoA-III A***

‘Adoption’ refers to the close translation of the instrument into the target language (He & van de Vijver, 2012). In order to initiate the adoption process of the *TCoA-III A* inventory in the Western Cape context, the researcher categorised all the questions from the *TCoA-III A* inventory into two sections. The first section focused on gathering teachers' demographic information and their assessment practices. The second section contained 27 statements that elicited information on teachers' conceptions of assessment.

In the first section, some of the questions from the *TCoA-III A* inventory were reframed to suit the South African educational context. For example, two ways exist to become a professionally qualified teacher in South African schools. The first route involves a four-year Bachelor of Education degree, and the second one involves a three- or four-year Bachelor's degree, followed by a one-year Postgraduate Certificate in Education (Department: Basic Education, n.d.) Therefore, the question, ‘what is your highest degree?’ (Annex I, p.179) was split into two questions – ‘*What is your highest academic qualification?*’ and ‘*What is your initial professional teacher qualification?*’ (i.e., first teaching qualification)’ (Annex I, Section 3, p.181). The researcher provided appropriate answer choices to these questions in the context of South African education.

Similarly, following the definition of ‘Grade’ provided by ‘The South African School, Act, 1996’ (Chapter 1, p.9), the question, ‘What level of the school do you teach at?’ (Annex I, Section 3, p.181), was reworded as ‘*In what Grades do*

*you currently teach Natural Science and Technology? (Please list all)*' (Annex I, Section 3, p.181).

Furthermore, *TCoA-III*A contained predetermined options of assessment practices for the questions related to teachers' assessment practices (Annex I, Section 1, p.179). However, the literature on revisions of school assessment policies in South Africa revealed that the CAPS subject-specific policies (DBE, 2011) lack adequate information for teachers to implement formative assessment practices in the classroom (Kanjee & Sayed, 2013). Therefore, to determine all the formative assessment practices that primary school science teachers could use in the Western Cape province, the format of the question was changed. Teachers were asked to provide answers to two separate questions to avoid forced responses. These questions were *Please describe in your own words what you believe 'formative assessment' to be*, and *Could you please give examples of assessment practices in your classroom when you think about formative assessment?*.

The second section of the inventory contained 27 statements. These 27 statements are indicative of a particular correlation with the underlying four purposes of assessment or factors, that is, *Improvement*, *School Accountability*, *Learner Accountability*, and *Irrelevance* (Brown, 2006). Hence, this section of the inventory was not revised by the researcher.

In addition to the above modifications, a change was made to the title of the inventory. The *TCoA-III*A inventory was intended to be adopted for use with primary school science teachers in Western Cape, South Africa, and thus the title

was modified to *Teachers' Conceptions of Assessment – Western Cape* and was abbreviated to “*TCoA-WC*”.

### ***Selection of science educational stakeholders to review TCoA-WC Instrument***

In the field of social sciences, obtaining feedback on inventory items from a group of experts can provide researchers with valuable insights into the content validity of their research instrument (Rubio, Berg-Weger, Tebb, Lee, & Rouch, 2003). Generally, the review consists of content experts and lay experts (Rubio et al., 2003). In addition to experts in content, Davis (1992) also suggests having experts in a panel who are knowledgeable about instrument construction. A review panel that includes both types of expertise maximises the chance that an instrument will be well-constructed and content-valid (Davis, 1992).

The *TCoA-III*A instrument, which was being adopted for primary school science teachers from the Western Cape province, is derived from a conceptual framework proposed by Brown (2002; 2004; 2008) (Chapter 2, p.29) and measures the phenomenon of conceptions of assessment in science education. Therefore, experts in science education and educational assessment were selected to evaluate the content and provide feedback on the *TCoA-WC* instrument. The categories of experts consisted of officials from (a) WCED - Curriculum Coordination and Advisers, (b) academics in science education from universities in the Western Cape, (c) curriculum developers - General Education and Training – WCED, (d) Member, the Research Department WCED, and (g) Director - major science teacher development centre in the Western Cape.

### ***Instructions to Stakeholders for Scrutinising the TCoA-WC Inventory***

Stakeholders were contacted by email and sent a formal invitation to participate in the research study (Annex II, p.182). For stakeholders to better understand the purpose of the research study, the background of the study was explained to them in detail in this invitation letter. They were given detailed instructions (Annex III, p.183) on scrutinising the inventory. Stakeholders were requested to read all the questions carefully and to determine whether the personal information requested is appropriate, necessary, and relevant to investigating primary school science teachers' conceptions of formative assessment in the Western Cape province. In the event that any inappropriate items were included in the inventory, or if any additional items were required, they were asked to write a brief explanation close to the item in the inventory. Regarding the language used in the inventory, stakeholders were requested to comment on whether it was appropriate and clear for primary school science teachers.

The researcher followed up with stakeholders through e-mail and phone calls to obtain their feedback on the inventory. Only three out of seven experts provided comments immediately. Four follow-up emails were sent to the remaining individuals, with a 15-day period between each email. Despite rigorous follow-up, only three stakeholders provided feedback.

While the literature on content validation differs on the minimum number of experts recommended for content validation, Yusoff (2019) indicates that two experts are the minimum that can be considered acceptable, whereas Lynn (1986) recommends that a minimum of three experts should be used. As the researcher

received comments on inventory from experts in varying fields, comments from three stakeholders were deemed appropriate to establish the content validity of the *TCoA-WC* inventory.

### ***Analysis of Stakeholders' Responses***

Considering the stakeholders' comments and suggested changes, the modifications were made to *TCoA-WC*. As previously mentioned, the *TCoA-WC* inventory was divided into two sections (Annex IV, p.184). The first section aimed to gather information about the teachers' backgrounds and assessment practices, while the second section consisted of 27 statements eliciting teachers' views on conceptions of assessment. Stakeholder suggestions led to only one language change in the first section of the *TCoA-WC* inventory. The item 'If not, please specify your specialised subject' was modified to '*If not, please specify your specialist subject*' (Annex IV, Question 9, p.185).

In the second section of the *TCoA-WC* inventory, stakeholders indicated two elements that may be linguistically unclear and misleading to teachers. Hence, those two items, that is, 'Assessment was integrated with teaching practice' and 'Assessment forces teachers against their beliefs,' were modified to '*Assessment was integrated with teaching*' (Annex IV, Section II-statement 5, p.187) and '*Assessment forces teachers against their beliefs of teaching,*' (Annex IV, Section II-statement 7, p.187.) respectively. Further, the current assessment policy (i.e., DBE, 2011) uses the term 'learner' instead of 'pupils' or 'students'. Hence, based on the suggestions of stakeholders, the word 'student' was replaced with 'learner' in all items of the inventory. Furthermore, as this study intended to explore teachers'

conceptions of formative assessment, the word ‘formative’ was placed before the word ‘assessment’ in all 27 items in the second section of the inventory.

### ***Translation and Back-Translation of the TCoA-WC Inventory***

In any research, it is critical to maximise the validity of inferences (Van de Vijver & Leung, 2011). To ensure accurate inferences in a context such as the Western Cape, it's essential to maintain a rigorous methodology that establishes cross-cultural ‘equivalence’ and minimises ‘bias’ across different cultures. The term ‘bias’ refers to differences in measurement instruments that do not exactly have the same meaning across and within cultures (Poortinga, 1989). The term ‘equivalence’ refers to ensuring comparability (Kankaraš & Moors, 2010) of instruments when testing in cross-cultural contexts (Hui & Triandis, 1985). The different types of equivalence can involve construct, structural or functional, metric or measurement, and scalar or full score equivalence (Van de Vijver & Leung, 2011). Cross-cultural biases must be absent for cross-cultural equivalence to exist, and cross-cultural bias always contributes to some form of inequivalence (Hui & Triandis, 1985; Van de Vijver & Leung, 2011). Considering the prevalence of the three main languages (Chapter 1, p.10), a cross-cultural methodology was adopted to adapt the *TCoA-III*A in the Western Cape cultural context.

Brislin (1970) has suggested the ‘back-translation’ of the inventory items as one of the methods to reduce bias and maximise equivalence in cross-cultural research. Back-translation is particularly valuable for determining the equivalence of inventory items. It entails translating the inventory item into various languages while maintaining the same ideas across different linguistic contexts (Hui &

Triandis, 1985). For the present study, the validated version of the *TCoA-WC* inventory was only available in English.

However, Afrikaans is the most spoken language in the Western Cape province, followed by isiXhosa (DBE, 2018). Translation of the *TCoA-WC* inventory into Afrikaans and isiXhosa was therefore crucial. The *TCoA-WC* inventory was thus separately translated into Afrikaans and isiXhosa using the ‘back-translation’ technique developed by Brislin (1970). Two bilingual experts fluent in Afrikaans were appointed to translate the validated *TCoA-WC* from English to Afrikaans. The first expert independently translated all the instructions, questions, and items of the *TCoA-WC* inventory from English to Afrikaans language. In the next step, the second expert translated the *TCoA-WC* inventory from Afrikaans back into English. The resulting English version, translated by the second expert, was then compared to the validated English version of *TCoA-WC* by the stakeholders. For isiXhosa, the same procedure was applied, but with two isiXhosa language experts. The translated inventories were then used for the purpose of a pilot study. Annexure V (p.189) and Annexure VI (p.196) contain back-translated versions of *TCoA-WC* inventories in Afrikaans and isiXhosa, respectively.

### ***Sample Design and Sample Selection Procedure***

Sample design refers to the strategies and procedures used to select sample participants for a study (Kabir, 2016). The sample design also includes the calculation methods used to determine the sample statistics. The sample design strategies involve defining the study's target population, identifying the sample

frame, specifying the sampling unit, selecting an appropriate sampling technique, determining the sample size, specifying the sampling plan, and selecting the sample (Kabir, 2016). In the following section, the sample design strategies used in the current study are outlined.

The present study was conducted in four Metro Education districts of the Western Cape, including Metro Central, Metro West, Metro South, and Metro East. These four districts collectively contribute 55% of the school population and 64% of the province's teacher population (DBE, 2018). These four districts have 535 primary public schools that include English, Afrikaans, and isiXhosa as a language of learning and teaching (LOLT) in schools (WCED *Find A School*, n.d.). Considering that a 'primary school teacher' is used as a unit of analysis for the present study, the first step was to select a sample of primary school teachers from four Metro Education districts. The Department of Basic Education publishes an education dataset every quarter of the year called "school master list data". This dataset provides a detailed record of each school in each province of South Africa. This list (School Masterlist Data, 2018) was used to select a sample of teachers for the study.

In order to conduct a study with primary science teachers in the four Metro Education districts, it was necessary to identify teachers who taught in schools with English, Afrikaans, and isiXhosa as LOLT from each Metro district. However, to invite the teachers to participate in the research, it was imperative first to obtain information about their schools as direct contact with them was not feasible otherwise. Therefore, the sample selection process began with the selection of

schools from each Metro district. A stratified random sampling technique was used to identify the schools from each Metro district. In stratified sampling, the population is divided into strata (or subgroups), and a random sample is drawn from each subgroup (Taherdoost, 2016). Therefore, the total number of primary schools derived from the 'school master list data' in each Metro district was categorised by strata or subgroups, which comprised education districts and circuits. To choose schools from each Metro Education district, the total number of schools within each metro was arranged in descending rank order and cumulative proportion, with the school with the highest teacher numbers at the top. The schools with the most number of teachers, making up 20% of the total number of teachers in each of the Metro districts, were selected as participating schools. It was ensured that the schools with English, Afrikaans, and isiXhosa as LOLT were included in the sample. Before collecting responses from teachers in the selected schools, ethics approval and permission to conduct the study were obtained.

### ***Ethics Approval***

Ethics, which is also known as moral philosophy, is a field that focuses on exploring the principles of right and wrong conduct (Vanclay, Braines & Taylor, 2013). The ethics principles include obtaining informed consent, respecting the anonymity of participants, protecting research data, and so forth (Vanclay et al., 2013). Ethics approval for the present exploration was obtained from the School of Education, Ethics of the Review Committee of the Faculty of Humanities, University of Cape Town (Annex VII, p.203) prior to conducting the study. Also,

permission to conduct the present research study in the four Metro Education districts of the Western Cape was obtained from the WECD (Annex VIII. p.204).

Prior to conducting the study with the whole capacity sample, the *TCoA-WC* was pilot-tested with a group of primary science teachers. The participating schools for the pilot study were selected from the schools that fell just outside the 20% cumulative percentage cutoff of schools that were selected for the study with the whole capacity sample. The pilot testing of the *TCoA-WC* with primary science teachers in the Western Cape is described in the following section.

### ***Pilot Testing of TCoA-WC***

Pilot studies are helpful in testing research instruments to determine a large scale study's/survey's practicality, and to create and amend a research protocol (Van Teijlingen & Hundley, 2002). Success of the research study is more likely when any methodological, administrative, and/or logistical issues identified during the pilot study are resolved beforehand. In this study, the purpose of piloting the validated *TCoA-WC* was two-fold, that is, (a) to identify any language difficulties, such as ambiguity and lack of clarity in items, that teachers might perceive while trying to follow the instructions and items in the questionnaire, and (b) to identify any methodological or administrative issues that may arise during the final stages.

The Western Cape province has a large number of primary public schools, including English, Afrikaans, and isiXhosa as a language of learning and teaching (LOLT) in schools (Chapter 1, p.10). Therefore, the *TCoA-WC* inventory comprised the instructions and items in three languages, that is, English, Afrikaans, and isiXhosa. Hence, a representative sample of teachers from schools that use English,

Afrikaans, and IsiXhosa as the language of learning and teaching was necessary. Thabane et al. (2010) suggest that calculations aren't always necessary to determine the sample size for a pilot study. As a general rule, the sample should be representative of the target population, and the sample size for the pilot study should be large enough to provide useful information regarding the feasibility aspects being assessed (Thabane et al., 2010). The participating schools for the pilot study were selected from the schools that fell just outside the 20% cumulative percentage cutoff of schools that were selected for the study with the whole capacity sample. Subsequently, the pilot study aimed to obtain a sample of 15 teachers, that is, five from a school that uses English, Afrikaans, and IsiXhosa as the language of learning and teaching.

To invite teachers to participate in the pilot study, each school selected as described above was initially contacted over the phone to obtain the school principal's name and the correct email address(s). The invitation letters (Annex IX, p.205) and the validated *TCoA-WC* inventory (Annex X, p.206) were thereafter emailed to the school principals. In this invitation letter, the principals were informed about the background of the researcher, the background of the study, the purpose of conducting the research, and the time estimated to complete the questionnaire. Through this letter, the principals of schools were also requested to provide their teachers' email addresses for the researcher to contact and follow up with teachers.

However, as a result of the coronavirus pandemic (COVID-19) occurrence during the year 2020, contacting teachers and following up with them to obtain their

responses presented particular challenges to this research study. In the year 2020, a national lockdown was implemented to prevent the spread of the COVID-19 pandemic (Zubane, Khoza & Mlambo, 2022). Later, in the year 2021, the South African government introduced the five-level COVID-19 alert system to manage the gradual easing of the lockdown (Republic of South Africa, n.d.). The pilot study phase of the present study coincided with the alert level 1 of the lockdown. Throughout the various levels of lockdown, the South African government implemented measures to ensure social distancing among learners in order to control the spread of the coronavirus (DBE, 2021; Ngogi, 2022; Maree, 2022). The government also introduced 'online learning' as an alternative to in-person instruction to prevent disruption to the curriculum (Ngogi, 2022).

The social distancing maintenance strategies involved a 'phasing in approach' (Ngogi, 2020), 'platooning', 'alternating days per week', and 'biweekly rotations' (DBE, 2021). Through the 'phasing in approach', learners rejoined their schools in batches based on their grades following the coronavirus pandemic (Ngogi, 2020). Each subsequent batch of learners rejoined after a gap of a few weeks. Platooning refers to the time-table model in which two distinct groups of teachers and learners use the same school building, with one group attending in the morning and the other in the afternoon (DBE, 2021). Learning or attending school on alternate days of the week or alternate weeks is defined by the terms 'alternating days per week' and 'bi-weekly rotations', respectively (DBE, 2021). 'Online learning' was one of the government's approaches whereby the study material was

made available to learners on the internet who could access it by staying at home (Zubane et al., 2022).

Initially, five schools from each language were contacted over email to participate in the pilot study. Due to the changes in teaching and learning methods during and post-pandemic, only three schools with English as LOLT, four with Afrikaans as LOLT, and one with isiXhosa as LOLT showed readiness to participate in the pilot project. However, among all the schools contacted, the principals from only one school with Afrikaans as LOLT and one school with isiXhosa as LOLT provided the email addresses of their teachers. The principals from the remaining schools promised the researcher that they would forward the email to their teachers.

After obtaining permission from the principals, the invitation letter for the science teachers (Annex XI, p.226) along with the instructions for reviewing the inventory (Annex – XII, p.227) and the Microsoft Word version of the *TCoA-WC* inventory (i.e., Annex X, p.206) with instructions and items presented simultaneously in English, Afrikaans, and isiXhosa languages were sent to the principal to be forwarded to the science teachers from Grades 4 to 7.

The purpose of providing the instructions for review was ultimately to ensure that the teacher fully understood all the inventory's instructions, questions, answer possibilities, and statements (i.e., items). Each language was assigned a different colour to make it easier for teachers to recognise their language of interest and to provide maximal ease in scrutinising the inventory (i.e., Annex X, p.206). Teachers were presented with the inventory in MS Word format and requested to read each item carefully and highlight phrases or statements they did not understand

using colours. The ‘unclear’ word or statement was suggested to be highlighted in a bright green colour, and the ‘ambiguous’ term was asked to be highlighted in pink colour in each section. They were also requested to insert a brief rationale next to the highlighted word to explain why the highlighted word or phrase was either unclear or ambiguous to them. The teachers were given two weeks to complete the scrutiny of the inventory. The participant teachers emailed the reviewed inventory directly to the researcher or through their principals.

### ***Final Changes to TCoA-WC Based on Science Teachers’ Comments***

All the comments received from the teachers from schools with English, Afrikaans, and isiXhosa as their LOLT were collated in a single Excel worksheet by categorising them according to the language of the inventory scrutinised.

The analysis of teachers’ comments at schools with isiXhosa and Afrikaans as LOLT revealed that all the teachers found all the instructions, words, and items of the inventory clear to understand and unambiguous. One of the teachers at the school with Afrikaans as LOLT wrote, “I have read through the (Afrikaans) instructions and questionnaire and did not find anything ambiguous. Everything was easy to understand and straightforward”. Another teacher from the school with Afrikaans as LOLT wrote, “The questions are well laid out. Sometimes it’s just hard to answer because you have to think about it first. However, no questions were badly worded. It is clear and to the point”.

However, teachers at the schools with English as LOLT found a few words and statements in the inventory to be unclear, and they suggested some adjustments. For example, one of the teachers highlighted the word “belief” in the statement, “I

would like to know about your personal beliefs about formative assessment". The teacher expressed confusion about the word 'belief'. Therefore, to clarify the word's meaning, additional words were added in parentheses following the word 'belief' in the statement. The statement was thus rephrased as "*I would like to know about your personal beliefs (own views) about formative assessment*" (Annex XIII, p.228).

The second section of the *TCoA-WC* inventory contained 27 statements. Brown (2002, 2004, 2006, 2008) derived these 27 statements based on literature related to the conceptions of assessment while developing the *TCoA-III A* inventory (Chapter 3, p.40). Hence, teachers' comments regarding each item in this section were addressed by referring to literature on conceptions of assessment that supported the item. For example, in the item 'Formative assessment places learners into categories', the teacher highlighted the word 'categories' and commented, "What do you mean by categories? Do you mean different ability groups?". According to Brown (2008), learners are grouped based on their performance in assessments. Therefore, this item was modified as "*Formative assessment places learners into categories (i.e., groups based on learner performance)*" (Annex XIII, Question 20, p.236).

Similarly, the item 'Formative assessment results should be treated cautiously because of measurement error' was modified as '*Formative assessment results should be treated cautiously because of measurement error in the accuracy of assessment data*' (Annex XIII, Question 27, p.238).

A total of four statements/question(s) from section I, and five from section II, were modified as described above. Thus, the pilot testing of the *TCoA-*

*WC* inventory enabled the construction of the unambiguous and linguistically precise version of the *TCoA-WC* that could be administered to a larger sample of Western Cape primary school science teachers.

### ***Creating the Online Survey***

Among the various survey methods, online surveys can yield large samples of data at a fraction of the cost of traditional mail or telephone surveys (Evans & Mathur, 2018). An online survey was used to collect data involving a target sample of the study. The online version of the *TCoA-WC* was created using an innovative component of Office 365 called 'Microsoft (MS) Forms.' The University of Cape Town offers access to this service to its students for conducting surveys for research purposes. It is an easy-to-use application and offers a unique feature called 'anyone can respond' (Rhodes, 2019) to the survey questionnaires. With this option, research students can gather data from individuals outside their institutions.

In addition, MS Forms include a feature that allows one to create sections for different questionnaire components (Rhodes, 2019). There is also the option of adding a subtitle, making the question compulsory, allowing a "long" or "short" answer for text questions, allowing multiple answers, re-ordering the answer options, and/or opting for an 'other' option for multiple-choice questions (Rhodes, 2019). Using MS Forms also has the advantage of allowing the sentences to be positioned one above the other. This feature was particularly beneficial in this study, as the questionnaire items were presented in three languages simultaneously to the teachers.

Another valuable aspect of the form is that the results can be directly imported into Excel spreadsheets, allowing statistical analysis to be performed more efficiently. Thus, the final online *TCoA-WC* inventory (Annex XIII, p.228) was created using MS Forms that contained two sections. The first section consisted of eighteen questions about teachers' personal information and their formative assessment practices. Of those 18 questions, 15 were text question type, and three were multiple-choice. In the second section, 27 statements about teachers' conceptions of assessment were presented in a Likert scale response format. The teachers were given six options representing a six-point positively packed agreement scale. Every question from both sections of the inventory was set as 'required' to ensure no questions were omitted.

#### **Administration of the Final TCoA-WC Instrument**

The online survey was administered in 65 public primary schools across four districts, including 17 schools in Metro Central, 16 in Metro East, 14 in Metro North, and 18 in Metro South. In the year 2014, the South African Government equipped public schools with internet connectivity and devices (Government Gazette 37718, 2014). Therefore, each school was contacted by phone to confirm the valid email address for communication. The invitation letters (Annex XIV, p.245) and the link for the final online survey (<https://forms.office.com/r/FE8hXb6EuN>) were then sent to the school principals through email to forward to their science teachers. Surveys were administered in the third week of June 2021, before the end of the second term.

When contacted by phone after sending e-mails, school principals generally refused to give the email addresses of their schoolteachers, as they did in the pilot study, but assured the researcher that the email would be forwarded to the teachers. One of the reasons provided by school principals for this approach was that it was the end of the term, formal assessments were thus in progress, and teachers could not be disturbed during that time. Despite the busy assessment schedules, teachers from six schools responded immediately. After a week of sending the initial invitation, the researcher followed up with the remaining schools via phone and email.

Unfortunately, the peak of COVID-19 at the end of June 2021, coupled with the announcement of Alert Level 4 of the National Lockdown Government (Government Gazette No. 44838, 2021), led schools to announce an early-term closure (Government Gazette No. 44772, 2021). During the Alert 4 lockdown period, the spread of the virus increased from moderate to high (Government Gazette No. 43599, 2020), and schools and other educational institutes were kept closed for face-to-face classes. This put tremendous pressure on teachers to complete the assessment activities prior to the regular assessment schedules. Later, the winter holidays were also extended by two weeks (extension period: 12th July to 24 July 2021) (Government Gazette No. 44838, 2021). The early-term closure of schools and the extension of the winter holidays is believed to have negatively affected the teachers' response to the survey.

The school closure and holiday extension permitted the researcher to collect data for a limited period of only ten weeks (i.e., between July 2021 and September

2021). During these ten weeks, most of the schools prohibited the physical entry of outsiders altogether (Government Gazette No. 44895, 2021), and the only way to reach the teachers was through email. However, teachers also were under pressure to complete the curriculum within a limited time during this period. The researcher did not get a response from some of the teachers after sending two to three follow-up emails. Thus, the COVID-19 situation posed a real challenge for the researcher in following up with teachers and obtaining their responses.

### **Need to Adopt an Additional Data Collection Strategy**

With the outbreak of the COVID-19 pandemic, South African schools implemented 'online learning' to ensure continued education for learners (DBE, 2021). 'Online learning' refers more specifically to delivering the learning experience through the internet and web-based applications (Monareng, Ramraj & Mashau, 2020) when learners are not physically present in the schools. The introduction of online learning placed an additional responsibility on teachers to prepare online lessons and extra homework for the learners at home (DBE, 2021). Additionally, some teachers had been absent due to COVID-19 or a family members' infection, which led to extra responsibility for their colleagues. A combination of all these factors negatively affected the response rate.

Although an online survey was adopted for this study's data collection method, only 95 responses were collected from 30 schools due to the changes in teaching and learning methods during the COVID-19 pandemic. Nulty (2008) suggests that paper surveys have the advantage of generating much higher response rates than online surveys. Dommeyer, Baum, Chapman, and Hanna (2002) also

indicate that the respondents often believe printed surveys are more anonymous than online ones. This leads to the suggestion that respondents are more honest when responding to printed surveys (Dommeyer et al., 2002). Therefore, in addition to online data collection, the researcher decided to offer paper copies of the questionnaire to schools that did not respond online. Out of the 65 schools that were contacted to participate in the study, 35 schools did not respond to the online survey at all. The researcher contacted the principals of the remaining 35 schools over the phone and requested that paper copies of the questionnaire be accepted.

The researcher assured schools that the questionnaires would be dropped off at school in person by following all COVID-19 rules and protocols. A total of 11 schools agreed to accept paper questionnaires under these conditions. Before delivering the questionnaire, the researcher confirmed an appointment with each school's principal or primary school head. To arrange an adequate number of paper copies for the teacher responses, the number of teachers teaching *Natural Science and Technology* (NST) in Grades 4 to 7 was also confirmed by schools. Consequently, 95 paper copies of the questionnaire and invitation letters for the principal and the teachers were dropped off at 11 schools. While handing over questionnaires, COVID-19 protocol and school rules and regulations were strictly observed. Teachers were given two weeks to complete the questionnaire. After two weeks, the researcher collected all the completed questionnaires personally. This way, 65 hard-copy responses were collected from teachers at 11 schools.

The data from the online responses (95 responses) and the paper copy responses (65) were combined in a single MS Excel file.

### **Integration of survey responses in Excel sheet**

A total of 160 responses were received from teachers of NST at 38 public primary schools. The researcher imported all the information from online responses into an Excel sheet using an inbuilt feature of MS Forms. The information obtained from paper copy responses was manually entered in the same Excel sheet by the researcher, along with the information on online responses. After collating 160 responses in a single Excel sheet, the researcher performed a data-cleaning procedure to refine the data.

### **Data cleaning**

The data-cleaning procedure involved three steps, as Miller, Acton, Fullerton, and Maltby (2002) recommended. The first step involved attaching special descriptions or labels to the variables that help explain the form and content of the dataset. Therefore, each variable from the *TCoA-WC* data set was assigned a special name or label. For example, the variable 'academic qualification' was assigned the special label 'A\_Qual,' while the six associated qualification levels, that is, Bachelor degree, B.Ed. Honours degree, Post Graduate Certificate in Education, Master's degree, and Doctorate degree were assigned the special labels as 1,2,3,4,5,6, respectively.

The second step of data cleaning involved carrying out validation or consistency checks to remove 'errors' and missing information in the dataset. The 'errors' are the codes that differ from the assigned labels. The errors in the coded data were then identified using '*IBM SPSS Statistics 27*' (2020) software. Because of this screening technique, three teachers' responses were removed from the

*TCoA-WC* data set. In the first case, the teacher did not provide complete information and chose the same answer option for each of the twenty-seven items. In the second case, the teacher was the department head, and he /she never taught NST. In the third case, the teacher's response was missing more than ten percent of the information and was therefore deemed incomplete. Therefore, 157 responses were used in the final statistical analysis of teachers' responses to the *TCoA-WC*.

In the third step of data cleaning, special labels are applied to missing values or error codes. Although the *TCoA-WC* data set did not contain any code that differed from the assigned label codes (i.e., error codes), it did contain missing value cells in some of the responses related to 27 items. The code '-99' was used as a special label to identify the cells with missing values. Appropriate assistance with further statistical analyses was sought from the Department of Statistical Sciences at UCT through the Department's 'Statistical consulting service' (<https://science.uct.ac.za/departments-statistics>).

### **Analyses of Data**

The data from 157 primary science teacher responses were analysed using the statistical software '*lavaan*'. In quantitative analysis, it is necessary to check the survey instrument's scale reliability or internal consistency. In social sciences, 'Cronbach's alpha' is used to measure the instrument's reliability (Multon & Coleman, 2010). It assesses whether the variables linked to each concept effectively represent that concept. Hence, the reliability of each concept in the *TCoA-WC* instrument was verified by calculating Cronbach's alpha of each concept.

Further, when demonstrating an instrument's validity in a new context, it is essential to consider whether the individual items represent the concept well and whether the items collectively represent all of its essential elements (Knekta, Runyon, & Eddy, 2019). Therefore, a confirmatory factor analysis (CFA) within structural equation modelling (SEM) was performed to establish the validity of the *TCoA-WC* model in the Western Cape context. The specifications of the confirmatory factor model identified by Brown (2006) (i.e., the *TCoA-III*A model) were compared to those of a newly identified *TCoA-WC* confirmatory factor model.

When assessing the validity of a newly identified confirmatory factor model, it is important to consider the degree to which the underlying theory of the previous model is reflected (Hooper, Coughlan, & Mullen, 2008) or how well the predicted values of the newly identified model correspond to the observed values (Wells, 2021). In other words, one must assess the 'model fit' for the newly identified model. To assess the model fit of the *TCoA-WC*, a variety of fit indices were used, including the chi-square test ( $\chi^2$ ), comparative fit index (CFI), root-mean-square error of approximation (RMSEA), and Tucker-Lewis (TLI).

The assumptions of multivariate normality were assessed by observing the distribution of factor variables (i.e., conceptions) and performing residual analyses. The significant relationships between teachers' demographic variables were established by calculating the statistically significant differences in mean scores (i.e., variance) for four conceptions across the demographic variables using Multivariate analysis of variance (MANOVA).

## Summary

In this chapter, the rationale for using quantitative research design for adapting the *TCoA-III*A inventory with the Western Cape primary science teachers is described. The *TCoA-III*A inventory was adapted to the Western Cape context using a rigorous cross-cultural adaptation and back-translation process. This process involved evaluating the clarity of instructions and questionnaire items through the evaluation of the *TCoA-III*A by science education stakeholders to establish its content validity. Once the *TCoA-III*A was validated, it was translated and back-translated into Afrikaans and isiXhosa, the two most spoken languages in the Western Cape province. The adaptation and translation of the *TCoA-III*A resulted in the “*Teachers’ Conceptions of Assessment - Western Cape (TCoA -WC)*” inventory. A pilot test using the *TCoA-WC* was conducted with a group of English, Afrikaans, and isiXhosa teachers in order to identify language-related challenges teachers may face while answering the questionnaire as well as administrative issues the researcher may encounter while conducting the study with the whole capacity sample. Teachers were selected by following a stratified random sampling method from four Metro Education districts of the Western Cape province, which included Metro Central, Metro North, Metro East, and Metro South. Teachers in 65 schools across four Metro Education districts in the Western Cape participated in the study. The data collection stage of the present study coincided with the first year of the COVID-19 pandemic, resulting in a limited response of 157 primary science teachers. These responses were further subjected to statistical analyses to find out the trustworthy answers to the research questions under investigation.



## CHAPTER 4: RESULTS

In this chapter, the results of administering the *Teachers' Conceptions of Assessment - Western Cape (TCoA-WC)* to primary school science teachers are presented. The data was collected from four Metro districts of the Western Cape Education Department in which 64% of Western Cape teachers are employed. The outcomes of statistical analyses carried out on the data are presented in this chapter.

### Details of the Study Sample

One hundred fifty-seven primary school science teachers from 38 schools in the four Metro districts (i.e., Metro Central, Metro East, Metro West, Metro South) of the Western Cape Education Department responded to the survey. The gender breakdown in the sample of 157 respondents was 41% male and 59% female. Of all the respondents, 64% of teachers spoke English as their home language, while 30% spoke Afrikaans, and 3% spoke isiXhosa. Only 3% of responding teachers did not specify their home language. Regarding academic qualifications, 59% of respondents held a Bachelor's degree, 18% held a B.Ed. Honours degree, 11% held a Postgraduate Certificate in Education (PGCE), 11% held a Diploma in Education, and 1% of teachers held a Master's degree. Further, the B.Ed (60%) and PGCE (20%) were the two most common professional qualifications held by respondents.

