



# ASSESSING THE PRIMARY SCHOOL MATHEMATICS IN SOUTH AFRICAN: LITERATURE AND TEACHERS PERSPECTIVE

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**ABSTRACT:** *Assessment of any form has to be informed by the assessor grounded knowledge of the content being assessed. The article reviews the various forms of assessment strategies advocated for foundation phase teachers in mathematics class rooms in South Africa. The paper attempts to address teachers' mathematics knowledge and how that knowledge is used to assess learners' acquisition of skills and values in mathematics. It further analyses the Annual National Assessment (ANA) in mathematics at Foundation Phase and its implications in the South Africa classroom. Assessment has both advantages and disadvantages. Literature points to the most prominent disadvantage as being that teachers tend to exhaust times allocated for teaching on drilling learners with assessment tasks in order for the learners to pass especially standardised and high stakes forms of assessment such as the ANA. Teachers may also rush through a series of concepts and denude teaching for understanding but instead replace it with procedural teaching and leave learners with insufficient mastery of the concepts. Literature further asserts that teachers that are less grounded in both content and instructional knowledge of mathematics usually display lack of the knowledge of how to use formative assessment such as ANA successfully. Literature seems to point to the fact that while there is concrete evidence on the value of assessment such as ANA, teachers in schools are beginning to replace teaching and concept dissemination time with rigorous preparations for assessments, learners are being drilled to pass the assessment tasks to safe guard, the schools, teachers and district credentials. While the intentions are convincing, non performing schools, are being labelled and the teachers and administrators put on stringent monitoring programmes.*

**Keyword:** Assessment, mathematics content knowledge, CAPS, ANA

## 1. INTRODUCTION

Assessment as a topical issue has drawn a lot of attention from various scholars (Jones, 2013; Guskey 2000) across the continent. A total of about 10,300,000 journals articles have been written on assessments in Africa while a notable amount of about 3,160,000 in mathematics in South Africa. In elementary mathematics, a total of about 1,810,000 journal articles exist. The root word, assessment is derived from the Latin verb 'assidere' which means 'to sit beside/ close in', Vender (2012). Assessment is any art of interpreting information about students' performance collected through any multitude of means, Brown & Hirschfeld, (2008). Williams (2011) alongside others asserts that the term assessment is primarily used to describe the process of evaluating, the productivity/ efficiency of ordered instructional activity at the end of a lesson.

Guskey (2000) pointed at assessment to mean obtaining information regarding a phenomenon using a variety of procedure, testing, observation, and documentation of performances. On the same note Luneta, (2013) decisively states, that it is a judgement about the quality, value, effectiveness or impact of educational procedure and learning. In line with this, the Department of Education (2007) explicate, assessment as a continuous planned activity that is based on the assessment of knowledge, skills, progress, quality and quality of performance and whether the learner can demonstrate his knowledge and skills in order to progress to a next grade. Assembling all these facts

together, assessment can be defined as the recognizing of, rating and recording learner's performance using various definite tools as per time for the purpose of accountability and improvement.

In order to ensure proper and maximum utilization of resources, Policy makers, legislators, economist and other stake holders have great interest in assessment because they see it as a means of ensuring accountability. Assessment by nature can serve as indicator to reveal the quality and quantity of school programs and teaching personnel, Brown & Hirschfeld (2008). Hence assessment is not only relevant to policy makers, it is also a diagnostic tool for teachers to determine the form and the amount of assistance to be given to the learner as the need may arise. Luneta (2013) elucidated further that assessment can help to rate learner's progress and learning process over time by teachers and parents.

However, certain conditions need to be satisfied in order to ensure the effectiveness of any assessment. Stiggins & Chappins (2005) expounded that assessment must be developed and guided by a clear purpose and it must accurately reflect the learning expectations. Method of assessments must be capable of reflecting the intended target and also act as a tool for teaching proficiency (Williams 2011). Above all it must be timely, understandable and helpful. Jones (2013) declared that assessment must be able to rate the effect of education systems - the learners, teachers and administrators.

