

AN INVESTIGATION INTO TEACHERS'  
VIEWS OF CONTINUOUS ASSESSMENT (CA)  
AND ITS IMPLEMENTATION IN  
GRADE 12 HIGHER GRADE  
MATHEMATICS IN THE ETHEKWINI  
REGION

(Quarter Module / Thesis)

By

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## **DEDICATION**

**TO MY PARENTS, ISHUWARLALL AND LILLY,**

**MY SISTER, NADIRA,**

**MY BROTHER VIREND AND**

**MY MOTIVATOR RESHMA SEWSUNKER.**

## DECLARATION

I, **SUREN DEONARAIN**, declare that the research involved in my dissertation submitted in partial fulfillment of the Masters of Education Degree (Mathematics Education), entitled : “An Investigation Into Teachers’ Views of Continuous Assessment (CA) and its Implementation in Grade 12 Higher Grade Mathematics in the Ethekwini Region,” represents my own and original work.



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**SUREN DEONARAIN**

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## ABSTRACT

*The proposed research is about the introduction of Continuous Assessment (CA) in Grade 12 Higher Grade Mathematics, as part of the learner's overall assessment. Schools are required by policy laid down by the Department of Education to implement CA in Grade 12 Mathematics. The introduction of CA is a new development. It is important to study how it is being implemented and the effect it has on the quality of Mathematics Education. The goals of this research are to:*

- *investigate Grade 12 Mathematics teachers' understanding and views of CA;*
- *the strategies that they are implementing in CA;*
- *how CA is impacting on the conceptual understanding of their learners and*
- *to what extent are teachers' assessment practices consistent with the Rationale of Continuous Assessment?*

*The data was collected by means of a questionnaire which consisted of both close-ended and semi-structured questions. The Statistical Package for the Social Sciences (SPSS) was used to analyze the quantitative data. The findings show that continuous assessment is not being implemented in terms of a wide range of alternate assessment strategies as it was intended to be, with pen and paper testing still being the more dominant practice. The findings also show that whilst Continuous Assessment is having a measured educational impact on teachers and learners, there are still problems experienced by educators. These problems are hampering its implementation. Teachers require more workshops on the Continuous Assessment strategies.*

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# **CHAPTER ONE**

## **THE RESEARCH AREA**

### **1. INTRODUCTION**

Post 1994 South Africa, has seen changes taking place in all spheres of life, including education which has undergone policy and structural changes. The changes in the curriculum has had an impact on how and on what we teach. Outcomes-based Education (OBE), forms the foundation of the curriculum in South Africa, (*Revised National Curriculum Statement Grades R-9:2002*). This is to be followed by the proposed phased introduction of the Further Education and Training (FET) band for grades 10-12. In addition, changes had to be in the way learners are assessed if the introduction of OBE and FET are to become meaningful. Hence we now have the concept of Continuous Assessment (CA) for all grades. This offers a new dimension to assessment in South Africa.

The aim of this chapter is to firstly, present the shift in assessment in Grade 12 Mathematics, secondly, to state the research problem, the critical questions, the rationale and the significance of the study.

### **2. THE CHANGING ASSESSMENT SCENE IN GRADE 12 MATHEMATICS IN SOUTH AFRICA**

According to Lubisi (2003:52) in the past decade government agencies and teacher organizations have sought to state explicit learning outcomes, goals or criteria for achievement in school mathematics which was seen in the light that teachers will use to make sense of student's mathematical competencies. Lubisi further suggests that there has been a growing trend towards assessment criteria with more complex open-ended mathematical processes as opposed to traditional routine algorithmic manipulations.

In South Africa this shift towards more varied assessment criteria gained ground in the mid - 1990's through the aims of the Interim Core Syllabus and more recently

through the *Revised National Curriculum Statement (2002)* for both grades R to 9, and grades 10 to 12 which is the revision of *Curriculum 2005*.

At a workshop in June 2000, the Acting Subject Advisor (Mathematics – North Durban Region), Mr D. Krupanandun, tabled a discussion on the dismal Grade 12 Mathematics results of November 1999 (Department of Education:2000). In his report he cited some of the reasons for the poor results with which we are all familiar, such as the lack of qualified teachers, learner's attitude to the subject, the Redeployment and Rationalization process, and the general lack of response from pupils. Whilst these factors were familiar to educators, what grasped the attention of the house was the fact that the main reason for the meeting was that a YEARMARK SYSTEM would be introduced at Grade 12 level as policy for the Province of KwaZulu-Natal (KZN).

It was here that the concept Continuous Assessment (CA) was introduced. This was not surprising seeing that South Africa was not excluded from reform in Mathematics internationally where there has been much debate over “assessment” in mathematics since 1990 (Department of Education:2000). These changes in assessment in Mathematics had been warranted in terms of preparing students for the rapid changes in technology, in globalization and in preparation for the workplace.

Mathematics Assessment in South Africa in Grade 12 had always been based on a one off external examinations (which are high stakes and whose primary function has always been to rank, grade, select and score) learners. This has changed since the year 2000 in KZN, with the introduction of Continuous Assessment at Grade 12 level as reported in a Departmental Circular entitled “*Subject Policies for the Compilation of the Continuous Assessment Year Mark-Senior Certificate Examinations Documents 1 & 2 (Part 1 and Part 2)*” in Goba (2003). The National Minister of Education, post 1994, had mandated that the weighting for CA should not be in excess of 25 % of the final promotion mark.

This presented a great challenge to educators, many of whom who were confronted with the concept of CA and the wide range of alternate assessment strategies for the first time, that could be used in Mathematics. Subsequently “CA in Mathematics”

became the focus of many workshops. As mentioned earlier CA must be seen in the context of embracing the curriculum changes in South Africa. Thus a brief outline of these curricula will be outlined below and the envisaged certification scene for South Africa in 2006 will be introduced.

### **3. OUTCOMES-BASED EDUCATION (OBE), FURTHER EDUCATION AND TRAINING (FET) AND CERTIFICATION FROM 2006**

Outcomes-Based education strives to enable all learners to achieve to their maximum ability by setting outcomes at the end of the learning process (*Revised National Curriculum Statement:2002*). The “*Outcomes*” (or I call it objectives) ought to be demonstrable by a learner at the end of an activity. One of the key elements of Outcomes-Based Education, as reported by Budaloo (2002:20), is the emphasis placed on the need for assessment as an integral part of teaching. CA ensures that assessment is continuous i.e. on an ongoing basis. In Mathematics assessment, the learners should be assessed in terms of cognitive thinking as well as psychomotor and affective domains to inform on teaching and learning. The type of assessment strategies we use can impact on these. Let’s examine the Further Education and Training (FET) band in terms of its Statement for Mathematics.