A total of 46% of respondents reported having specialised in *Natural Sciences and Technology* during their professional teacher qualification, compared to 54% who did not specialise in this school subject. The respondents had varying years of experience teaching *Natural Sciences and Technology*, ranging from 1 to 32 years. Fifty-six percent of respondents reported receiving 'assessment' training

from the Western Cape Education Department, while the rest (44%) did not report receiving such training. The number of learners in the classes reported by the respondents ranged from 19 to 59. Of all respondents, 5% taught at schools only for girls, 10% at schools for boys, and 85% taught at co-educational schools.

Regarding teachers' participation, the survey results revealed that the Metro South district had the highest percentage of teacher responses (37%), with Metro Central following closely behind (33%). Metro North and Metro East had lower response rates, at 17% and 13%, respectively. Respondents were from schools that offered varying Languages of Learning and Teaching (LOLT). Fifty-four percent of respondents were from schools that offered Afrikaans and English as separate or combined LOLT (i.e., parallel and dual-medium schools). The remaining respondents were from schools that offered only English as LOLT (40%), only isiXhosa as LOLT (4%), and only Afrikaans as LOLT (2%). Among 65 schools selected adopting the stratified sampling method from four metro districts (Chapter 3, p.62.), ten schools used Afrikaans and isiXhosa as parallel languages of teaching and learning, making up only 15% of the total population of the schools. Accordingly, it can be concluded that the low percentage of responses obtained from teachers in schools with isiXhosa as the language of learning and teaching does not affect the overall teachers' conceptions of assessment reported in this study.

### **Reliability of TCoA-WC Factors Using Cronbach's Alpha**

In social science research, the evaluation of any instrument begins with evaluating its validity and reliability (Cohen, Manion, & Morrison, 2002). In quantitative research, reliability is a term that refers to consistency and replicability

over time (Cohen et al., 2002). The reliability of the instrument refers to the degree to which the same measurement can be repeated by different persons on different occasions, under different conditions, using an alternative instrument (Drost, 2011).

As used in this study, the term ‘factor’ is used to refer to the different conceptions of assessment (i.e., *Improvement*, *School accountability*, *Learner Accountability*, and *Irrelevance*). The term ‘item’ is a statement associated with each factor. Generally, Cronbach's alpha coefficient is used to measure the internal consistency of the research instrument (Multon & Coleman, 2010). Hence, to ascertain internal consistency, Cronbach alpha was calculated for all variables pertaining to each factor of the *Teachers' Conceptions of Assessment - Western Cape (TCOA-WC)*. In Table 4.1, the Cronbach's alpha coefficient for each factor, along with two-sided 95% confidence intervals, is given.

**Table 4.1**

*The Index of Internal Consistency and Reliability - Cronbach Alpha Coefficient*

Factor	Cronbach Alpha	95% CI	
		<i>LL</i>	<i>UL</i>
<i>School Accountability</i>	.663	.606	.712
<i>Learner Accountability</i>	.672	.617	.720
<i>Improvement</i>	.910	.894	.907
<i>Irrelevance</i>	.749	.729	.768

*Note.* CI = Confidence interval; LL = Lower limit; UL = Upper limit.

Typically, internal consistency is considered 'good' or 'adequate' when the scales have a Cronbach alpha coefficient in the range of .70 to .79 (Multon & Coleman, 2010). The alpha coefficients for the factors *Improvement* and *Irrelevance* fall within the range of .70 to 0.79, indicating that the teachers' responses to items

associated with them are consistent and, therefore, *Improvement* and *Irrelevance* have good internal consistency.

The remaining two factors, *School Accountability*, and *Learner Accountability*, have Cronbach alpha values just below the benchmark of .7. Low alpha values are likely caused by a few items used to calculate Cronbach's alpha values (Tavakol & Dennick, 2011). Cronbach's alpha values for *Improvement* and *Irrelevance* were calculated using 13 and eight items, respectively. On the other hand, alpha values for *School Accountability* and *Learner Accountability* were calculated using only three items each (Annex XV, p.246). This may explain the low values of Cronbach's alpha for *School Accountability* and *Learner Accountability*. Nevertheless, Cronbach's alpha values between .6 and .7 indicate an acceptable level of reliability (Ursachi, Horodnic, & Zait, 2015). The alpha values for *School Accountability* and *Learner Accountability* of the *TCoA-WC* fell within the range of .6 and .7, thus demonstrating adequate internal consistency.

The acceptable level of Cronbach's alpha coefficient for all four factors, namely, *Learner Accountability*, *School Accountability*, *Improvement*, and *Irrelevance*, confirmed that the different subsets of items associated with these factors would yield similar results when the *TCoA-WC* was tested with Western Cape primary science teachers. As a result, the *TCoA-WC* inventory can be reliably used to evaluate the conceptions of formative assessment of Western Cape primary school science teachers.

**Validity of Teachers' Conceptions of Assessment Inventory – Western Cape  
(TCoA-WC)**

The validity of an instrument is the degree to which it measures what it claims to measure (Tavacol & Dennick, 2011). A confirmatory factor analysis (CFA) is the most widely used application to confirm the validity of constructs of the inventory (Hooper et al., 2008). Therefore, a CFA was conducted with the collected data to analyse the validity of *TCoA-WC*. This CFA analysis resulted in a CFA measurement model (i.e., *TCoA-WC* model). The validity of this *TCoA-WC* model was further evaluated by analysing standardised factor loadings associated with each item and using a range of model fit indices.

***Confirmatory Factor Analysis (CFA)***

Factor analysis is a customary statistical approach used to examine the relationship between a set of survey items to determine whether the answers provided by respondents on different subsets of items have a higher correlation than on others (Knekta et al., 2019). This method can determine whether a specific collection of items is likely to measure predetermined factors (Knekta et al., 2019). Thus, factor analysis provides validity evidence concerning the internal structure of the instrument (Knekta et al., 2019). In other words, this method analyses the 'dimensionality' among the survey items (Kline, 2011).

There are two types of factor analysis (Brown, 2008; Knetta et al., 2019), namely, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Data exploration with EFA enables one to analyse patterns underlying a set of data, while CFA confirms previously formulated theoretical models (Knekta et al., 2019).

As can be seen from the aims and objectives of the study (Chapter 1, p.6), the purpose of this study was to confirm the usability of the newly adopted model (i.e., *TCoA-WC* model) by comparing it with Brown's (2006) *TCoA-III*A model. Consequently, it is imperative to evaluate and verify the internal structure of the *TCoA-WC* model and compare it with the *TCoA-III*A structure. The CFA method facilitates the comparison of observed data with a theoretically grounded model to determine the causal relationships between factors and the related items (Mueller & Hancock, 2001). Therefore, in this study, CFA is chosen over EFA to examine the internal structure of the *TCoA-WC* inventory.

In the CFA method, various factor extraction methods could be used to obtain a matrix of factor weight (Sarmiento & Costa, 2019). For the *lavaan* statistical analysis software, the Maximum Likelihood (ML) method is used as the default factor extraction method (Finch & French, 2015). In the case of CFA, the observed indicator variables (i.e., items) and the observed continuous variables (i.e., factors) are hypothesised to be linearly related (Savalei & Rhemtulla, 2013). However, linear relationships cannot be formed between observed variables and factors when data are categorical. Categorical variables are types of variables that can be grouped (Kelley & Maxwell, 2010). The *TCoA-WC* data contained categorical variables such as sex, age, academic qualification, professional qualification, and so forth. Xia and Yang (2018) recommend using the diagonally weighted least squares (DWLS) estimation method to analyse the categorical data and eliminate biased parameter estimates. Therefore, the DWLS method was used as a factor extraction method in this study. Furthermore, when evaluating any model's validity via CFA analysis, the

most critical aspect is analysing the standardised factor loadings and the correlation between the factors (Wells, 2021). Hence, to allow correlations between factors, the 'oblique rotation method' was used.

Knekta et al. (2019) suggest that the first element to interpret in a CFA is the model fit indices that the researcher chose a priori. The estimates of the model fit indices are crucial in determining whether the covariance structure observed in new data is equivalent to or strongly resembles the covariance structure of the theoretical model (Goretzko, Siemond, & Sterner, 2023; Knekta et al., 2019). In other words, estimating the model fit indices of the *TCoA-WC* is crucial to determining if the *TCoA-WC* model's covariance matrix is equivalent to the *TCoA-IIIA* covariance matrix. Therefore, it was decided to conduct a CFA at the initial phase of the data analysis with the data collected using *TCoA-WC* inventory. This CFA is referred to as a preliminary CFA in this chapter.

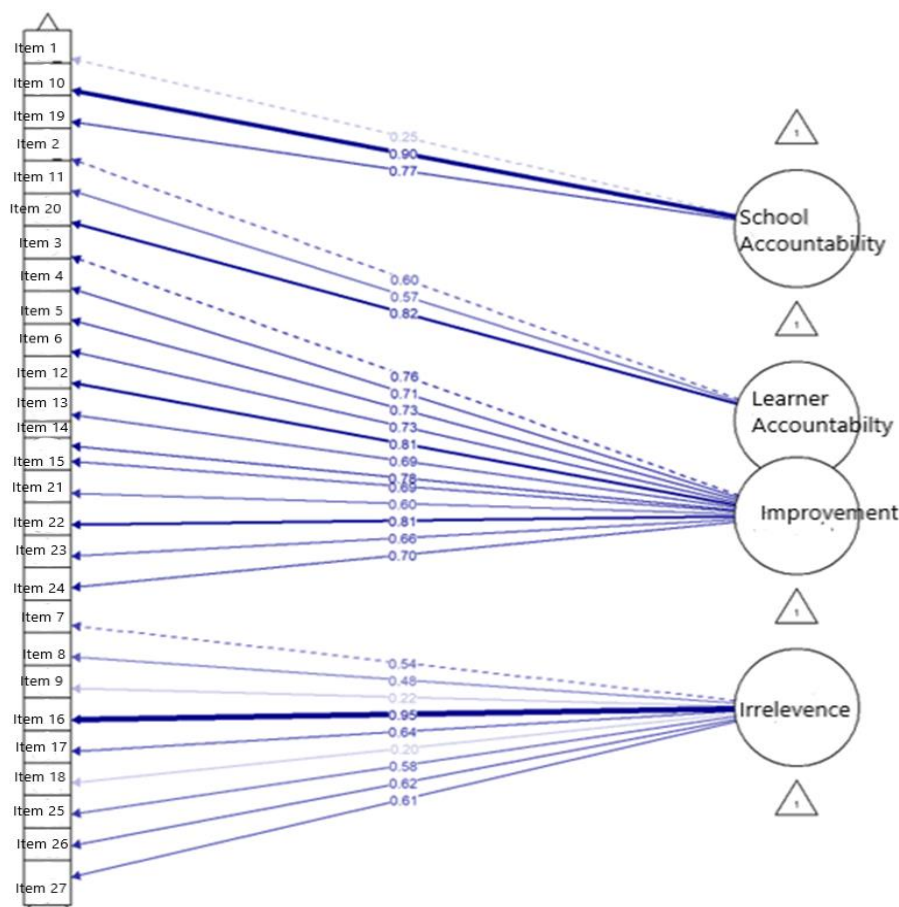
Further, the estimation of a CFA solution requires identifying the measurement model (Brown & Moore, 2012). Measurement models are path diagrams or models that specify the number of factors, the relationship between factors and items, and the relationships among indicator errors in the observed data (Brown & Moore, 2012). In other words, measurement models are essential to understand the theoretical relationships between the measured items and an associated factor. Measurement models are also helpful in understanding the specifications of the statistical model (Brown & Moore, 2012).

The CFA measurement model constructed using the data collected by the *TCoA-WC* inventory is presented in Figure 4.1. In Figure 4.1, the items are depicted

in squares, while the factors are represented in ovals. The one-directional arrow originating from the oval to the square represents the item-factor relationship or a factor loading related to each item. When interpreting the arrows, it is worth noting that the thicker arrows signify a strong relationship, while the dotted arrows indicate a moderate relationship, and the faded arrows represent a weaker relationship. The triangles present in-between two factors represent the error variances associated with items.

**Figure 4.1**

*The CFA Measurement Model Constructed Based on Data Collected by TCoA-WC Inventory*



The results obtained from the CFA measurement model obtained through the *TCoA-WC* data (Figure 4.1), along with the correlations between factors and items resulting from CFA analysis of *TCoA-WC* data (Table 4.2), make it possible to describe and characterise Western Cape science teachers' conceptions of formative assessment.

In the following section, the correlations between factors and items resulting from CFA analysis are presented.

### **Correlations between factors and items of *TCoA-WC* data**

In confirmatory factor analysis, each item has a factor loading associated with it. Factor loading indicates the percentage of a respondent's response attributed to a specific factor (Knekta et al., 2019). These factor loadings reflect the pattern of relationships between the factor and items. In other words, factor loadings measure the degree to which factors and items are correlated (Brown & Moore, 2012). Larger values indicate a closer link between a factor and an item (Finch & French, 2015). In Table 4.2, the factor loadings associated with each factor (i.e., *School Accountability*, *Learner Accountability*, *Improvement*, and *Irrelevance*) to the related item in the *TCoA-WC* model are presented. The item numbers mentioned in Table 4.2 correspond with the numbers for each item in section two of the *TCoA-WC* inventory (Annex XV, p.246).

The factor loading associated with each item in Table 4.2 was evaluated following the guidelines suggested by Bandalos and Finney (2010) and Comrey and Lee (1992). According to Bandalos and Finney (2010), the variability measured by

the factor in an item should be a minimum of 50%. This is essential for an item to be considered as one of the components of the factor. The amount of variability measured by a factor in each item is calculated by squaring a standardised factor loading associated with each item and indicated by  $R^2$  (Knekta et al., 2019).

**Table 4.2**

*Factor Loadings Associated with Each Factor Based on Preliminary CFA*

Items	Factors			
	<i>School Accountability</i>	<i>Learner Accountability</i>	<i>Improvement</i>	<i>Irrelevance</i>
Item1	.249			
Item 10	.899			
Item 19	.774			
Item 2		.605		
Item 11		.574		
Item 20		.818		
Item 3			.756	
Item 4			.706	
Item 5			.730	
Item 6			.734	
Item 12			.811	
Item 13			.689	
Item 14			.784	
Item 15			.688	
Item 21			.602	
Item 22			.810	
Item 23			.661	
Item 24			.697	
Item 7				.540
Item 8				.482
Item 9				.222
Item 16				.950
Item 17				.643
Item 18				-.203
Item 25				.581
Item 26				.621
Item 27				.612

It is desirable to have standardised factor loading as .7 because the square of .7 is .49, which is approximately equal to 50% variability. Based on the variance the factor measures in the item, Comrey and Lee (1992) provide recommendations for deciding whether an item belongs among those defining the factor. Items with a factor loading of .7 (i.e., 50% shared variance) are regarded as 'excellent', while those with a factor loading of .63 (i.e., 40% shared variance) are considered 'very good' (Comrey & Lee, 1992). Items with a factor loading of .55 (i.e., 30% shared variance) are deemed good, and those with a factor loading of .45 (i.e., 20% shared variance) are considered as 'fair' (Comrey & Lee, 1992).

A total of 15 items in Table 4.2, that is, item numbers 3, 4, 5, 6, 10, 12, 13, 14, 15, 16, 19, 20, 22, 23, and 24 have factor loading values close to or above .70. These 15 items can thus be considered "excellent" in terms of the shared variability of the associated factors. For the remaining 12 items, the factor loading values are below .7. Although the factor loadings were below .7, Knekta et al. (2013) suggest that it is necessary to consider the theoretically implied relationship between the item and the factor to determine the acceptable strength of the factor loading.

The factor loadings for 10 items of the remaining 12 items, that is, Items 2, 7, 8, 9, 11, 17, 21, 25, 26, and 27, were within the range of .5 to .6 (Table 4.2). Following Comrey and Lee's (1992) guidelines, it can be inferred that these 12 items shared a variance in the range of 20% to 40%. Therefore, these 12 items are considered "fair", "good", and "very good" items, respectively, based on their degree of shared variance with the corresponding factors. Of the remaining two items, Item 1 has a factor loading of .249, whereas Item 18 has a factor loading of

-.203 (Table 4.2). The negative factor loading of Item18 reveals an inverse relationship between Item18 and *Irrelevance*, contrary to what was expected based on theory.

***Results of the fit indices of the TCoA-WC data matrix***

Evaluating the goodness of fit is crucial when performing CFA as it determines how well the proposed model fits the observed data (Hooper et al., 2008). In order to evaluate the goodness of fit of a model, a range of model fit indices are used, which evaluate the relationship between the observed data and the theoretical data that would be predicted from the model (Alavi, Visentin, Thapa, Hunt, Watson, & Cleary, 2020). Each of these indices focuses on a different aspect of data fit within the model (Finch, 2020). In order to evaluate the fit of the *TCoA-WC* model, four indices were used (i.e., chi-square test, comparative fit index, Tucker-Lewis index, and Root mean square of approximation).

***Chi-square Test ( $\chi^2$ )***. The chi-square is commonly used as an absolute fit index (Alavi et al., 2020). This test was performed here to examine the fit between the hypothesised model (i.e., *TCoA-III A* model) and the data from the set of observed variables (i.e., *TCA-WC* model). This test is based on the testing of a null hypothesis (Alavi et al., 2020). The null hypothesis of interest is that the covariance structure observed in the *TCoA-WC* data matrix is identical to that of the *TCoA-III A* covariance structure. Results of the chi-square test showed a low chi-square value compared to the degree of freedom, showing no statistical difference between the *TCoA-WC* and *TCoA-III A* covariance matrices,  $\chi^2(318, N = 157) = .0, p < .005$ .

**Comparative Fit Index (CFI).** This test is performed to analyse the model fit by examining the disparity between the observed data and the proposed model (Sarmiento & Costa, 2019), even when the sample size is small (Tabachnick & Fidell, 2014). A Comparative Fit Index (CFI) larger than .95 indicates a “good” model data fit (Hu & Bentler, 1999), whereas a CFI larger than .90 but less than .95 indicates a reasonable model data fit (Kline, 2005). The *TCoA-WC* model exhibits almost good data fit with a CFI value of .942, showing that there is no major disparity between *TCoA-WC* and *TCoA-IIIA* data matrices.

**Tucker – Lewis Index (TLI).** TLI, sometimes referred to as the non-normed fit index, is closely related to the Comparative Fit Index (Finch & French, 2015). TLI values of .95 or higher indicate a good fit for a model (Hu & Bentler, 1999). The TLI value obtained for the *TCoA-WC* model was .936, slightly less than the benchmark. Hence, the model can be considered to exhibit an adequate fit.

**Root Mean Square Error of Approximation (RMSEA).** As an absolute fit index, RMSEA measures how far a hypothesised model is from the perfect model (Xia & Yang, 2018) by avoiding sample size issues (Sarmiento & Costa, 2019). Thus, the RMSEA value is helpful in determining the discrepancies between *TCoA-WC* (i.e., hypothesised model) and *TCoA-IIIA* (i.e., perfect model) models. A RMSEA value below .06 indicates a relatively good data fit (Hu & Bentler, 1999). The RMSEA value of the *TCoA-WC* model was found to be  $<.005$ , indicating that the *TCoA-IIIA* model is a good fit for the data obtained from the *TCoA-WC* inventory. Based on the results of four fit indices, it can be concluded that the *TCoA-IIIA* model exhibited a good fit for the *TCoA-WC* data. Once the fit indices of the

*TCoA-WC* data were evaluated, it was analysed further to determine its nature and the distribution of variables. In the following section, the results concerning the nature and the distribution of variables in *TCoA-WC* data are presented.

### **Analysis of the Multivariate Nature of the TCoA-WC Data Matrix**

Multivariate methods provide more reliable results when the variables follow an exact or approximate normal distribution (Korkmaz, Göksülük, & Zararsiz, 2014). Conversely, multivariate statistics perform poorly if the data are not normally distributed (Korkmaz et al., 2014). Consequently, three types of graphical representations of the residuals, including histograms, quantile-quantile plots, and scatterplots, were performed with a dual aim. Firstly, to analyse the nature of the *TCoA-WC* data matrix. Secondly, to examine the assumption that the set of variables obtained for each factor in the *TCoA-WC* data can be treated as independent observations originating from a multivariate normal distribution.

#### ***Frequency Distribution Histograms of Residuals***

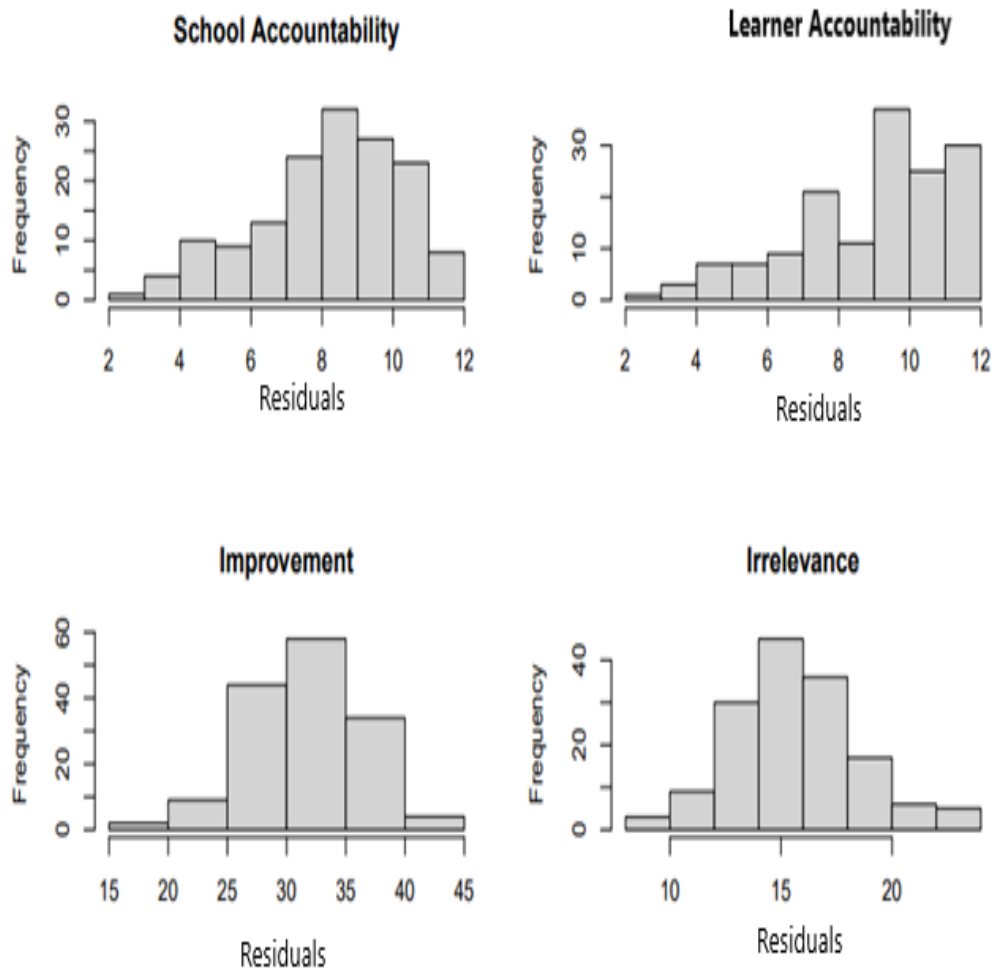
A residual in a linear regression analysis is defined as the difference between the variable's observed value and its predicted value (Cox & Snell, 1968). According to the assumption of linear regression, residuals have a normal distribution (Osborne & Waters, 2002) and can be standardised to be equal in variance (Dunn & Smyth, 1996). The distribution of residuals related to each factor was analysed by drawing a frequency distribution histogram of residuals.

A visual inspection of histograms in Figure 4.2 shows that the two factors, *Improvement* and *Irrelevance*, have a near-perfect bell-shaped curve and were normally distributed. For the factor of *School Accountability*, the residuals'

distribution was slightly skewed but followed a normal distribution in general. A negatively skewed distribution was found to be present in the case of *Learner Accountability*, suggesting that teachers' responses to *Learner Accountability* clustered towards the upper end of the distribution produced by their scores.

**Figure 4.2**

*Histogram Showing the Distribution of Residuals After Fitting the TCoA-WC Model with CFI*



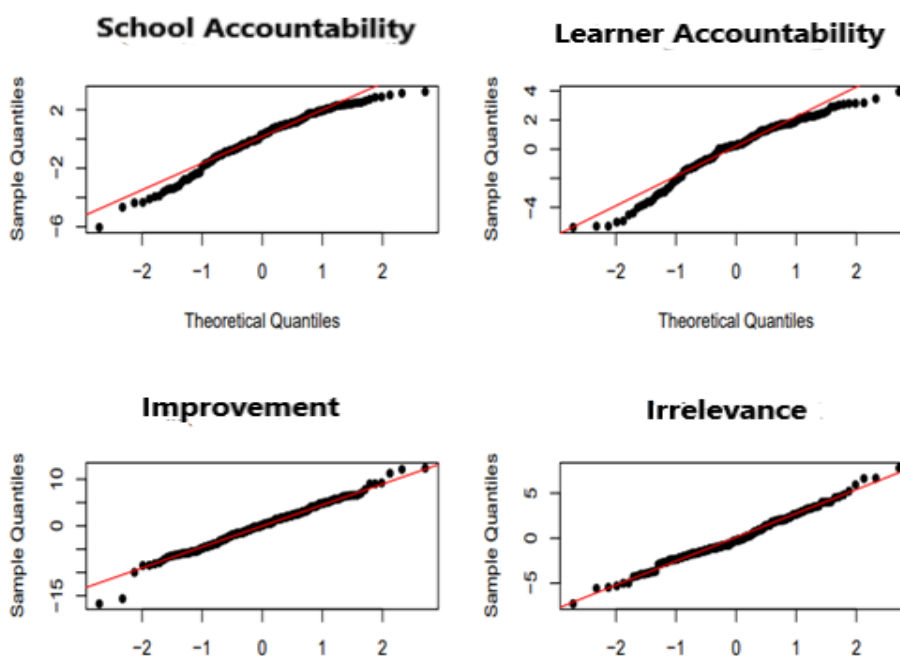
### *Quantile-Quantile Plots (Q-Q plots)*

A quantile is a value that divides a probability distribution into equal intervals, with each interval representing the same percentage of the population (Robledo & Velarde, 2022). The Q-Q plot is used to determine whether two data sets belong to the same distribution. In these plots, a normal distribution is shown as the base distribution, and its quantiles are shown on the x-axis as “Theoretical Quantiles.” Likewise, sample quantiles are plotted along the y-axis as “Sample Quantiles”.

The Q-Q plot for each factor of the TCoA-WC (i.e., *School Accountability*, *Learner Accountability*, *Improvement*, and *Irrelevance*) data matrix was plotted separately to view the distribution of residuals related to each factor (Figure 4.3).

**Figure 4.3**

*Q-Q Plots for Each Factor of the TCoA-WC Data Matrix*



A straight line provides readers with a clue with respect to where the points should line up if the sample matches the base distribution. The graphical representations of Q-Q plots for *Improvement* and *Irrelevance* clearly show that most of the data points lie along a straight line (Figure 4.3), and hence, it can be inferred that the sample matches the base distribution. In both *Learner Accountability* and *School Accountability*, the data points on the higher and lower end of the straight line show only a few deviations. However, it can be clearly seen that those points lie close to the straight line in both cases, indicating that the data followed the norm of a multivariate normal distribution.

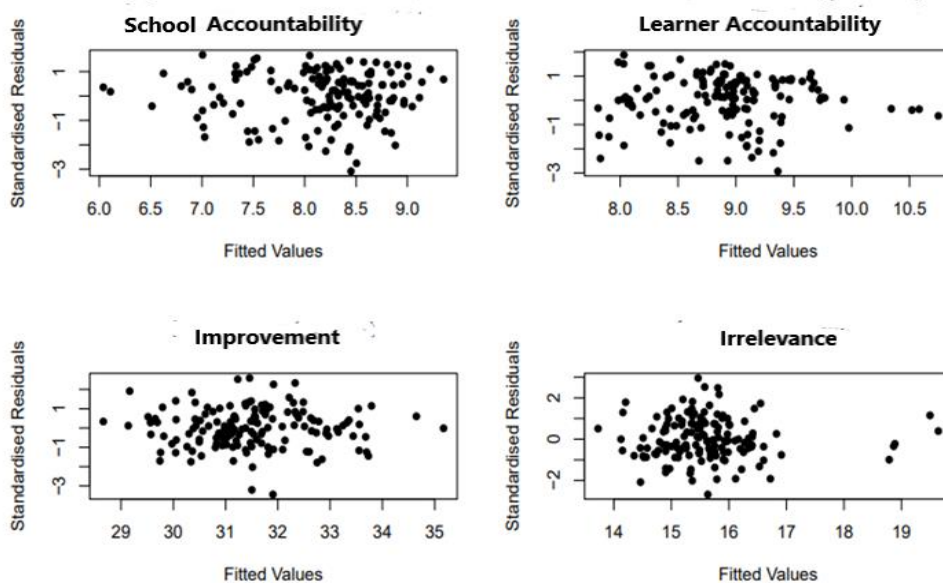
### ***Scatterplots of Residuals***

The distribution of residuals can also be visually observed by plotting a standard residual plot, in which the standard residual values are plotted against the fitted values obtained from the regression model. Cook and Weisberg (1982) suggest that these plots can be used to detect the nonlinearity of residuals and non-constant error variances. A correctly specified linear regression model will result in haphazard residual plots (Cook & Weisberg, 1982).

The scatterplots of standardised residuals were plotted separately for each factor, that is, *School Accountability*, *Learner Accountability*, *Improvement*, and *Irrelevance* of the *TCoA-WC* model (Figure 4.4). Inspection of the above four scatter plots reveals no obvious pattern in the scatter of residuals, and residuals appear haphazardly distributed across all four plots. Thus, it can be inferred that the *TCoA-WC* data meets the assumptions for the simple linear model to perform MANOVA analysis.

**Figure 4.4**

*Scatterplot of Standardised Residuals Vs. Fitted Value for each Factor of TCoA-WC model*



### Multivariate Analysis of Variance (MANOVA)

One of the aims of this study is to explore the demographic variable(s) that affect teachers' conceptions of formative assessment. Using the MANOVA statistical technique, one can examine the relationships among variables rather than consider each variable separately (Bray & Maxwell, 1985). This statistical technique was used here to analyse the relationship between four factors (i.e., *School Accountability*, *Learner Accountability*, *Improvement*, and *Irrelevance*) and the demographic variables of the teachers who responded to the survey questionnaire.

While performing the MANOVA, it is advantageous to have similar subgroup sizes to reduce the degree of freedom and to produce significant

relationships between variables (Harlow, 2014). Therefore, some changes were made to a number of variables from the *TCoA-WC* data matrix as follows.

### ***Transforming the Variables***

The factor loadings obtained through the CFA analysis of the *TCoA-WC* data (Table 4.2, p.90) were used to fit the MANOVA model. Chou and Bentler (1995) recommended a sample size of more than 500 for accurate results in CFA analysis. However, due to COVID-19 restrictions, the researcher could collect only 160 responses, of which 157 were used for the statistical analyses. The preliminary analyses for MANOVA revealed that there are too many variables for the 157 observations. Brown (2008) suggests that the likelihood of obtaining effective results from MANOVA increases when groups being compared are of relatively similar size. Brown (2008) further recommends formulating similar size sub-groups by clustering subcategories related to variables within factors. Therefore, changes were made to a number of variables and factor levels from the *TCoA-WC* data matrix.

### **Removal of Variables**

The literature review on South African teachers highlighted factors such as teachers' inadequate knowledge of policy requirements (Kuze & Shumba, 2011; Vandeyar & Killen, 2007) or assessment literacy (Kanjee & Mthembu, 2015; Schuld et al., 2017) regarding teachers' conceptions of assessment (Chapter 2, p.45). Considering these factors, it was concluded that teachers' age, gender, and home language may play only a minor role in South African teachers' conceptions

of formative assessment. Accordingly, three demographic variables of comparatively less interest (i.e., age, sex, and home language) were removed.

### **Joining the Factor Levels of Variables**

There were six sub-levels for each of the two variables, namely, *Professional Qualification* and *Academic Qualification*. In South Africa, the entry qualification into the teaching profession is a four-year Bachelor of Education (B.Ed.) or a three-year bachelor's degree with a one-year Post Graduate Certificate in Education (Government Gazette 38487, 2008). Accordingly, the subcategories related to the variable *Academic Qualifications* were categorised into two groups, namely, teachers who had qualifications greater than or equal to Honours and teachers who had qualifications below Honours.

Moreover, the literature revealed that teachers holding advanced qualifications, such as PGCE or Masters, consider the importance of assessment more significant than those having foundational qualifications, such as Bachelor of Education (Calveric, 2010). Therefore, the different levels of teachers' professional qualifications derived from the questionnaire were combined into three levels to analyse how the Western Cape primary school science teachers with different professional qualifications conceive formative assessments. These sublevels were Certificate or Diploma, Postgraduate Certificate in Education (PGCE), and Other. The 'Other' category included all the remaining qualifications except B.Ed. The B.Ed. category was used as a reference group against the remaining three categories while performing MANOVA analyses.