## **2. THE THEORETICAL PERSPECTIVE OF ASSESSMENT**

The process of assessment has three on going stages as highlighted by Jones (2013): the identification of student learning objectives, collation of information and, application of information to institutionalized decision making. It is worth emphasising that the assessment process work like the human body system in which each aspect must work individually but at the same time flowing into each other, aiming at a common goal. Assessment requires that educators collect direct evidences' of student performances and constantly strive to improve the educational experiences for students.

Naturally, assessments serve the following purpose, progress evaluation, instructional planning and implementation, programme planning, diagnosis screening, selection, classification and certification (Killen, 2003). Assessment also should be able to measure students' attainments of creativity, leadership and imagination (Knight 2006). Assessments are of great significance in every level of education. According to James (2013), assessment in higher level of education has the capacity to rate the effect of education on the student. It helps students to know there performance. It serves as a means of sensitizing the students to improvement on their performance (Carless et al. 2007). Knight (2006) explicate that assessment helps to measure students' attainment of leadership, creativity and innovation. Flether et al (2011) also affirmed that assessment is a source of information about the teaching process, student performance in terms of the how and why of learning and the academic program itself.

At the lower level of education (pre-school), assessment helps to determine the effectiveness' of educational experience (Worthan, 2008). It helps to evaluate how programme is meeting goals set for children, identify children who may be in need of specialized services, and also plan instructional activities for individual and group of children. Most importantly, it helps to identify programme improvement and staff development needs. Although the younger the child, the more difficult it is to obtain valid assessment (Epstein et al 2004), yet there are specialized assessments designed to meet this needs such as academic readiness test developmental screening.

There are different types of assessment. Cornelius (2013) promulgated that there are two major types of assessment (Formative and Summative). Peril et al (2009) highlighted and distinguished



three major types of assessments; Formative, Interim and Summative assessments. Peril et al (2009) define Interim assessment to mean 'assessment administered during instruction to evaluate students' knowledge and skills relative to a specific set of academic goals in order to inform policy makers or educator decisions at classroom school, or district level'. The purpose of this type of assessment is instructional, evaluative and predictive and for provision of data for policy makers.

Formative assessment also known as alternative forms of assessment has similarly be described as authentic assessment, Self-assessment, Dynamic assessment and Performance assessment (Archer et al. 1999). It is any form of assessment in which the learners provide answers to specific questions using their own ideas, words and conceptions as well as displaying creativity in the class. Tompelli (1999) simplify formative assessment as using today's understanding to modify tomorrow instructions. It takes place on a daily basis and it is an ongoing process in the classroom. It helps to put together information over time, to ascertain what learners are able to do and how they progress towards achieving learning outcomes.

Authentic assessment, a type of formative assessment is a daily and continuous process (mostly criteria referenced) where the learner's performance is rated against external criteria and not against a class average (Goodyer 2008). Authentic assessment focuses on demonstration of knowledge and skills in way that resemble real life situation as closely as possible in order to help learners to achieve success later in life.

Performance based assessment on the other hand is the direct, systematic observation of actual learner performances according to pre-established performance (Butler 2001). Learners are aware of what knowledge and skills they will be assessed as well as what the assessor the teachers expects of them. These activities include visual exhibits, verbal and non-verbal expression writing and speaking.

Portfolio assessment is a collection of a learner works, oral presentation, written work and even drawing. The content of the portfolio is determined by the teacher while the quantity is determined by the ability of the learner. Portfolio assessment entails production of file by learner, for rating by the teacher in order to identify the skill of the learner over time (Bender, 2001). Bouwer (2005) opined that is a helpful way of identifying what learners can do, it reveal the development of the learner over time.

Observation based assessment is a form of assessment in which the teacher's ability to observe, or watch carefully especially with rapt attention to details of behaviour of the learner for the purpose of arriving at a judgement is the major tool. The accuracy of the assessment depend purely on the teacher's commitment, sensitivity and alertness to the learners' behavioural attitudes, dispositions and needs. It is more child a centred method of assessment that helps the teacher to take a close look at the learners' ability to master the curriculum (Wood 2002).