Learners wishing to continue with their schooling after grade 9 will enter into the Further Education and Training (FET) band. It is encouraging to note that all learners passing through this band will acquire a functioning knowledge of Mathematics, empowering them in a range of mathematical skills and knowledge, and an extended study for those who wish study the mathematical sciences in terms of a career path. As CA espouses the use of authentic assessment strategies, this will integrate with the central purpose of Mathematics in the FET phase, which is to establish a connection between mathematics as a discipline and its application with the real-world (Department of the National Curriculum Statement for FET Schools:2002).

The ‘revolutionary’ new further education system which does away with marks and symbols will see the first learners pass Grade 12 with an FET certificate in 2008 as

announced by the Minister of Education, reported by Moodley (2003). Key to this is that in future there will be no symbols or percentage marks reflected on the report cards. Instead learners will be given written assessments ranging from 'Inadequate Achievement' (fail) to 'Outstanding' (more than 70%), remarks learners are familiar with in the OBE phase. Higher education institutions will in future base intake of students on their individual subject performance rather than aggregate performance as is the current status. This type of assessment system may perhaps strengthen the ethos of CA which looks at more holistic assessment of a learner in a subject rather than just considering symbols and percentages.

#### **4. OUTLINING THE RESEARCH PROBLEM**

From 12 years of experience in teaching mathematics, my greatest anxiety was the perceived negative attitude of many learners towards Mathematics and the poor results which they produced. I found a general lack of understanding by learners of concepts, amongst other problems, while marking Matriculation Mathematics papers.

I strongly believe that the nature of the conventional assessment program (paper-pencil testing), being used acted as a strong contributory factor. We may have been absorbed in teaching and assessing towards testing and examinations, thus sidelining real understanding and applications of Mathematics in the real world. Furthermore, assessment was mainly at the end of a section or end of term and was mainly through pencil-paper testing. Little or no alternate creative assessment strategies were being used which could have allowed learners greater opportunity in understanding and displaying their skills and knowledge. Consequently, OBE was introduced and the paradigm of continuous monitoring of a learner's progress, termed Continuous Assessment (CA) was recommended.

In Mathematics meetings and workshops, I often perceived that whilst Continuous Assessment was readily embraced by the fraternity, teachers were struggling to cope with this new paradigm in assessment. It seemed natural to ask whether they were implementing the "new" or alternate strategies. My main concern was whether

teachers were simply interpreting continuous assessment as “assessing continuously” – meaning giving more tests more frequently?

Out of my genuine concern to investigate this I embarked on this research study to investigate teachers’ views and interpretations of CA, the types of strategies they were using and the impact CA was having on their learners’ conceptual understanding in Mathematics.

## **5. CRITICAL RESEARCH QUESTIONS**

To investigate the research question of whether teachers understand CA and are implementing it consistent to its intended rationale, which is about conducting assessment on an ongoing basis in an authentic context using a variety of different and appropriate methodologies so as to improve learners’ conceptual understanding in Mathematics, my research study focused on three critical research questions: These critical questions were :

1. What are Mathematics teachers’ interpretation and understanding of CA in Grade 12 Higher Grade Mathematics in the Ethekwini Region?
2. What range of assessment strategies are Grade 12 Higher Grade Mathematics teachers in the Ethekweni Region implementing in CA?
3. How do the Grade 12 Higher Grade Mathematics teachers evaluate the impact of the implementation of CA on the conceptual understanding of learners in Mathematics? i.e. does the use of CA strategies have a “teaching effect” ?

## **6. RATIONALE FOR THE STUDY**

The demands of the 21<sup>st</sup> century are upon us, and thus Mathematics Education has to address these. As more students take mathematics programs, mastering of skills and gaining Mathematical understanding is important. Industry around the world want not just knowledge but competence and creative use of knowledge. Communities are also

expressing that too many learners fail and those who succeed often seem to have little they can use beyond school itself argued by Malcolm et al (1999). These views are reiterated by Jansen (2003), who argued that whilst there was an increase in the pass rate of learners in the Grade 12 2003 Matriculation Examinations, deeper analysis showed that more than a quarter of the learners failed and the pass rate in critical subjects like Mathematics and Physical Science was very poor. These issues had to be addressed by looking at the Education systems in place. In South Africa Outcomes-Based Education, as a pedagogy, has been introduced, to carry learners forward into the new millennium to equip them with skills, attitudes and values in the teaching of Mathematics. To support these changes, the concept of CA has been introduced in grades 4-11 since the inception of Curriculum 2005, and in 2000 in grade 12 (*Guidelines for Continuous Assessment in Mathematics HG & SG:2001*).

CA is a new paradigm in assessment to many teachers and has been met with anxiety, confusion and frustration amongst teachers, learners and parents.

Given the anecdotal scenario it was of interest to ascertain how teachers of Mathematics were interpreting this new paradigm in assessment, and the strategies they are using. Finally, I wanted to find out the impact that CA was having on the conceptual understanding of learners.

## **7. SIGNIFICANCE OF THE STUDY**

The research study could be of importance to the following role players :

1. National and Provincial policy makers who formulate policy with the view to alerting them to the current status of CA in Grade 12 Mathematics.
2. Curriculum planners and developers with a view to informing them on the degree to which the CA for Grade 12 Mathematics is being introduced and the strategies that are being implemented by teachers.
3. Subject-advisors of Mathematics who conduct workshops in CA and monitor its implementation.

4. Tertiary institutions engaged in teacher training with a view to designing appropriate in-service programs to support CA as outlined in the curriculum.
5. Teachers in Grade 12 Mathematics with a view to improving their assessment strategies and practices.
6. Textbook authors who develop resources on assessment in Mathematics.

This chapter has focused on the changing assessment scene taking place in the South African context, with the introduction of OBE presently and FET in the future. It also highlighted the research problem, critical questions and significance of the study. The next chapter sets the theoretical framework which is embedded in the literature review.

## **8. PREVIEW OF FOLLOWING CHAPTERS**

In Chapter 2, I outlined the literature review and the basis it provides for a theoretical framework for the study, whilst in Chapter 3 a review of the methodological approach is outlined. In Chapter 4 an analysis of the data gathered is conducted which forms the basis for the limitations and recommendations dealt with in Chapter 5.

## **CHAPTER TWO**

### **LITERATURE REVIEW AND THEORETICAL FRAMEWORK**

#### **1. INTRODUCTION**

To investigate Continuous Assessment in Mathematics, it is important to look at a holistic view of assessment in Mathematics. To achieve this objective, a literature review will be provided, forming the basis of the theoretical framework for the study. Firstly, the definitions of assessment in Mathematics, including Continuous Assessment, the views of mathematics assessment abroad and locally, learning theories, empirical studies on assessment and the implication of the literature review will be highlighted. It is important to look at learning theories in Mathematics as our practices in the classroom are influenced by the way learners learn. This has also impacted on the way assessment is conducted. The definition of assessment has been the subject of many debates and research and it is important to bring this to the fore in the study in terms of its relevance to CA. The implications of the literature review will conclude this chapter.