Additionally, in one of the questions, teachers were asked to indicate all the grades in which they teach *Natural Sciences and Technology*. A variety of combinations of teacher responses resulted in multiple variables. Responses have thus been grouped into three categories, namely, teachers teaching in Grades 4 to 6 (i.e., Intermediate Phase), teachers teaching in Grade 7 (i.e., Senior Phase), and teachers teaching in both intermediate and senior Grades (i.e., Both).

***Eliciting statistically significant relationship between factors and demographic variables***

A statistically significant result is one associated with a very rare occurrence in a random sample under the null hypotheses (Carver, 1978). MANOVA analyses begin with testing the null hypothesis that the means of groups are the same for all groups (Bray & Maxwell, 1985). In educational research, a  $p$ -value of .05 is commonly used as a cut-off point to determine the rarity of the event, and this cut-off point is referred to as a .05 level of significance (Carver, 1978). In Table 4.3, a  $p$ -value of .05 is used as a cut-off point for determining the rarity of linear relationships between factors and demographic variables identified in *TCoA-WC* data. Aside from  $p$ -values, the linear 'effect size' of different relationships between demographic variables and the factors detected in *TCoA-WC* data are presented in Table 4.3. According to Snyder and Lawson (1993), the effect size estimate indicates how much the dependent variable can be predicted, controlled, or explained by the independent variable. The magnitude of the effect size ranges from 0 to 1, where 0 indicates the weakest strength of association, and 1 indicates the highest strength of association between the factor and demographic variable,

respectively (Snyder & Lawson, 1993; Huston, 1993). The effect size estimates presented in Table 4.3 reveal the proportion of the variance predicted in each of the four factors by the observed relationships in the *TCoA-WC* data matrix.

**Table 4.3**

*The Linear Effect Size of Each Demographic Variable against the Factor Variable*

Demographic variable	Effect Size	Std. error	t-test	p-value
<i>School Accountability</i>				
(Intercept)	6.666	1.433	4.652	.7738
A_Qual >= Honours	-.405	.446	-.907	.366
P_Qual (Certificate or Diploma)	-.482	.683	-.705	.482
P_Qual (Certificate or Diploma)	-.104	.708	-.147	.883
P_Qual (Other)	-1.266	.460	-2.752	.007*
P_Qual (PGCE)	.137	.988	.138	.890
NST_SpecYes	.011	.332	.033	.974
NST_Expi	.011	.026	.440	.670
Grades_Intermediate	.762	1.183	.644	.521
Grades_Senior	.681	1.21	.562	.575
WCED_TrainingYes	.329	.386	.854	.395
Class_NST_Length	.024	.023	1.052	.294
School_Single-sex Boys	.509	.601	.847	.398
School_Single-sex Girls	-.658	.979	-.673	.502
<i>Learner Accountability</i>				
(Intercept)	10.721	1.553	6.902	1.818
A_Qual >= Honours	.273	.484	.565	.573
P_Qual (Certificate or Diploma)	-.564	.741	-.762	.447
P_Qual (Certificate or Diploma)	.704	.767	.917	.361
P_Qual (Other)	-1.009	.499	-2.024	.045*
P_Qual (PGCE)	.587	1.071	.548	.585
NST_Spec_Yes	-.248	.360	-.689	.492
NST_Expi	-.008	.028	-.270	.788

Table 4.3 continued

Demographic variable	Effect Size	Std. error	t-test	p-value
Grades_Intermediate	-1.624	1.282	-1.267	.207
Grades_Senior	-1.348	1.312	-1.027	.306
WCED_TrainingYes	.158	.418	.379	.705
Class_NST_Length	-.004	.025	-.145	.885
School_Single-sex Boys	.114	.651	.176	.870
School_Single-sex Girls	1.356	1.061	1.278	.204
<i>Improvement</i>				
(Intercept)	32.028	3.626	8.834	4.737
A_Qual>= Honours	.819	1.129	.725	.470
P_Qual (Certificate or Diploma)	.798	1.729	.461	.645
P_Qual (Certificate or Diploma)	2.621	1.791	1.463	.146
P_Qual (Other)	-.554	1.163	-.476	.635
P_Qual (PGCE)	-.971	2.501	-.388	.699
NST_Spec_Yes	-.159	.841	-.189	.851
NST_Expi	-.002	.066	-.038	.970
Grades_Intermediate	-1.647	2.993	-.550	.583
Grades_Senior	-.299	3.063	-.098	.922
WCED_TrainingYes	-.510	.976	-.522	.602
Class_NST_Length	.030	.059	.505	.614
School_Single-sex Boys	-1.420	1.520	-.934	.352
School_Single-sex Girls	-.756	2.476	-.305	.761
<i>Irrelevance</i>				
(Intercept)	15.887	1.993	7.97	5.933
A_Qual>= Honours	-.391	.621	-.630	.530
P_Qual (Certificate or Diploma)	.461	.95	.485	.629
P_Qual (Certificate or Diploma)	-.191	.985	-.194	.847
P_Qual (Other)	-.108	.640	-.169	.866
P_Qual (PGCE)	3.845	1.375	2.796	.006*
NST_Spec_Yes	-.289	.462	-.625	.533
NST_Expi	-.020	.036	-.547	.585
Grades_Intermediate	-.784	1.646	-.477	.634
Grades_Senior	.184	1.684	.109	.913
WCED_TrainingYes	-.625	.537	-1.164	.246

Table 4.3 continued

Demographic variable	Effect Size	Std. error	t-test	p-value
Class_NST_Length	.022	.032	.680	.498
School_Single-sex Boys	.511	.836	.611	.542
School_Single Girls	.919	1.362	.675	.501

*Note.* An asterisk (\*) is used to mark a  $p$ -value  $\leq 0.05$ . The full names of all the variables and their related abbreviations are enclosed as Annexure XVI (p.247)

The results from Table 4.3 reveal that for four relationships, the effect sizes are positive and of high magnitude. These relationships are between 1. *Learner Accountability* and *Intermediate Grade* (.762), 2. *Learner Accountability* and *Professional Qualification (certificate and Diploma)* (.704), 3. *Improvement* and *Academic Qualification  $\geq$  Honours* (.819), and 4. *Improvement* and *Professional Qualification (Certificate and Diploma)* (.798). This means that the demographic variables, namely, *Intermediate grade*, *Professional Qualification (Certificate and Diploma)*, *Academic Qualification  $\geq$  Honours*, and *Professional Qualification (Certificate and Diploma)*, accounted for more than 70% of the variance of their respective factor variables. However, the  $p$ -values for these relationships were found to be above .05, revealing that none of these four were statistically significant.

The visual inspection of Table 4.3 revealed three significant relationships with  $p$ -values below .05. The first statistically significant relationship was found between teachers with 'Other' professional qualifications and *School Accountability*. This relationship scored 1.27 Likert scale points on average less than the reference group of *4-year Bachelor of Education degree (B.Ed.)* ( $t(156) = -2.752, p=.007$ ). The second statistically significant relationship was found between teachers with 'Other' professional qualifications and *Learner Accountability*. This relationship

scored 1.01 Likert scale points on average less than the reference group of *4-year Bachelor of Education degree (B.Ed.)* ( $t(156) = -2.024, p=.045$ ). The third statistically significant relationship was found between teachers holding a *Postgraduate Certificate of Education (PGCE)* as a professional qualification and *Irrelevance*. This relationship scored 3.84 Likert scale points on average more than the reference group of *4-year Bachelor of Education degree (B.Ed.)* ( $t(156) = 2.796, p=.006$ ).

After identifying the significant relationships between factors and demographic variables, further analyses were conducted to investigate the practices of formative assessments among science teachers in primary schools in the Western Cape. The results of these analyses are presented in the following section.

### **Western Cape Primary School Science Teachers' Practices of Formative Assessment**

To elicit information on Western Cape primary school science teachers' practices of formative assessment, responding teachers were asked to give examples of assessment practices in their classroom when they think about formative assessment. The *TCoA-WC* inventory was used to gather self-reported formative assessment practices of primary science teachers in the Western Cape. These practices were classified using the classification offered by Brown (2004), which includes 11 different assessment methods. The results of this categorisation are presented in Table 4.4. Table 4.4 shows that the respondent teachers employ a variety of formative assessment practices in their classrooms to varying degrees of implementation.

**Table 4.4**

*The Frequency Table Showing Western Cape Primary School Science Teachers' Practices of Formative Assessment in Descending Order of Frequency.*

Assessment practice classification offered by Brown (2004)	Frequency (f) (%) of the Western Cape primary science teachers' self-reported practices of formative assessment collected using <i>TCoA-WC</i> inventory
Learner written work (e.g., activity sheets, spelling or math facts)	21
Teacher-Made written test	18
Portfolio / Scrapbook /Project	16
Oral question and answer	12
Conferencing	6
Learner self or peer assessment	5
Standardised test	5
1-3 Hour examination	5
Unplanned observation	3
Essay test	3
Planned observation (e.g., <i>Running Record, Checklist</i> )	2

However, based on the results of Table 4.4, learners' 'written work' activities were the most preferred form of formative assessment by respondents. As reported by Western Cape primary science teachers through the *TCoA-WC* inventory, written assessment practices included informal written quizzes, online quizzes, mind maps, and activity worksheets. Further, 'teacher-made written tests' are the second most preferable formative assessment method according to the formative assessment practices reported in the *TCoA-WC* inventory. This form of assessment includes practices such as short revision tests, open book tests, end-of-topic assessments, small class tests, weekly assignments, and speed tests. Learners'

projects or practical work was also a prevalent form of formative assessment for the teachers who responded. Furthermore, planned observation was the least preferred form of formative assessment among these teachers. This form of assessment included the use of checklists and rubrics. Thus, it is evident from Table 4.4 that Western Cape primary school science teachers, in general, tend to mainly use written work activities when conducting formative assessments.

### Summary

A total of 157 responses collected using the *TCoA-WC* inventory from the Western Cape primary science teachers were analysed by performing three types of statistical analyses. Firstly, the results of Cronbach's alpha values for four conceptions of assessment or factors (i.e., *Improvement*, *School Accountability*, *Learner Accountability*, and *Irrelevance*), obtained from the *TCoA-WC* data demonstrated adequate internal consistency. Secondly, the confirmatory factor analysis (CFA) analysis of the *TCoA-WC* data revealed a factor structure similar to that of the *TCoA-III*A model, confirming the presence of the above-mentioned four main conceptions of assessment and associated 27 items in the thinking of Western Cape primary science teachers. In essence, the reliability analysis and CFA analysis confirmed that *TCoA-WC* is a valid and reliable measure of Western Cape primary science teachers' conceptions of formative assessment. The *TCoA-WC* model also exhibited well-fitted psychometric properties. Thirdly, the MANOVA analysis of the *TCoA-WC* data yielded three statistically significant relationships, revealing that different levels of *Professional Qualification* can have an impact on responding teachers' conceptions of formative assessment. Further, the analysis of respondent teachers' self-reported formative assessment practices gathered through the *TCoA-WC*

inventory highlighted learners' 'written work' as the most preferred practice of formative assessment while 'planned observations' as the least preferred practice of formative assessment by the Western Cape primary science teachers.

## CHAPTER 5: DISCUSSION

In general, the appropriate use of formative assessment in classrooms has been shown to raise learner achievement, increase equity in learner outcomes, and improve learners' abilities to learn (OECD/CERI, 2008). Therefore, in several countries, formative assessment is considered a fundamental aspect of education reform (Chapter 2, p.22). In South African assessment policy reforms in education, formative assessment was introduced through the '*Assessment Policy in the General Education and Training Band*' (DoE, 1998). The subsequent policy revisions (Chapter 2, p.25) valued the use of classroom assessment for formative purposes. However, the introduction of new assessment policies and the effective implementation of formative assessments have always remained a challenge for the South African education system (Kanjee & Sayed, 2013; Pryor & Lubisi, 2002). Against this historical background of numerous changes in assessment policies, this study explored the conceptions of formative assessment among Western Cape primary school science teachers. The results of this exploration are discussed in this chapter.

### **Purpose of the Study**

This study aimed to investigate Western Cape primary school science teachers' conceptions of formative assessment by developing a suitable research inventory. In the context of assessment, teachers' conceptions about the purposes of assessment can influence their interpretation of assessment policies and assessment practices (Pajares, 1992; Tittle, 1999; Thompson, 1992). Based on this supposition,

Brown (2002, 2004, 2006) developed a research inventory popularly known as the *Abridged Teachers' Conceptions of Assessment (TCoA-III)* through a line of research. This inventory can be used to measure the strength of teachers' conceptions of assessment (Brown, 2004), the relationships within teachers' conceptions of assessment (Brown et al., 2011), in the development of teacher training programmes (Brown, 2002), and even in designing assessment policies (Brown, 2002). In light of the advantages offered by the *TCoA-III* inventory, it was adapted in the present study to explore Western Cape primary school science teachers' conceptions of formative assessment.

The study also aimed to investigate the demographic variable(s) that affect Western Cape primary school science teachers' conceptions of formative assessment, and to identify teachers' formative assessment practices in primary school science classrooms. In essence, the study intended to contribute to the ongoing debate regarding assessment reforms based on how Western Cape primary school science teachers conceptualise formative assessments.

The study is therefore aimed to answer the following research questions:

1. Is the *TCoA-III* inventory of Brown (2006) valid for use with Western Cape primary school science teachers?
2. What are the conceptions of formative assessment held by Western Cape primary school science teachers?
3. Which demographic variable(s) affect Western Cape primary school science teachers' conceptions of formative assessment?

4. What formative assessment practices do primary school science teachers in the Western Cape prefer?

### **Methodology**

It is well known that quantitative methodologies are commonly used to measure social phenomena (Sukamolson, 2007). Quantitative methodologies convert actualities into variables, and their ultimate objective is to determine the relationship among those variables (Punch, 2003). Studying teachers' conceptions of assessment is seen as a social phenomenon (Brown, 2008). Therefore, in order to provide trustworthy answers to the above research questions, a quantitative research method was used in the study.

It is evident that the social phenomenon under investigation (i.e., teachers' conceptions of assessment) does not exist in a quantitative form and requires a tool to measure it (Sukamolson, 2007). Such social phenomenon can be measured using a tool, such as a questionnaire that asks respondents to rate a number of pertinent questions (Sukamolson, 2007). Brown (2006) and his colleagues developed the inventory known as the '*Abridged Teachers' Conceptions of Assessment (TCoA-III A)*' inventory in Queensland, Australia (Chapter 2, p.39). In the present study, the *TCoA-III A* was adapted for and validated in the Western Cape context and named '*Teachers' Conceptions of Assessment - Western Cape (TCoA-WC)*'. This inventory was used to analyse conceptions of teachers from the four Metro Education districts of the Western Cape province, that is, Metro North, Metro East, Metro West, and Metro South (Figure 1.2, p.12).

Further, Ilesanmi (2009) asserts that before testing instruments in new contexts, they must be standardised, reliable, and have a face and concurrent validity. Furthermore, the instrument must consider the population's characteristics and cultural norms. Therefore, broad adaptation and validation processes of Brown's (2006) *TCoA-III*A were performed, which included multiple steps (Chapter 3, p.54). Scientific investigations that primarily explore attitudes or behaviours employ surveys as a data collection method (Ilesanmi, 2009). In the present study, data were collected by developing an online survey as a data collection method. The online survey was administered to teachers from 65 primary schools from four Metro Education districts (Chapter 3, p.71). However, multiple challenges to online data collection due to the COVID-19 outbreak during the administration phase (Chapter 3, p.74) led to collecting responses through paper copies as an alternative data collection strategy. A total of 157 primary science teacher responses were obtained and analysed using *SPSS* and *lavaan* in R statistical software.

According to Brown (2002), teachers' conceptions of assessment fall into four broad categories (Chapter 2, p.29). Brown (2006) developed the *Teachers' Conception of Assessment Inventory (TCoA-III)*A based on these four broad categories or conceptions of assessment, namely, *Improvement*, *School Accountability*, *Learner Accountability*, and *Irrelevance*. Therefore, in the present study, confirmatory factor analysis (CFA) was used to determine whether the *TCoA-WC* data exhibits all four factors and whether these factors correlate with associated items as exhibited by *TCoA-III*A (Chapter 4, p.85). Multivariate Analysis of Variance (MANOVA) was performed to determine whether respondent

teachers' demographic characteristics show any significant relationship with the conceptions identified in the *TCoA-WC* data (Chapter 4, p.96). Frequency distribution analysis was performed to analyse respondent teachers' self-reported practices of formative assessments (Chapter 4, p.105).

### **Limitations of Study**

In this study, the data collection phase coincided with the first year of the COVID-19 pandemic. The COVID-19 situation presented several challenges to collecting teachers' responses due to government health initiatives and decisions, as well as stringent regulations imposed on and by participating schools (Chapter 3, p.73). Thus, the COVID-19 situation resulted in only a limited number of responses being collected, despite best efforts. Nevertheless, the *TCoA-WC* measurement model was evaluated and validated through multiple statistical analyses.

### **Providing Answers to the Research Questions**

The following sections provide insights into the questions that the present study aims to answer.

***RQ1: Is the TCoA-III inventory of Brown (2006) valid for use with Western Cape primary school science teachers?***

South African current assessment policy in education (DBE, 2011) places a crucial demand on implementing formative assessment due to its significance in the educational process. However, the limited studies conducted exploring South African teachers' formative assessment practices highlighted the need for improvements in teachers' understanding of and use of formative assessments in

classrooms (Chapter 2, p.45). Given the context, it was decided to gain a comprehensive understanding of South African teachers' opinions or conceptions of formative assessment and make their thinking explicit by conducting the present research study.

Through comprehensive research, Brown (2002, 2004, 2006) developed the *Abridged Teachers' Conceptions of Assessment (TCoA-III A)* inventory to make teachers' conceptions of assessment measurable and more explicit. This inventory is recognised as a valid measure of conceptions of assessment worldwide (Chapter 2, p.42). *TCoA-III A* examines the four different purposes of assessment (Chapter 2, p.31) or 'factors', namely, *Improvement*, *School Accountability*, *Learner Accountability*, and *Irrelevance*. Each of these factors is measured by a number of underlying 'items'. Each item represents the conception of the assessment derived from the literature on conceptions of assessment. *TCoA-III A* is a shorter, less time-consuming version with similar psychometric quality (Brown, 2006) compared to its previous longer versions (Chapter 2, p.41).

Among the studies conducted on conceptions of assessment in South Africa, Jane (2013) conducted a qualitative study measuring conceptions of assessment of South African teachers using the theoretical framework based on *TCoA-III A* (Chapter 2, p.31) and successfully identified the factors affecting South African Teachers' conceptions of assessment. Therefore, it was decided to investigate the conceptions of formative assessment held by primary science teachers in the Western Cape quantitatively, using *TCoA-III A*. However, as the original *TCoA-III A* was adapted and validated in the Queensland context, it was necessary to adapt it to

the Western Cape context before using it for Western Cape primary science teachers. Therefore, as a means of finding out whether the *TCoA-III*A inventory is valid for use with primary school science teachers in the Western Cape, a number of steps were followed in the adaptation and validation process of the *TCoA-III*A inventory.

An adaptation is a process by which an instrument is made culturally compatible with the new culture being explored (Hambleton & Patsula, 1995). The adaptation of the instrument begins with the translation of the instrument (Borsa, Damario & Bandeira, 2012). The original *TCoA-III*A inventory, created by Brown in the year 2006, was adapted in the Queensland context and was only available in English. Therefore, the adaptation of *TCoA-III*A for the Western Cape began by translating it into Afrikaans and isiXhosa, the region's most spoken languages (Chapter 1, p.11).

Although translating the instrument is the first step (Borsa et al., 2012) in the adaptation process, the translation also has to take into account cultural, idiomatic (i.e., finding equivalent expressions to inventory items in new cultures), linguistic, and contextual factors in a new culture (Hambleton, 2005). This ensures that each section of the translated instrument is accurate and appropriate for the target audience. Consequently, two distinct steps were followed before translating instructions and items from the original *TCoA-III*A into Afrikaans and isiXhosa.

As a first step, the researcher reframed some questions of the *TCoA-III*A to align with South African educational policies (Chapter 3, p.56), and the modified inventory was renamed as *Teachers' Conceptions of Assessment – Western Cape*

and was abbreviated to “*TCoA-WC*”. As a second step, three science education stakeholders evaluated the instructions to teachers, the questions related to teachers' demographic details, and 27 items related to conceptions of assessment from *TCoA-WC* (Chapter 3, p.58). This evaluation aimed to assess the appropriateness of teachers' demographic information, to ensure that instructions to teachers and items of the *TCoA-WC* are unambiguous, and to verify the precision of the language used for Western Cape primary science teachers. The researcher then made the changes to the *TCoA-WC* based on science stakeholders' suggestions (Chapter 3, p.60). Thus, before translating the *TCoA-WC* inventory into Afrikaans and isiXhosa, its language was rigorously evaluated for appropriateness and unambiguity.

Further, the instructions, questions, and 27 items from the *TCoA-WC* inventory were translated into Afrikaans and isiXhosa by adopting the back-translation (Brislin, 1970) process (Chapter 3, p.61) by the respective language experts. This step ensured the linguistic equivalence of the two versions of *TCoA-WC* (i.e., validated by science stakeholders and back-translated by language experts) for Afrikaans and isiXhosa language inventories.

After the back-translation step, the translated versions of the *TCoA-WC* were pilot-tested with five teachers from each language (i.e., English, Afrikaans, and isiXhosa). During the pilot phase, participating teachers evaluated the appropriateness of *TCoA-WC* instructions and 27 items, including their meaning and language-related issues. This pilot study also proved to be helpful in providing the researcher with insights on the optimal approach for the administration of *TCoA-WC* among primary science teachers in schools. After receiving the

comments from the participating teachers, the changes were made to the *TCoA-WC* based on their comments. Consequently, the pilot study resulted in a *TCoA-WC* that was clear, unambiguous, comprehensible, and could be used as the final version for administration to the whole capacity sample of the study. The final version of the *TCoA-WC* (Annex XIV, p.245) was then administered to primary science teachers from selected schools in the Western Cape.

After collecting the responses from teachers, quantitative analyses were performed using data collected using *TCoA-WC*. The quantitative analyses comprised two parts, namely, the reliability analysis of factors extracted from *TCoA-WC* data (Chapter 4, p.82) and the confirmatory factor analysis of *TCoA-WC* data (Chapter 4, p.85). The reliability of the four factors of *TCoA-WC* inventory was determined based on Cronbach's alpha values of the four main factors Brown (2006) identified (i.e., *School Accountability*, *Learner Accountability*, *Improvement*, and *Irrelevance*). Overall, Cronbach's alpha values (Table 4.1, p.83) of all four factors fell within the acceptable reliability level recommended by experts (Multon & Coleman, 2012; Ursachi et al., 2015). Accordingly, Cronbach's Alpha values obtained for the four factors of the *TCoA-WC* demonstrated appropriate reliability.

Further, the quantitative analyses were performed with the data collected using the *TCoA-WC* inventory. The first part of the quantitative analyses involved developing a 'measurement model' (Figure 4.1, p.88) by performing confirmatory factor analysis (CFA) in order to analyse the structure generated through the data collected using *TCoA-WC*. The aim of CFA analysis was twofold. Firstly, to evaluate the structure of Western Cape primary science teachers' conceptions of

formative assessment (Figure 4.1, p.88) generated through the CFA measurement model. The second aim was to evaluate the psychometric properties of the *TCoA-WC* inventory (Chapter 4, p.92).

The structure of the Western Cape primary school science teachers' conceptions was evaluated by observing the 'configural invariance' of the CFA model (Figure 4.1, p.88). Configural invariance tests only the overall structure of the CFA model, including whether there is the same number of relevant factors and whether the same items are associated with each factor across the groups (Campbell, Barry, Joe, & Finney, 2008). The CFA analysis of the *TCoA-WC* data revealed configural invariance for four factors and 27 items based on Brown's *TCoA-III*A inventory (2006) (Table 4.2, p.90; Figure 4.1, p.88). In other words, the CFA analysis of the *TCoA-WC* data verified and confirmed that the internal factor structure of the *TCoA-WC* inventory is consistent with that of the *TCoA-III*A inventory. This means that the *TCoA-WC* inventory includes the four key assessment conceptions (or factors) identified by Brown (2006), namely, *Improvement*, *School Accountability*, *Learner Accountability*, and *Irrelevance*, along with their corresponding 27 items. Moreover, the results of multiple psychometric analyses (i.e., chi-square test, comparative fit index, Tucker-Lewis index, and Root mean square error of approximation) (Chapter 4, p.92) conducted on the data collected using *TCoA-WC* inventory confirmed that the *TCoA-III*A model fitted the *TCoA-WC* data matrix well.

Although the CFA analysis confirmed the configural invariance for the *TCoA-III*A model (Figure 4.1, p.88) in the *TCoA-WC* data, it revealed a hierarchical

difference between the two models. The *TCoA-WC* model consisted of four factors, each with its associated item. Whereas the *TCoA-III A* model (Annex XV, p.246) has an additional level of nine contributing factors to the main four factors (i.e., *Improvement, School Accountability, Learner Accountability, and Irrelevance*). Brown (2006) refers to the four main factors as second-order factors and the nine contributing factors as first-order factors (or higher-order factors). The absence of these nine 1st-order factors in the *TCoA-WC* model may be attributed to the sample sizes associated with these studies. As the data collection phase of the present study coincided with the COVID-19 pandemic, the researcher could collect only 157 responses from the Western Cape primary science teacher population. Meanwhile, the *TCoA-III A* model was built using 525 replies (Brown, 2006). Nevertheless, the 27 items from the *TCoA-WC* model loaded onto the same factors as those from the *TCoA-III A* model.

Although the current study had a limitation in statistical analyses due to its low sample size, it is important to question why the well-fitting model of *TCoA-WC* was unable to identify any of the first-order factors in Western Cape practicing primary science teachers' thinking. In studies similar to the present one, Brown and colleagues tested *TCoA-III A* in various countries to validate its structure. Brown and Michaelides (2011) surveyed the Greek version of *TCoA-III A* with 249 teachers in Cyprus. Unlike the present study, a combination of exploratory and confirmatory analyses was used to evaluate Greek teachers' responses. The researchers initially tested two separate measurement models, but the Cyprus data did not fit Brown's (2006) *TCoA-III A* model. After generating each model, changes were made to the

analytical methods and statistical analyses to generate each of the following models. Finally, this process resulted in a well-fitting hierarchical model of Cyprus teachers' assessment conceptions. The final model was found to have a unique structure whereby Cyprus teachers endorsed four conceptions of assessment into positive and negative orientations toward assessment. Based on the results of their study, Brown and Michaelides (2011) concluded that teachers in Cyprus consider assessments to be essential and beneficial to the teaching-learning process; at the same time, teachers are also aware of the misuse of assessments or policies. The analytical process followed in Brown and Michaelides's (2011) study implies that there is a possibility of obtaining a hierarchical model with appropriate modifications in the analytical method or statistical analyses of the present study data. In light of Cyprus's low-stakes assessment system similar to South Africa's, the model obtained with alternative analytical methods for the *TCoA-WC* data may reflect the hierarchical model or even a model similar to Cyprus teachers' model and may be helpful in making Western Cape teachers' conceptions of assessment more explicit.

A second similar exploration was conducted by Brown et al. (2009) in an attempt to validate *TCoA-III A* in Hong Kong. Brown et al. (2009) administered the Chinese version of the *TCoA-III A* inventory to 374 primary and secondary teachers in Hong Kong. Brown et al. (2009) study revealed that Hong Kong teachers' responses resulted in a hierarchical model that kept the 27 items from Brown's *TCoA-III A* model, but there were some differences in the paths connecting the first and second-order factors. The education system in Hong Kong places a greater emphasis on holding learners accountable for their performance in assessments.

There is a strong cultural association between accountability and learner improvement in Hong Kong (Brown et al., 2009). The researchers believed in the impact of such cultural association on the results of their study. Culturally, revisions to South African assessment policies (DoE, 2007; DBE, 2010, 2012) have linked teacher accountability to learners' improved performance in assessment (Kanjee & Sayed, 2013). At the same time, assessment policy revisions in South Africa had shown an appreciation for the use of formative assessment for the improvement of learners (Chapter 2, p.25).

Accordingly, it can be expected that a psychometrically well-fitted model of Western Cape primary science teachers obtained in this study (i.e., *TCoA-WC* measurement model) would have reflected the endorsement of either the *School Accountability* or *Improvement* factor by the participating teachers. However, an absence of endorsement of any specific factor in the data collected by using the *TCoA-WC* inventory indicates the possibility of two reasons. It could be due to either participating teachers being unaware of policy expectations, or that participating teachers were not aware of the purpose of formative assessment as outlined in the current DBE (2011) assessment policy.

Professor Anil Kanjee's research related to formative assessment (Chapter 2, p.46) could be helpful in providing guidelines for further evaluating Western Cape primary science teachers' thinking. Based on the results of Kanjee's studies with South African teachers (i.e., Kanjee, 2020; Kanjee & Mthembu, 2015; Schuld et al., 2017), there is a possibility that the participating teachers in the present study may be unaware of the purpose of formative assessment, which resulted in a

nonhierarchical or simple model of *TCoA-WC* as well as an absence of endorsement of any factor.

Overall, Brown's studies related to the validation of *TCoA-III A* studies in different jurisdictions noted some deviation in factor structures and, consequently, differences in conceptions of assessment that teachers have endorsed in each study. The above studies (Brown et al., 2009; Brown & Michaelides, 2011) have been conducted in different cultural contexts (i.e., Western and Asian societies). Across cultures, learners and teachers view assessments differently (Brown et al., 2009). *TCoA-III A* and *TCoA-WC* also have been developed in different educational cultures. The *TCoA-III A* model was created with Queensland teachers when Queensland had education policies that allowed a period of one to 10 years of schooling without any assessments (Brown et al., 2011). Queensland's assessment policies did not require any common achievement standards or compulsory common assessments (Brown et al., 2011). Conversely, *TCoA-WC* was developed in the Western Cape, South Africa. The South African current assessment policy clearly defines achievement standards (DBE, 2011) for primary school learners. Therefore, apart from the issue of sample size, differences in the factor structure of *TCoA-III A* and *TCoA-WC* may also be attributed to cultural differences in the education system between Queensland and South Africa.

Further, Table 4.1 (p.83) shows the presence of low factor loading (i.e., below .3) or negative factor loading. According to Ximenez (2009), the low factor loadings could be due to the presence of low reliability of the associated factor. On the other hand, Barnes et al. (2015) suggest that the low factor loading could also

be due to the high scores associated with other items of the same factor. Nevertheless, the overall Cronbach's Alpha values (Table 4.1, p.83) for the four factors extracted from the *TCoA-WC* data showed adequate internal consistency or reliability.

The theoretical relationship proposed by the *TCoA-III*A model was evaluated against the *TCoA-WC* model using various fit indices. These fit indices (Chapter 4, p. 94) were generated during the confirmatory factor analysis (Chapter 4, p. 90) with the *TCoA-WC* data. The four different model fit indices, namely, the Chi-square test, Comparative fit index, Root mean square of approximation, and Tucker-Lewis index evaluated for the *TCoA-WC* model confirmed that the *TCoA-III*A model fitted the *TCoA-WC* data matrix well.

To summarise, the validity of *TCoA-III*A for use with Western Cape primary school science teachers was analysed and confirmed by establishing conceptual, idiomatic, and linguistic equivalences of *TCoA-III*A items in a local context, by analysing its reliability through Cronbach's alpha values, by validating the internal structure of the *TCoA-WC inventory* through confirmatory factor analysis (CFA), and by comparing the model fit statistical analyses with the obtained data. The results of the reliability analysis of four factors, namely, *School Accountability*, *Learner Accountability*, *Improvement*, and *Irrelevance*, exhibited adequate to good internal consistency. In addition, the results of the fit indices from the CFA analysis were consistent with the overall fit statistics recommendations. In other words, the results of fit indices confirmed that the *TCoA-WC* data has theoretical support for using the *TCoA-III*A model in the Western Cape context. Thus, it can be inferred

from the reliability analysis based on Cronbach's alpha values and validity analysis based on confirmatory factor analysis (i.e., psychometric analyses) that the *TCoA-WC* inventory can be used to analyse conceptions of formative assessment of Western Cape primary school science teachers.

***RQ2: What are the conceptions of formative assessment held by Western Cape primary school science teachers?***

The conceptions of the formative assessment held by Western Cape primary school science teachers were determined based on the results obtained through CFA analysis of *TCoA-WC* data (Figure 4.1, p.90; Table 4.2, p.92). The CFA analysis yielded four factors with underlying 27 items measuring Western Cape primary school science teachers' conceptions of formative assessment. The factor loading matrix of four factors with underlying 27 items did not show any cross-loadings of the items. These four factors identified in the CFA analysis of the *TCoA-WC* data were labelled with reference to Brown's (2006) descriptions of item assignments and interpretation, that is, "*School Accountability*", "*Learner Accountability*", "*Improvement*", and "*Irrelevance*". The variance shared by the items related to the four identified factors ranged from 30% to 50% with their respective items. Also, the examination of configural invariance of *TCoA-WC* data through CFA analysis corroborated the grouping of identical items under the same category as observed in the *TCoA-III A* inventory (Chapter 5, p. 120), meaning that the same paths are admissible to the Western Cape teachers despite the differences between languages and educational cultures between Western Cape and Queensland. The four-factor solution was tested by CFA and established an acceptable fit (Chapter 4, p. 94).