Self-assessment and peer assessment, another category of assessment makes the student to be able to give personal rating of their work. The learners takes over the role of the teacher in evaluating their work. The teacher can help the learners by providing a criteria for judging the work or help learners to judge their work, (Seifert & Suiton, 2009). Self-assessment can lead learners have a self-controlled behaviour. Peer assessment entails evaluating or rating each other works. This gives confidence and freedom of expression on the part of the learners. For effectiveness, the class must have been exposed to criteria needed for the evaluation of such work. Learners ought to have been tutored in observational skills so that the assessment will be objective and sensible and will not be an opportunity for negative remarks and bullying.

Summative assessments are the typically pencil and paper test assessments which are usually content and input based (Santrock 2011). It is also categorised as Formal assessment. Harten

&James(1997) expounded that summative assessment can be described as learning achieved at a certain time for the purposes of reporting to parents, other teacher, the pupils themselves and in a summary form to other interested parties such as school administrators. It is designed to evaluate students mastery of what has been taught and it occurs after instruction has been given and has been carried out by the student (Cornelius 2013). Summative assessment aimed to measure what the learner has learnt and what the learner can do. It can be either criterion referenced or norm reference, Harlen &James (1999). Summative assessment is usually applied at the end of a particular instructional period and/or at the end of the academic year and gives direction about a learner's promotion to a next grade of future planning and work placement. It is also called assessment of learning.

The following has been highlighted as the characteristic of summative assessment: it takes place at certain intervals when the achievement has to be reported; it relates to progression in learning against public criteria; it requires method which are as dependable as possible without compromising validity, it involves some quality assurance procedures, and it should be based on evidence from full range of performance relevant to the criteria being used (Harlen & James (1999).

However, there is literature such as Andrade & Cizek (2010) advocating for the use of formative assessment or the call for shift from the use of assessment of learning (AOL) summative assessment to assessment for learning (AFL) formative assessment probably because of the above stated characteristic. Stiggin (2005) explicates that AOL can render hopelessness among students who fails as failure implies further assessment. Assessment for learning creates learners' self-confidence and hope in their ability to acquire knowledge and skills in mathematics (Madison-Harries & Muoneke 2012). Assessment for learning also enables learners to be more aware of their thought process which can later be used to make changes in thinking (Wiliams 2011). Assessments for learning, (AFL) focuses on learners, as they are more involved in the assessment process .They are the initial connection between assessment and learning. AFL aims at making every learner over time to be motivated and self-directed. The teacher gradually ceases to be the external assessor because the learner utilize the knowledge they are exposed to (Crisp 2012). According to literature the ultimate goal in AFL is for students to acquire the skill and the habit of mind to be meta-cognitively aware and increasing independent in the task of knowledge acquisition (Andrade & Cizek 2010).

Formative assessment (AFL) is highly beneficial both to the learner and teacher. Clarks (2011) acknowledged that it has the capacity to enrich learning and to aid deeper understanding of core content. It helps the teacher to construct more personalized instruction for all students, and adapt the instructional strategy when necessary (Dorn (2010). Unlike summative assessment where feedbacks can only be obtained at the end of a long period of time, AFL serves as a snitch, informing the teacher ahead of time about the most effective step of instruction and enabling the teacher to modify teaching style and obtain feedbacks quickly (Cornelius, 2011).

The educational system has been clout by the socio – political and economic ambience of Post - Apartheid in South Africa. It has resulted in the adoption of new language policies for education, emergence of national qualification framework, desegregation of schools and changes in curricula (Vanderyar 2007). The South African government since inception has introduced diver types of intervention initiatives and assessment programmes:- The Quality, Learning And Teaching Campaign 2008; The Quality, Improvement, Development, Support and Up-liftment Programme 2005; Southern African Consortium For Monitoring Educational Quality SACMEQ II project 2000-2005; Systematic Evaluation Programme (2001, 2004 2007); Monitoring Learning Achievement ( MLA project) 1999. Also included was the South African Monitoring System for Primary Schools Project (SAMP) which was initiated by the Centre for Evaluation Assessment (CEA) (Archer & Howie 2013); the Annual National Assessment (ANA) (2011).