To realize the above aspects of the literature review I used Internet search engines (e.g. Google and Eric Data Base), including the Electronic Journals in Mathematics Education e.g. Journal for Research in Mathematics Education. The literature survey also included manual searches of existing journals and books available in South African libraries. I have also used the Department of Education's handbooks and policy documents.

#### **2. LEARNING THEORIES**

One of the suggestions cited by Budaloo (2002) for education systems around the world undergoing changes is to accommodate the changing learning patterns amongst learners. The way teachers assess should have its foundations on the way learners learn. This is confirmed by Brown et al (1997:24) who claim that students may have a predominant style, which allows for a cohesive process in the teaching-learning situation. Brown et al (1997:23) looked at the work of Entwistle and Associates

(Entwistle 1987,1992) in which two dominant orientations in student learning were identified:

- knowledge – seeking
- understanding – seeking

Understanding has greater relevance to this study. Learners' seeking understanding are seen as those learners who tend to look for the global picture before exploring any detail and are intrinsically motivated rather than response orientated. Hence they are likely to be deep problem solvers and to be creative and independent (Brown et al 1997:24). The "understanding way" of learning Mathematics is encouraged as it leads to deep processing which has the domino effect on enhancing conceptual understanding. Tynjala (1999:369), gives an account of Vosniadou's (1994) description of conceptual change either as an "enrichment" of an existing conceptual structure or as a "revision" of it. The research investigates whether teachers feel that CA has been able to enhance understanding in Mathematics amongst the Grade 12 Higher Grade (HG) learners.

Research studies have shown that in Mathematics, constructivist learning is important in order to achieve higher order thinking amongst learners. According to Tynjala (1999:365), this is achieved by a learner's active continuous process of constructing and reconstructing his or her conceptions. The literature confirms that a CA strategy to assessment is conducive to constructivist learning. This is so as one is moving from a knowledge transmitting paradigm of learning towards a constructivist learning mode. The literature also emphasizes that a constructivist learning environment is suitable to CA, as assessment here is not a separate examination at the end of a course but rather assessment methods are integrated into the learning process to find out what kinds of qualitative changes are taking place in a learner's knowledge (Tynjala 1999:365).

From the above review, assessment strategies such as investigations, practical demonstrations, research assignments and projects are suitable to constructivist learning as they emphasize understanding, creative thinking and problem solving

instead of memorizing and reproducing information as is conducted in pencil-paper tests.

Also implied in the review is the need to develop assessment task procedures that are embedded in the learning process. This must take into account the individuality of the learner and focus on meaningful or contextual tasks that assess more than just cognitive skills.

Teachers must therefore question assessment strategies used as the latter are accountable to learners and the community.

### **3. DEFINING THE TERM “ASSESSMENT”**

When considering the definitions of assessment one must take into account whereby students using Mathematics as a field of knowledge; and where Mathematics is continually being applied and integrated to more fields of work and study according to the *Guide to Grade 10/11/12 Mathematics Educators Document* (Department of Education:2001). As a result proponents of change of assessment practices suggest that it should be designed to reflect more precisely complex “real life” performances and problems than is possible with short answer and choice response questions, that characterize many teacher made tests. Continuous Assessment epitomizes this philosophy, which demands that assessment be conducted with a view that students know and understand Mathematics. They must be able to use Mathematics in the changeable world that these students will face during their lifetime (Budaloo:2002).

From the above discussion it can be seen that assessment of student performance should be underpinned by a goal of achieving an understanding in mathematics and being able to apply it in the real world.

#### **3.1 VARIOUS WRITERS’ VIEWS ON ASSESSMENT**

The following views of writers on assessment encompasses all sectors of the education community and the wider political spectrum. The views subscribe to

assessment as being ongoing, continuous and aspire to using a variety of strategies to unlock student potential.

Rao and Reddy (1992) mention that as early as 1982 in the United States, there has been a marked increase in educators finding new ways to evaluate student learning and to report on student progress. Niss (1993) mentions that ongoing research in assessment in Mathematics is influenced by the way mathematics is being taught and learnt in our classrooms. The increasing attention given to assessment world-wide, is reinforced by Cohen et al (1996:363), who state that *“assessment is twofold: on the one hand assessment is being used for educational improvement, increased school effectiveness and curriculum reform, and on the other hand it is being used for political control of teachers, students, curricula, centralized policy making, educational selection and the determination of life changes in competitive markets.”*

David Clarke (1996:327) declares that *“assessment is at the heart of educational endeavour.”* Clarke sees assessment as having three distinct and fundamental purposes, which are primarily to model, to monitor and to inform. Clarke’s definition subscribes to the NCTM’s definition of assessment *“as the process of gathering evidence about a student’s knowledge, their ability to use a disposition towards Mathematics and of making inferences from the evidence for a variety of purposes.”* (NCTM:1995). In a further review of the term assessment, Doug Clarke (2003:2), in a seminar at the Ninth National Congress of the Association of Mathematics in South Africa (AMESA), mentions that *“if genuine understanding, problem solving and group skills were valued, and the ability to use what has been learned in ‘real’ situations, then there is a need to expand the context of assessment techniques, combining ‘informal’ assessment with a greater range of formal methods of assessment.”* By giving learners other strategies such as projects, investigations, orals, group work, the range of skills that can be exercised by a learner are broadened, thus giving him or her a chance to be assessed thereby demonstrating his or her potential.

Also alternative strategies may lead to deeper thinking and understanding of a problem than just pen–paper testing. According to Noam (1996) in Budaloo (2002), we need to make students partners in the process of assessment in order to strengthen

the objectives of assessment. Consequently, assessment is shifting from the practice of “testing” pupils on what they do not know to one where we assess from the perspective of looking at a learner’s performance in a variety of contexts. This view is also confirmed by Kulm in his book “Mathematics Assessment: what works in the Classroom” reviewed by Harris (1996). In the book he cites examples, like scoring alternative assessments to the traditional use of partial credit, citing a shift to the “expectation that student think,” or getting students to develop rubrics and then to score their own work using the rubrics. We can see that Kulm views paper-pencil testing as a minor goal of Mathematics education.

Cohen et al (1996:365), argues that the views on assessment are not all congruent. They mention that some countries have addressed assessment strategies that are more traditional in nature (closed multiple-choice, tick box forms of assessment). There is a rise in forms of assessment which focus on low-level recall of factual knowledge which elevates content over skills and where assessment is largely undertaken by written examinations. These practices are in the pencil-paper testing domain of assessment. Whilst South Africa has officially embraced CA as the assessment paradigm, is this really happening in practice?