However, even after the confirmation of configural invariance and the well-fitting model of *TCoA-WC* data to the *TCoA-III A* inventory model, the CFA results did not reveal Western Cape primary science teachers endorsing or rejecting any specific conception of assessment. Nevertheless, the CFA results of *TCoA-WC* data confirmed the presence of four conceptions of assessment in the thinking of Western Cape primary school science teachers, namely, *School Accountability*, *Learner Accountability*, *Improvement*, and *Irrelevance*.

In terms of endorsement of particular conceptions of assessment, teachers have been found to endorse different conceptions of assessment in the studies that attempted to validate *TCoA-III A* inventory in various countries. For example, 374 Hong Kong primary and secondary school teachers (Brown et al., 2009) strongly associated using assessment for improving teaching and learning with making learners accountable through assessment. Such conceptions held by teachers contributed significantly to adopting examination preparation practices. According to Brown et al. (2009), teachers in Hong Kong may hold these conceptions of assessment because of the influence of Chinese cultural norms and policies regarding examinations as part of school culture. Another cross-cultural exploration to validate *TCoA-III A* (Brown, 2006) was conducted by Brown and Remesal (2012) with pre-service teachers from New Zealand (324 teachers) and Spain (674 teachers). The researchers noted the differences in the measurement models obtained from the two countries as well as teachers' conceptions of assessment. Pre-service teachers from New Zealand demonstrated a higher tendency to perceive assessment as a means of measuring school quality and grading learners, thus

contributing to the improvement of teaching and learning. Conversely, Spanish pre-service teachers exhibited a greater inclination to view assessment as an irrelevant process. Brown and Remesal (2012) suggested that variations in conceptions of assessment between two countries arise from disparities in cultures, educational policies, contextual factors, and demographics.

Taken together, both these explorations (i.e., Brown et al., 2009; Brown & Remesal, 2012) emphasised that educational culture and policies can have an effect on teachers' conceptions of assessment. Considering the DBE (2011) assessment policy's emphasis on improving learner performance through formative assessment practices, it can be expected that teachers in the present study would have endorsed the *Improvement* factor. However, there is a significant difference between the sample sizes between Brown et al. (2009) and Brown and Remesal's (2012) studies compared to the present investigation. The large sample sizes in the former studies facilitated complex statistical analyses, resulting in hierarchical measurement models. Hence, it is anticipated that a repeat study conducted with a larger sample size than was obtained in the present study is likely to lead to the identification of specific conceptions of formative assessment held by science teachers in Western Cape primary schools as well as possible factors that may explain such teachers' endorsement of particular conceptions.

***RQ3: Which demographic variable(s) affect Western Cape primary school science teachers' conceptions of formative assessment?***

MANOVA analyses were conducted to determine whether the demographic variables and four factors from the *TCoA-WC* inventory make a significant

contribution to explaining participating teachers' conceptions of formative assessment which yielded the three statistically significant relationships. The first statistically significant relationship reported in MANOVA results was between *Professional Qualification (Other)* and *School Accountability* (Table 4.3, p.102). The 'Other' category included respondents who did not hold a professional qualification such as a PGCE, certificate, or diploma.

In the educational accountability field, the accountability of schools for their learners is often referred to as performance-based or test-based accountability (Anderson, 2005; Elmore & Fuhrman, 2001; Ehren, Paterson & Baxter, 2020). Test-based accountability is an essential part of South African assessment policy revisions (Chapter 2, p.28), and it still continues to exist (Kanjee & Sayed, 2013). As far as the school accountability system in South African schools is concerned, Spaul (2015) asserts that it is hindered by teachers' weak content knowledge or incompetence when it comes to delivering curricula. In the present study, 54% of respondents were not specialised in teaching *Natural Sciences and Technology* (NST) (Chapter 4, p.81). In addition, respondents with 'Other' qualifications did not hold professional qualifications for teaching. Consequently, the lack of professional qualifications and non-specialisation in NST among respondents might explain why respondents with 'Other' professional qualifications were less inclined to hold schools and teachers accountable for learners' success through formative assessments than their B.Ed. counterparts.

As part of their accountability to learners, teachers are responsible for providing quality instruction in the classroom (Maphosa, Mutekwe, Machingambi,

Wadesango, & Ndofirepi, 2012) and implementing meaningful assessment forms (O'Shea, 2020). However, the literature review of South African teachers' conceptions of assessment (Chapter 2, p.45) revealed that teachers at all levels and all types of schools still struggle to use formative assessment effectively. Therefore, if formative assessments are not being used effectively in classrooms, it may indicate a paucity of quality instruction and a lack of meaningful assessment forms. Shalem (2003) recommends identifying and providing teachers with the particular learning opportunities that they require in order to sustain different educational reforms (e.g., the introduction of formative assessment). Given the significant relationship found between *School Accountability* and *Professional Qualifications (Other)*, it would be beneficial for teachers with 'Other' qualifications to receive special learning opportunities with respect to formative assessment. Such learning opportunities will enable them to improve their skills and knowledge with respect to formative assessment.

The MANOVA results reported a second statistically significant relationship between *Professional Qualifications (Other)* and *Learner Accountability* (Table 4.3, p.102). It is evident from this relationship that respondents with *Professional Qualifications (Other)* were less likely to consider learners to be held accountable for their performance in formative assessment compared to their B.Ed. counterparts.

Brown (2008) suggests that the accountability of learners can be demonstrated by their improved performance in assessments. The literature on formative assessment indicates that learners are the key players in their own

learning journey through formative assessments (Chapter 2, p.19; 21). Learning occurs when the learners are engaged in different tasks that promote higher-order thinking, either individually or collaboratively with their peers (Chapter 2, p.20, 21). At the same time, the literature on formative assessment also reveals that teachers play a crucial role in formative assessments by offering learners constructive feedback on their performance in formative assessments (Chapter 2, p.20). Hence, formative assessment is a collaborative effort between learners, peers, and teachers. Therefore, it is crucial to understand that learners bear some degree of accountability for their performance in formative assessments.

As far as the accountability of learners in South African schools is concerned, a recent study by Mgoqi and Schudel (2021) with Grade Seven *Natural Sciences and Technology* teachers in Cape Town, Western Cape, provided important insights for maximising the accountability of learners. In order to improve learners' higher-order thinking in the *Natural Sciences* and foster accountability of learners through formative assessments, Mgoqi and Schudel (2021) advised teachers to have a certain set of abilities. These include that before assessing learners, teachers should be clear about the goal of the assessment and ensure that low-, medium-, and high-order thinking requirements are consistently presented within assessment tasks and rubrics. In addition, the assessment criteria should be logically arranged within rubrics. However, arranging formative assessment tasks in such a skillful manner would require a teacher with deep Natural Science content knowledge and a thorough acquaintance with formative assessment strategies. In the present study, the respondents grouped under

*Professions Qualifications (Other)* were not professionally qualified to teach *Natural Science*. Hence, it becomes imperative to provide training about the skillful implementation of formative assessment in Natural Sciences classrooms to the teachers who lack professional qualifications in teaching *Natural Sciences and Technology*. This will enable teachers to enhance their learners' performance through formative assessments, thereby promoting accountability among learners.

The third statistically significant relationship identified through MANOVA was reported between the respondents grouped under *Professional Qualifications (PGCE)* and *Irrelevance*. Teachers who hold PGCE qualifications were more likely to view the process of formative assessment as unhelpful to the teaching and learning process when compared to their counterparts with B.Ed. degrees. This relationship may be attributed to the structural difference between the two teacher qualifications in South Africa. Although the PGCE qualification is unique, it does present certain challenges. The South African Council on Higher Education (CHE, 2010) points out some of the concerns related to the PGCE qualification.

To begin with, PGCE is a one-year academic qualification that serves as a 'capping' qualification after completing a Bachelor's degree (Bitzer, Botha, & Menkwel, 2008). One of the crucial aspects of PGCE is to develop specialised pedagogical content knowledge (PCK) among novice practitioners (*National Qualifications Framework Act No. 67 of 2008, Government Gazette 38487, 2015*). To help novice practitioners cultivate their PCK effectively, it is crucial that they have a sound understanding of the fundamental principles and techniques of a specific discipline and can communicate them in a way that is easily

comprehensible to their learners. Also, they need to be able to create suitable learning opportunities for learners and develop appropriate assessment methods for learners (*National Qualifications Framework Act No. 67 of 2008*, Government Gazette 38487, 2015). Consequently, in order to design educational activities and assessments in *Natural Sciences and Technology*, teachers must possess a strong understanding of PCK in *Natural Science and Technology*.

Secondly, the implementation of school-based teaching practices by PGCE or B.Ed. students is a crucial aspect of teacher qualification programs in South Africa (Government Gazette 38487, 2015). Such practices are crucial for the development of a practical understanding of teaching and learning, which includes the implementation of diverse assessment methods in South African schools (Government Gazette 38487, 2015). However, there is a difference between the time frame defined for school-based practices for PGCE and B.Ed. programme. The B.Ed. students are required to spend a minimum of 20 weeks to a maximum of 32 weeks during the duration of 4 years, whereas PGCE students are required to spend a minimum of eight weeks and a maximum of 12 weeks during the duration of one year. Thus B.Ed. students get more time to develop a strong PCK and practical knowledge on the implementation of assessments in specific disciplines compared to PGCE students. In other words, due to the structural differences between PGCE and B.Ed. the programme, the B.Ed. students are presented with greater opportunities to cultivate a robust PCK and foster favourable conceptions of assessment towards the implementation of school-based assessments compared to PGCE students. Therefore, the third statistically

significant relationship obtained in this study necessitates a deeper analysis of conceptions of assessment of respondents with PGCE professional qualifications.

Regardless of the professional qualification a teacher holds, Hofmeyer (2015, pg.11) opines:

A qualified teacher is not the same as a good teacher. While a qualified teacher in South Africa is one who has at least four years of post-school ITE, not all qualified teachers are competent professionals able to provide quality teaching and learning.

Steyn (2008) supports this viewpoint, indicating that South African teachers are not yet prepared to meet the educational demands of growing democracy in the 21<sup>st</sup> century. In terms of professional competence, the South African Education Council (SACE, 2018) has set a standard for professional teaching and conduct, tailored to suit the South African context. Acquiring these skills can help South African teachers achieve professional competency in teaching, leading to improved school-based assessment practices in schools across the country.

**RQ:4 Which formative assessment practices are preferred by Western Cape primary school science teachers?**

To find out the answer to this question, Western Cape primary school science teachers were asked to indicate their classroom practices during formative assessments. A frequency distribution analysis (Table 4.4, p.106) was used to analyse teachers' self-reported practices. Among the variety of practices, Western

Cape primary school science teachers preferred to assess learners based on their written work.

Similar to the results of the present study, Mgoqi (2019) reported that in primary schools' *Natural Sciences* classrooms in the Western Cape, teachers predominantly assess learners using written work during formative assessments. The majority of teacher respondents in Mgoqi's (2019) study used the traditional pen and paper method. However, assessing learners based on their written work is a typically teacher-controlled traditional assessment method (Quansah, 2018), in which learners simply follow the instructions given by their teachers. Formative assessments, on the other hand, demand learners to engage in their own assessment and to think about their own progress in terms of what it means to get better (Black & Wiliam, 1998a). Therefore, it is imperative for teachers to possess a comprehensive knowledge of various formative assessment techniques that go beyond written assignments in order to involve learners in their own assessment activities. Despite the fact that teachers in the present study reported formative assessment practices such as conferencing, peer, and self-assessment, these non-written forms were much less prevalent than written forms of assessments among their classroom assessment practices (Table 4.4, p.106). Therefore, it is necessary to train teachers about the innovative forms of formative assessment and how to effectively use them in the *Natural Sciences* classroom.

### **Implications of Findings and Recommendations**

Identifying teachers' conceptions of assessment is useful in understanding differences between the demands of educational policy related to assessments and

teachers' classroom assessment practices (Segers & Tillema, 2011). The current CAPS policy (DBE, 2011) emphasises implementing formative assessment, and therefore, the present study has attempted to explore Western Cape primary school science teachers' conceptions of formative assessment in the first instance by validating *Teachers' Conceptions of Assessment - Western Cape (TCoA-WC)*.

In the Western Cape province, Afrikaans and English are the most commonly spoken languages. Therefore, it was ensured through qualitative analyses that the *TCoA-WC* is conceptually and linguistically equivalent to the cultural and linguistic diversity of the Western Cape province. The validated *TCoA-WC* inventory is made available in three languages simultaneously, that is, English, Afrikaans, and isiXhosa. This unique feature of the inventory maximises the likelihood that respondents understand each item, thereby enhancing the validity of the inventory. The *TCoA-WC* can also serve as a ready research tool for researchers who intend to explore primary teachers' conceptions of assessment in English, Afrikaans, and isiXhosa languages. Further, the *TCoA-WC* may be useful in assessing teachers' conceptions of assessment in other provinces of South Africa if the demographics and cultural factors of each province are considered and the *TCoA-WC* is adapted accordingly.

The qualitative and quantitative analyses related to the validity of *TCoA-WC* confirmed that the *TCoA-WC* inventory developed through the traditional adaptation processes has similar traits to that of the *TCoA-III A* inventory. After validating the *TCoA-WC* in the Western Cape context with practicing primary science teachers, the next step is to investigate the conceptions of assessment these

teachers endorse and how that conception(s) influence their classroom assessment practices. One of the approaches, as suggested by Daniels, Poth, Papile, and Hutchinson (2018), is to observe teachers' classroom assessment practices to determine if their existing conceptions have an impact on their assessment practices. It is also necessary to examine if those practices remain committed to the expectations of the current assessment policy (i.e., DBE, 2011). If the teachers' existing conceptions of assessment and practices differ from the expectations set by the DBE (2011), it is necessary to refine those conceptions and guide teachers toward a better understanding of the current formative assessment approaches. The role of teacher education is absolutely critical in this process. Brown (2004) insists that in-service teacher education should help teachers to be aware of their existing conceptions of assessment. After becoming aware of their own conceptions in this regard, an intervention related to assessment may assist teachers in aligning their assessment practices with current assessment policies. Brown (2004) and Brown and Harris (2008) suggest that such interventions can also be offered to pre-service teachers in order to give them the best chance of being successful in implementing assessment reforms in the future. Brief in-class interventions have also been proven to be effective in enhancing teachers' assessment literacy (Smith, Worsfold, Davies, Fisher, & McPhail, 2013)

Further, the small sample size of the present study limited the use of complex statistical analyses and also resulted in hierarchical differences between *TCoA-III*A and *TCoA-WC* measurement models. Hence, it is recommended that the research be repeated with a considerably larger sample size of over 500 participants. The

discussion on the CFA factor structure (p.122) also highlighted that in different educational cultures, teachers have different conceptions of assessment. Therefore, the conceptions of assessment of another South African culture (i.e., the teachers belonging to another South African language group), could be explored as part of a new research agenda.

MANOVA results revealed that the various levels of professional qualifications could have an impact on teachers' conceptions of formative assessment. Especially teachers who do not possess professional qualifications for teaching could consider the purpose of formative assessment differently than professionally qualified teachers. Effective evaluation skills possessed by professionally qualified teachers are crucial for ensuring quality teaching, which leads to an overall improvement in school effectiveness and enhancement of educational standards. Considering the fact that teachers of *Natural Sciences and Technology* in Western Cape primary schools are not always professionally qualified and the fact that written forms of assessment are the most dominant formative assessment practice among participants in the present study, in-service and pre-service teacher professional development could be useful for developing the essential professional competencies among primary school *Natural Sciences and Technology* teachers in the area of formative assessment.

### **Significance of the Study**

Based on the current assessment policy's (i.e., DBE, 2011) emphasis on formative assessment, the motivation to conduct this study was to provide data on how teachers in primary schools conceive formative assessment and they

implement formative assessment practices. Currently, very little data exists on primary school science teachers' conceptions of formative assessment in the Western Cape or elsewhere in South Africa. The study provided the data by developing a research inventory (*TCoA-WC*) through a comprehensive, cross-cultural adaptation process. As a result, the *TCoA-WC* inventory is conceptually, linguistically, and culturally appropriate for use in the Western Cape province.

It is anticipated that the study will contribute positively to the ongoing debate on assessment as it has identified four conceptions of formative assessment that exist in the thinking of Western Cape primary school science teachers. Hence, the meaningful use of *TCoA-WC* inventory can potentially contribute to the field of teachers' conceptions and formative assessment. Moreover, the *TCoA-WC* inventory is relatively short, not particularly time-consuming, and is available in three languages simultaneously. Therefore, it is anticipated that it will be useful for future researchers as well as teacher professional development initiatives to make teachers' conceptions of formative assessment explicit.

### **Conclusion**

This study has developed an inventory that can be used to determine teachers' conceptions of formative assessment and shed light on primary science teachers' conceptions and practices of formative assessment in the Western Cape. It is hoped that by using this information, teacher professional development initiatives will be able to help teachers implement formative assessment practices in a way that aligns with DBE (2011) policy, thereby enhancing the performance of learners.



## REFERENCES

- Ahmedi, V. (2019). Teachers' attitudes and practices towards formative assessment in primary schools. *Journal of Social Studies Education Research*, 10(3), 161-175. <https://www.learntechlib.org/p/216460/>.
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social psychology*, 32(4), 665-683. <https://doi.org/10.1111/J.1559-1816.2002.TB00236.X>
- Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections. *Psychology & Health*, 26(9), 1113-1127. <https://www.tandfonline.com/doi/full/10.1080/08870446.2011.613995?scroll=top&needAccess=true&role=tab>
- Alavi, M., Visentin, D. C., Thapa, D. K., Hunt, G. E., Watson, R., & Cleary, M. L. (2020). Chi-square for model fit in confirmatory factor analysis. *Journal of Advanced Nursing*. 76(9). 2209-2211. <httpAPPS://doi.org/10.1111/jan.14377>
- Almeida, A. B., Rosistolato, R. P., & Cerdeira, D. G. (2022). Conceptions and assessment practices in Rio de Janeiro municipal schools. *Ensaio: Avaliação e Políticas Públicas em Educação*, 30, 920-941. <https://doi.org/10.1590/S0104-40362022003003593>
- Anderson, J. A. (2005). *Accountability in education*. Paris: International Institute for Educational Planning. <https://unesdoc.unesco.org/ark:/48223/pf0000140986>
- Andrade, H. L. (2010). Students as the definitive source of formative assessment. *Handbook of Formative Assessment*, 90-105.

[https://digitalcommons.lib.uconn.edu/cgi/viewcontent.cgi?article=1007&context=nera\\_2010](https://digitalcommons.lib.uconn.edu/cgi/viewcontent.cgi?article=1007&context=nera_2010)

Azis, A. (2012). Teachers' conceptions and use of assessment in student learning. *Indonesian Journal of Applied Linguistics*, 2(1), 40-52.

[http://file.upi.edu/Direktori/FPBS/JUR.\\_PEND.\\_BAHASA\\_INGGRIS/196706091994031-DIDI\\_SUKYADI/4.%20Astuti%20Azis-41-52%20final.pdf](http://file.upi.edu/Direktori/FPBS/JUR._PEND._BAHASA_INGGRIS/196706091994031-DIDI_SUKYADI/4.%20Astuti%20Azis-41-52%20final.pdf)

Babbie, E. R. (2016). *The Practice of Social Research* (14th ed.). Boston: Cengage Learning.

<https://ebookcentral.proquest.com/lib/uoct/detail.action?docID=4332975&pq-origsite=primo>

Baird, J. A., Andrich, D., Hopfenbeck, T. N., & Stobart, G. (2017). Assessment and learning: Fields apart?. *Assessment in Education: Principles, Policy & Practice*, 24(3), 317-350. <https://doi.org/10.1080/0969594X.2017.1319337>

Bandalos, D., Finney, S. (2010). Factor analysis. Exploratory and confirmatory. In G. R. Hancock, R. O. Mueller, & L. M. Stapleton, (Eds.), *The reviewer's guide to quantitative methods in the social sciences* (pp. 93-114). Routledge: New York. <http://ndl.ethernet.edu.et/bitstream/123456789/25490/1/6.pdf.pdf>

Bantwini, B. (2017). Analysis of teaching and learning of natural sciences and technology in selected Eastern Cape province primary schools, South Africa. *Journal of Education*, (67), 39-64. <https://doi.org/10.17159/2520-9868/i67a02>

- Barnes, N., Fives, H., & Dacey, C. M. (2015). Teachers' beliefs about assessment. In H. Fives, & M. G. Gill (Eds.), *The handbook of research on teachers' beliefs* (pp. 229-233). Routledge: New York.  
[https://www.montclair.edu/profilepages/media/6109/user/Barnes\\_et\\_al\\_2015\\_teachers\\_beliefs\\_about\\_assessment.pdf](https://www.montclair.edu/profilepages/media/6109/user/Barnes_et_al_2015_teachers_beliefs_about_assessment.pdf)
- Beaton, D., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2007). Recommendations for the cross-cultural adaptation of the DASH & QuickDASH outcome measures. *Institute for work & health*, 1(1), 1-45.  
[https://dash.iwh.on.ca/sites/dash/files/downloads/cross\\_cultural\\_adaptation\\_2007.pdf](https://dash.iwh.on.ca/sites/dash/files/downloads/cross_cultural_adaptation_2007.pdf)
- Beets, P. (2012). An analysis of education assessment policies in South Africa after 1994. *Journal of Social Sciences*, 33(1), 5-19.  
<https://doi.org/10.1080/09718923.2012.11893082>
- Bell, B., & Cowie, B. (2001). The characteristics of formative assessment in science education. *Science Education*, 85(5), 536–553. <https://doi.org/10.1002/sce.1022>
- Bennett, R. (2011). Formative assessment: a critical review, *Assessment in Education: Principles, Policy & Practice*, 18(1), 5-25.  
<https://doi.org/10.1080/0969594X.2010.513678>
- Berry, R. (2011). Assessment reforms around the world. In R. Berry & B. Adamson (Eds), *Assessment Reform in Education. Education in the Asia-Pacific Region: Issues, Concerns and Prospects* (pp. 89-102). Springer: Dordrecht.  
[https://doi.org/10.1007/978-94-007-0729-0\\_7](https://doi.org/10.1007/978-94-007-0729-0_7)

Birenbaum, M., DeLuca, C., Earl, L., Heritage, M., Klenowski, V., Looney, A., ... & Wyatt-Smith, C. (2015). International trends in the implementation of assessment for learning: Implications for policy and practice. *Policy Futures in Education*, 13(1), 117-140.

<https://journals.sagepub.com/doi/pdf/10.1177/1478210314566733>

Bitzer, E., Botha, J., & Menkveld, H. (2008). The review of teacher education programmes and transformational quality. *South African Journal of Higher Education*, 22(6), 1172-1184. <https://journals.co.za/doi/pdf/10.10520/EJC37502>

Black, P., & Wiliam, D. (1998a). Assessment and classroom learning. *Assessment in Education: principles, policy & practice*, 5(1), 7-74.

<https://doi.org/10.1080/0969595980050102>

Black, P., & Wiliam, D. (1998b). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, 80(2), 139-144.

<https://doi.org/10.1177/003172171009200119>

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability (formerly: Journal of Personnel Evaluation in Education)*, 21(1), 5-31.

<https://link.springer.com/article/10.1007/s11092-008-9068-5>

Black, P., & Wiliam, D. (2018). Classroom assessment and pedagogy. *Assessment in Education: Principles, Policy & Practice*, 25(6), 551-575.

<https://www.tandfonline.com/doi/abs/10.1080/0969594X.2018.1441807>

Borsa, J. C., Damásio, B. F., & Bandeira, D. R. (2012). Cross-cultural adaptation and validation of psychological instruments: Some considerations. *Paidéia*

- (*Ribeirão Preto*), 22, 423-432. <https://doi.org/10.1590/S0103-863X2012000300014>
- Box, C., Skoog, G., & Dabbs, J. M. (2015). A case study of teacher personal practice assessment theories and complexities of implementing formative assessment. *American Educational Research Journal*, 52(5), 956-983. <https://doi.org/10.3102/0002831215587754>
- Bray, J. H., & Maxwell, S. E. (1985). *Multivariate analysis of variance*. SAGE: Thousand Oaks, CA. <https://doi.org/10.4135/9781412985222>
- Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-cultural psychology*, 1(3), 185-216. <https://doi.org/10.1177%2F135910457000100301>
- Brown, G. (2002). Teachers' conceptions of assessment. (Doctoral dissertation, University of Auckland). University of Auckland Archive. <https://researchspace.auckland.ac.nz/handle/2292/63>
- Brown, G. (2004). Teachers' conceptions of assessment: Implications for policy and professional development. *Assessment in Education: Principles, Policy & Practice*, 11(3), 301-318. <https://doi.org/10.1080/0969594042000304609>
- Brown, G. (2006). Teachers' conceptions of assessment: Validation of an abridged version. *Psychological Reports*, 99(1), 166-170. <https://doi.org/10.2466%2Fpr0.99.1.166-170>
- Brown, G. T. (2008). *Conceptions of assessment: Understanding what assessment means to teachers and students*. New York: Nova Science Publishers.

- Brown, G. T. (2011). Teachers' conceptions of assessment: Comparing primary and secondary teachers in New Zealand. *Assessment Matters*, 3, 45-70. <http://hdl.handle.net/2292/24816>
- Brown, G. T. (2017). *Assessment of student achievement*. Routledge: New York. <https://doi.org/10.4324/9781315162058>
- Brown, G., & Gao, L. (2015). Chinese teachers' conceptions of assessment for and of learning: Six competing and complementary purposes. *Cogent Education*, 2(1), 1-19. <https://doi.org/10.1080/2331186X.2014.993836>
- Brown, G., & Harris, L. (2008). Unintended consequences of using tests to improve learning: How improvement-oriented resources heighten conceptions of assessment as school accountability. *Journal of Multidisciplinary Evaluation*, 6(12), 68-91. <https://doi.org/10.56645/jmde.v6i12.236>
- Brown, G. T., Hui, S. K., Yu, W. M., & Kennedy, K. J. (2011). Teachers' conceptions of assessment in Chinese contexts: A tripartite model of accountability, improvement, and irrelevance. *International Journal of Educational Research*, 50(5-6), 307-320. Th <https://doi.org/10.1016/j.ijer.2011.10.003>
- Brown, G. T., Kennedy, K. J., Fok, P. K., Chan, J. K. S., & Yu, W. M. (2009). Assessment for student improvement: Understanding Hong Kong teachers' conceptions and practices of assessment. *Assessment in Education: Principles, Policy & Practice*, 16(3), 347-363. <https://doi.org/10.1080/09695940903319737>

- Brown, G., Lake, R., & Matters, G. (2011). Queensland teachers' conceptions of assessment: The impact of policy priorities on teacher attitudes. *Teaching and Teacher Education*, 27(1), 210-220. <https://doi.org/10.1016/j.tate.2010.08.003>
- Brown, G. T. L., & Michaelides, M. P. (2011). Ecological rationality in teachers' conceptions of assessment across samples from Cyprus and New Zealand. *European Journal of psychology of Education*, 26, 319-337. <https://link.springer.com/article/10.1007/s10212-010-0052-3>
- Brown, G., & Remesal, A. (2012). Prospective teachers' conceptions of assessment: A cross-cultural comparison. *The Spanish Journal of Psychology*, 15(1), 75-89. <https://www.scirp.org/%28S%28351jmbntvnsjt1aadkposzje%29%29/reference/referencespapers.aspx?referenceid=2870667>
- Brown, T. A., & Moore, M. T. (2012). Confirmatory factor analysis. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling*, (pp. 361-37). New York: Guilford Publications. [https://www.researchgate.net/profile/Michael-Moore-75/publication/251573889\\_Hoyle\\_CFA\\_Chapter\\_-\\_Final/links/0deec51f14d2070566000000/Hoyle-CFA-Chapter-Final.pdf](https://www.researchgate.net/profile/Michael-Moore-75/publication/251573889_Hoyle_CFA_Chapter_-_Final/links/0deec51f14d2070566000000/Hoyle-CFA-Chapter-Final.pdf)
- Browne, E. (2016). *Evidence on formative classroom assessment for learning. Knowledge, Evidence and learning for development*. Helpdesk report. (pp. 1-32). Brighton, Institute of Development Studies: UK, <https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/13209/003%20Classroom%20Assessments%20v3.pdf?sequence=1>
- Burger, A., & Silima, T. (2006). Sampling and sampling design. *Journal of Public Administration*, 41(3), 656-668. <https://hdl.handle.net/10520/EJC51475>

- Calveric, S. (2010). *Elementary teachers' assessment beliefs and practices*. (Doctor of Philosophy dissertation, Virginia Commonwealth University), Virginia Commonwealth University Archive. <https://doi.org/10.25772/0XTP-8W56>
- Carver, R. (1978). The case against statistical significance testing. *Harvard Educational Review*, 48(3), 378-399.  
<https://doi.org/10.17763/haer.48.3.t490261645281841>
- Chappuis, S., & Stiggins, R. (2008). Finding balance: Assessment in the middle school classroom. *Middle Ground*, 12(2), 12-15.  
<http://rapps.pbworks.com/f/Finding+Balance-+MS.pdf>
- Chou C. P., & Bentler, P. M. (1995). Estimates and tests in structural equation modeling. In R. H. Hoyle (Ed.), *Structural equation modeling: concepts, issues, and applications* (pp. 37-55). Sage: Thousand Oaks, CA.
- Churchill Jr, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 16(1), 64-73.  
<http://www.jstor.org/stable/3150876?origin=JSTOR-pdf>
- Clarke, M. (2012). *What matters most for student assessment systems: a framework paper*. Systems Approach for Better Education Results (SABER) student assessment working paper no. 1. World Bank: Washington, DC.  
<http://documents.worldbank.org/curated/en/216631468149691772/What-matters-most-for-student-assessment-systems-a-framework-paper>
- Cohen, L., Manion L., & Morrison K. (2002). *Research Methods in Education*. (5th ed.). RoutledgeFalmer: London.

- Colapietro, V. (2006). Toward a pragmatic conception of practical identity. *Transactions of the Charles S. Peirce Society*, 173-205. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.732.156&rep=rep1&type=pdf>
- Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis*. Hillsdale, NJ: Erlbaum.
- Cook, R. D., & Weisberg, S. (1982). *Residuals and influence in regression*. Chapman and Hall: New York.
- Cook-Sather, A. (2010). Students as learners and teachers: Taking responsibility, transforming education, and redefining accountability. *Curriculum Inquiry*, 40(4), 555-575. [https://repository.brynmawr.edu/cgi/viewcontent.cgi?article=1010&context=edu\\_pubs](https://repository.brynmawr.edu/cgi/viewcontent.cgi?article=1010&context=edu_pubs)
- Cowie, B., & Bell, B. (1999). A Model of Formative Assessment in Science Education, *Assessment in Education: Principles, Policy & Practice*, 6(1), 101-116. <https://doi.org/10.1080/09695949993026>
- Cox, D. R., & Snell, E. J. (1968). A general definition of residuals. *Journal of the Royal Statistical Society: Series B (Methodological)*, 30(2), 248-265. <https://doi.org/10.1111/j.2517-6161.1968.tb00724.x>
- Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative and Mixed Method Approaches* (3rd ed.). Los Angeles: SAGE.

- Crichton, H., & McDaid, A. (2015). Learning intentions and success criteria: learners' and teachers' views. *The Curriculum Journal*, 27(2), 190-203.  
<https://doi.org/10.1080/09585176.2015.1103278>
- Dada, F., Dipholo, T., Hoadley, U., Khembo, E., Muller, S. & Volmink, J. (2009). *Report of the task team for the review of the implementation of the National Curriculum Statement*. Department of Basic Education: Pretoria.  
[https://www.gov.za/sites/default/files/gcis\\_document/201409/reviewimplncs.pdf](https://www.gov.za/sites/default/files/gcis_document/201409/reviewimplncs.pdf)
- Daniels, L. M., Poth, C., Papile, C., & Hutchison, M. (2014). Validating the conceptions of assessment-III scale in Canadian preservice teachers. *Educational Assessment*, 19(2), 139-158.  
<https://doi.org/10.1080/10627197.2014.903654>
- Darmody, M., Lysaght, Z., & O'Leary, M. (2020). Irish post-primary teachers' conceptions of assessment at a time of curriculum and assessment reform. *Assessment in Education: Principles, Policy & Practice*, 27(5), 501-521.  
<https://doi.org/10.1080/0969594X.2020.1761290>
- Davis, L. L. (1992). Instrument review: Getting the most from a panel of experts. *Applied Nursing Research*, 5(4), 194-197. [https://doi.org/10.1016/S0897-1897\(05\)80008-4](https://doi.org/10.1016/S0897-1897(05)80008-4)
- Dayal, H (2021). Secondary mathematics teachers' conceptions of assessment. In Y. H. Leong, B. Kaur, B. H. Choy, J. B. W. Yeo, & S. L. Chin (Eds.), *Excellence in Mathematics Education: Foundations and Pathways* (Proceedings of the 43rd

annual conference of the Mathematics Education Research Group of Australasia) (pp. 179-186). MERGA: Singapore.