The initiatives were geared towards improving the quality and levels of educational outcomes. South Africa also participated in international assessment programmes: (PIRLS) Progress in International Reading Literacy Study and Trends in International Mathematics and Science Study (TIMSS), the performance of which caused an outcry in the country. TIMSS (1999; 2003, 2008) in particular continues to show South African learners as having the lowest performance in mathematics among the participating countries. These dismal results and other reasons such as; difficulties in the implementation of the National Curriculum Statements (NCS) and teachers being over loaded with new content, led to the development of a “new” curriculum, CAPS (Curriculum and Assessment Policy Statement). There are arguments that CAPS is an amendment of the National Curriculum Statement and that it is an adjustment to what is taught (curriculum) and not how teachers teach (teaching method ) SOA(2014). CAPS is now the major document for assessing, implementing and evaluating the objectives and goals of education. It has been strategized that CAPS will be accomplished, incrementally and gradually. It will take off with foundation phase (grade R-3) in 2012, in 2013 with Intermediate phase (Grade 4-6) and in 2014 Senior phase (Grade7-9). This new curriculum CAPS has also been criticised. Themane (2012) argued that the modified curriculum although make available to the teacher great freedom to interpret the curriculum but it also exposes the teacher to the tiring responsibility of planning for every details. Spuall (2012) further emphasised that the curriculum has made way for good accountability but accountability can’t mobilize resources that school can’t provide. However, Timcke (2013) maintained that Outcome Based Education was not really given a full blooded chance” and contended that it was used as an intra-governmental power struggle designed to fail. Swartz (2006) also declared that current assessment policy (National Curriculum Statement) would not succeed in engendering critical thinking and learning, hinting that these were some of the factors behind low performance in mathematics in both national and international assessments. CIE (2010) is of the opinion that CAPS is patchy and does not state how to prepare learners for the examination. Luneta (2014) argues that the success of the new assessment tools and new curricula depends highly on the teachers’ instructional and mathematics content competence. Naroth & Luneta (2015) assert that teachers that are instructionally and mathematics content competent can engage with any given curricula and would be able to adjust to its demands successfully.

Research point to the fact that teachers’ content and instructional knowledge is fundamental if they are to provide appropriate and effective assessment tasks. However though Vandeyar & Killen (2003) deduced more than a decade ago that some teachers are yet to change their method of teachings which are out dated it is unfortunately still factual today (CDE, 2013). Kuze (2011) deduced that there are no definite and clear cut patterns as regards assessment (formative) in some schools in South Africa. Most of the studies on assessment tend to focus on the teacher factor. Black & Williams (1998) emphasise that assessment cannot be carried out outside the influence and supervision of the teacher. When teacher ignore appropriate assessment practise, assessment become a meaningless activity unrelated to learning.

Stressing the magnitude of assessment, Collis (1999) was of the opinion that, if assessments procedures are not altered a curriculum with the finest principle and best intention will produce little positive result. Vandeyar et al (2003) argued that if teacher do comprehend the primary and basic principles of high quality assessments, they will have minimal challenges in adapting their assessment. Vithal et al (2005) delineated that before assessment can be meaningful its purpose must be directly in harmony with the objective of the subject. Using mathematics as an example DOE (2002:24) states that “the purpose of teaching and learning of mathematics can enable the learner to develop deep conceptual understanding in order to make sense of mathematics, and acquire the specific knowledge and skills necessary for the application of mathematics to physical, social and mathematical problem” and assessment is at the core of that exercise.



Mathematical knowledge, skill and value will enable the learner; to participate, equitably and meaningfully (with awareness of rights) in political, social, environmental and economic activities; contribute responsibly to the reconstruction and development of society by using mathematics tools to expose inequality, assess environmental problems and risk (DOE 2002). Brodie & Pournara (2005) proclaim that the purpose of learning is to be able to develop deep conceptual understanding of whatever is taught in order to apply to authentic, and real life situation.