From the above views we see that assessment is about providing information about learners’ performance, understanding and achievement which influences teaching and classroom instruction. There is also a strong move away from using only traditional assessment types.

### **3.2 DEFINITIONS OF ASSESSMENT FROM POLICY DOCUMENTS**

It is relevant to look at definitions of assessment in the context of South Africa as this is the focus of this study. A definition from Curriculum 2005 states the following :  
*“Assessment is the process of identifying, gathering and interpreting information about a learner’s achievements as measured against nationally agreed outcomes for a particular phase of learning...”* (Department of Education, Government Gazette, 1998:8). The *National Curriculum Revised Statement* (2002:93), defines assessment

as “a continuous, planned process of gathering information about the performance of learners measured against the Assessment Standards of the Learning Outcomes (OBE).” It requires clearly defined criteria and a variety of appropriate strategies to enable teachers to give constructive feedback to learners and to report to parents and other stakeholders.” It is important to note that in the revised statement varied strategies of assessment are mentioned for teachers to give an account about student learning. This is the philosophy of CA.

In the United States a professional teacher’s organization for Mathematics, similar to AMESA, called the National Council of Teachers of Mathematics (NCTM), has devised the *Principles and Standards* which offers vision and direction for school mathematics programs. The Principles elaborate important characteristics of Mathematics programs, and the Standards discuss the mathematics that students need to know and be able to do across grades (News Bulletin 2000:1). The revised NCTM Principles of 2000 argues that “*Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*” The Principles of 2000 highlight that students learn Mathematics with understanding and actively building new knowledge from experience and previous knowledge (News Bulletin 2000:8).

According to the Learning Standard (1995:1), “*assessment incorporated in Mathematics learning should be consistent with, and sometimes the same as the activities used in instruction.*” Hence assessment should not simply mark the end of a learning cycle, rather it is an integral part of instruction that encourages and support further learning, which is congruent with the philosophy of CA. It is relevant mentioning these aspects of the NCTM’s Standards and Principles as it is relates to the research study and the changing assessment and learning scene in South Africa

### **3.3 INTERNATIONAL TRENDS IN ASSESSMENT**

The assessment policies between different countries must be seen in the ways that education is organized and its place in the broad social context according to Ridgway & Passey in Niss (1993:69). Standardized assessments and examinations are used in

parallel to Continuous Assessment at secondary school levels according to Ramsuran (1997:15). This is similar to the promotion requirements in South Africa for all grades in the secondary phase. In the United States (US), the United Kingdom (UK), Zambia, Japan and Argentina standardized tests are used for entry at certain levels in schooling or into Higher Education. In the US, the *Scholastic Aptitude Test (SAT)* is used for entrance into state universities, in the UK the *Advanced Level Examinations* were used to gain access to Advanced Level courses, whilst in Zambia students take a *Primary School Leaving Examination* which not only certifies the completion of primary education, but also determines who will receive access to secondary education according to Ridgway & Passey (1993) in Niss (1993:60–62). According to Cohen et al (1996:364), in China there is sole use of National Examinations. Whilst we see that standardized testing and examinations gives a general indication of performance in Mathematics, it must be mentioned that the demerits are also great. This is summed up aptly by Cooney & Badger (1990:507) from the United States who say, *“Questions that tap the ability to integrate different aspects of Mathematics, to discover patterns, to conjecture, to abstract and generalize, to solve real – world problems, and to engage in extended investigations – are not compatible with the requirements of a mass produced, machine scored test.”*

Dillon (2003), elaborates on the law in the US known as “No Child Left Behind” which requires states to test every public school student in the third through eighth grades and one high school grade every year. This somewhat demonstrates the emphasis the US places on Standardized testing where the law has been nicknamed by critics as “No Child Left Untested.” These high stakes tests, besides the problems with them mentioned earlier, are shown to have their problems in having mistakes in them, not taking into account bias and sensitivity of groups - thus not assessing what it sets to test (Dillon:2003). These reasons show the disadvantages of going the route of standardized testing and testing in general. Roeber (1996) speaks about the development and management of performance assessments (assessments that go beyond pencil-and-paper) which could be created, validated, and used in large scale administered assessments at state and local levels in the US. This is further evidence of emphasis placed on external testing and standardizing, which the literature shows is counter productive. This is supported by Koretz (2000), who argues that the *“over-reliance on achievement tests in accountability systems produces perverse incentives”*

(referring to improving the performance of teachers and functioning of schools), which can be helped by using test scores along with numerous other measures which are more subjective than test scores.

In Niss (1993:60), Ridgway (1988) expresses disappointment with one element of the *New Curriculum* being introduced in the UK, i.e. the Task group on Assessment and Testing which was established to offer advice on appropriate methods of testing which are affordable and easy to use. The disappointment is clear as Ridgway (1988), emphasizes that it will likely result in paper-pencil tests which will be easy to mark, and fail in terms of assessing practical skills, problem solving, investigative work or group work which are essential elements of mathematical curricula.

At this juncture in the literature review, it is appropriate to mention the so called “Maths Wars” in the US as it impacts on the current assessment debate.

This debate on the content that should be taught in Mathematics and how it should be taught has generated the so called “Maths Wars” in the US according to Van de Walle (1999:1). On the one hand you have a group who strongly believe children need to learn “the basics” (which consists primarily of arithmetic and computation, mastery of basic facts for all four operations, pencil and paper computation skills etc), whilst on the other hand are those who believe in the message of the Standards (which include amongst others, learning Mathematics with understanding and acquiring the skills and knowledge needed to solve mathematical problems, having a knowledge of both the traditional basics of Mathematics as well as the new basics – such as data analysis and statistics – needed for the technological world we live in and developing reasoning skills that will engender flexible and resourceful problem solving (News Bulletin 2000:8). An analysis by Van de Walle (1999:2) shows that the basics tend to be about content, specifically about content when today’s adults were in school, whilst the reform is more about how children learn and how to achieve the content goals one desires. With reform taking place in Mathematics around the world, the view of educating learners who are mainly “content efficient” in Mathematics is not enough in preparing learners for the challenges of the 21<sup>st</sup> century.

With the above reviews and definitions on assessment it is appropriate to look at Continuous Assessment in this context.

## **4. CONTINUOUS ASSESSMENT: ESTABLISHING A CONCEPTUAL FRAMEWORK**

### **4.1 DEFINITIONS OF CONTINUOUS ASSESSMENT**

The review of this definition is central to the research as views, policies and questions will be measured against this definition.

Continuous Assessment (CA) is the assessment of the learner's performance carried out on an on-going basis at the site by the educator, using various assessment techniques is the definition offered by *Guidelines for CASS in Mathematics HG & SG* (2001).