<https://files.eric.ed.gov/fulltext/ED616215.pdf>

Delandshere, G., & Jones, J. H. (1999). Elementary teachers' beliefs about assessment in mathematics: A case of assessment paralysis. *Journal of Curriculum and Supervision*, 14(3), 216.

Department of Basic Education (DBE). (2010). *The Status of the Language of Learning and Teaching (LOLT) in South African public Schools*. Department of Basic Education: Pretoria. <https://evaluations.dpme.gov.za/evaluations/135>

Department of Basic Education (DBE). (2011). *Curriculum and Policy Statement, Grades 4-6. Natural sciences and Technology*. Department of Basic Education: Pretoria.

<https://www.education.gov.za/LinkClick.aspx?fileticket=IzbFrpzoQ44=>

Department of Basic Education (DBE). (n.d.). *ECD Masterlist Data*. Department of Basic Education.

<https://www.education.gov.za/Programmes/EMIS/EMISDownloads.aspx>

Department of Basic Education. (2012). *Action Plan to 2014: Towards the Realisation of Schooling, 2025 - Full version*. Department of Basic Education: Pretoria. [https://edulibpretoria.files.wordpress.com/2013/05/action-plan-to-2014-popular-version\\_1.pdf](https://edulibpretoria.files.wordpress.com/2013/05/action-plan-to-2014-popular-version_1.pdf)

Department of Basic Education. (2013). *Education Districts in South Africa: A review* [Map]. District profiles, small schools and learner migration project for

the national Department of Basic Education (DBE). Retrieved November 25, 2023, from

[https://gis-solutions.co.za/images/downloads/Review\\_of\\_education\\_districts\\_March\\_2013\\_sample\\_pages.pdf](https://gis-solutions.co.za/images/downloads/Review_of_education_districts_March_2013_sample_pages.pdf)

Department of Basic Education. (2018). *Education Statistics in South Africa in 2016*. Department of Basic Education: Pretoria. <https://www.education.gov.za/Portals/0/Documents/Publications/Education%20Statistic%20SA%202016.pdf?ver=2018-11-01-095102-947>

Department of Basic Education. (2021). *Guidelines for Development of the school timetables – reopening of schools Covid-19*. <https://section27.org.za/wp-content/uploads/2020/05/guidelines-for-timetabling.pdf>

Department of Education. (1996). *South African Schools Act, Number 86*. Government Printers: Pretoria. <https://www.gov.za/documents/south-african-schools-act>

Department of Education. (1997). *Curriculum 2005: Lifelong learning for the twenty-first century*. Government Printers: Pretoria. <http://hdl.voced.edu.au/10707/107848>

Department of Education. (1998). *Assessment policy in the general education and training phase: Grade R to 9 and ABET*. Government Gazette No. 19640. Government Printers: Pretoria

Department of Education. (2004). *White paper on e-education*. Government Printers: Pretoria.

[https://www.sahistory.org.za/sites/default/files/white%20paper\\_on\\_e-education\\_2004.pdf](https://www.sahistory.org.za/sites/default/files/white%20paper_on_e-education_2004.pdf)

Department of Education. (2005). *The national protocol on assessment for schools in the general and further education and training band (Grades R–12)*.

Department of Education: Pretoria.

[https://www.gov.za/sites/default/files/gcis\\_document/201409/doefetnationalprotocolassgrader12.pdf](https://www.gov.za/sites/default/files/gcis_document/201409/doefetnationalprotocolassgrader12.pdf)

Department of Education. (2007). *National policy on assessment and qualifications for schools in the General Education and Training band*. Government Gazette, No.29626. Government Printers: Pretoria.

[https://www.greengazette.co.za/documents/government-gazette-29626-of-12-feb-2007-vol-500\\_20070212-GGN-29626.pdf](https://www.greengazette.co.za/documents/government-gazette-29626-of-12-feb-2007-vol-500_20070212-GGN-29626.pdf)

Dixon, H. (1999). *The effect of policy on practice: an analysis of teachers' perceptions of school based assessment practice*. (Master's thesis, Massey University). Massey University: New Zealand.

[https://mro.massey.ac.nz/bitstream/handle/10179/7075/01\\_front.pdf?sequence=1](https://mro.massey.ac.nz/bitstream/handle/10179/7075/01_front.pdf?sequence=1)

Dommeyer, C. J., Baum, P., Chapman, K. S., & Hanna, R. W. (2002). Attitudes of business faculty towards two methods of collecting teaching evaluations: Paper vs. online. *Assessment & Evaluation in Higher Education*, 27(5), 455-462.

<https://doi.org/10.1080/0260293022000009320>

Drost, E. A. (2011). Validity and reliability in social science research. *Education Research and perspectives*, 38(1), 105-123.

<https://www.proquest.com/scholarly-journals/validity-reliability-social-science-research/docview/1020696142/se-2>

Dunn, K. E., & Mulvenon, S. W. (2009). A critical review of research on formative assessments: The limited scientific evidence of the impact of formative assessments in education. *Practical Assessment, Research, and Evaluation*, 14(1), 1-11. <https://doi.org/10.7275/jg4h-rb87>

Dunn, P. K., & Smyth, G. K. (1996). Randomized quantile residuals. *Journal of Computational and Graphical Statistics*, 5(3), 236-244. <https://doi.org/10.2307/1390802>

Earl, L. (2006). Assessment - a powerful lever for learning. *Brock Education Journal*, 16(1), 1-16.

[https://www.researchgate.net/publication/265188352\\_Assessment\\_-\\_A\\_Powerful\\_Lever\\_for\\_Learning](https://www.researchgate.net/publication/265188352_Assessment_-_A_Powerful_Lever_for_Learning)

Edwards, J. G. (2013). Peer assessment in the classroom. *The Companion to Language Assessment*, 2, 730-750.

<https://doi.org/10.1002/9781118411360.wbcla002>

Ehren, M., Paterson, A., & Baxter, J. (2020). *Accountability, capacity and trust to improve learning outcomes in South Africa*. Foreign, Commonwealth & Development Office: UK. <https://www.jet.org.za/resources/comparative-case-study-report.pdf/view>

Elmore, R. F., & Fuhrman, S. H. (2001). Holding schools accountable: Is it working?. *Phi Delta Kappan*, 83(1), 67-72.

[https://repository.upenn.edu/gse\\_pubs/8](https://repository.upenn.edu/gse_pubs/8)

Etikan, I., & Bala, K. (2017). Sampling and sampling methods. *Biometrics & Biostatistics International Journal*, 5(6), 1-3.

<http://dx.doi.org/10.15406/bbij.2017.05.00149>

Evans, J. R., & Mathur, A. (2018). The value of online surveys: A look back and a look ahead. *Internet Research*, 28(4), 854-887.

<https://www.emerald.com/insight/content/doi/10.1108/IntR-03-2018-0089/full/html>

Fabrigar, L. R., & Wegener, D. T. (2014). Exploring causal and noncausal hypotheses in nonexperimental data. In Harry T. Reis and Charles M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (2<sup>nd</sup> ed., pp. 504-533). Cambridge University Press: Cambridge.

<https://doi.org/10.1017/CBO9780511996481.024>

Farrell, A. M., & Rudd, J. M. (2009, November 30-December 2). *Factor analysis and discriminant validity: A brief review of some practical issues*. Australia and New Zealand Marketing Academy Conference 2009. Anzmac: Australia.

[https://publications.aston.ac.uk/id/eprint/7644/1/factor\\_analysis\\_ANZMAC\\_2009.pdf](https://publications.aston.ac.uk/id/eprint/7644/1/factor_analysis_ANZMAC_2009.pdf)

Finch, W. H. (2020). Using fit statistic differences to determine the optimal number of factors to retain in an exploratory factor analysis. *Educational and Psychological Measurement*, 80(2), 217-241.

<https://doi.org/10.1177/0013164419865769>

Finch, W., & French, B. (2015). *Latent variable modelling with R*. Routledge: New York.

- Fives, H., & Buehl, M. (2012). Spring cleaning for the “messy” construct of teachers’ beliefs: What are they? Which have been examined? What can they tell us. *APA Educational Psychology Handbook*, 2, 471-499. <https://psycnet.apa.org/doi/10.1037/13274-019>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <http://www.jstor.org/stable/3151312>
- Frohbieter, G., Greenwald, E., Stecher, B., & Schwartz, H. (2011). *Knowing and Doing: What Teachers Learn from Formative Assessment and How They Use the Information*. CRESST Report 802. National Center for Research on Evaluation, Standards, and Student Testing (CRESST). Retrieved February 15, 2020, from <https://files.eric.ed.gov/fulltext/ED522825.pdf>
- Government Gazette No. 17579. (1996). *The South African Schools Act, No. 84*. Republic of South Africa. Government Printer: Pretoria. [https://www.gov.za/sites/default/files/gcis\\_document/201409/act84of1996.pdf](https://www.gov.za/sites/default/files/gcis_document/201409/act84of1996.pdf)
- Government Gazette No. 37718. (2020). *MTN (pty) ltd 1800mhz and 2100mhz radio frequency spectrum licence universal service obligations as amended*. Independent communication authority of South Africa. Government Printer: Pretoria. <https://gazettes.africa/akn/za/officialGazette/government-gazette/2014-06-04/37718/eng@2014-06-04>
- Government Gazette No. 38487. (2008). *National qualifications framework act no. 67 of 2008*. Republic of South Africa. Government Printer: Pretoria.

[https://www.dhet.gov.za/Teacher%20Education/National%20Qualifications%20Framework%20Act%2067\\_2008%20Revised%20Policy%20for%20Teacher%20Education%20Qualifications.pdf](https://www.dhet.gov.za/Teacher%20Education/National%20Qualifications%20Framework%20Act%2067_2008%20Revised%20Policy%20for%20Teacher%20Education%20Qualifications.pdf)

Government Gazette No. 43599. (2020). *Directions issued in terms of regulation 3(3) of the regulations made under section 27(2) of the Disaster Management Act, 2002 (Act No. 57 of 2002): Criteria to guide the determination of alert levels.*

Department of Health. Government Printer: Pretoria.  
[https://www.gov.za/sites/default/files/gcis\\_document/202008/43599rg11158gon867\\_0.pdf](https://www.gov.za/sites/default/files/gcis_document/202008/43599rg11158gon867_0.pdf)

Government Gazette No. 44772. (2021). *Disaster Management Act 2002: Amendments of Regulations issued in terms of section 27(2) – 27 June 2021.*

Government Notices. Government Printer: Pretoria.  
[https://www.gov.za/sites/default/files/gcis\\_document/202106/44772rg11299gon565.pdf](https://www.gov.za/sites/default/files/gcis_document/202106/44772rg11299gon565.pdf)

Government Gazette No. 44838. (2021). *Disaster Management Act 2002: Amendments of Regulations issued in terms of section 27(2) – 11 July 2021.*

Government Notices. Government Printer: Pretoria.  
[https://www.gov.za/sites/default/files/gcis\\_document/202107/44838rg11306gon610.pdf](https://www.gov.za/sites/default/files/gcis_document/202107/44838rg11306gon610.pdf)

Government Gazette No. 44895. (2021). *Disaster Management Act 2002: Amendments of Regulations issued in terms of section 27(2) – 25 July 2021.*

Government Notices. Government Printer: Pretoria.

[https://www.gov.za/sites/default/files/gcis\\_document/202107/44895rg11314gon651.pdf](https://www.gov.za/sites/default/files/gcis_document/202107/44895rg11314gon651.pdf)

Gebril, A., & Brown, G. T. (2014). The effect of high-stakes examination systems on teacher beliefs: Egyptian teachers' conceptions of assessment. *Assessment in Education: Principles, Policy & Practice*, 21(1), 16-33.

<https://doi.org/10.1080/0969594X.2013.831030>

Gibson, R., Smith, C., Chamberlain, S., Falcon, R. & Gerrans, G. (1997). Science and technology education and the new South African school curriculum. *Journal of the Southern African Institute of Mining and Metallurgy*, 97(4), 175-177.

[https://journals.co.za/doi/pdf/10.10520/AJA0038223X\\_2425](https://journals.co.za/doi/pdf/10.10520/AJA0038223X_2425)

Gipps, C. (1999). Chapter 10: Socio-cultural aspects of assessment. *Review of Research in Education*, 24(1), 355-392.

<https://doi.org/10.3102/0091732X024001355>

Gonzales, R., & Fuggan, C. (2012). Exploring the conceptual and psychometric properties of classroom assessment. *The International Journal of Educational and Psychological Assessment*, 9(2), 45-60. <https://ssrn.com/abstract=1898884>

Goretzko, D., Siemund, K., & Sterner, P. (2023). Evaluating model fit of measurement models in confirmatory factor analysis. *Educational and Psychological Measurement*, 1-22. <https://doi.org/10.1177/00131644231163813>

Govender, P. (2019). Formative assessment as 'formative pedagogy' in Grade 3 mathematics. *South African Journal of Childhood Education*, 9(1), 1-12.

<http://www.scielo.org.za/pdf/sajce/v9n1/46.pdf>

- Green, C., García-Millán, C., & Lucendo-Noriega, A. (2022). *Spotlight: Formative Assessment - Improving learning for every child*. Hundred research report (pp. 1-88). Hundred: Helsinki. <https://hundred.org/en/collections/hundred-2022>
- Griffiths, T., Gore, J., & Ladwig, J. (2006). Teachers' fundamental beliefs, commitment to reform and the quality of pedagogy. *Australian Association for Research in Education Annual Conference*, (pp. 1-38). Australian Association for Research in Education (AARE): Australia. [https://www.researchgate.net/publication/260753161\\_Teachers'\\_fundamental\\_beliefs\\_commitment\\_to\\_reform\\_and\\_the\\_quality\\_of\\_pedagogy](https://www.researchgate.net/publication/260753161_Teachers'_fundamental_beliefs_commitment_to_reform_and_the_quality_of_pedagogy)
- Guillemin, F., Bombardier, C., & Beaton, D. (1993). Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. *Journal of Clinical Epidemiology*, 46(12), 1417-1432. [10.1016/0895-4356\(93\)90142-n](https://doi.org/10.1016/0895-4356(93)90142-n)
- Halverson, K. (2007). *Why teach science in early childhood?* Baidu. <http://wenku.baidu.com/view/b2449c78a26925c52dc5bf04.html>.
- Hambleton, R. K., & Patsula, L. (1998). Adapting tests for use in multiple languages and cultures. *Social Indicators Research*, 45, 153-171. <https://link.springer.com/article/10.1023/A:1006941729637>
- Harlen, W. (2005). Teachers' summative practices and assessment for learning—tensions and synergies. *Curriculum Journal*, 16(2), 207-223. <https://bera-journals.onlinelibrary.wiley.com/doi/abs/10.1080/09585170500136093>
- Harlen, W. (2009). Improving assessment of learning and for learning. *Education*, 3-13, 37(3), 247-257.

<https://www.tandfonline.com/doi/abs/10.1080/03004270802442334>

Harlow, L. L. (2014). *The essence of multivariate thinking: Basic themes and methods*. Routledge: New York.

Harris, L., & Brown, G. (2009). The complexity of teachers' conceptions of assessment: Tensions between the needs of schools and students. *Assessment in Education: Principles, Policy & Practice*, 16(3), 365-381.

<https://doi.org/10.1080/09695940903319745>

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81-112. <https://doi.org/10.3102/003465430298487>

Heritage, M. (2007). Formative assessment: What do teachers need to know and do? *Phi Delta Kappan*, 89(2), 140-145.

<https://doi.org/10.1177/003172170708900210>

Hofmeyer, J. (2015). *Teachers in South Africa: Supply and demand 2013-2025*.

Centre for Development and Enterprise. Technical Report. Africa portal: Johannesburg. <https://www.africaportal.org/publications/teachers-south-africa-supply-and-demand-2013-2025/>

Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods*, 6(1), 53-60.

<https://academic-publishing.org/index.php/ejbrm/article/view/1224/1187>

Hu, L., & Bentler, P. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives, *Structural Equation*

- Modeling: A Multidisciplinary Journal*, 6(1), 1-55.  
<https://doi.org/10.1080/10705519909540118>
- Hui, C. H., & Triandis, H. C. (1985). Measurement in cross-cultural psychology: A review and comparison of strategies. *Journal of Cross-cultural Psychology*, 16(2), 131-152. <https://doi.org/10.1177/0022002185016002001>
- Huston, H. L. (1993). *Meaningfulness, Statistical Significance, Effect Size, and Power Analysis: A General Discussion with Implications for MANOVA*. Mid-South Educational Research Association conference, November 9-12, 1993, New Orleans: LA. <https://files.eric.ed.gov/fulltext/ED364608.pdf>
- IBM Corp. (2020). *IBM SPSS Statistics for Windows*, Version 27.0. Armonk, IBM Corp: NY.
- Ilesanmi, O. O. (2009). What is cross-cultural research. *International Journal of Psychological Studies*, 1(2), 82-96. [10.5539/ijps.v1n2p82](https://doi.org/10.5539/ijps.v1n2p82)
- Ilescu, D. (2017). What is equivalence? In D. Ilescu (Ed.) *Adapting Tests in linguistic and cultural situations* (pp. 127-228). Cambridge University Press: Cambridge.
- International Council for Science (ICSU). (2011). Report of the ICSU Ad-hoc Review Panel on Science Education. *International Council for Science*, Paris, 1-42. Retrieved February 13, 2019, from <https://council.science/cms/2017/05/Report-on-Science-Education-final-pdf.pdf>.
- Jane, S. (2013). A vision of improvement of learning: South African teachers' conceptions of classroom assessment. *Perspectives in Education*, 31(2), 14-21.

- Jones, A., & Moreland, J. (2005). The importance of pedagogical content knowledge in assessment for learning practices: A case-study of a whole-school approach. *Curriculum Journal*, 16(2), 193-206. <https://doi.org/10.1080/09585170500136044>
- Jones, J. (2004). Framing the assessment discussion. *YC Young Children*, 59(1), 14-18. <https://www.jstor.org/stable/42729033>
- Kabir, S. (2016). Sample and Sampling designs. *In Basic Guidelines for Research: An Introductory Approach for All Disciplines* (1<sup>st</sup> ed., pp.168-180). Book Zone Publication: Bangladesh. [https://www.researchgate.net/publication/325390597\\_BASIC\\_GUIDELINES\\_FOR\\_RESEARCH\\_An\\_Introductory\\_Approach\\_for\\_All\\_Disciplines](https://www.researchgate.net/publication/325390597_BASIC_GUIDELINES_FOR_RESEARCH_An_Introductory_Approach_for_All_Disciplines)
- Kanjee, A. (2009). Enhancing teacher assessment practices in South African schools: Evaluation of the assessment resource banks. *Education as Change*, 13(1), 73–89. <https://doi.org/10.1080/16823200902940599>
- Kanjee, A. (2020). Exploring primary school teachers' use of formative assessment across fee and no-fee schools. *South African Journal of Childhood Education*, 10(1), 1-13. <https://hdl.handle.net/10520/EJC-1fa184f045>
- Kanjee, A., & Mthembu, J. (2015). Assessment literacy of foundation phase teachers: An exploratory study. *South African Journal of Childhood Education*, 5(1), 142-168. <http://www.scielo.org.za/pdf/sajce/v5n1/10.pdf>
- Kanjee, A., & Sayed, Y. (2013). Assessment policy in post-apartheid South Africa: Challenges for improving education quality and learning. *Assessment in*

- Education: Principles, Policy & Practice*, 20(4),442-469.  
<https://doi.org/10.1080/0969594X.2013.838541>
- Kankaraš, M., & Moors, G. (2010). Researching measurement equivalence in cross-cultural studies. *Psihologija*, 43(2), 121-136.  
<https://www.ceeol.com/search/article-detail?id=692977>
- Kelley, K., & Maxwell, S. E. (2010). Multiple regression. In G. R. Hancock & R. O. Mueller (Eds.), *The reviewer's guide to quantitative methods in the social sciences* (pp. 281–297). Routledge: New York.
- Kibble, J. D. (2017). Best practices in summative assessment. *Advances in Physiology Education*, 41(1), 110-119.  
<https://doi.org/10.1152/advan.00116.2016>
- Kline, R. (2005). Principles and practices of structural equation modelling (2<sup>nd</sup> ed.). Guilford Press: New York.
- Kline, R. (2011). Principles and practices of structural equation modelling (3<sup>rd</sup> ed.). Guilford Press: New York.
- Knekta, E., Runyon, C., & Eddy, S. (2019). One size doesn't fit all: Using factor analysis to gather validity evidence when using surveys in your research. *CBE—Life Sciences Education*, 18(1), 1-17. <https://doi.org/10.1187/cbe.18-04-0064>
- Korkmaz, S., Göksülük, D., & Zararsiz, G. Ö. K. M. E. N. (2014). MVN: An R package for assessing multivariate normality. *R Journal*, 6(2). 151-162.  
[10.32614/RJ-2014-031](https://doi.org/10.32614/RJ-2014-031)

- Kulasegaram, K., & Rangachari, P. K. (2018). Beyond “formative”: assessments to enrich student learning. *Advances in Physiology Education*, 42(1), 5-14. <https://doi.org/10.1152/advan.00122.2017>
- Kuze, M. W., & Shumba, A. (2011). An investigation into formative assessment practices of teachers in selected schools in Fort Beaufort in South Africa. *Journal of Social Sciences*, 29(2), 159-170. <https://doi.org/10.1080/09718923.2011.11892966>
- Laboratory of International Assessment Studies. (2018). *The lab interview series: An interview with Anil Kanjee*. <https://international-assessments.org/the-lab-interview-series-an-interview-with-anil-kanjee/>
- Leahy, S., Lyon, C., Thompson, M., & Wiliam, D. (2005). Classroom Assessment: Minute by Minute, *Day by Day Educational Leadership*, 63 (3), 18–24. [http://www.aliciahenderson.net/uploads/1/9/6/1/19614797/dylan\\_wiliam\\_article.pdf](http://www.aliciahenderson.net/uploads/1/9/6/1/19614797/dylan_wiliam_article.pdf)
- Levin, B. B. (2015). Development of teachers’ beliefs. In H. Fives & M. G. Gill (Eds.), *International handbook of research on teachers’ beliefs* (pp. 48-66). Routledge Taylor & Francis Group: New York and London.
- Linn, R. L. (2000). Assessments and accountability. *Educational Researcher*, 29(2), 4-16. <https://doi.org/10.3102/0013189X029002004>
- Loock, C., & Gravett, S. (2014). Towards a governance and management model for teaching schools in South Africa. *South African Journal of Childhood Education*, 4(3), 174-191. <https://www.scielo.org.za/pdf/sajce/v4n3/12.pdf>

- Looney, J. (2011), “*Integrating Formative and Summative Assessment: Progress Toward a Seamless System?*”, OECD Education Working Papers, No. 58, OECD Publishing: Paris. <https://www.oecd-ilibrary.org/docserver/5kghx3kbl734-en.pdf?expires=1550264478&id=id&accname=guest&checksum=7D1FC7DA61E526F08D074E90A71A4108>.
- Lubbe, A., Mentz, E., Olivier, J., Jacobson, T. E., Mackey, T. P., Chahine, I. C., ... & de Beer, J. (2021). *Learning through assessment: An approach towards self-directed learning* (p. 314). AOSIS: Cape Town. <https://library.oapen.org/bitstream/handle/20.500.12657/53901/1/9781776341634.pdf>
- Lubisi, R. C., & Murphy, R. J. (2002). Assessment in South African schools. *Assessment in Education: Principles, Policy & Practice*, 9(2), 255-268. [10.1080/0969594022000001968](https://doi.org/10.1080/0969594022000001968)
- Lucas, B., Claxton, G., & Spencer, E. (2013). Progression in student creativity in school: First steps towards new forms of formative assessments. *Contemporary Readings in Law & Social Justice*, 6(2), 81-121. <https://doi.org/10.1787/19939019>
- Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research*, 35(6), 382-386. <https://psycnet.apa.org/doi/10.1097/00006199-198611000-00017>
- Magnusson, S. J., Borko, H., & Krajcik, J. S. (1999). Nature, sources, and development of pedagogical content knowledge for science teaching. In J. Gess-

- Newsome & N. Lederman (Eds.), *Examining pedagogical content knowledge* (pp. 95-132). Kluwer Press: Boston, MA.
- Maphosa, C., Mutekwe, E., Machingambi, S., Wadesango, N., & Ndofirepi, A. (2012). Teacher accountability in South African public schools: A call for professionalism from teachers. *The Anthropologist*, 14(6), 545-553. <https://doi.org/10.1080/09720073.2012.11891280>
- Maree, J. G. (2022). Managing the Covid-19 pandemic in South African Schools: Turning challenge into opportunity. *South African Journal of Psychology*, 52(2), 249-261. <https://doi.org/10.1177/00812463211058398>
- Marton, F. (1981). Phenomenography – Describing conceptions of the world around us. *Instructional Science*, 10, 177–200. [https://www.ida.liu.se/divisions/hcs/seminars/cogsciseminars/Papers/marton\\_-\\_phenomenography.pdf](https://www.ida.liu.se/divisions/hcs/seminars/cogsciseminars/Papers/marton_-_phenomenography.pdf)
- Messick, S. (1993). Foundations of validity: Meaning and consequences in psychological assessment. *ETS Research Report Series*, 1993(2), 1-18. <https://doi.org/10.1002/j.2333-8504.1993.tb01562.x>
- Mgoqi, N. (2019). An exploration of formative assessment in primary school Natural Sciences classrooms. [Unpublished Master of Education thesis]. Rhodes University: Makhanda. <https://core.ac.uk/download/pdf/270044431.pdf>
- Mgoqi, N., & Schudel, I. (2021) Formative Assessment for Quality Environmental Learning in Natural Sciences Classrooms. In I. Schudel, Z. Songqwaru, S. Tshiningayamwe, & H. Lotz-Sisitka (Eds.), *Teaching and Learning for Change: Education and Sustainability in South Africa*. (pp. 239-253). African Minds:

- South Africa. [https://www.scienceopen.com/hosted-document?doi=10.47622/9781928502241\\_14](https://www.scienceopen.com/hosted-document?doi=10.47622/9781928502241_14)
- Miller, R., Acton, C., Fullerton, D., & Maltby, J. (2009). *SPSS for social scientists*. Bloomsbury Publishing: UK.
- Monareng, J., Ramraj, A. B., & Mashau, P. (2020). The rise in online learning in South African schools due to the Coronavirus pandemic. *Gender & Behaviour*, 18(4). <https://www.ajol.info/index.php/gab/article/view/203432>
- Mondal, A., & Mete, J. (2013). Continuous and Comprehensive Evaluation—An Appraisal. *Issues and Ideas in Education*, 1(2), 121-138. <https://iie.chitkara.edu.in/index.php/iie/article/view/140>
- Moss, C. M., Brookhart, S. M., & Long, B. A. (2013). Administrators' roles in helping teachers use formative assessment information. *Applied Measurement in Education*, 26(3), 205-218. <https://doi.org/10.1080/08957347.2013.793186>
- Mueller, R. O., & Hancock, G. R. (2001). Factor analysis and latent structure: Confirmatory factor analysis. In N. J. Smelser & P.B. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (pp. 5239-5244). <https://doi.org/10.1016/B0-08-043076-7/00426-5>
- Muller, J. (2004). Assessment, qualifications and the National Qualifications Framework in South African schooling. *Changing class: Education and social change in post-apartheid South Africa*, 221-246. [https://www.academia.edu/26600396/Assessment\\_qualifications\\_and\\_the\\_National\\_Qualifications\\_Framework\\_in\\_South\\_African\\_schooling](https://www.academia.edu/26600396/Assessment_qualifications_and_the_National_Qualifications_Framework_in_South_African_schooling)

- Multon, K. D., & Coleman, J. S. (2010). Coefficient alpha. In N. Salkind (Ed.) *Encyclopaedia of research design* (pp. 616-620). SAGE publishing Inc: Thousand Oaks. <https://dx.doi.org/10.4135/978141296128>
- Muñoz, A. P., Palacio, M., & Escobar, L. (2012). Teachers' beliefs about assessment in an EFL context in Colombia. *Profile Issues in Teachers Professional Development*, 14(1), 143-158. [http://www.scielo.org.co/scielo.php?pid=S1657-07902012000100010&script=sci\\_abstract&tlng=pt](http://www.scielo.org.co/scielo.php?pid=S1657-07902012000100010&script=sci_abstract&tlng=pt)
- Muskin, J. A. (2015). Student learning assessment and the curriculum: Issues and implications. *Educational Theory*, 58(1), 63-82. <http://www.druckerinstitute.com/peter-druckers-life-and-legacy/>
- Naong, M. N. (2008). Overcoming challenges of the new curriculum statement-a progress report. *Interim: Interdisciplinary Journal*, 7(2), 164-176. [https://hdl.handle.net/10520/AJA1684498X\\_21](https://hdl.handle.net/10520/AJA1684498X_21)
- Nardi, P. M. (2018). *Doing survey research: A guide to quantitative methods*. Routledge: New York. <https://doi.org/10.4324/9781315172231>
- National Education Policy. (2020). *National Education Policy 2020*. Ministry of Human Resource Development: Government of India. [https://www.education.gov.in/sites/upload\\_files/mhrd/files/NEP\\_Final\\_English\\_0.pdf](https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf)
- Ndawi, O., & Peasuh, M. (2005). Accountability and school obligation: A case study of society's expectations of the school curriculum in Zimbabwe. *South African Journal of Education*, 25(3), 210-115.

- Ngogi, E. (2020). *The Impact of COVID-19 Pandemic on South African Education : Navigating Forward the Pedagogy of Blended Learning*. Office of the MEC for Education, Department of Education: KwaZulu-Natal.  
<https://www.researchgate.net/project/The-Impact-of-COVID-19-Pandemic-on-South-African-Education-Navigating-Forward-the-Pedagogy-of-Blended-Learning-dagogy>
- Nulty, D.D. (2008). The adequacy of response rates to online and paper surveys: what can be done? *Assessment & Evaluation in Higher Education*, 33(3), 301-314. <https://doi.org/10.1080/02602930701293231>
- O'Shea, A. (2020). Teachers' conceptions of assessment for learning: what are the implications for children?. *Polish Journal of Educational Studies*, 72(1), 64-78. <https://doi.org/10.2478/poljes-2019-0005>
- Oluwatayo, J. A. (2012). Validity and reliability issues in educational research. *Journal of Educational and Social Research*, 2(2), 391-400.
- Opre, D. (2015). Teachers' conceptions of assessment. *Procedia-Social and Behavioral Sciences*, 209(2015), 229-233. <https://doi.org/10.1016/j.sbspro.2015.11.222>
- Organisation for Economic Co-operation and Development (OECD). (2013). *Synergies for better learning: An international perspective on evaluation and assessment*. Final synthesis report from the Review (pp. 35-56). OECD publication: Paris, France. <https://www.oecd.org/education/school/synergies-for-better-learning.htm>

- Organisation for Economic Co-operation and Development (OECD). (2005). *Formative Assessment: Improving Learning in Secondary Classrooms* [Policy Briefs]. (pp. 1-8). OECD publication: Paris, France. <https://www.oecd.org/education/ceri/35661078.pdf>
- Organisation for Economic Co-operation and Development (OECD). (2007). *Education policy analysis: Focus on higher education 2005-2006*. (pp. 1-168) OECD publication: Paris, France. <https://www.oecd-ilibrary.org/content/publication/epa-2006-en>
- Organisation for Economic Co-operation and Development (OECD). (2022). *OECD work on Education and skills. Directorate for Education and skills*. (pp. 1-23). OECD publication: Paris, France. <https://www.oecd.org/education/OECD-Education-Brochure.pdf>
- Organisation for Economic Co-operation and Development /Centre for Education Research and Innovation (OECD/CERI). (2008). “Learning in the 21st Century: Research, Innovation and Policy”. *Assessment for Learning: Formative Assessment*. Paper presented at CERI International Conference. OECD publication: Paris, France. <http://www.oecd.org/dataoecd/19/31/40600533.pdf>
- Osborne, W. & Waters, E. (2002). Four assumptions of multiple regression that researchers should always test. *Practical Assessment, Research, and Evaluation*. 8(2). 1-5. <https://doi.org/10.7275/r222-hv23>
- Pajares, M. (1992). Teachers’ beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, 62(3), 307-332.