The strain in the South African context is the evidence that most mathematics teachers have low content knowledge. Spaul (2013:4) wrote 'many South African mathematics teachers have below-basic levels of content knowledge, with high proportions of teachers being unable to answer questions aimed at their pupils'. Given such a scenario assessment which is supposed to be informed by good subject knowledge of what is being assessed gets compromised (Luneta 2013). Assessment which is aimed at creating an inner awareness in learners where learning is seen as a tool to develop self and improve the society is compromised (Vandeyar & Killen 2007). In order to improve the situation teachers need to address four conceptions of assessment (Brown 2003): (a) useful because it can provide information for improving instruction and learning; (b) a necessary process for making learners accountable for their learning; (c) a process by which teachers and/or schools are made accountable; and (d) irrelevant to the work of teachers and the life of learners. To achieve these, teacher role and conception is very critical. Hill (2000) and Brown (2003) suggest there are four major types of conception that teachers can hold about assessment which can affect their practise. Postulating on this fact, Vandeyar & Killen (2007), resolved that for assessment to be effective, teacher's conception must be acknowledged, challenged and changed. On this same issue, Kienowski (2013), proved the need to work on teachers literacy and teachers capacity on assessment in order to enhance learning. It is not enough to ensure and enforce appropriate assessment techniques and practises there is need to educate teachers on the what, when, why and how of assessments. Simms & George (2014) asserted that assessment is key process in assuring quality education.

Assessment in whatever form, must aim at helping the learner, assist the teacher in diagnosing learner's weakness and strength, developing ability and skill, evaluating the curriculum and providing feedback for parents, policy makers and learners. Policy makers can utilize assessment in formulating policies and aiding decision making. However, assessment aims and strategies must be clearly and unambiguously stated in measurable terms and within a realistic time frame to attain the goals and objectives of education.

### **3. THE EMERGENT OF THE ANNUAL NATIONAL ASSESSMENT (ANA)**

In order to address these questions the study endeavoured to explore the Annual National Assessment examinations that foundation phase learners under go in South Africa. There are several studies that have pointed to the fact that South African learners have performed dismally in a number of international assessment studies (Howie, 2002). As part of strategic plan to respond to the aforementioned crisis, the South African government and the Basic Department of Education decided to prioritize the improvement of the quality and levels of the educational outcomes in the schooling system. The extent to which the desired outcomes were to be achieved was to be monitored through the Annual National Assessment Guidelines for Interpretation and use of ANA 2012 pointed at a widespread realisation that in order to improve grade 12 results, performance of learners in the lower grades must be improved. This necessitated the introduction of the standardised assessment, Annual National Assessment (ANA) as part of the Foundation for Learning Campaign in the foundation and intermediate phase (DBE, 2012). ANA was established as a standardized assessment practice to assess learners' achievement in the foundation and intermediate phase (DBE, 2012). Before ANA, there was no reliable way of knowing which schools performed better than others in the foundation and intermediate phase because assessments were not sufficiently standardized across schools (Annual National Assessments 2011, 2010). The system