The IEB (1996) draft document on assessment defines continuous assessment as providing “ *for a variety of ways demonstrating competence across a range of contexts, these should be structured so that they can be recorded and included in summative assessment; they should be based on interesting and demanding tasks which motivate and support learning and should be accompanied by helpful feedback to the learner as well as formal recording of results, some part of this must be based on observation of the learner working in normal learning conditions, rather than specific assessment tasks,*” cited in Ramsuran (1997:11).

Reddy and Le Grange (1996), define CA as an evaluation of the whole child over a period of time, which assesses a variety of skills and attitudes, wider than what is possible with conventional testing. They add that the process is cumulative in nature and is often used in conjunction with external examinations at secondary levels.

Also important are the claims by Pennycuick (1990), that the validity of students results is increased by gathering assessment data over a substantial period of time and by maximizing the range of educational objectives which are assessed, and in this way

continuous assessment serves a broader range of assessment functions and in particular formative functions.

A further definition, "*Continuous Assessment represents continuous awareness and monitoring by the teacher of the development and knowledge of learners over a period of time. It is a gradual "build up" of a cumulative judgment about performance*" (Department of Education and Culture:1995).

From the above definitions, CA is seen as an essential part of the teaching and learning process that operates in the classroom situation. It is a systematic way used by teachers to determine how well their students have learned and what has been taught. This is achieved by teachers using various assessment strategies (both traditional and alternative). They will be able to tell whether their instructions have been effective and to gauge students' understanding. CA has been the practice of other African countries such as Tanzania (where it was seen as necessary to get rid of the ambush type of examination), and Nigeria (where CA was inducted with the objective of being the system of evaluation that is comprehensive and a collection of more valid and reliable assessment data for guidance and counseling purposes) reported by Ramsuran (1997:14).

From the above discussion it can be judged that CA as an assessment paradigm is progressive compared to traditional assessment. However, the introduction of CA for Grade 12 Mathematics has been met with a great deal of anxiety, frustration and confusion amongst teachers, parents and learners. For many educators who had been using traditional assessment strategies, the introduction of CA required a major paradigm shift in assessment strategies. Whilst there has been workshops by the department, no attempt has been made by the Department to find out how teachers are coping with this paradigm shift and how competent they are with the alternative forms of assessment in mathematics (e.g. Projects, investigations, tutorials, journal writing etc.). Whilst results have shown an improvement, has the quality of Mathematics learning been improved amongst learners? Are teachers implementing CA as a series of tests (pen-paper tests) or are they genuinely incorporating alternate forms of assessment?

These questions are very relevant if CA is to be genuinely implemented. Ramsuran (1997:17) concurs that literature reviews outline some of the problems as: teachers lacking expertise and experience in CA, inadequate structural and administrative support, heavy workloads, large classes, low conditions of service, and inadequate resources. Similar findings were reported by Budaloo (2002:30) who cited Brosnan's (1996) study, where she found that factors most often cited by practitioners in 35 schools in impeding their use of alternate assessments were, resistance to change, time, knowledge and lack of in-service. Romberg et al (1992), also reported that the expectations of external assessments appear to have a profound influence on what is valued in the classroom. This is seen in the sense of the external Senior Certificate examinations for Grade 12 learners in South Africa, which is a high stakes examinations determining their future career paths. To a large extent they have an influence on teachers in assessment strategies for Grade 12 learners. Jansen (2003) concurs with this, by explaining that schools in South Africa are under enormous pressure to perform and, as studies in the US and the UK have shown, they act to optimize results by taking short cuts.

## **4.2 CONTINUOUS ASSESSMENT VERSUS TRADITIONAL ASSESSMENT**

It is clear from the above definitions that CA represents a shift from assessments being mainly formal and summative (i.e. the traditional pen and paper test) to formative and ongoing. This view is supported by Stiggins (1994:33) when they explain that *"in the old era teachers were not seen as needing to know a great deal about assessment (mainly pen and paper type test). Now, teachers have to be crystal clear about learners expectations as student learning is outcomes orientated."* These assessment strategies (pen and paper tests) are seen as narrow in the sense that they are one shot measures. The skills assessed are mostly "recall" without assessing a learner's other faculties. The pressure of pen and paper tests leads to performance that is not representative of a learner's knowledge and understanding. There is the added burden if English is not a strong point, since learners will find it difficult to demonstrate what they know and can do using this assessment format (Clarke 2003:3). This argument demonstrates the inadequacy of pencil-paper testing and the

need to vary our strategies to assess genuine Mathematics learning and development in a learner.

This notion is supported by Ramsuran (1997:15) who outlines that in her review, of a number of sources, *“continuous assessment impacts positively on teaching and learning, resulting in an improvement in student performance; providing the basis for more effective guidance of the child and reducing the negative backwash of examinations.”*

### **4.3 RATIONALE FOR THE INTRODUCTION OF CA IN GRADE 12 MATHEMATICS IN SOUTH AFRICA**

As mentioned earlier, the potential of CA is pedagogically sound. In the past, in South Africa, prior to the year 2000, the performance of a learner at Grade 12 level in Mathematics was based on the outcome of a single written examination which literature has shown to be inadequate. Hence below is the official rationale outlined by the Department of Education and South African Certification Council for its introduction (*Guidelines for CA in Mathematics HG and SG – 2001*). This included the following :

- \* *“Assessment is ongoing and therefore learners will be compelled to work consistently and this will contribute to re-instating the culture of teaching and learning.*
- \* *Learners will be assessed using different and appropriate assessment methodologies and this will provide a more valid assessment of a learner’s performance.*
- \* *Assessment will now take place in an authentic context i.e. the learner will be assessed in a realistic situation which is integral to the learning process.*
- \* *Assessment will feed back immediately into the learning process, thus promoting the formative role of assessment.*
- \* *Judgment of the learner’s performance (summative assessment) will now be carried out by the teacher who works immediately with the learner.*
- \* *Development of skills.”* (Department of Education and South African Certification Council :2001).

The inclusion of CA is not separate but seen in tandem with the principles of OBE, which inter-alia states, that assessment should be :

- \* *“promoting learning*
- \* *adequate, comprehensive and authentic*
- \* *continuous*
- \* *including a formative and summative component”* (Department of Education and South African Certification Council:2001).

This reminds us of a similar situation in the US where the 10 *Standards* describe the mathematical knowledge, understanding and skills that students should acquire from pre-kindergarten through to Grade 12 (News Bulletin 2000:8). According to the Department of Education to promote and control the authenticity of the CA mark, a component of the CA mark should be administered in a controlled environment, hence meaning the writing of tests or examinations. Part of the rationale of the study is to gauge whether these assessment strategies are dominant in terms of determining the CA mark.