- <https://srlsite.files.wordpress.com/2018/02/pajares-1992-teachers-beliefs-and-educational-research-cleaning-up-a-messy-construct.pdf>
- Phurutse, M. C. (2005). Factors affecting teaching and learning in South African schools. *Report presented to the Education Labour Relations Council*. Human Sciences Research Council Press: Cape Town, South Africa.
- Plüddemann, P., Braam, D., October, M., & Wababa, Z. (2004). *Dual-medium and parallel-medium schooling in the Western Cape: From default to design*. PRAESA: Cape Town, South Africa. <http://www.praesa.org.za/wp-content/uploads/2017/01/Paper17.pdf>
- Poortinga, Y. H. (1989). Equivalence of cross-cultural data: An overview of basic issues. *International Journal of Psychology*, 24(6), 737-756. <https://doi.org/10.1080/00207598908247842>
- Popham, J. W. (2006). Needed: A dose of assessment literacy. *Educational Leadership*, 63(6), 84-85. <https://eric.ed.gov/?id=EJ745569>
- Popham, W. (2009). Assessment literacy for teachers: Faddish or fundamental?. *Theory into Practice*, 48(1), 4-11. <https://doi.org/10.1080/00405840802577536>
- Pratt, D. D. (1992). Conceptions of teaching. *Adult Education Quarterly*, 42(4), 203-220. <https://doi.org/10.1177/074171369204200401>
- Pryor, J., & Lubisi, C. (2002). Reconceptualising educational assessment in South Africa—testing times for teachers. *International Journal of Educational Development*, 22(6), 673-686. [https://doi.org/10.1016/S0738-0593\(01\)00034-7](https://doi.org/10.1016/S0738-0593(01)00034-7)
- Puad, L. M. A. Z., & Ashton, K. (2021). Teachers' views on classroom-based assessment: an exploratory study at an Islamic boarding school in Indonesia. *Asia*

- Pacific Journal of Education*, 41(2), 253-265.  
<https://doi.org/10.1080/02188791.2020.1761775>
- Punch, K. (2003). Relationship between variables. In K. Punch (Ed.) *Survey Research* (pp. 12-25). SAGE publications: London.  
<https://dx.%3Cwbr%3Edoi.%3Cwbr%3Eorg/10.4135/9781849209984>
- Quansah, F. (2018). Traditional or performance assessment: What is the right way to assessing learners. *Research on Humanities and Social Sciences*, 8(1), 21-24.  
<https://core.ac.uk/download/pdf/234676217.pdf>
- Rahi, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues and instruments development. *International Journal of Economics & Management Sciences*, 6(2), 1-5. <https://doi.org/10.4172/2162-6359.1000403>
- Raman, R., & Nedungadi, P. (2010). *Adaptive learning methodologies to support reforms in continuous formative evaluation*. Paper presented in 2010 at International Conference on Educational and Information Technology (Vol. 2, pp. V2-429). IEEE: Chongqing, China.  
<https://ieeexplore.ieee.org/document/5607608>
- Rashid, R. A., & Jaidin, J. H. (2014). Exploring Primary School Teachers' Conceptions of "Assessment for Learning". *International Education Studies*, 7(9), 69-83. <http://dx.doi.org/10.5539/ies.v7n9p69>
- Remesal, A. (2007). Educational reform and primary and secondary teachers' conceptions of assessment: The Spanish instance, building upon Black and

- Wiliam. *The Curriculum Journal*, 18(1), 27-38.  
<https://doi.org/10.1080/09585170701292133>
- Remesal, A. (2011). Primary and secondary teachers' conceptions of assessment: A qualitative study. *Teaching and Teacher Education*, 27(2), 472-482.  
<https://www.sciencedirect.com/science/article/abs/pii/S0742051X1000168X>
- Republic of south Africa (n.d.). COVID-19 / Coronavirus.  
<https://www.gov.za/Coronavirus#:~:text=Adjusted%20alert%20level%20%20was%20in%20place%20from%2031%20May,2020%20until%2028%20February%202021>
- Rhodes, J.M. (2019). *Creating a Survey Solution with Microsoft Forms, Flow, SharePoint, and Power BI*. In: *Creating business applications with office 365*. Apress: Berkeley, CA. [https://doi.org/10.1007/978-1-4842-5331-1\\_11](https://doi.org/10.1007/978-1-4842-5331-1_11)
- Robledo, A., & Velarde, C. (2022). How, why and when Tsallis statistical mechanics provides precise descriptions of natural phenomena. *Entropy*, 24(12), 1761. <https://doi.org/10.3390/e24121761>
- Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, 48(2), 1–36. [doi:10.18637/jss.v048.i02](https://doi.org/10.18637/jss.v048.i02).
- Roy, T. K., & Acharya, R. (2016). *Statistical survey design and evaluating impact*. Cambridge University Press: Cambridge.
- Rubio, D., Berg Weger, M., Tebb, S., Lee, E., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research*, 27, 94-104. <https://doi.org/10.1093/swr/27.2.94>

- Ruiz-Primo, M. A. (2011). Informal formative assessment: The role of instructional dialogues in assessing students' learning. *Studies in Educational Evaluation*, 37(1), 15-24. <https://doi.org/10.1016/j.stueduc.2011.04.003>
- Sadler, D. R. (1989). Formative assessment and the design of instructional systems. *Instructional Science*, 18(2), 119-144. <https://link.springer.com/article/10.1007/BF00117714>
- SAEMEO INNOTECH. (2015). *Assessment system in Southeast Asia: Models, successes and challenges*. SAEMEO INNOTECH: Philippines. [https://www.seameo-innotech.org/portfolio\\_page/assessment-systems-in-southeast-asia/](https://www.seameo-innotech.org/portfolio_page/assessment-systems-in-southeast-asia/)
- Sarmiento, R. & Costa, V. (2019). Confirmatory Factor Analysis – A case study. *arXiv e-prints*, arXiv-1905. Semantic scholar. <https://www.semanticscholar.org/paper/Confirmatory-Factor-Analysis-A-Case-study-Sarmiento-Costa/a4e19cbb6cc766ad197935d2fc4974bb425e2698>
- Savalei, V., & Rhemtulla, M. (2013). The performance of robust test statistics with categorical data. *British Journal of Mathematical and Statistical Psychology*, 66(2), 201-223. <https://doi.org/10.1111/j.2044-8317.2012.02049.x>
- Sayed, Y., & Kanjee, A. (2013). Assessment in Sub-Saharan Africa: challenges and prospects. *Assessment in Education: Principle, Policy and Practice*, 20(4), 373-384. <https://doi.org/10.1080/0969594X.2013.849056>
- Schuld, N., Kanjee, A., & White, T. (2017). Tinder or flint: Igniting Grade 2 teachers' understanding of learning, teaching and assessment. *Journal of Education*. (70), 109-132.

[http://www.scielo.org.za/scielo.php?script=sci\\_arttext&pid=S2520-98682017000300006](http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2520-98682017000300006)

Scott, J. (2015). The promises, problems, and prospects of research on teachers' beliefs. in H. Fives & M. G. Gill (Eds.), *International handbook of research on teachers' beliefs* (pp.13-30). Routledge: London.

Segers, M., & Tillema, H. (2011). How do Dutch secondary teachers and students conceive the purpose of assessment?. *Studies in Educational Evaluation*, 37(1), 49-54. <https://doi.org/10.1016/j.stueduc.2011.03.008>

Shalem, Y. (2003). Do we have a theory of change? Calling change models to account. *Perspectives in Education*, 21(1), 29-49. <https://hdl.handle.net/10520/EJC87182>

Shepard, L. A. (2009). Commentary: Evaluating the validity of formative and interim assessment. *Educational Measurement: Issues and Practice*, 28(3), 32-37. <https://doi.org/10.1111/j.1745-3992.2009.00152.x>

Sidhu, G. K., Kaur, S., & Chi, L. J. (2018). CEFR-aligned school-based assessment in the Malaysian primary ESL classroom. *Indonesian Journal of Applied Linguistics*, 8(2), 452-463.

<https://pdfs.semanticscholar.org/8887/4c4af948f8906fc0ca1bc91f1e71dc9772e5.pdf>

Smith, C. D., Worsfold, K., Davies, L., Fisher, R., & McPhail, R. (2013). Assessment literacy and student learning: the case for explicitly developing students 'assessment literacy'. *Assessment & Evaluation in Higher Education*, 38(1), 44-60. <https://doi.org/10.1080/02602938.2011.598636>

- Smith, M. L., & Fey, P. (2000). Validity and accountability in high-stakes testing. *Journal of Teacher Education*, 51(5), 334-344.  
<https://doi.org/10.1177/0022487100051005>
- Snyder, P., & Lawson, S. (1993). Evaluating results using corrected and uncorrected effect size estimates. *The Journal of Experimental Education*, 61(4), 334-349.  
[10.1080/00220973.1993.10806594](https://doi.org/10.1080/00220973.1993.10806594)
- South African Council for Educators (SACE). (2020). *Professional Teaching Standards*. [https://www.sace.org.za/assets/documents/uploads/sace\\_31561-2020-10-12-Professional%20Teaching%20Standards%20Brochure.pdf](https://www.sace.org.za/assets/documents/uploads/sace_31561-2020-10-12-Professional%20Teaching%20Standards%20Brochure.pdf)
- South African Council on Higher Education (CHE). (2010). *Report on the National Review of Academic and Professional Programmes in Education*. CHE: Pretoria.  
[https://www.che.ac.za/sites/default/files/publications/Higher\\_Education\\_Monitor\\_11.pdf](https://www.che.ac.za/sites/default/files/publications/Higher_Education_Monitor_11.pdf)
- Spaull, N. (2015). Schooling in South Africa: How low-quality education becomes a poverty trap. *South African Child Gauge*, 12(1), 34-41.
- Spren, C. A., & Vally, S. (2010). Outcomes-based education and its (dis) contents: Learner-centred pedagogy and the education crisis in South Africa. *Southern African Review of Education with Education with Production*, 16(1), 39-58.  
<https://hdl.handle.net/10520/EJC98984>
- Statistics South Africa. (2018). *Provincial profile: Westerns Cape, community survey 2016*.  
<https://cs2016.statssa.gov.za/wpcontent/uploads/2018/07/WesternCape.pdf>

- Steyn, G. M. (2008). Continuing professional development for teachers in South Africa and social learning systems: Conflicting conceptual frameworks of learning. *Koers*, 73(1), 15-31. <http://www.scielo.org.za/pdf/koers/v73n1/02.pdf>
- Stiggins, R. J. (1991). Assessment literacy. *Phi Delta Kappan*, 72(7), 534-539. <https://www.jstor.org/stable/20404455>
- Stockemer, D., Stockemer, G., & Glaeser. (2019). A short introduction to survey research. In D. Stockemer (Ed.) *Quantitative methods for the social sciences* (pp. 23-36). Springer international publishing: New York <https://doi.org/10.1007/978-3-319-99118-4>
- Sukamolson, S. (2007). Fundamentals of quantitative research. *Language Institute Chulalongkorn University*, 1(3), 1-20. [https://www.academia.edu/5847530/Fundamentals\\_of\\_quantitative\\_research](https://www.academia.edu/5847530/Fundamentals_of_quantitative_research)
- Tabachnick, B. G., & Fidell, L. S. (2014). *Using multivariate statistics* (6th ed., pp. 1–983). New Jersey: Pearson Education Inc.
- Taherdoost, H. (2016). Sampling methods in research methodology; how to choose a sampling technique for research. *International Journal of Academic Research in Management (IJARM)*, 5(2), 18-27. <https://hal.archives-ouvertes.fr/hal-02546796>
- Tanner, K. (2018). Survey designs. In *Research methods* (pp. 159-192). Chandos Publishing: UK.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53-55. [10.5116/ijme.4dfb.8dfd](https://doi.org/10.5116/ijme.4dfb.8dfd)

- Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., ... & Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. *BMC Medical Research Methodology*, *10*(1), 1-10.  
<https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/1471-2288-10-1>
- Thaçi, L., Janusheva, V., & Talevski Dimitrija, J. (2020). The effects of the formative assessment on students' motivation in the Republic of Kosovo. *International Journal of Education-TEACHER*, *10*(19), 5-13.  
<https://eprints.uklo.edu.mk/id/eprint/5440/1/document.pdf>
- Thomas, L., Deaudelin, C., Desjardins, J., & Dezutter, O. (2011). Elementary teachers' formative evaluation practices in an era of curricular reform in Quebec, Canada. *Assessment in Education: Principles, Policy & Practice*, *18*(4), 381-398. <https://doi.org/10.1080/0969594X.2011.590793>
- Thompson, A. (1992). Teachers' beliefs and conceptions: A synthesis of the research. In D. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 127–146). Macmillan Publishing Co, Inc.  
<https://psycnet.apa.org/record/1992-97586-007>
- Tien, N. H., Anh, D. T., Van Luong, M., Ngoc, N. M., & Vuong, N. T. (2020). Formative assessment in the teacher education in Vietnam. *Journal of Hunan University Natural Sciences*, *47*(8).  
<http://www.jonuns.com/index.php/journal/article/viewFile/429/427>

- Tittle, C. K. (1994). Toward an educational psychology of assessment for teaching and learning: Theories, contexts, and validation arguments. *Educational Psychologist*, 29(3), 149-162. [https://doi.org/10.1207/s15326985ep2903\\_4](https://doi.org/10.1207/s15326985ep2903_4)
- Trumbull, E., & Lash, A. (2013). *Understanding formative assessment: Insights from Learning theory and measurement theory*. (pp. 1-20). WestEd: San Francisco.
- <https://www.bhamcityschools.org/cms/lib5/AL01001646/Centricity/Domain/131/Understanding%20formative%20assessments%202013.pdf>.
- Ursachi, G., Horodnic, I. A., & Zait, A. (2015). How reliable are measurement scales? External factors with indirect influence on reliability estimators. *Procedia Economics and Finance*, 20, 679-686. [https://doi.org/10.1016/S2212-5671\(15\)00123-9](https://doi.org/10.1016/S2212-5671(15)00123-9)
- Van de Vijver, F. , & Leung, K. (2011). Equivalence and bias: A review of concepts, models, and data analytic procedures. In D. Matsumoto, & F. J. R. van de Vijver (Eds.) *Cross-cultural research methods in psychology* (pp. 17–45). Cambridge University Press: NY.
- Van der Kleij, F. M., Cumming, J. J., & Looney, A. (2018). Policy expectations and support for teacher formative assessment in Australian education reform. *Assessment in Education: Principles, Policy & Practice*, 25(6), 620-637. <https://doi.org/10.1080/0969594X.2017.1374924>
- Van Teijlingen, E., & Hundley, V. (2002). The importance of pilot studies. *Nursing Standard*, 16(40), 33-36. <https://doi.org/10.7748/ns2002.06.16.40.33.c3214>

- Vanclay, F., Baines, J. T., & Taylor, C. N. (2013). Principles for ethical research involving humans: ethical professional practice in impact assessment Part I. *Impact Assessment and Project Appraisal*, 31(4), 243-253. <https://doi.org/10.1080/14615517.2013.850307>
- Vandeyar, S., & Killen, R. (2007). Educators' conceptions and practice of classroom assessments in post-apartheid South Africa. *South African Journal of Education*, 27(1), 101-115.
- Wells, C. S. (2021). Confirmatory Factor Analysis. In C. Well (Ed), *Assessing measurement invariance for applied research* (pp.245-294). Cambridge University Press: Cambridge. <https://doi.org/10.1017/9781108750561>
- Western Cape Government. (2015). *Provincial Strategic Plan 2014-2019*. [https://www.westerncape.gov.za/text/2015/October/western\\_cape\\_provincial\\_strategic\\_plan\\_2014-2019.pdf](https://www.westerncape.gov.za/text/2015/October/western_cape_provincial_strategic_plan_2014-2019.pdf)
- Western Cape Government. (2015). *WCED announces details on e-learning "smart schools" project*. Media Release. [https://wcedonline.westerncape.gov.za/comms/press/2015/16\\_23feb.html](https://wcedonline.westerncape.gov.za/comms/press/2015/16_23feb.html)
- Western Cape Government. (n.d.). *WCED education districts in brief*. Retrieved January 20, 2019, from <https://wcedonline.westerncape.gov.za/branchIDC/Districts/briefly.html>
- Western Cape Government. (n.d.). *WCED find-a-school*. Retrieved January 20, 2019, from <https://wcedemis.westerncape.gov.za/wced/findaschool.html>
- Western Cape Education Department. (WCED). (n.d.). *WCED Education Districts* [Map]. Retrieved November 25, 2023, from

<https://wcedonline.westerncape.gov.za/contact/districts>

Wiliam, D. (2006). Formative assessment: Getting the focus right. *Educational assessment*, 11(3-4), 283-289.

<https://www.tandfonline.com/doi/abs/10.1080/10627197.2006.9652993?journalCode=heda20>

Wiliam, D. (2017). Assessment for learning: Meeting the challenge of implementation. *Assessment in Education: Principles, Policy & Practice*, 1-4.

<https://doi.org/10.1080/0969594X.2017.1401526>

Wiliam, D., & Thompson, M. (2008). Integrating assessment with learning: What will it take to make it work? In *The Future of Assessment: Shaping Teaching and Learning* (pp. 53-82). Routledge: NY.

<https://discovery.ucl.ac.uk/id/eprint/10001162/>

Wills, G., Debra S., and Kotze J. (2016). *Interrogating a paradox of performance in the WCED: A provincial and regional comparison of student learning*. No.

14/2016. <https://ideas.repec.org/p/sza/wpaper/wpapers270.html>

Wilmot, D. (2003). The inception phase of a case study of outcomes-based education assessment policy in the Human and Social Sciences Learning Area of C2005. *South African Journal of Education*, 23(4), 313-318.

<https://www.ajol.info/index.php/saje/article/view/24952>

Winterbottom, M., Brindley, S., Taber, K. S., Fisher, L. G., Finney, J., & Riga, F. (2008). Conceptions of assessment: trainee teachers' practice and values. *The Curriculum Journal*, 19(3), 193-213.

<https://doi.org/10.1080/09585170802357504>

- Word Education Forum (WEF). (2015). *Final report*. UNESCO: France.  
<http://www.unesco.org/open-access/terms-use-ccbysa-en>.
- Xia, Y., & Yang, Y. (2018). RMSEA, CFI, and TLI in structural equation modelling with ordered categorical data: The story they tell depends on the estimation methods. *Behaviour Research Methods*, 51, 409–428.  
<https://doi.org/10.3758/s13428-018-1055-2>
- Ximénez, C. (2009). Recovery of weak factor loadings in confirmatory factor analysis under conditions of model misspecification. *Behavior Research Methods*, 41(4), 1038-1052. <https://doi.org/10.3758/BRM.41.4.1038>
- Yan, Z., Li, Z., Panadero, E., Yang, M., Yang, L., & Lao, H. (2021). A systematic review on factors influencing teachers' intentions and implementations regarding formative assessment. *Assessment in Education: Principles, Policy & Practice*, 28(3), 228-260. <https://doi.org/10.1080/0969594X.2021.1884042>
- Yates, A., & Johnston, M. (2018). The impact of school-based assessment for qualifications on teachers' conceptions of assessment. *Assessment in Education: Principles, Policy & Practice*, 25(6), 638-654.  
<https://doi.org/10.1080/0969594X.2017.1295020>
- Yusoff, M. S. B. (2019). ABC of content validation and content validity index calculation. *Resource*, 11(2), 49-54. <https://doi.org/10.21315/eimj2019.11.2>
- Zarei, L., Bagheri, M. S., & Sadighi, F. (2021). An investigation of Iranian EFL learner accountability: A demand for learner accountability. *Cogent Arts & Humanities*, 8(1), 1-27.  
<https://www.tandfonline.com/doi/pdf/10.1080/23311983.2020.1870066>

Zubane, P., Khoza, S., & Mlambo, V. (2022). Challenges and opportunities via online learning: how has basic schooling responded to COVID-19: A South African perspective. *Innovative Issues and Approaches in Social Sciences*, 15, 1-20. <https://doi.org/10.5281/zenodo.5718635>

## ANNEXURES

Annex I: *TCoA-III*A Inventory Developed by Brown (2006)**Conceptions of Assessment III Abridged Survey**

This survey asks about your beliefs and understandings about ASSESSMENT, whatever that term means to you. Please answer the questions using YOUR OWN understanding of assessment.

1. Please indicate which of the following assessment PRACTICES you have in mind when you think about assessment.

When I think about ASSESSMENT these are the kinds of PRACTICES I have in mind (*Tick all that apply*)

- |   |  |
|---|--|
| <input type="checkbox"/> Unplanned Observation  | <input type="checkbox"/> Student Self or Peer Assessment |
| <input type="checkbox"/> Oral Question & Answer   | <input type="checkbox"/> Conferencing                    |
| <input type="checkbox"/> Planned Observation ( <i>e.g.</i><br><i>Running Record, Checklist</i> )                | <input type="checkbox"/> Portfolio / Scrapbook           |
| <input type="checkbox"/> Student Written Work ( <i>e.g.</i><br><i>activity sheets, spelling or math facts</i> ) | <input type="checkbox"/> Teacher Made Written Test       |
| <input type="checkbox"/> Marked Homework  | <input type="checkbox"/> <u>Standardised Test</u>        |
|   | <input type="checkbox"/> Essay Test                      |
|   | <input type="checkbox"/> 1-3 Hour Examination            |

2. Please give your rating for each of the following 27 statements based on YOUR opinion about assessment. Indicate how much you actually agree or disagree with each statement. Use the following rating scale and choose the one response that comes closest to describing your opinion.

- > Strongly Disagree
- > Mostly Disagree
- > Slightly Agree
- > Moderately Agree
- > Mostly Agree
- > Strongly Agree

Note that the ratings are ordered from Disagree on the LEFT to Agree on the RIGHT.

*Please continue ...*

*Please tick one box for each statement*

Conceptions of Assessment	Strongly Disagree	Mostly Disagree	Slightly Agree	Moderately Agree	Mostly Agree	Strongly Agree
1. <u>Assessment</u> provides information on how well schools are doing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. <u>Assessment</u> places students into categories	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. <u>Assessment</u> is a way to determine how much students have learned from teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. <u>Assessment</u> provides feedback to students about their performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. <u>Assessment</u> is integrated with teaching practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. <u>Assessment</u> results are trustworthy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. <u>Assessment</u> forces teachers to teach in a way against their beliefs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. <u>Teachers</u> conduct assessments but make little use of the results	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. <u>Assessment</u> results should be treated cautiously because of measurement error	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. <u>Assessment</u> is an accurate indicator of a school's quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. <u>Assessment</u> is assigning a grade or level to student work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. <u>Assessment</u> establishes what students have learned	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. <u>Assessment</u> feeds back to students their learning needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. <u>Assessment</u> information modifies ongoing teaching of students	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Please continue ...*

*CoA-III Abridged ©2001-2007, Dr. Gavin Brown, University of Auckland*

*Please tick one box for each statement*

Conceptions of Assessment	Strongly Disagree	Mostly Disagree	Slightly Agree	Moderately Agree	Mostly Agree	Strongly Agree
15. <u>Assessment</u> results are consistent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. <u>Assessment</u> is unfair to students	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. <u>Assessment</u> results are filed & ignored	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. <u>Teachers</u> should take into account the error and imprecision in all assessment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. <u>Assessment</u> is a good way to evaluate a school	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. <u>Assessment</u> determines if students meet qualifications standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. <u>Assessment</u> measures students' higher order thinking skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. <u>Assessment</u> helps students improve their learning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. <u>Assessment</u> allows different students to get different instruction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. <u>Assessment</u> results can be depended on	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. <u>Assessment</u> interferes with teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. <u>Assessment</u> has little impact on teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. <u>Assessment</u> is an imprecise process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Please continue ...*

*CoA-III Abridged ©2001-2007, Dr. Gavin Brown, University of Auckland*

**Would you also provide the following personal information?**

**A) What is your role in education?**

*(Tick one only)*

- Trainee Teacher  
 Teacher  
 Senior Teacher  
 Assistant or Deputy Principal  
 Principal  
 Other: \_\_\_\_\_

**B) What is your highest degree?**

*(Tick one only)*

- Bachelor  
 Postgraduate Certificate  
 Postgraduate Diploma  
 Master  
 Doctor

**C) For how many years have you taught?** *(Tick one only)*

- Less than 2  
 Between 2 and 5  
 Between 6 and 10  
 More than 10

**D) What is your specialist teaching subject?** *(Tick one only)*

- English  
 Mathematics  
 Science  
 Other: \_\_\_\_\_

**E) What is your sex?** *(Tick one only)*

- Female  
 Male

**F) What type of school do you teach at?** *(Tick one only)*

- Single Sex BOYS  
 Single Sex GIRLS  
 Coeducational

**G) What level of school do you teach at?** *(Tick one only)*

- Band 1  
 Band 2  
 Band 3

**H) What training in educational assessment have you had?** *(Tick all that apply)*

- None  
 Some hours as part of pre-service training  
 ½ to 1 day Workshop or Seminar  
 Completed undergraduate Paper  
 Completed postgraduate Paper  
 Other: *(give details)*  
 \_\_\_\_\_  
 \_\_\_\_\_

*Thank you for your help. Your cooperation is appreciated.*

## Annex II: Invitation Email to Stakeholders

RE: Teachers' views of formative assessment - Apama Ghorpade - Outlook - Google Chrome

about:blank

Delete Archive Report Reply Reply all Forward Zoom Read / Unread Categorize Flag / Unflag Print

**RE: Teachers' views of formative assessment**

Dear ,

I trust that you are well!

As you are aware, I am investigating Western Cape primary school science teachers' conceptions of formative assessment. My study has received ethical clearance from UCT. I am attaching my research proposal and ethical clearance letter for your reference. I am attempting to answer the following two research questions:

1. What conceptions of 'formative assessment' do the practicing Western Cape primary school teachers hold and what practices do they associate with this term?
2. What is the relationship between Western Cape primary school teachers' conceptions of formative assessment and their associated practices?

My research is based on that of Gordon Brown from the University of New Zealand, whose research has been influential and is useful for international comparisons. I have adapted Brown's Teachers' Conception of Assessment (TCoA) inventory for use in the Western Cape (a draft is attached for your information) and the entire inventory will be translated into both Afrikaans and isiXhosa once it is finalised.

My research is now at a stage where I need to validate the inventory and obtain feedback on it from important stakeholders. **I would thus be most grateful if you would be able to briefly comment on the inventory (attached). The instructions are attached and hopefully clear and simple (just use Track Changes and Comments in the attached MSWord file). If not, please let me know!**

**I would be grateful if comments could be returned to me by no later than 13 December 2019. Please be assured that all comments are confidential.**

In anticipation, thank you for your assistance here!

With best wishes and kind regards,

Apama Ghorpade (& Rudi Laugisch)

Reply Reply all Forward

## Annex III: Instructions to Stakeholders

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### WESTERN CAPE PRIMARY SCIENCE TEACHERS' CONCEPTIONS OF FORMATIVE ASSESSMENT

#### *Validation of the Teacher's Conceptions of Assessment Inventory (TCoA III)* Abridged

#### Instructions to Education stakeholders

This survey instrument asks teachers' opinions about FORMATIVE ASSESSMENT, whatever that term means to them.

1. In Section I, teachers are asked questions about their personal information. This section contains a total of 14 questions.
  - i. Please read all the questions carefully.
  - ii. Decide if the personal information requested is appropriate, essential and relevant to investigating the views of science teachers in the Western Cape Province on formative assessment.
  - iii. If any undesirable item is included or any additional items are necessary to be considered in this section of the inventory, kindly provide a brief justification.
  
2. In Section II, teachers are asked about their personal beliefs about formative assessment. This section contains 28 questions. Teachers have been asked to indicate how much they agree or disagree with each of the statements.
  - i. Is the language used appropriate and clear for Western Cape primary school teachers? *(Please note: this inventory will be translated into isiXhosa and Afrikaans after the completion of the validation process.)*
  - ii. If the language is not clear, please suggest changes.
  
3. Kindly *email* your comments and suggestions to <rudiger.laugksch@uct.ac.za> AND <GHRAPA001@myuct.ac.za> before 13 December 2019.

Thank you for your time – it is much appreciated!

Signed by candidate

A/Prof. RC Laugksch  
School of Education, UCT

28 Nov 2019

Signed by candidate

Ms Aparna Ghorpade

## Annex IV: TCoA-WC for Stakeholder Review

Aparna Ghorpade (GHRAPA001@myuct.ac.za)

### WESTERN CAPE PRIMARY SCHOOL TEACHERS' CONCEPTIONS OF FORMATIVE ASSESSMENT

#### INVENTORY DRAFT 4

##### Instructions to teachers

This survey asks your opinion about FORMATIVE ASSESSMENT, whatever that term means to you. Please answer the questions using YOUR OWN ideas about formative assessment.

In **Section I**, I would like to ask you questions about your personal information as this survey is administered in order to find out your ideas about assessment. This section contains a total of 14 questions. In responding to the questions, please mark the appropriate box or write your answer in a blank space provided.

In **Section II**, I would like to know about your personal beliefs about formative assessment. This section contains 28 questions. Please indicate how much you agree or disagree with each of the statement.

When you have completed this questionnaire please click on 'submit' to submit the questionnaire.

Thank you very much for your cooperation!

#### Teacher's Conceptions of Assessment Inventory (TCoA III) Abridged

##### Section I

1. What is your e-mail address?

-----

2. What is your age (in years)?

-----

3. What is your sex?

Female

Male

4. What is your home language?

English

Afrikaans

isiXhosa

Other

5. Please specify your home language if different from the above three languages?

---

Aparna Ghorpade (GHRAPA001@myuct.ac.za)

-----

6. What is your highest **academic** qualification?

- Bachelor
- B.Ed. Honors
- Postgraduate Certificate
- Postgraduate Diploma
- Master
- Doctor

7. What is your initial **professional** teacher qualification?

- 4-year Bachelor of Education degree (B.Ed.)
- Postgraduate Certificate in Education (PGCE)
- Advanced Certificate in Education (ACE)
- Advanced Diploma in Education (ADE)
- National Professional Diploma in Education (NPDE)

8. Have you specialised in the subject of Natural Science and Technology during your professional teacher qualification?

- Yes
- No

9. If not, please specify your specialised subject.

-----

10. For how many years have you taught Natural Sciences and Technology at the Intermediate Phase (i.e., Grades 4-6)?

-----

11. What Grades do you currently teach Natural Science and Technology to?

-----

12. Have you received any training on 'Assessment' from the Western Cape Education Department (WCED)?

Yes

No

13. If yes, please give details on the training of the assessment (for example: Some hours as part of pre-service training,  $\frac{1}{2}$  to 1-day Workshop or Seminar, etc.)

-----

14. How many learners are in your largest Natural Science and Technology class?

-----

15. What type of school do you teach at?

Single-sex boys

Single-sex girls

Co-educational

Section II

Please give your rating for each of the following 28 statements based on **YOUR** opinion about assessment. Indicate how much you agree or disagree with each statement. Use the following rating scale and choose the one response that comes closest to describing your opinion.

- Strongly Disagree
- Mostly Disagree
- Slightly (a little) Agree
- Moderately (fairly) Agree
- Mostly Agree
- Strongly Agree

Note that the ratings are ordered from Disagree on the LEFT to Agree on the RIGHT.

Please tick one box for each statement

Conceptions of Assessment	Strongly Disagree	Mostly Disagree	Slightly (a little) Agree	Moderately (fairly) Agree	Mostly Agree	Strongly Agree
1. Assessment provides information on how well schools are doing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Assessment places students into categories	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Assessment is a way to determine how much students have learned from teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Assessment provides feedback to students about their performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Assessment is integrated with teaching practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Assessment results are trustworthy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Assessment forces teachers to teach in a way against their beliefs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Teachers conduct assessments but make little use of the results	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Assessment results should be treated cautiously because of measurement error	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Assessment is an accurate indicator of a school's quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Assessment is assigning a grade or level to <u>student work</u>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Assessment establishes what students have learned	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Assessment feeds back to students their learning needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Assessment information modifies <u>ongoing</u> teaching of students	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Aparna Ghorpade (GHRAPA001@myuct.ac.za)

15. Assessment results are consistent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Assessment is unfair to students	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Assessment results are filed & ignored	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Teachers should <u>take into account</u> the <u>error and imprecision</u> in all assessment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Assessment is a good way to evaluate a school	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Assessment determines if students meet qualifications standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Assessment measures students' <u>higher order</u> thinking skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Assessment helps students improve their learning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Assessment allows different students to get different instruction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Assessment results can be depended on	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Assessment interferes with teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Assessment has little impact on teaching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Assessment is an imprecise process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

END-----

**Annex V: Afrikaans version of Back-translated TCoA-III**  
**WES-KAAPSE LAERSKOOL ONDERWYSERS SE BEGRIP VAN**  
**FORMATIEWE ASSESSERING**  
**INVENTARIS**

**Instruksies in Afrikaans**

Hierdie ondersoek vra u opinie oor FORMATIEWE ASSESSERING, wat dié term ook al vir u mag beteken. Antwoord asseblief die vrae deur U EIE idees oor formatiewe assessering te gebruik.