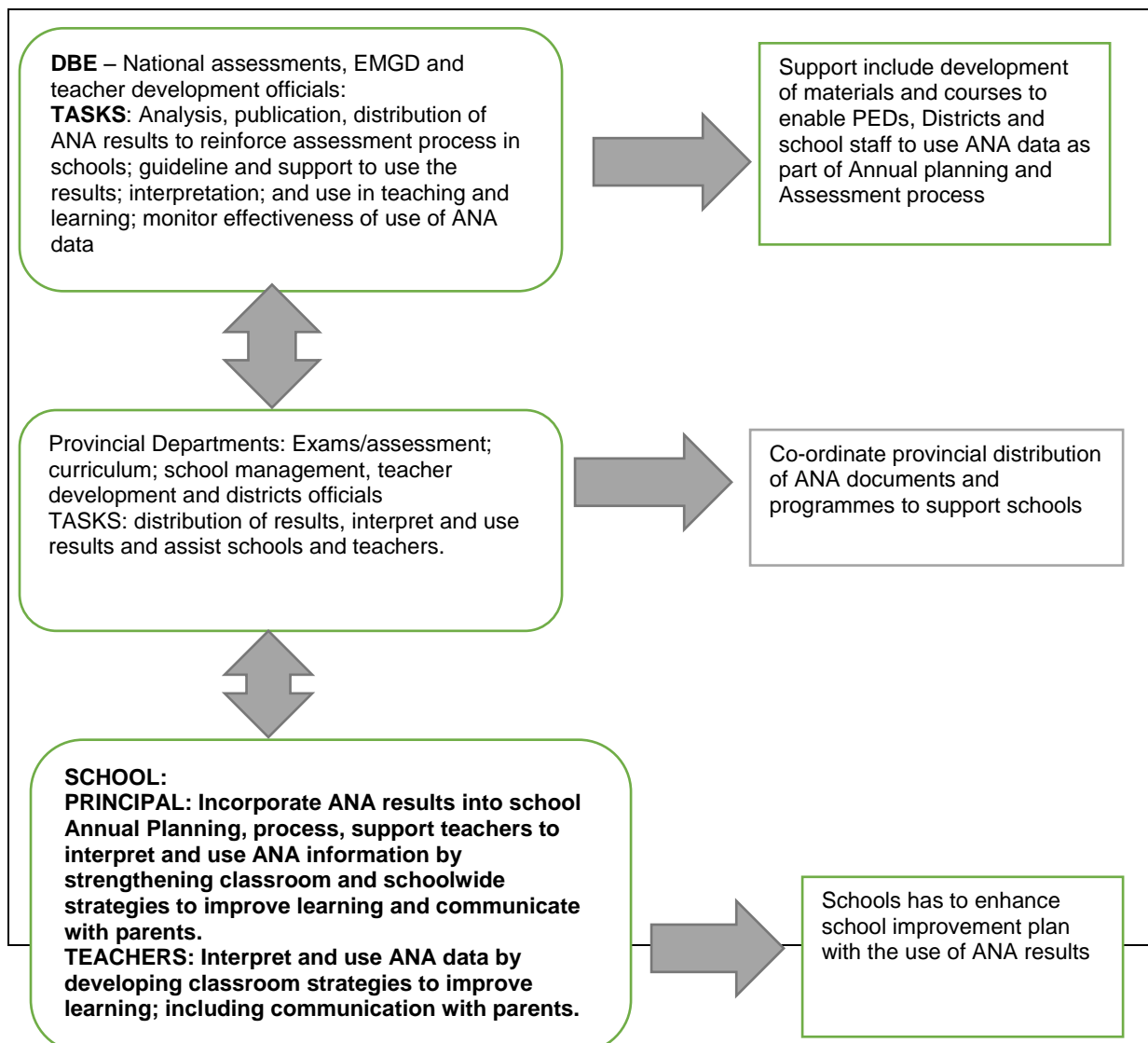


depended on assessments internally and marked by schools themselves to judge whether learning and teaching was of a reasonable standard, and aligned to the country's curriculum expectations (Curriculum News, 2011)

According to the Report on the ANA 2011 (DBE, 2010), part of the purpose of ANA is to make a decisive contribution towards better learning in schools as it adds to variety of existing assessments as well as in form teachers on planning classroom work. At the national level, ANA is a vital instrument intended to measure learners progress towards the national target of aiming to produce at least 60% of learners at the final grades of three curriculum phases grade 3, 6 and 9 who should be able to perform at an acceptable level in mathematics and languages. The Action Plan 2014 (DBE, 2010) articulated that by 2014 schools would be able to boast 60% of the learners being able to perform at an acceptable rate of 50% or above in the mathematics ANA. This target forms the first three of 27 goals in action plan to 2014 (Action Plan To 2014: Towards the Realization of Schooling 2025, 2010). In addition, report on the ANA 2011 (2010) outlines the following four key effects ANA should have on schools:

- To expose teachers to better assessment practices,
- To make it easier for districts to identify schools in most need of assistance,
- Encourage schools to celebrate outstanding performance,
- And also empower parents with important information about their children's performance.

**Figure 1** The process and actions on the use of ANA results.





**(Adapted from Annual National Assessment 2011, A guideline for interpretation and use of ANA results; DBE, 2010)**

Research question:

*What are the mathematics teachers' impression of the ANA at foundation phase in South Africa?*

#### **4. METHODOLOGY**

The study was a qualitative in approach undertaken in natural classroom settings and used mathematics teachers responses to a questionnaire as primary data sources (Gall et al, 1999). The collection and documenting of data were considered in cognisance of the naturalistic research paradigm, with the notion of generating hypothesis as the study unfolded rather than the quantitative hypothesis-testing framework (Gall et al, 1999).