According to the *Revised National Curriculum Statement* (2002:95), Continuous Assessment is the chief method by which assessment takes place. This statement suggests characteristics of CA, are applicable to any grade. I have chosen a few that are relevant to the study :

- *“takes place over a period of time and is ongoing : Learning is assessed regularly and the records of learners’ progress are updated throughout the year.*
- *Supports the growth and development of learners: Learners become active participants in learning and assessment, understand the criteria that are used for assessment activities, are involved in self – evaluation, set individual targets for themselves, reflect on their learning, and thereby experience raised self – esteem.*

- *Allows for integrated assessment : This includes combining a number of different assessment methods. A variety of assessment methods and opportunities must be provided through which learners can demonstrate their ability.*
- *Uses strategies that cater for a variety of learner needs (language, physical, psychological, emotional and cultural): It is important to cater for different rates and styles of learning in your assessment.*
- *Allows for summative assessment: Summative assessment needs to be planned carefully from the beginning of the year, to include a variety of assessment strategies – for example, exercises, tasks, projects, school and class tests – are but some of the strategies which will provide learners with a range of opportunities to show what they have learned.”*

The above synopsis will be used in this study to evaluate the practices of educators of CA in Grade 12 HG Mathematics.

#### **4.4 CONTINUOUS ASSESSMENT , UNDERSTANDING AND MATHEMATICS**

The shift to CA has implications for the teacher and learner in Mathematics (Niss: 1993). The need for CA is to address the dilemma: In what way can we assess the essential components of mathematical knowledge, insight, thinking, creativity, problem solving and overall capability? The learning of algorithms as emphasized in the past, should not be overemphasized as it is to the detriment of understanding. Davis (1992:228) argues that one gets a feeling of ‘understanding’ when a new idea can be fitted into a larger framework of previously assembled ideas in one’s mind, just like when one assembles a jig saw. The analogy is apt since you are seeing the relationship of parts to the whole and not just accumulating information. According to Skemp (1976), the difficulties caused in Mathematics education today, is the teaching of Mathematics by ‘Instrumental Understanding.’ This is where mathematics is taught in terms of rules and procedures or “rules without reasons” (Skemp 1976:20). Skemp (1976) views “Relational Understanding” as knowing what to do and why. The fact that most teachers teach instrumental Mathematics, can be attributed according to

Skemp, to instrumental mathematics being easier to understand and whose rewards are more immediate and more apparent.

Skemp (1976: 24), in playing devil's advocate also gives the advantages of relational mathematics where he outlines it as being more adaptable to new tasks, it is easier to remember and that if people get satisfaction from relational understanding, they may not only try to understand relationally new material which is put before them, but also actually seek out new material and explore new areas.

Just because less knowledge is involved, one can often get the right answer more quickly and reliably (Skemp 1976:23). He further states that teachers might teach for instrumental understanding on the grounds of preparing pupils for the examinations and maybe feel that relational understanding of a concept would take too long to achieve.

Learning Mathematics by rules as going against the principles of engaging learners to think creatively, logically, appreciating the beauty of Mathematics and preparing them for the advancements and challenges they will face in an advancing world. Literature does suggest situational factors that make it difficult in teaching Mathematics relationally, for example, the examination system, over-burdened syllabi and the fixed psychological mindset of teachers (Skemp 1976:24). Thus in the study whilst we look at CA and its impact on understanding, further research will be necessary to get a deeper understanding of why teachers say what they say on this issue.

#### **4.5 CA STRATEGIES AND SOME WRITERS' VIEWS**

An important aspect of the inquiry is to look at teachers' assessment strategies in the 'spirit' of Continuous Assessment and evaluating this in terms of the literature reviewed. According to the *Department of Education KZN Circular (2001)*, CA in Mathematics should be a combination of sources both quantitative and qualitative in order to assess the functioning of an individual or group within Mathematics or in the application of Mathematics. Thus using student's classroom work along with projects and other out-of-class work is a rich source of assessment data for making inferences

about students' learning. Other strategies of mathematics assessment and learning are oral comments, written paper, journal entries, drawings, projects, investigations, model making, practical demonstrations, learner profiles, etc. (Department of Education and South African Certification Council:2001). This is supported by Skemp (1976:24), who is of the view that from the marks a pupil makes on the paper it is very hard to make valid inferences about the mental process by which pupils have been led to make them-talking to pupils is the best way to find out about how and why a child thinks that way.

Considering the list above, how competent are teachers in assessing and implementing these strategies? Have the workshops been informative and regular to gauge this? The view of Black and Dockrell (1984) in the context of the study, who recognized that teachers require extensive in-service work on assessment techniques if improved assessment strategies are to be implemented successfully is important.

The potential pedagogical value of CA is superior to the traditional methods of assessment. The implementation of it needs investigation! It is important that while we are moving to more diverse assessment tasks they must still meet the requirement in that assessments should be practical, reliable and valid. This applies regardless of whether the assessment is at primary, secondary or tertiary level. CA is a step in the right direction if we want to prepare learners to be critical thinkers.

In a review by Harris (1996), of Kulm's (1994) book "Mathematics Assessment: What works in a Classroom," she points out that it is advantageous if a link is made between what teachers are probably doing as instruction and assessment and what is advocated in alternative assessments. This is valid in assisting teachers when in a transition phase, as is with the paradigm of Continuous Assessment in South Africa.

It is important to ask that whilst we may have various strategies of CA available, are teachers just using them to fulfill policy requirements or is genuine planning going into the assessment policies of a school Mathematics Department to implement CA in bringing about quality Mathematics learning?

Barnes et al (2000) argues that the rigor of assessment tasks should match the expectations of the system. If for example, students are to work with and interpret real data statistics, they should be given not only decontextualized data in order to conform to time constraints, but also contextual data. If not, then there is a degree of misalignment.

The point of equity in assessment is made by Morgan and Watson (2002), which is seen from the point of view of attempting to ensure that all students are given equal opportunities to display their achievements. Paper and pencil tests can prejudice students as it assesses certain skills but does not assess a child's ability to use his or her other faculties e.g. verbal, creativity, etc.

#### **4.6 STATISTICAL ANALYSIS ON ASSESSMENT**

Learning theories discussed earlier, show that a constructivist learning environment is beneficial to learners in Mathematics in building concepts, understanding, etc. This is supported by a continuous assessment paradigm. Research studies on student learning outcomes in a student educational course confirm a positive impact on student quality of learning and conceptual building in a constructivist learning environment to the traditional environment mode reported by Tynjala (1999:375). Tynjala's findings showed that students' learning outcomes in the course was more favored in a constructivist learning environment as compared with a traditional examination driven study mode. Eighty percent of the constructivist group students emphasized that their thinking had developed compared to 15 % of the traditional group who felt the same. Also most constructivist group students (60%), emphasized gaining a critical perspective, compared to the traditional group where only 8% expressed this. These findings support the argument of the inadequacy of learning and assessing in a traditional mode (Tynjala 1999: 386).