In **Afdeling I**, vra ek 16 vrae oor u persoonlike inligting. In u antwoorde, klik asseblief die mees gepaste blokkie of skryf u antwoord in die oop spasie wat voorsien is.

In **Afdeling II**, wil ek graag meer uitvind oor u persoonlike oortuigings oor formatiewe assessering. Hierdie afdeling bevat 27 vrae. Dui asseblief aan hoeveel u met elkeen van die stellings saam stem of nie saam stem nie.

Wanneer u die vraelys voltooi het, klik asseblief op “submit” om die vraelys en u antwoorde in te stuur.

Baie dankie vir u hulp met hierdie ondersoek!

**Onderwysers se Begrip van Assessering Inventaris (TCoA III) Verkorte**

**weergawe**

**Afdeling I**

1. Wat is u ouderdom (in jare)?

-----

2. Wat is u geslag?

Vroulik

Manlik

3. Wat is u huistaal?

Engels

Afrikaans

isiXhosa

Ander

4. Spesifiseer asseblief u huistaal indien dit nie een van die bostaande tale is nie?

-----

5. Wat is u hoogste **akademiese** kwalifikasie?

Baccalaureus graad

B.Ed Honneursgraad

Nagraadse Onderwys Sertifikaat

Nagraadse Onderwys Diploma

Meestersgraad

Doktorsgraad

6. Wat is u aanvanklike **professionele** onderwyskwalifikasie?

4-jaar Baccalaureus Onderwysgraad (B.Ed.)

Nagraadse Onderwyssertifikaat (NOS)

Gevorderde Onderwyssertifikaat (GOS)

Gevorderde Diploma in Opvoedkunde (GDO)

Nasionale Professionele Diploma in Onderwys (NPDO)

Ander, spesifiseer asseblief -----

-----

**7.** Het u gespesialiseer in *Natuurwetenskap en Tegnologie* as vakgebied gedurende u professionele onderwyskwalifikasie?

Ja

Nee

**8.** Indien nie, spesifiseer asseblief u gespesialiseerde vakgebied.

-----

**9.** Hoeveel jare het u *Natuurwetenskappe en Tegnologie* aangebied vir Intermediêre fase (d.w.s. Graad 4-6)?

-----

**10.** Vir watter Grade gee u tans *Natuurwetenskap en Tegnologie*? (Omkring alles wat van toepassing is)

Graad 4

Graad 5

Graad 6

Graad 7

**11.** Het u enige opleiding oor ‘Assessering’ ontvang vanaf die Wes-Kaapse Onderwys Departement (WKOD)?

Ja

Nee

**12.** Indien ja, verskaf asseblief die besonderhede van die INDIENSOPLEIDING ontvang (byvoorbeeld: ½ tot 1 dag Werkswinkel, Seminaar, ens.)

-----

**13.** Hoeveel leerders is daar in u grootste *Natuurwetenskap- en Tegnologie*klas?

-----

14. In watter tipe skool werk u?

- Seunskool
- Meisieskool
- Skool met beide seuns en dogters

15. Beskryf asseblief in u eie woorde wat u glo 'formatiewe assessering' is.

-----  
 -----  
 -----  
 -----  
 -----

16. Kan u asseblief voorbeelde verskaf van assesseringspraktyke in u klaskamer, wanneer u dink oor formatiewe assessering?

-----  
 -----  
 -----

<b>Afdeling</b>
-----------------

Verskaf asseblief u gradering van die volgende 27 stellings, gebaseer op **U EIE** opinie oor assessering. Dui aan hoeveel u saam stem of nie saam stem nie met elke stelling. Gebruik die volgende graderingskaal en kies een antwoord wat die naaste aan u opinie is.

- Stem glad nie saam nie
- Stem meestal nie saam nie
- Stem 'n bietjie saam
- Stem redelik saam
- Stem meestal saam
- Stem definitief saam

Neem kennis dat die graderings georden is vanaf, Stem nie saam nie tot Stem saam, van BO na ONDER.

*Kies slegs een opsie vir elke stelling*





<b>22.</b> Formatiewe assessering help leerders om beter te leer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>23.</b> Formatiewe assessering maak dit moontlik vir verskillende leerders om verskillende instruksies en onderrig te ontvang	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>24.</b> Daar kan op formatiewe assesseringsuitslae staatgemaak word.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>25.</b> Formatiewe assessering meng in met onderrig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>26.</b> Formatiewe assessering het 'n klein inpak op onderrig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>27.</b> Formatiewe assessering is 'n onpresiese proses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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**Annex VI: isiXhosa Version of Back-translated TCoA-III**

**IINGCAMANGO ZOOTITSHALA BAMABANGA APHANTSI**

**BASENTSHONA KOLONI NGOHLOLO OLUQHUBAYO**

**ULUDWE LWEZINTO**

**Imiyalelo ngesiXhosa**

Olu phando lucela uluvo lwakho ngoHLOLO OLUQHUBAYO, intsingiselo yeli gama kuwe. Nceda uphendule imibuzo ngokusebenzisa iibono ZAKHO ngohlolo oluqhubayo.

**Kwicandelo I**, ndikubuza imibuzo eli-16 ngeenkukacha zakho. Xa uphendula imibuzo, nceda ubeke uphawu kwibhokisi afanelekileyo okanye ubhale impendulo yakho kwisikhewu osinikiweyo.

**Kwicandelo II**, ndingathanda ukwazi ngeenkolelo zakho malunga nohlolo oluqhubayo. Eli candelo liqulathe imibuzo engama-27. Nceda uphawule ukuba ungqinelana okanye awungqinelani kangakanani na nentetho nganye yezi ntetho. Xa sele uligwalisile eli phepha-mibuzo, nceda ucofe ku- ‘ngenisa’ ukungenisa iimpindulo zakho.

Enkosi kakhulu ngoncedo lwakho!

**Iingcamango zikaTitshala Zoludwe Lwezinto Zohlolo (iTCoA III)**

**Ezishwankathelweyo**

**Section I**

1. Mingaphi iminyaka yakho?

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2. Yintoni isini sakho?

Ibhinqa

Indoda

3. Luluphi ulwimi lwakho lwasekhaya?

IsiNgesi

IsiBhulu

isiXhosa

Olunye

4. Nceda ukhankanye ulwimi lwakho lwasekhaya ukuba lwahlukile kwezi lwimi zintathu zingentla.

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5. Yeyephi eyona mfaneleko ephezulu **kwezemfundo** ofikelele kuyo?

Isidanga seBachelor

Isidanga seeHonours kwezemfundo

ISatifiketi sesidanga esingakumbi kwezemfundo

IDiploma yesidanga esingakumbi kwezemfundo

Isidanga seeMasters

Isidanga sobuGqirha

6. Yeyiphi imfaneleko yakho **yomsebenzi** wobutitshala yokuqala?

Isidanga seBachelor kwezemfundo esiminyaka mi-4 (iB. Ed.)

ISatifiketi sesidanga esingakumbi kwezemfundo (iPGCE)

ISatifiketi esintsonkothileyo kwezemfundo (iACE)

IDiploma entsokothileyo kwezemfundo (iADE)

IDiploma yelizwe yomsebenzi kwezemfundo (iNPDE)

Engenye, nceda ukhankanye -----

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7. Ubufumene ubungcali kwizifundo *zezululwazi yezemvelo nezobugcisa bonxibelelwano* ngelixa lwemfaneleko yakho yomsebenzi wobutitshala?

Ewe

Hayi

8. Ukuba akunjalo, nceda ukhankanye izifundo onobungcali kuzo.

-----

9. Mingaphi iminyaka ofundise ngayo izifundo *zenzululwazi kwezemvelo nezobugcisa bonxibelelwano* kwisigaba esiphakathi (Oko kukuthi, amaBanga esi-4-6)?

-----

10. Ngawaphi amaBanga owafundisa izifundo zenzululwazi kwezemvelo nezobugcisa bonxibelelwano? (Yakhela isangqa kuwo wonke afanelekileyo)

IBanga lesi-4

IBanga lesi-5

IBanga lsi-6

IBanga lesi-7

11. Likhona uqeqesho olufumeneyo 'kuHlolo' uluphuma kwisebe lezemfundo lweNtshona Kapa (iWCED)?

Ewe

Hayi

12. Ukuba kunjalo, nceda unike iinkcukacha zoqeqesho olufumeneyo ESEMSEBENZINI (umzekelo: Ucweyo oluntsuku eziyi-½ ukuya kusuku olu-1, Ingqungquthela, njl. njl.)

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13. Bangaphi abafundi abakweyona klasi yakho inkulu yezifundo *zenzululwazi kwezemvelo nezobugcisa bonxibelelwano*?

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14. Ufundisa kwisekolo esinjani?

Kwesesini samakhwenkwe odwa

Kwesesini samantombazana odwa

Kwesixubileyo

15. Nceda uchaze usebenzisa amagama akho into okholelwa ukuba luyiyo  
'uhlolo oluqhubayo'

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16. Unganceda unike imizekelo yezinto ezenziwayo kuhlolo kwiklasi yakho xa  
ucinga 'ngohlolo oluqhubayo'?

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<b>Icandelo</b>
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Nceda unike umlinganiselo wakho kwintetho nganye yezi nentetho zingama-27 zilandelayo ngokusekwe kuluvo LWAKHO ngohlolo. Phawula ukuba ungqinelana okanye awungqinelani kangakanani nentetho nganye. Sebenzisa lon mlinganiselo-sikali olandelayo ze ukhethe impendulo enye esondele kakhulu ekuchazeni uluvo lwakho.

- Andivumi ngamandla
- Andivumi inkoliso
- Ndivuma kancinci
- Ndivuma njee
- Ndiyavuma inkoliso
- Ndivuma ngamandla

Qaphela ukuba imilinganiselo ilungelelaniswe ngokuqala kuAndivumi ukuya kuNdiyavuma ukusuka PHEZULU ukuya ngeZANTSI, ngokulandelelana.

*Nceda ubeke uphawu kwintetho nganye*





19. Uhlolo oluqhubayo yindlela entle yokuphonononga isikolo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Uhlolo oluqhubayo lufumanisa ukuba umfundi uyafikelela kwinqanaba elifunekayo lwamanqaku okanye umgangatho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Uhlolo oluqhubayo lenza umlinganiselo wezakhono zokucinga zomfundi eziphezulu	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Uhlolo oluqhubayo lunceda ukuba umfundi aphucuke kwindlela yokufunda	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Uhlolo oluqhubayo luvumela abafundi abahlukeneyo okuba bafundiswe ngeendlela ezahlukileyo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Iziphumo zohlolo oluqhubayo zingathenjwa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Uhlolo oluqhubayo luphazamisana nokufundisa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Uhlolo oluqhubayo lunefuthe elincinci ekufundiseni	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Uhlolo oluqhubayo yinkqubo engachanekanga	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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## Annex VII: Ethics Approval Letter



### SCHOOL OF EDUCATION

Dr. Joanne Hardman

University of Cape Town, Fikrate Bwg 303, Rondebosch, 7701  
 Physical address: Humanities Graduate School Building, University Ave South, Upper Campus  
 Tel: +27 (0) 21 650 3020 Fax: +27 (0) 21 650 3489  
 E-mail: Joanne.Hardman@uct.ac.za Internet: www.uct.ac.za/depts/educate

EDNREC20190501

8 May 2019

Ms. A. Ghorpade  
 University of Cape Town

**RE: Ethical Clearance for Academic Research Project**

I am pleased to inform you that ethical clearance has been granted by the School of Education Ethics Review Committee of the Faculty of Humanities for your academic research project entitled: **Western Cape Primary School Science Teachers' Conceptions of Formative Assessment**. We wish you all the best with your research.

Regards

Signed by candidate

\_\_\_\_\_  
 ASSOCIATE PROFESSOR JOANNE HARDMAN  
 ETHICS CHAIR

## Annex VIII: Permission from WCED to Conduct the Study



Directorate: Research

[Audrey.wyngaard@westerncape.gov.za](mailto:Audrey.wyngaard@westerncape.gov.za)

tel: +27 021 467 9272

Fax: 0865902282

Private Bag X9114, Cape Town, 8000

wced.wcape.gov.za

**REFERENCE:** 20200214-4485

**ENQUIRIES:** Dr A T Wyngaard

Mrs Aparna Ghorpade  
1 Uxbridge Court  
329 Main Road  
Kenilworth  
7708

Dear Mrs Aparna Ghorpade

### RESEARCH PROPOSAL: WESTERN CAPE PRIMARY SCHOOL TEACHERS' CONCEPTIONS OF FORMATIVE ASSESSMENT

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **22 June 2020 till 30 September 2021**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

**The Director: Research Services  
Western Cape Education Department  
Private Bag X9114  
CAPE TOWN  
8000**

We wish you success in your research.

Kind regards.  
Signed: Dr Audrey T Wyngaard  
Directorate: Research  
**DATE: 25 March 2021**

Lower Parliament Street, Cape Town, 8001  
tel: +27 21 467 9272 fax: 0865902282  
Safe Schools: 0800 45 46 47

Private Bag X9114, Cape Town, 8000  
Employment and salary enquiries: 0861 92 33 22  
[www.westerncape.gov.za](http://www.westerncape.gov.za)

## Annex IX: Pilot Study Invitation to Principal



### SCHOOL OF EDUCATION

Associate Professor ~~Rudiger~~ Laugisch

University of Cape Town, Private Bag X3, Rondebosch, 7701  
 Physical address: rm 5.14.2, Neville Alexander Building, University Ave South, Upper Campus  
 Tel: +27 (0) 21 650 2777 Fax: +27 (0) 21 650 3489  
 E-mail: Rudiger.Laugisch@uct.ac.za Internet: <http://www.education.uct.ac.za/>

14 April 2021

Dear Sir/ Madam,

I am Mrs. Apama Ghorpade, a M.Ed. student at the University of Cape Town. Currently, I am involved in the above-mentioned research project. This project has received ethics clearance from the University of Cape Town (UCT) and approval from the Western Cape Education Department (WCED) which is attached for your information (Annex-I). I would like to invite the teachers from your school to participate in the pilot study.

The South African curriculum has seen several assessment related reforms since 1994 and an emphasis has been to implement formative assessment practices at the classroom level. In any type of assessment, teachers are a key interpreter of assessment information in a classroom situation and their conceptions of assessment play an important role in successful implementation of assessment practices. Therefore, considering the important position of formative assessment in the South African curriculum reforms, this study aims to contribute to the ongoing debate on assessment reform by exploring the relationship between the Western Cape primary school science teachers' conceptions about formative assessment and their associated practices.

The data for the final research study will be collected by using an online inventory. Hence, this pilot study is intended to identify the possible difficulties and challenges teachers may experience while reading the questions and/or statement from the questionnaire. To ease the process for teachers, the MS-Word version of the questionnaire will be presented to them simultaneously in three languages – English, Afrikaans, and isiXhosa. The questionnaire is attached for your information. Each of these three languages has been allotted a specific colour to make it easy for teachers to identify their preferred language of instruction. Teachers are requested to highlight all ambiguous or unclear questions, statements, or word(s) in their own language of instruction. The participating teachers may later be interviewed according to their convenience to understand their obstacles while reading the questionnaire instructions and items. Teachers' participation in this pilot study will involve no more than 8 minutes, but their participation here would be extremely valuable in creating a trustworthy final version of the questionnaire.

This pilot study asks for teachers' personal contact details and e-mail addresses only for the purpose of contacting and following up with teachers. I assure you that any information collected during this study will be strictly confidential. I also assure you that the school's and teachers' identity will not be revealed in any part of the research report.

I would be grateful if you would assist me by encouraging your teachers to participate in the pilot study. If you agree, I request you to kindly provide me with the list of possible teachers and their contact numbers and/or e-mail addresses who teach Natural Sciences and Technology in Grades 4 to 6 in your school.

Should you have any queries please feel free to contact me via email [GHRAPA001@myuct.ac.za](mailto:GHRAPA001@myuct.ac.za) or at 021 761 2634(H) / 060 62 15639 (cell).

Thank you for assisting in this study!

Warm regards,

Signed by candidate

Apama Ghorpade

Signed by candidate

A/Prof Rudi Laugisch

(Supervisor)

**Annex X: TCoA-WC Validated by Stakeholders**

**WESTERN CAPE PRIMARY SCHOOL TEACHERS' CONCEPTIONS OF  
FORMATIVE ASSESSMENT**

**WES-KAAPSE LAERSKOOL ONDERWYSERS SE BEGRIP VAN  
FORMATIEWE ASSESSERING**

**IINGCAMANGO ZOOTITSHALA BAMABANGA APHANTSI**

**BASENTSHONA KOLONINGOHOLO OLUQHUBAYO**

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**INVENTORY**

**INVENTARIS**

**ULUDWE LWEZINTO**

**Instructions in English**

This survey asks your opinion about FORMATIVE ASSESSMENT, whatever that term means to you. Please answer the questions using YOUR OWN ideas about formative assessment.

In **Section I**, I ask you 16 questions about your personal information. In responding to the questions, please click the appropriate box or write your answer in the space provided.

In **Section II**, I would like to know about your personal beliefs about formative assessment. This section contains 27 questions. Please indicate how much you agree or disagree with each of the statements.

When you have completed this questionnaire, please click on 'submit' to submit your answers and responses.

Thank you very much for your assistance!

### **Instruksies in Afrikaans**

Hierdie ondersoek vra u opinie oor FORMATIEWE ASSESSERING, wat dié term ook al vir u mag beteken. Antwoord asseblief die vrae deur U EIE idees oor formatiewe assessering te gebruik.

In **Afdeling I**, vra ek 16 vrae oor u persoonlike inligting. In u antwoorde, klik asseblief die mees gepaste blokkie of skryf u antwoord in die oop spasie wat voorsien is.

In **Afdeling II**, wil ek graag meer uitvind oor u persoonlike oortuigings oor formatiewe assessering. Hierdie afdeling bevat 27 vrae. Dui asseblief aan hoeveel u met elkeen van die stellings saam stem of nie saam stem nie.

Wanneer u die vraelys voltooi het, klik asseblief op “submit” om die vraelys en u antwoorde in te stuur.

Baie dankie vir u hulp met hierdie ondersoek!

### **Imiyalelo ngesiXhosa**

Olu phando lucela uluvo lwakho ngoHLOLO OLUQHUBAYO, intsingiselo yeli gama kuwe. Nceda uphendule imibuzo ngokusebenzisa iimbono ZAKHO ngohlolo oluqhubayo.

**Kwicandelo I**, ndikubuza imibuzo eli-16 ngeenkukacha zakho. Xa uphendula imibuzo, nceda ubeke uphawu kwibhokisi afanelekileyo okanye ubhale impendulo yakho kwisikhewu osinikiweyo.

**Kwicandelo II**, ndingathanda ukwazi ngeenkolelo zakho malunga nohlolo oluqhubayo. Eli candelo liqulathe imibuzo engama-27. Nceda uphawule ukuba ungqinelana okanye awungqinelani kangakanani na nentetho nganye yezi ntetho. Xa sele uligcwalisile eli phepha-mibuzo, nceda ucofe ku- ‘ngenisa’ ukungenisa iimpindulo zakho.

Enkosi kakhulu ngoncedo lwakho!

**Teacher’s Conceptions of Assessment Inventory (TCoA III) Abridged**

**Onderwysers se Begrip van Assessering Inventaris (TCoA III) Verkorte**

**weergawe**

**Iingcamango zikaTitshala Zoludwe Lwezinto Zohlolo (iTCoA III)**

**Ezishwankathelweyo**

**Section I /Afdeling I /Icandelo I**

1. What is your age (in years)?

**Wat is u ouderdom (in jare)?**

Mingaphi iminyaka yakho (ngeminyaka)?

-----

2. What is your sex?

Wat is u geslag?

Yintoni isini sakho?

Female / **Vroulik** / Ibhinqa

Male / **Manlik** / Indoda

3. What is your home language?

Wat is u huistaal?

Luluphi ulwimi lwakho lwasekhaya?

English / **Engels** / IsiNgesi

Afrikaans/ **Afrikaans** / IsiBhulu

isiXhosa/ **isiXhosa** / isiXhosa

Other/ **Ander** / Olunye

4. Please specify your home language if different from the above three languages?

Spesifiseer asseblief u huistaal indien dit nie een van die bostaande tale is nie?

Nceda ukhankanye ulwimi lwakho lwasekhaya ukuba lwahlukile kwezi lwimi zintathu zingentla.

-----

5. What is your highest **academic** qualification?

Wat is u hoogste **akademiese** kwalifikasie?

Yeyephi eyona mfaneleko ephezulu **kwezemfundo** ofikelele kuyo?

Bachelor degree / **Baccalaureus graad** / Isidanga seBachelor

B.Ed. Honours degree / **B.Ed Honneursgraad** / Isidanga seeHonours

kwezemfundo

- Postgraduate Certificate in Education / **Nagraadse Onderwys Sertifikaat** / ISatifiketi sesidanga esingakumbi kwezemfundo
- Postgraduate Diploma in Education / **Nagraadse Onderwys Diploma** / IDiploma yesidanga esingakumbi kwezemfundo
- Master's degree / **Meestersgraad** / Isidanga seeMasters
- Doctorate / **Doktorsgraad** / Isidanga sobuGqirha

6. What is your initial **professional** teacher qualification?

**Wat is u aanvanklike professionele onderwyskwalifikasie?**

**Yeyiphi imfaneleko yakho yomsebenzi wobutitshala yokuqala?**

- 4-year Bachelor of Education degree (B.Ed.)/ **4-jaar Baccalaureus Onderwysgraad (B.Ed.)** / Isidanga seBachelor kwezemfundo esiminyaka mi-4 (iB. Ed.)
- Postgraduate Certificate in Education (PGCE) / **Nagraadse Onderwysertifikaat (NOS)** / ISatifiketi sesidanga esingakumbi kwezemfundo (iPGCE)
- Advanced Certificate in Education (ACE) / **Gevorderde Onderwysertifikaat (GOS)** / ISatifiketi esintsonkothileyo kwezemfundo (iACE)
- Advanced Diploma in Education (ADE) / **Gevorderde Diploma in Opvoedkunde (GDO)** / IDiploma entsokothileyo kwezemfundo (iADE)
- National Professional Diploma in Education (NPDE) / **Nasionale Professionele Diploma in Onderwys (NPDO)** / IDiploma yelizwe yomsebenzi kwezemfundo (iNPDE)
- Other, please specify / **Indien ander, spesifiseer asseblief** / Ukuba engenye, nceda ukhankanye

-----

7. Have you specialised in the subject of *Natural Science and Technology* during your professional teacher qualification?

Het u gespesialiseer in Natuurwetenskap en Tegnologie as vakgebied gedurende u professionele onderwyskwalifikasie?

Ubufumene ubungcali kwizifundo zezululwazi yezemvelo nezobugcisa bonxibelelwanongelixa lwemfaneleko yakho yomsebenzi wobutitshala?

Yes/ Ja / Ewe

No / Nee / Hayi

8. If not, please specify your specialist subject.

Indien nie, spesifiseer asseblief u gespesialiseerde vakgebied.

Ukuba akunjalo, nceda ukhankanye izifundo onobungcali kuzo.

-----

9. For how many years have you taught Natural Sciences and Technology at the Intermediate Phase (i.e., Grades 4-6)?

Hoeveel jare het u Natuurwetenskappe en Tegnologie aangebied vir Intermediêre fase (d.w.s. Graad 4-6)?

Mingaphi iminyaka ofundise ngayo izifundo zenzululwazi kwezemvelo nezobugcisa bonxibelelwano kwisigaba esiphakathi (Oko kukuthi, amaBanga esi-4-6)?

-----

10. In what Grades do you currently teach *Natural Science and Technology*? (Tick all that apply)

Vir watter Grade gee u tans Natuurwetenskap en Tegnologie? (Omkring alles wat van toepassing is)

Ngawaphi amaBanga owafundisa izifundo zenzululwazi kwezemvelo nezobugcisa

bonxibelelwano? (beka uphawu kwiibokisi ezifanelekileyo)

Grade 4 / Graad 4 / IBanga lesi-4

Grade 5 / Graad 5 / IBanga lesi-5

Grade 6 / Graad 6 / IBanga lesi-6

Grade 7 / Graad 7 / IBanga lesi-7

11. Have you received any training on ‘Assessment’ from the Western Cape Education Department (WCED)?

Het u enige opleiding oor ‘Assessering’ ontvang vanaf die Wes-Kaapse Onderwys

Departement (WKOD)?

Lukhona uqeqesho olufumeneyo ‘kuHlolo’ uluphuma kwisebe lezemfundo lweNtshona Kapa

(iWCED)?

Yes / Jaa / Ewe

No / Nee / Hayi

12. If yes, please give details of the IN-SERVICE training received (for example: ½ to 1-day Workshop, Seminar, etc.)

Indien ja, verskaf asseblief die besonderhede van die INDIENSOPLEIDING ontvang (byvoorbeeld: ½ tot 1 dag Werkswinkel, Seminaar, ens.)

Ukuba kunjalo, nceda unike iinkcukacha zoqeqesho olufumeneyo ESEMSEBENZINI (umzekelo: Ucweyo oluntsuku eziyi-½ ukuya kusuku olu-1, Ingqungquthela, njl. njl.)

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13. How many learners are in your largest *Natural Science and Technology* class?

Hoeveel leerders is daar in u grootste *Natuurwetenskap- en Tegnologieklas*?

Bangaphi abafundi abakweyona klasi yakho inkulu yezifundo *zenzululwazi kwezemvelo nezobugcisa bonxibelelwano*?

-----

14. What type of school do you teach at?

In watter tipe skool werk u?

Ufundisa kwisekolo esinjani?

- Single-sex boys / **Seunskool** / Kwesesini samakhwenkwe odwa
- Single-sex girls / **Meisieskool** / Kwesesini samantombazana odwa
- Co-educational / **Skool met beide seuns en dogters** / Kwesixubileyo

15. Please describe in your own words what you believe ‘formative assessment’ to be.

Beskryf asseblief in u eie woorde wat u glo ‘formatiewe assessering’ is.

Nceda uchaze usebenzisa amagama akho into okholelwa ukuba luyiyo ‘uhlolo oluqhubayo’

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16. Could you please give examples of assessment practices in your classroom when you think about formative assessment?

Kan u asseblief voorbeelde verskaf van assesseringspraktyke in u klaskamer, wanneer u dink oor formatiewe assessering?

Unganceda unike imizekelo yezinto ezenziwayo kuhlolo kwiklasi yakho xa ucinga ‘ngohlolo oluqhubayo’?

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**Section II /Afdeling II /Icandelo II**

**Instructions in English**

Please give your rating for each of the following 27 statements based on YOUR opinion about assessment. Indicate how much you agree or disagree with each statement. Use the following rating scale and choose the one response that comes closest to describing your opinion.

- Strongly Disagree
- Mostly Disagree
- Slightly (a little) Agree
- Moderately (fairly) Agree
- Mostly Agree
- Strongly Agree

Note that the ratings are ordered from Disagree to Agree from the TOP to the BOTTOM, respectively.

Please tick one option for each statement

### **Instruksies in Afrikaans**

Verskaf asseblief u gradering van die volgende 27 stellings, gebaseer op U EIE opinie oor assessering. Dui aan hoeveel u saam stem of nie saam stem nie met elke stelling. Gebruik die volgende graderingskaal en kies een antwoord wat die naaste aan u opinie is.

- Stem glad nie saam nie
- Stem meestal nie saam nie
- Stem 'n bietjie saam
- Stem redelik saam
- Stem meestal saam
- Stem definitief saam

Neem kennis dat die graderings georden is vanaf, Stem nie saam nie tot Stem saam, van BO na ONDER.

Kies slegs een opsie vir elke stelling

### **Imiyalelo ngesiXhosa**





kangakanani kuhlohlo						
<p>4. Formative assessment provides feedback to learners about their performance</p> <p>Formatiewe assessering verskaf terugvoering aan leerders oor hulle prestasie</p> <p>Uhlolo oluqhubayo lunika ingxelo kubafundi ngendlela abaqhube ngayo</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>5. Formative assessment is integrated with teaching</p> <p>Formatiewe assessering is geïntegreerd met onderrig</p> <p>Uhlolo oluqhubayo ludibene nokufundisa</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>6. Formative assessment results are trustworthy</p> <p>Formatiewe assesseringsuitslae is betroubaar</p> <p>Iziphumo zohlolo oluqhubayo zithembekile</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>7. Formative assessment forces teachers</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>to teach in a way that is against their beliefs about teaching</p> <p>Formatiewe assessering forseer onderwysers om klas te gee op 'n manier wat teenstrydig is met hulle oortuigings omtrent onderwys</p> <p>Uhlolo oluqhubayo lunyanzelisa ootitshala ukuba bafundise ngeendlela ezinxamnye neenkolelo zabo ngokufundisa</p>						
<p>8. Teachers conduct formative assessments but make little use of the results</p> <p>Onderwysers doen Formatiewe assessering, maar maak min gebruik van die uitslae</p> <p>Ootitshala bayaluqhuba uhlolo oluqhubayo kodwa abazisebenzisi iziphumo zalo</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>9. Formative assessment results should be treated cautiously because of</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<p>measurement error</p> <p>Formatiewe assessering se uitslae behoort versigtig hanteer te word as gevolg van maatstaaf probleme / foute</p> <p>Iziphumo zohlolo oluqhubayo kufanele ukuba ziphathwe ngobulumko ngenxa yempazamo yomlinganiselo</p>						
<p>10. Formative assessment is an accurate indicator of a school's quality</p> <p>Formatiewe assessering is 'n akkurate aanwyser van 'n skool se kwaliteit</p> <p>Uhlolo oluqhubayo sisalathiso esichanekileyo sobunjani besikolo</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>11. Formative assessment is assigning a grade or level to learner's work</p> <p>Formatiewe assessering is wanneer 'n graad of vlak aan 'n leerder se werk toegeken word</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



<p>Formatiewe assesseringsinligting laat toe dat die deurlopende onderrig van leerders aangepas word</p> <p>Iinkcukacha zohlolo oluqhubayo zitshintsha ukufundiswa kwabafundi okuqhubayo</p>						
<p>15. Formative assessment results are consistent</p> <p>Formatiewe assesseringsuitslae is konsekwent</p> <p>Iziphumo zohlolo oluqhubayo ziyangqinelana</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>16. Formative assessment is unfair to learners</p> <p>Formatiewe assesserings is onregverdig teenoor leerders</p> <p>Uhlolo oluqhubayo lunobulungisa kubafundi</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>17. Formative assessment results are filed and ignored</p> <p>Formatiewe assesseringsuitslae</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



<p>learners meet the required standard for the grade or level</p> <p>Formatiewe assessering bepaal of leerders aan die standaardvereistes van 'n graad of vlak voldoen</p> <p>Uhlolo oluqhubayo lufumanisa ukuba umfundi uyafikelela kwinqanaba elifunekayo lwamanqaku okanye umgangatho</p>						
<p>21. Formative assessment measures learners' higher order thinking skills</p> <p>Formatiewe assessering meet leerders se hoër orde denkvaardighede</p> <p>Uhlolo oluqhubayo lenza umlinganiselo wezakhono zokucinga zomfundi eziphezulu</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>22. Formative assessment helps learners improve their learning</p> <p>Formatiewe assessering help</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



<p>interferes with teaching</p> <p>Formatiewe assessering meng in met onderrig</p> <p>Uhlolo oluqhubayo lumphazamisana nokufundisa</p>						
<p>26. Formative assessment has little impact on teaching</p> <p>Formatiewe assessering het 'n klein inpak op onderrig</p> <p>Uhlolo oluqhubayo lunefuthe elincinci ekufundiseni</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>27. Formative assessment is an imprecise process</p> <p>Formatiewe assessering is 'n onpresiese proses</p> <p>Uhlolo oluqhubayo yinkqubo engachanekanga</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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## Annex XI: Pilot Study – Invitation letter to Science Teachers



### SCHOOL OF EDUCATION

Associate Professor Rüdiger Laugksch

University of Cape Town, Private Bag XI, Rondebosch, 7701  
 Physical address: rm 5.14.2, Neville Alexander Building, University Ave South, Upper Campus  
 Tel: +27 (0) 21 650 2777 Fax: +27 (0) 21 650 3489  
 E-mail: Rüdiger.Laugksch@uct.ac.za Internet: <http://www.education.uct.ac.za/>

21 April 2021

Dear Teacher,

I am Mrs. Aparna Ghorpade, a M.Ed. student at the University of Cape Town. Currently, I am involved in the above-mentioned research project. I have obtained the permission from your school principal to conduct this pilot study in your school and I would like to invite you to participate in the pilot study. This will take no more than 8 minutes of your time.

The South African curriculum has seen several assessment related reforms since 1994 and an emphasis has been to implement formative assessment practices at the classroom level. In any type of assessment, teachers are a key interpreter of assessment information in a classroom situation and their conceptions of assessment play an important role in successful implementation of assessment practices. Therefore, considering the important position of formative assessment in the South African curriculum reforms, this study aims to contribute to the ongoing debate on assessment reform by exploring the relationship between the Western Cape primary school science teachers' conceptions about formative assessment and their associated practices.