It involved 25 foundation phase teachers Majority (82%) said that the ANA has assisted them in identifying learners' weaknesses but that it is not possible to cover all the mathematical content that the ANA tests. The teachers were asked to explain how useful and supportive to learning of mathematics the ANA was.

#### **5. DESCRIPTIVE ANALYSIS AND FINDINGS**

While the Figure 1 show the good intentions of ANA (Support *include development of materials and courses to enable PEDs, Districts and school staff to use ANA data as part of Annual planning and Assessment process of using the ANA*), the schools are not using the results, teachers surveyed responded that they have not been developing any materials and neither have the district officers shown them how. According to the teachers there is very little planning that takes place in schools after the ANA results have been announced

Majority (89 %) of the teachers surveyed think that ANA is useful but not well implemented. The teachers hinted that while the ANA does point out the learners weaknesses, it has little significance in identifying the causes of the errors or the misconceptions behind the errors. Most of the errors the learners make are well known to the teachers but they have difficulties dealing with the causes. The quotation from one of the teachers certifies their view.

*The tests are good. They show the weakness in learners.*

Majority (79 %) of teachers surveyed think that a number of teachers are spending more time preparing learners for ANA examinations than teaching. The teachers agreed in unison that because of the emphasis the government is putting on ANA and the implications if the learners in the school did not perform accordingly most of the time and months before the ANA examinations is spent revising for ANA instead of teaching for understanding. One teacher is quoted below:



We are spending the months before ANA revising only, very little teaching

Majority of teachers (84%) think that the content spread of ANA is more than what they can teach and cover over the given time in class as a result they resort to teaching to the tests. There is a belief among the teachers surveyed that the ANA examination cover more content than they can actual teach in the time provided by the Department of Education. One teachers had this to say:

It is impossible to cover the content of the ana questions

Majority of teachers (77 %) think that it is not fare for the government to label schools as none performing based on ANA results as there are other forms of assessment that the learners undergo. The schools that

Schools are labelled under performing

Majority of the teachers (72%) surveyed think that the ANA is not serving the purpose it was meant for as the questions are of very high thinking order than what the learners do in their everyday learning. There was a belief among teachers surveyed that the ANA question were too difficult compared to the questions in their class workbooks and exercises. This makes it difficult for learners to answer these questions as there are of a higher cognitive level than they are used to. Below is a quote from one of the teachers.

Questions too difficult not meant for my class!!

The teachers surveyed (67 %) revealed that the ANA was causing both teaching and learning anxiety. There was a feeling among the teachers that when the period for ANA examinations was approaching, most teachers, learners and even the school administration is anxious. Below is a quote from one of the teachers' response to the questionnaire.

# The whole school is Geared of ANA

## 6. CONCLUSION

This article has addressed critical issues involving assessment in South Africa and how to date teachers are still grappling with it and the role teachers knowledge bases (Content knowledge, Pedagogical knowledge and Pedagogical Content Knowledge PCK) play in ensuring effective assessment in the classroom. Good learning cannot take place when there is little or misaligned assessment tasks and procedures. The literature has revealed that while several article have been written regarding the essence of assessment little was done to enhance teachers' assessment knowledge and skills.

There was a definite and well-articulated reason why the ANA was conceptualised and its ultimate benefits to both the teachers and the learners. There however seems to be a missing link in its implementation. The foregone discussion point to the fact that majority of teachers value ANA but at the same time see it as benefiting them because it fails to point to the causes of the error the learners are making.

The ANA seems to create a stigma among schools and learners, the labelling of schools as non performing as a result of ANA has made some teachers and schools disregard the advantages of the exercise but rather loth it for its punitive measures.

It is therefore recommended in this paper that teachers are invited for professional development workshops that addresses the learners' errors and the possible misconceptions that might have led to the errors. Concerted effort must be placed upon decentralising the development of ANA analysis structure that are informed by teacher input in mathematics.

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