It is appropriate to mention the findings of the Third International Mathematics and Science Study - Repeat ((TIMSS-R)-1998/1999) as it provides policy makers and researchers with data amongst other things, on outcomes of teaching strategies,

assessment strategies and learner profiles. Needless to say that South African learners did poorly compared to their international counterparts in both studies, worse than other Third World countries (Jansen 2003). In the TIMSS-R SA learners mean score of 275 was well below the international mean of 487 as summarized by Howie (2000). Some of the other findings which I consider relevant to the study, was that 27% of the learners were taught by teachers with no formal qualifications, approximately half of the educators did not feel confident to teach Mathematics, the average class size for Mathematics was 50, etc. These issues are pertinent to the study and provides a basis for designing my questionnaire.

Finally, the Dinaledi Project (a project to improve performance in Mathematics and Science) was launched in South Africa owing to the dismal Matriculation results (e.g. in 2002 the pass rate was 40 % in HG and 12 % in SG) (Monare 2003:12). Coupled with this, assistance by the Department of Education is contributing to results beginning to improve. With the introduction of CA, it is hoped that this improvement will be taken further, especially in the 'hardship subjects' (like Mathematics and Science). In 2003 the Mathematics pass rate showed a slight improvement from 56% to 58%, although the quality of the passes is in question according to Jansen (2003). Thus much work still needs to be done in the area of Mathematics.

#### **4.7 IMPLICATIONS OF THE LITERATURE REVIEW**

The implications of this literature review on teachers' views and practices of Continuous Assessment in Grade 12 Mathematics will be explored. The review was important in informing me on constructing the research instrument. The synthesis of the literature has been relevant to my study in that :

- \* it informed me of the various definitions of assessment and how continuous assessment relates to this so as to be able to conceptualize the study.

- \* it highlighted the policy statements in assessment and continuous assessment in South Africa, which was relevant in analyzing the assessment practices of teachers in HG Mathematics.

\* it alerted me to the assessment practices in different countries, so as to be able to position the assessment paradigm in South Africa and its transformation.

\* the contrast between traditional and alternate forms of assessment was highlighted - this alerted the research design to teachers' practices in Mathematics that would focus the study.

\* the literature review also heightened my knowledge on the potential and problem areas experienced by educators in implementation of Continuous Assessment which would also focus the study.

\* it offered a review of the concept of Understanding in Mathematics, assisting me in exploring this focus in my study with the view of Continuous Assessment.

This chapter focused on assessment abroad and locally, the strengths and weaknesses of traditional testing, the value of CA and statistical data on assessment relevant to the study. The next chapter sets out the research methodology engaged in the study.

## **CHAPTER 3**

### **RESEARCH METHODOLOGY**

This chapter outlines the methodological approach and procedural strategies used to investigate teachers' views and implementation in the context of Continuous Assessment in Grade 12 HG Mathematics.

#### **1. THE GENERAL METHODOLOGICAL ORIENTATION**

The research investigates teachers' interpretations and implementation of Continuous Assessment in Grade 12 HG Mathematics classrooms, the consistency of this with the rationale of CA and its impact on the conceptual understanding of learners. A review of the literature did not reveal any research based on the assessment practices of Mathematics teachers in Grade 12 HG classes in the context of Continuous Assessment in South Africa. In KwaZulu-Natal, the year 2000 had been chosen for the implementation of CA in Grade 12 classes (Goba 2003). This was preceded by workshops by the Department of Education. To date there has been no research conducted in determining the assessment strategies used by grade 12 Mathematics teachers, the problems they may be experiencing, etc. It was for this reason that I chose to explore the assessment strategies that Grade 12 HG Mathematics teachers are using and more importantly if they are using the alternate strategies to testing as suggested by policy documents for Grade 12 Mathematics on CA (Department of Education and South African Certification Council:2001).

#### **2. METHODOLOGY**

A quantitative approach was used, by means of a questionnaire to collect the data, with close-ended questions, including 2 semi-structured questions. According to Denzin and Lincoln (1994), "*quantitative studies emphasise the measurement and the analysis of causal relationships between variables and not the processes.*" The quantitative researcher uses mathematical models and statistical tables and graphs. According to Warwick & Lininger (1975:175), the advantages of the closed or

structured response is that this type of question is easier to answer, easier to code and analyze and makes it easier for the respondent to comment on sensitive or unpleasant subjects. The most serious limitation of the closed response is that it may direct the response of the respondent (or his/her pen), by providing acceptable answers or scale. Some respondents may be tempted to avoid work by selecting the easiest alternative, such as "Uncertain." The inclusion of the semi-structured questions was to allow the respondents to answer in some detail and to qualify and clarify their responses. It also allows for unanticipated findings to be discovered. Given that this was a mini dissertation I was confident that data collected would shed light on the research questions. According to Denzin and Lincoln (1990:2), "*The choice of which tools to use, which research practices to employ, is not set in advance. The choice of research practice depends upon the questions that are asked and the questions depend on their context.*" As I did not intend to study teachers in their natural setting, the use of observations was not relevant.

My research can be as classified as a Survey Research. According to Warwick and Lininger (1975:1) "*a survey uses a method of collecting information about a human population in which direct contact is made with the units of the study (individuals, organizations, communities, etc) through a systematic means such as questionnaires and interview schedules.*" My study employed a survey methodology using a questionnaire on a sample of educators in the Ethekekwini Region. A survey contributes in providing answers such as "*who does what, why?, how?, what effect?*" (Warwick & Lininger 1975:4). My critical questions were phrased in these terms which thus makes a survey relevant in investigating.

### **3. INSTRUMENTATION, SAMPLING AND DATA COLLECTION**

Questionnaire design is a process of translating the goals of the research into questions that will obtain the necessary information according to Warwick & Lininger (1975:18). According to Neuman (1997:233), the two key principles for good survey questions is firstly to avoid confusion and secondly, to keep the respondent's perspective in mind. Thus the questionnaire goes through a process of trial and error involving long hours and discussions and then several pretests (called pilot studies).

For the study, questionnaires were chosen as the primary source of data as it enabled me to obtain quick, quantitative data of the sample of teachers on their views, interpretation and strategies in Continuous Assessment. The choice of the method was negotiated with the supervisor, who took into account that this was a mini-dissertation. The questions were devised by myself and reviewed by my supervisor.