The data for the final research study will be collected by using an online questionnaire. Hence, this pilot study is intended to identify possible difficulties and challenges teachers may face while answering the questions and/or responding to the statements from the questionnaire. Your participation in this pilot study will involve no more than 8 minutes, but it would be extremely valuable in creating a trustworthy final version of the questionnaire.

This pilot study asks for teachers' personal contact details and e-mail addresses only for the purpose of contacting and following up with teachers. I assure you that any information collected during this study will be strictly confidential. I also assure you that your identity will not be revealed in any part of the research report.

I would be grateful if you would assist me by participating in the pilot study. If you agree, I request you to kindly read the attached instructions for scrutinizing the survey questions and statements. Kindly note that you may later be asked to be interviewed according to your convenience to understand better your obstacles while scrutinizing the questionnaire.

Should you have any queries please feel free to contact me via email [GHRAPA001@myuct.ac.za](mailto:GHRAPA001@myuct.ac.za) or at 021 761 2634(H) / 060 62 15689 (cell).

Thank you for considering participating in this study!

Warm regards,

Signed by candidate

Aparna Ghorpade

Signed by candidate




A/Prof. Rudi Laugksch

(Supervisor)

## Annex XII: Pilot study – Instructions to Teachers


### INSTRUCTIONS FOR SCRUTINIZING TEACHER'S CONCEPTIONS OF ASSESSMENT – III (TCOA-III) ABRIDGED QUESTIONNAIRE

Teacher's Conceptions of Assessment – III (TCOA-III) Abridged questionnaire is simultaneously presented in three languages – English, Afrikaans, and isiXhosa. Each of these three languages has been allotted a following colour to identify your preferred language of instruction. Please **choose only one language** of your preference to scrutinize the questionnaire.


English – Black   
 Afrikaans – Red   
 isiXhosa – Blue 

*Please do not answer the questionnaire*, but only highlight the ambiguous words or statements. See the instructions below:

|

**Step I:** Please read the initial instructions and guidelines carefully and **highlight** any words or phrases or statements you do not understand **using bright green colour.** 

**Step II:** Please read 'Section I' of the questionnaire.

- a. Please **highlight** any words or phrases or statements you do not understand **using bright green colour.**
- b. If any item is **ambiguous** (that is, if an item has more than one meaning for you) please **highlight** it **using pink colour.** 

**Step III:** **Now** please read the initial instructions and guidelines for 'Section II' of the questionnaire carefully and **highlight** any words or phrases or statements you do not understand **using bright green colour.**

**Step IV:** **Now** please read items 1 to 27 and their options of the 'Section II' carefully and repeat the tasks as described in Step II above.

Please insert your comment (in English) next to the highlighted word

**Step V:** Kindly return the completed questionnaire on or before 27<sup>th</sup> May 2021 via email to me. (Email: ghrapa001@myuct.ac.za)

Thank you very much for your assistance!

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## Annex XIII: Final TCoA-WC (Online Inventory)

# WESTERN CAPE PRIMARY SCHOOL SCIENCE TEACHERS' CONCEPTIONS OF FORMATIVE ASSESSMENT

WES-KAAPSE LAERSKOOLOO WETENSKAPONDERWYSERS SE BEGRIP VAN FORMATIEWE ASSESSERING

IINGCAMANGO ZOOTITSHALA BEZENZULULWAZI BAMABANGA APHANTSI BASENTSHONA KOLONI NGOHLOLO  
OLUQHUBAYO

### INSTRUCTIONS IN ENGLISH:-

This survey asks your opinion about FORMATIVE ASSESSMENT, whatever that term means to you. Please answer the questions using YOUR OWN ideas about formative assessment.

In Section I, I ask you 18 questions about the general information. In responding to the questions, please click the appropriate box or write your answer in the space provided.

In Section II, I would like to know about your personal beliefs (i.e., own views) about formative assessment. This section contains 27 questions. Please indicate how much you agree or disagree with each of the statements.

When you have completed this questionnaire, please click on 'submit' to submit your answers and responses.

Thank you very much for your assistance!

### INSTRUKSIES IN AFRIKAANS:-

Hierdie ondersoek vra u opinie oor FORMATIEWE ASSESSERING, wat dié term ook al vir u mag beteken. Antwoord asseblief die vrae deur U EIE idees oor formatiewe assessering te gebruik.

In Afdeling I, Ek sal u 18 vrae oor u algemene inligting vra. In u antwoorde, klik asseblief die mees gepaste blokkie of skryf u antwoord in die oop spasie wat voorsien is.

In Afdeling II, Ek wil graag meer uitvind oor u persoonlike oortuigings (d.w.s. eie beskouing of opinie) oor formatiewe assessering. Hierdie afdeling bevat 27 vrae. Dui asseblief aan hoeveel u met elkeen van die stellings saam stem of nie saam stem nie.

Wanneer u die vraelys voltooi het, klik asseblief op "submit" om die vraelys en u antwoorde in te stuur.

Baie dankie vir u hulp met hierdie ondersoek!

### IMIYALELO NGESIXHOSA:-

Olu phando lucela uluvo lwakho ngoHLOLO OLUQHUBAYO, intsingiselo yeli gama kuwe. Nceda uphendule imibuzo ngokusebenzisa iimbono ZAKHO ngoHLOLO oluqhubayo.

Kwicandelo I, ndikubuza imibuzo eli-18 ngeenkukacha zakho ngokubanzi. Xa uphendula imibuzo, nceda ubeke uphawu kwibhokisi afanelekileyo okanye ubhale impendulo yakho kwisikhewu osinikiweyo.

Kwicandelo II, ndingathanda ukwazi ngeenkolelo zakho (iingcamango zakho, ukutsho) malunga nohlolo oluqhubayo. Eli candelo liqulathe imibuzo engama-27. Nceda uphawule ukuba ungqinelana okanye awungqinelani kangakanani na nentetho nganye yezi ntetho.

Xa sele uligcwalisile eli phepha-mibuzo, nceda ucofe ku- 'ngenisa' ukungenisa iimpindulo zakho.

Enkosi kakhulu ngoncedo lwakho!

TEACHERS' CONCEPTIONS OF ASSESSMENT INVENTORY (TCoA- III) ABRIDGED

ONDERWYSERS SE BEGRIP VAN ASSESSERING INVENTARIS (TCOA III) VERKORTE WEERGAWE

IINGCAMANGO ZIKATITSHALA ZOLUDWE LWEZINTO ZOHLOLO (ITCOA III) EZISHWANKATHELWEYO

\* Required

SECTION I  
AFDELING I  
ICANDELO I

1. English: What is your e-mail address? (Voluntary /Optional)  
Afrikaans: Wat is u e-posadres? (Vrywillig/Opsioneel)  
isiXhosa: Ithini idilesi yakho ye-imeyile? (ayisosinyanzeliso)

2. English: What is your age (in years)?  
Afrikaans: Wat is u ouderdom (in jare)?  
isiXhosa: Mingaphi iminyaka yakho (ngeminyaka)? \*

3. English: What is your sex?  
Afrikaans: Wat is u geslag?  
isiXhosa: Yintoni isini sakho? \*

- Female / Vroulik / Ibhinqa  
 Male / Manlik / Indoda

4. English: What is your home language?  
Afrikaans: Wat is u huistaal?  
isiXhosa: Luluphi ulwimi lwakho lwasekhaya? \*

- English / Engels / IsiNgesi  
 Afrikaans / Afrikaans / IsiBhulu  
 isiXhosa / isiXhosa / isiXhosa  
 Other / Ander / Olunye

5. English: Please specify your home language if different from the above three languages.  
Afrikaans: Spesifiseer asseblief u huistaal indien dit nie een van die bostaande tale is nie.  
isiXhosa: Nceda ukhankanye ulwimi lwakho lwasekhaya ukuba lwahlukile kwezi lwimi zintathu zingentla. \*

6. English: What is your highest 'ACADEMIC' qualification?

Afrikaans: Wat is u hoogste AKADEMIESE kwalifikasie?

isiXhosa: Yeyephi eyona mfaneleko ephezulu KWEZEMFUNDO ofikelele kuyo? \*

- Bachelor degree / Baccalaureus graad / Isidanga seBachelor
- B.Ed. Honours degree / B.Ed Honneursgraad / Isidanga seeHonours kwezemfundo
- Postgraduate Certificate in Education / Nagraadse Onderwys Sertifikaat / ISatifiketi sesidanga esingakumbi kwezemfundo
- Postgraduate Diploma in Education / Nagraadse Onderwys Diploma / IDiploma yesidanga esingakumbi kwezemfundo
- Master's degree / Meestersgraad / Isidanga seeMasters
- Doctorate / Doktorsgraad / Isidanga sobuGqirha

7. English: What is your initial 'PROFESSIONAL' teacher qualification (i.e., first teaching qualification)?

Afrikaans: Wat is u aanvanklike PROFESSIONELE onderwyskwalifikasie (d.w.s. eerste onderwyskwalifikasie)?

isiXhosa: Yeyiphi imfaneleko yakho YOMSEBENZl wobutitshala yokuqala? \*

- 4-year Bachelor of Education degree (B.Ed.) / 4-jaar Baccalaureus Onderwysgraad (B.Ed.) / Isidanga seBachelor kwezemfundo esiminyaka mi-4 (B. Ed.)
- Postgraduate Certificate in Education (PGCE) / Nagraadse Onderwysertifikaat (NOS) / ISatifiketi sesidanga esingakumbi kwezemfundo (iPGCE)
- Advanced Certificate in Education (ACE) / Gevorderde Onderwysertifikaat (GOS) / ISatifiketi esintsonkothileyo kwezemfundo (iACE)
- Advanced Diploma in Education (ADE) / Gevorderde Diploma in Opvoedkunde (GDO) / IDiploma entsokothileyo kwezemfundo (iADE)
- National Professional Diploma in Education (NPDE) / Nasionale Professionele Diploma in Onderwys (NPDO) / IDiploma yelizwe yomsebenzi kwezemfundo (iNPDE)
- Other / Ander / Engenye

8. English: If Other, please specify.

Afrikaans: Indien ander, spesifiseer asseblief.

isiXhosa: Ukuba engenye, nceda ukhankanye.

9. English: Have you specialised in the subject of Natural Science and Technology during your professional teacher qualification?

Afrikaans: Het u gespesialiseer in Natuurwetenskap en Tegnologie as vakgebied gedurende u professionele onderwyskwalifikasie?

isiXhosa: Ubufumene ubungcali kwizifundo zezululwazi yezemvelo nezobugcisa bonxibelelwano

ngelixa lwemfaneleko yakho yomsebenzi wobutitshala? \*

Yes / Ja / Ewe

No / Nee / Hayi

10. English: If not, please specify your specialist subject.

Afrikaans: Indien nie, spesifiseer asseblief u gespesialiseerde vakgebied.

isiXhosa: Ukuba akunjalo, nceda ukhankanye izifundo onobungcali kuzo.

11. English: For how many years have you taught Natural Sciences and Technology at the Intermediate Phase (i.e., Grades 4-7)?

Afrikaans: Hoeveel jare het u Natuurwetenskappe en Tegnologie aangebied vir Intermediêre case

(d.w.s. Graad 4-7)?

isiXhosa: Mingaphi iminyaka ofundise ngayo izifundo zenzululwazi kwezemvelo nezobugcisa bonxibelelwano kwisigaba esiphakathi (Oko kukuthi, amaBanga esi-4-7)? \*

12. English: In what Grades do you currently teach Natural Science and Technology? (Tick all that

apply)

Afrikaans: Vir watter Grade gee u tans Natuurwetenskap en Tegnologie? (Omkring alles wat van

toepassing is)

isiXhosa: Ngawaphi amaBanga owafundisa izifundo zenzululwazi kwezemvelo nezobugcisa bonxibelelwano? (beka uphawu kwiibokisi ezifanelekileyo) \*

Grade 4 / Graad 4 / IBanga lesi-4

Grade 5 / Graad 5 / IBanga lesi-5

Grade 6 / Graad 6 / IBanga lesi-6

Grade 7 / Graad 7 / IBanga lesi-7

13. English: Have you received any training on 'Assessment' from the Western Cape Education Department (WCED)?  
 Afrikaans: Het u enige opleiding oor 'Assessering' ontvang vanaf die Wes-Kaapse Onderwys Departement (WKOD)?  
 isiXhosa: Likhona uqeqesho olufumeneyo 'kuHlolo' uluphuma kwisebe lezemfundo lweNtshon (iWCED)? \*

- Yes / Jaa / Ewe  
 No / Nee / Hayi

14. English: If yes, please give details of the IN-SERVICE training received (for example: ½ to 1-day Workshop, Seminar, etc.)  
 Afrikaans: Indien ja, verskaf asseblief die besonderhede van die INDIENSOPLEIDING ontvang (byvoorbeeld: ½ tot 1 dag Werkwinkel, Seminaar, ens.)  
 isiXhosa: Ukuba kunjalo, nceda unike iinkcukacha zoqeqesho olufumeneyo ESEMSEBENZINI (umzekelo: Ucweyo oluntsuku eziyi-½ ukuya kusuku olu-1, Ingqungquthela, njl. njl.) \*

15. English: How many learners are in your largest Natural Science and Technology class?  
 Afrikaans: Hoeveel leerders is daar in u grootste Natuurwetenskap- en Tegnologieklas?  
 isiXhosa: Bangaphi abafundi abakweyona klasi yakho inkulu yezifundo zenzululwazi kwezemvelo nezobugcisa bonxibelelwano? \*

16. English: What type of school do you teach at?  
 Afrikaans: In watter tipe skool werk u?  
 isiXhosa: Ufundisa kwisekolo esinjani? \*

- Single-sex boys / Seunskool / Kwesesini samakhwenkwe odwa  
 Single-sex girls / Meisieskool / Kwesesini samantombazana odwa  
 Co-educational / Skool met beide seuns en dogters / Kwesixubileyo

17. English: Please describe in your own words what you believe 'formative assessment' to be.  
 Afrikaans: Beskryf asseblief in u eie woorde wat u glo 'formatiewe assessering' is.  
 isiXhosa: Nceda uchaze usebenzisa amagama akho into okholelwa ukuba luyiyo 'uhlolo oluqhubayo'. \*

18. English: Could you please give examples of assessment practices in your classroom when you

think about formative assessment?

Afrikaans: Kan u asseblief voorbeelde verskaf van assesseringspraktyke in u klaskamer, wanneer u

dink oor formatiewe assessering?

isiXhosa: Unganceda unike imizekelo yezinto ezenziwayo kuhlolo kwiklasi yakho xa ucinga 'ngohlolo oluqhubayo'? \*

6



SECTION II  
AFDELING II  
ICNDELO II

INSTRUCTIONS IN ENGLISH:-

Please give your rating for each of the following 27 statements based on YOUR opinion about assessment. Indicate how much you agree or disagree with each statement. Use the following rating scale and choose the one response that comes CLOSEST to describing your opinion.

- Strongly Disagree
- Mostly Disagree
- Slightly (a little) Agree
- Moderately (fairly) Agree
- Mostly Agree
- Strongly Agree

Note that the ratings are ordered from Disagree to Agree from the TOP to the BOTTOM, respectively.

Please tick one option for each.

-----  
INSTRUKSIES IN AFRIKAANS:-

Verskaf asseblief u gradering van die volgende 27 stellings, gebaseer op U EIE opinie oor assessering. Dui aan hoeveel u saam stem of nie saam stem nie met elke stelling. Gebruik die volgende graderingskaal en kies een antwoord wat die naaste aan u opinie is.

- Stem glad nie saam nie
- Stem meestal nie saam nie
- Stem 'n bietjie saam
- Stem redelik saam
- Stem meestal saam
- Stem definitief saam

Neem kennis dat die graderings georden is vanaf, Stem nie saam nie tot Stem saam, van BO na ONDER.

Kies slegs een opsie vir elke stelling.

-----  
IMIYALELO NGESIXHOSA:-

Nceda unike umlinganiselo wakho kwintetho nganye yezi nintetho zingama-27 zilandelayo ngokusekwe kuluvo LWAKHO ngohlolo. Phawula ukuba ungqinelana okanye awungqinelani kangakanani nentetho nganye. Sebenzisa lon mlinganiselo-sikali olandelayo ze ukhetho impendulo enye esondele kakhulu ekuchazeni uluvo lwakho.

- Andivumi ngamandla
- Andivumi inkoliso
- Ndivuma kancinci
- Ndivuma njee
- Ndiyavuma inkoliso
- Ndivuma ngamandla

Qaphela ukuba imilinganiselo ilungelelaniswe ngokuqala kuAndivumi ukuya kuNdiyavuma ukusuka PHEZULU ukuya ngeZ-ANTSI, ngokulandelelana.

Nceda ubeke uphawu kwintetho nganye enokukhethwa

19. English: Formative assessment provides information on how well schools are doing.  
 Afrikaans: Formatiewe assessering verskaf inligting oor hoe goed skole vaar.  
 isiXhosa: Uhlolo oluqhubayo lunika iinkcukacha ngedlela eziqhuba ngayo izikolo. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

20. English: Formative assessment places learners into categories ((i.e., grouping based on learner performance).  
 Afrikaans: Formatiewe assessering plaas leerders in kategorieë (d.w.s. groepering gebaseer op leerderprestasie).  
 isiXhosa: Uhlolo oluqhubayo lwahlula-hlula abafundi ngokwamaqela (amaqela asekelwe kwindlela aqhuba ngayo umfundi, ukutsho). \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

21. English: Formative assessment is a way to determine how much learners have learned from teaching.  
 Afrikaans: Formatiewe assessering is 'n manier om te bepaal hoeveel leerders geleer het uit die onderrig wat hulle ontvang het.  
 isiXhosa: Uhlolo oluqhubayo yindlela yokufumanisa ukuba abafundi bafunde kangakanani kuhlohlo. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

22. English: Formative assessment provides feedback to learners about their performance.  
 Afrikaans: Formatiewe assessering verskaf terugvoering aan leerders oor hulle prestasie.  
 isiXhosa: Uhlolo oluqhubayo lunika ingxelo kubafundi ngendlela abaqhube ngayo. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

23. English: Formative assessment is integrated with teaching.  
 Afrikaans: Formatiewe assessering is geïntegreerd met onderrig.  
 isiXhosa: Uhlolo oluqhubayo ludibene nokufundisa. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

24. English: Formative assessment results are trustworthy.  
 Afrikaans: Formatiewe assesseringsuitslae is betroubaar.  
 isiXhosa: Iziphumo zohlolo oluqhubayo zithembekile. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

25. English: Formative assessment forces teachers to teach in a way that is against their beliefs about teaching.

Afrikaans: Formatiewe assessering forseer onderwysers om klas te gee op 'n manier wat teenstrydig is met hulle oortuigings omtrent onderwys.

isiXhosa: Uhlolo oluqhubayo lunyanzelisa ootitshala ukuba bafundise ngeendlela ezinxamnye neenkolelo zabo ngokufundisa. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

26. English: Teachers conduct formative assessments but make little use of the results.

Afrikaans: Onderwysers doen Formatiewe assessering, maar maak min gebruik van die uitslae.

isiXhosa: Ootitshala bayaluqhuba uhlolo oluqhubayo kodwa abazisebenzisi iziphumo zalo. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

27. English: Formative assessment results should be treated cautiously because of measurement error in the accuracy of assessment data.

Afrikaans: Formatiewe assessering se uitslae behoort versigtig hanteer te word as gevolg van maatstaaftrekkings of foute in die akkuraatheid van assesseringsdata.

isiXhosa: Iziphumo zohlolo oluqhubayo kufanele ukuba ziphathwe ngobulumko ngenxa yempazamo yomlinganiselo ekuchanekeni kweenkukacha zohlolo. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

28. English: Formative assessment is an accurate indicator of a school's quality.  
 Afrikaans: Formatiewe assessering is 'n akkurate aanwyser van 'n skool se kwaliteit.  
 isiXhosa: Uhlolo oluqhubayo sisalathiso esichanekileyo sobunjani besikolo. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

29. English: Formative assessment is assigning a grade or level (i.e., competency level) to learner's work.  
 Afrikaans: Formatiewe assessering is wanneer 'n graad of vlak (d.w.s. bevoegdheidsvlak) aan 'n leerder se werk toegeken word.  
 isiXhosa: Uhlolo oluqhubayo lukunika amanqaku okanye umgangatho (izinga lesakhono, ukutsho). \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

30. English: Formative assessment establishes what learners have learned.  
 Afrikaans: Formatiewe assessering stel vas wat leerders geleer het.  
 isiXhosa: Uhlolo oluqhubayo lufumanisa ukuba bafunde ntoni na abafundi. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

31. English: Formative assessment feeds back to learners about their learning needs.  
 Afrikaans: Formatiewe assesserings gee terugvoer aan leerders oor wat hul leerbehoefes is.  
 isiXhosa: Uhlolo oluqhubayo lunika ingxelo kubafundi ngezidingo zabo zokufunda. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

32. English: Formative assessment information modifies ongoing teaching of learners.  
 Afrikaans: Formatiewe assesseringsinligting laat toe dat die deurlopende onderrig van leerders aangepas word.  
 isiXhosa: linkcukacha zohlolo oluqhubayo zitshintsha ukufundiswa kwabafundi okuqhubayo.  
 \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

33. English: Formative assessment results are consistent with teacher judgement and assessment tool.  
 Afrikaans: Formatiewe assesseringsuitslae is konsekwent met die onderwysers se oordeel en assesseringshulpmiddels.  
 isiXhosa: Iziphumo zohlolo oluqhubayo ziyangqinelana nesigqibo sikatishala nesixhobo sohlolo. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

34. English: Formative assessment is unfair to learners.  
 Afrikaans: Formatiewe assesserings is onregverdig teenoor leerders.  
 isiXhosa: Uhlolo oluqhubayo lunobulungisa kubafundi. \*
- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla
- 
35. English: Formative assessment results are filed and ignored.  
 Afrikaans: Formatiewe assesseringsuitslae word geliasseer en geignoreer.  
 isiXhosa: Iziphumo zohlolo oluqhubayo zifakwa kwifayile ze zingahoywa. \*
- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla
- 
36. English: Teachers should take into account the error and imprecision in all formative assessment.  
 Afrikaans: Onderwysers behoort foute en onpresiesheid van alle formatiewe assessering in ag te neem.  
 isiXhosa: Ootitshala kufanele ukuba bathathele ingqalelo iimpazamo nokungachaneke kwiintlole eziqhubayo zonke. \*
- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

37. English: Formative assessment is a good way to evaluate a school.  
 Afrikaans: Formatiewe assessering is 'n goeie manier om 'n skool te evalueer.  
 isiXhosa: Uhlolo oluqhubayo yindlela entle yokuphonononga isikolo. \*
- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla
38. English: Formative assessment determines if learners meet the required standard for the grade or level.  
 Afrikaans: Formatiewe assessering bepaal of leerders aan die standaardvereistes van 'n graad of vlak voldoen.  
 isiXhosa: Uhlolo oluqhubayo lufumanisa ukuba umfundi uyafikelela kwinqanaba elifunekayo wamanqaku okanye umgangatho. \*
- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla
39. English: Formative assessment measures learners' higher order thinking skills.  
 Afrikaans: Formatiewe assessering meet leerders se hoër orde denkvaardighede.  
 isiXhosa: Uhlolo oluqhubayo lenza umlinganiselo wezakhono zokucinga zomfundi eziphezulu. \*
- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

40. English: Formative assessment helps learners improve their learning.  
 Afrikaans: Formatiewe assessering help leerders om beter te leer.  
 isiXhosa: Uhlolo oluqhubayo lunceda ukuba umfundi aphucuke kwindlela yokufunda. \*
- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla
- 
41. English: Formative assessment allows different learners to get different instruction.  
 Afrikaans: Formatiewe assessering maak dit moontlik vir verskillende leerders om verskillende instruksies en onderrig te ontvang.  
 isiXhosa: Uhlolo oluqhubayo luvumela abafundi abahlukeneyo okuba bafundiswe ngeendlela ezahlukileyo. \*
- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla
- 
42. English: Formative assessment results can be depended on (i.e., results are reliable and valid).  
 Afrikaans: Daar kan op formatiewe assesseringsuitslae staatgemaak word, (d.w.s. dat uitslae betroubaar en geldig is).  
 isiXhosa: Iziphumo zohlolo oluqhubayo zingathenjwa (iziphume zithembekile kwaye zisengqiqweni, ukutsho). \*
- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndiyavuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

43. English: Formative assessment interferes with teaching.  
Afrikaans: Formatiewe assessering meng in met onderrig.  
isiXhosa: Uhlolo oluqhubayo luphazamisana nokufundisa. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndivuvuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

44. English: Formative assessment has little impact on teaching.  
Afrikaans: Formatiewe assessering het 'n Klein inpak op onderrig.  
isiXhosa: Uhlolo oluqhubayo lunefuthe elincinci ekufundiseni. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndivuvuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

45. English: Formative assessment is an imprecise process.  
Afrikaans: Formatiewe assessering is 'n onpresiese proses.  
isiXhosa: Uhlolo oluqhubayo yinkqubo engachanekanga. \*

- Strongly Disagree / Stem glad nie saam nie / Andivumi ngamandla
- Mostly Disagree / Stem meestal nie saam nie / Andivumi inkoliso
- Slightly (a little) Agree / Stem 'n bietjie saam / Ndivuma kancinci
- Moderately (fairly) Agree / Stem redelik saam / Ndivuma njee
- Mostly Agree / Stem meestal saam / Ndivuvuma inkoliso
- Strongly Agree / Stem definitief saam / Ndivuma ngamandla

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## Annex XIV: Final study – Invitation Letter to Principal



### SCHOOL OF EDUCATION

Associate Professor Rüdiger Laugksch

University of Cape Town, Private Bag X3, Rondebosch, 7701  
 Physical address: rm 5.14.2, Neville Alexander Building, University Ave South, Upper Campus  
 Tel: +27 (0) 21 650 2777 Fax: +27 (0) 21 650 3489  
 E-mail: Rüdiger.Laugksch@uct.ac.za Internet: <http://www.education.uct.ac.za/>

16<sup>th</sup> September 2021

**Subject: Invitation to participate in a research study entitled “Western Cape Primary School Science Teachers’ Conceptions of Formative Assessment”**

Dear Sir/Madam,

I am Mrs. Aparna Ghorpade, a M.Ed. student at the University of Cape Town. Currently, I am involved in the above-mentioned research project. This project has received ethics clearance from the University of Cape Town (UCT) and approval from the Western Cape Education Department (WCED). I would like to invite the teachers from your school to participate in this study.

The South African curriculum has seen several assessment related reforms since 1994, and an emphasis has been to implement formative assessment practices at the classroom level. In any type of assessment, teachers are a key interpreter of assessment information in a classroom situation, and their conceptions of assessment play an important role in successful implementation of assessment practices. Therefore, considering the important position of formative assessment in the South African curriculum reforms, this study aims to contribute to the ongoing debate on assessment reform by exploring the relationship between the Western Cape primary school science teachers’ conceptions about formative assessment and their associated practices.

Teachers’ participation in this study involves the completion of an online survey questionnaire by the teachers who teach Natural Sciences and Technology in Grades 4 to 7. The questionnaire is simultaneously presented in English, Afrikaans, and isiXhosa language to avoid language comprehension difficulties, if any, while answering the questionnaire. It comprises 17 questions that ask about a teacher’s general information and 27 multiple-choice statements. It should take no longer than 10 minutes to complete. You can access the questionnaire by clicking the link below:

<https://forms.office.com/r/9W8sRc5KAF>

Teachers’ participation in this survey is purely voluntary. I assure you that any information collected during this study will be strictly confidential. It will be used only for the statistical purposes and will be reported only in aggregated form. I also assure you that the school’s and teachers’ identity will not be revealed or associated with teacher responses in any part of the research report.

I would be grateful if you would assist me by encouraging your teachers to participate in this study. If you agree, I request you to kindly provide me with the list of possible teachers and their e-mail addresses who teach Natural Sciences and Technology in Grades 4 to 7 in your school.

Should you have any queries please feel free to contact me via email [ghrapa001@myuct.ac.za](mailto:ghrapa001@myuct.ac.za) or at 021 761 2634(H) / 060 62 15689 (cell).

Thank you for assisting in this study!

Warm regards,

Signed by candidate

Aparna Ghorpade

Signed by candidate

A/Prof. Rudi Laugksch

(Supervisor)

**Annex XV: TCoA-III A Measurement Model (Brown, 2008)**

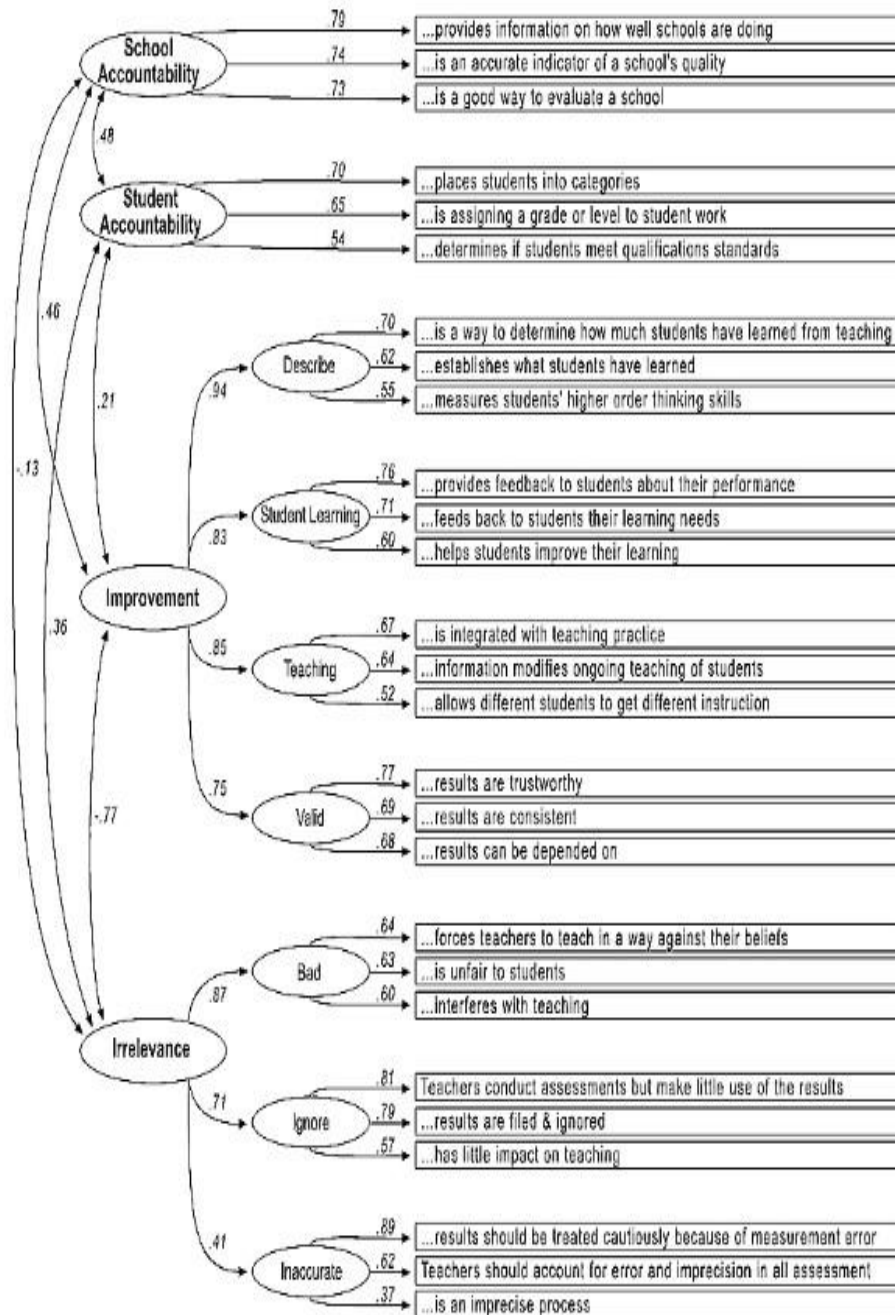


Figure 6. New Zealand Primary Teachers' Conceptions of Assessment Measurement Model—CoA-III A Abridged Scale.

### Annex XVI: Abbreviations of Variables and Their Descriptions

Abbreviation of variables	Description of variables
A_qual	Academic Qualification
P_qual	Professional Qualification
NST_Spec_Yes	Teacher is a specialist in teaching Natural Sciences and Technology
NST_Spec_No	Teacher is not a specialist in teaching Natural Sciences and Technology
NST_Expi	Number of years of work experience in teaching Natural Sciences and Technology
Grades_intermediate	Grades 4 to 6
Grades_senior	Grade 7
WCED_Training_Yes	Teacher has received training on assessment from WCED
WCED_Training_No	Teacher has not received training on assessment from WCED
Class_NST_Length	Number of learners in largest Natural Sciences and Technology class
School_Single-sex Boys	Schools where only male learners are enrolled
School_Single-sex Girls	Schools where only female learners are enrolled