To ensure the questions were understood and answered adequately, I took the following steps:

- a) The purpose of the study was clearly outlined and the importance emphasized in order to facilitate the study in a covering letter to each respondent.
- b) My supervisor and peers studied the questionnaire once it was drafted, which assisted in editing and removing all ambiguities. A pilot study was conducted and the results served to establish whether differences existed in the responses of teachers and the overall research objectives. A section was also included for respondents to point weaknesses in terms of layout, clarity, language and structuring of the questionnaire.
- c) Clear instructions were given to ensure that the respondents understood the procedures when answering the questionnaire. This contributed to the validity of the data obtained.
- d) Anonymity of the respondents was decided on as I felt that this was the best way of obtaining responses that would be honest.

To establish a measure of validity of the information received, teachers had to indicate the number of Grade 12 HG Mathematics classes they were teaching as the study was focused only on Grade 12 Higher Grade Mathematics teachers. According to Wiersma (1991) internal reliability refers to the extent that the data collection, analysis and interpretation are consistent given the same conditions. The research instrument was a survey questionnaire and analyzed by computer analysis.

The questionnaire had five parts to it, with each part containing categories of questions that are related to the three research questions. Part A of the questionnaire sought to establish demographic data of the respondents in terms of designation, years of experience, gender, type of school, qualifications, number of classes etc. Part B was designed to determine teachers' views and interpretation of Continuous Assessment in their school. Part C was used to find out what assessment strategies teachers were using in their HG Mathematics classrooms. Part D sought to establish respondents' needs in terms of workshops of the Continuous Assessment strategies. Part E and Part F were designed to establish teachers' views on the impact of CA on the conceptual understanding of their learners. Part G consisted of the semi-structured questions focusing on the advantages and disadvantages of CA.

According to Stoker (1989:100), for a survey whose aim is to obtain information on certain characteristics of the population as a whole, this can be achieved by either studying or investigating every element of the population (called a census survey) or by selecting a number of elements from the population and studying or investigating this subset of the elements of the population. This subset of the elements of the population is generally known as a *sample*.

Probability sampling was used. Each unit has the same probability of being included in the sample. Simple random sampling was used to ensure each element an equal element an equal and independent chance of being included in the sample.

The questionnaire was distributed to a hundred Grade 12 HG Mathematics teachers in the Ethekwini Region. The sample was obtained as follows: Schools from the three districts in the Ethekwini Region (Umlazi, Pinetown and Ilembe) were pooled according to the Ex- Education Departments (pre-1994). Thereafter a simple random selection process was performed on the sample, to obtain a sample of 100, (30 from Ex- House of Delegates, 30 from Ex- department of Education schools, 20 from Ex- House of Assembly schools and 20 from the Ex- House of Representatives schools). This was to ensure that a varied array of views were obtained from teachers in the different race groups, teaching Higher Grade 12 Mathematics. The demographics of the Ethekwini Region dictate a greater concentration of Indian and African teachers, hence more questionnaires were distributed to them than the other race groups

(Department of Education:2003). With the assistance of the Department of Education's mailing list, questionnaires were mailed with a return envelope to each of the chosen schools. A due date was given for the return, taking into account respondents time constraints. Table 3.1 reflects the response rate from the circuits in the Ethekewini Region.

Table 3.1

<b>Number of Questionnaires</b>	<b>Number Returned</b>	<b>Return Rate</b>
100	40	40%

The return rate of 40% was considered adequate for the study as this was a mini-dissertation and I will only be reporting on my findings. Teacher Information for the schools that responded show that 23 (57.5%) were Level One teachers, 13 (32.5 %) were Heads of Department, and 4 (10%) were deputy Principals. A computer based analysis system, SPSS, was used to obtain descriptive statistics in the form of charts, tables and percentages. The items of the questionnaire were analyzed individually or categorized in an attempt to identify response patterns in which Continuous Assessment was being implemented by the sample of teachers.

#### **4. PROBLEMS ENCOUNTERED WITH DATA COLLECTION**

1. Return rate of the questionnaires were affected by:

- i) Schools going into recess during the September vacation in 2003.
- ii) Some questionnaires were either spoilt or incomplete (e.g. more than one tick for items requiring a single response)
- iii) General apathy on the part of some respondents.

2. The issue of language for some English Second Language teachers may have posed a comprehension challenge.

In the next chapter the purpose of the data analysis discussed is to make sense of the accumulated information. The data in the chapter shows the results of teachers' experiences with Continuous Assessment and the type of Strategies they are employing.

## **CHAPTER 4**

### **ANALYSIS OF DATA**

#### **1. INTRODUCTION**

In this chapter, I will analyze the data in order to provide reasonable answers to the research questions of this study. The quantitative analysis of the questionnaire is designed to inform us of teachers' views and strategies in Continuous Assessment. The questionnaire was answered by 40 Grade 12 HG Mathematics teachers in the Ethekwini Region of Kwa-Zulu Natal from a sample of 100. It will be beyond the scope of this research to consider all the ramifications of the implementation of CA in Mathematics. Instead, consideration will be given to a selection of criteria outlined in the critical questions. Through this process of the data analysis, I will contribute my views to the existing body of knowledge on CA.

#### **2. ANALYSIS**

To facilitate the analysis of the data, a coding, using a numerical scale was assigned to the responses. The codes were transferred from the questionnaire into a computer package called SPSS for the data analysis. This is a methodical approach so that data entry errors were minimized. Once all the data was entered, frequency tables were compiled using the various variables and analysis was on these. Tables were also converted into graphs as required and analyzed.

The responses of the semi-structured questions were listed and categorized into main categories. The responses of these questions gave some insight into the responses given in the questionnaires and were used to enrich the data.

#### **3. PRESENTATION OF DATA**

The basic aim of the research report is to communicate the findings as simply and directly as possible. Above all else, the writing should be marked by clarity and accuracy (Warwick & Lininger 1975:321). A method of communication is needed by a researcher when he wishes to describe the sample or present evidence of an association or difference between variables. Tables, graphs and figures must be used

to make concise presentations of statistical decision – making information. This process is discussed below.

### **3.1 TABLES, FIGURES AND GRAPHS**

According to Adams & Schavaneveldt (1985:342), tables are the most frequently used medium of communication in the presentation of data. Any form of descriptive or inferential statistics can be presented in a tabular format. Tables consist of an interrelation between rows (running horizontally) and columns (which run vertically). Tables are a simple, concise medium for the presentation of data. In certain forms of data it is useful to highlight information through the use of pictorial presentation. – called a figure (Adams & Schavaneveldt 1985:343). The figure offers simplicity and offers a dramatic effect on the comparisons between factors. A frequently used figure is the pie chart. The pie chart is a circle divided up according to the proportion of each item's weight. A pictorial representation of figures are graphs, which are derived by combining the row and column dimension of the table. The common types of graphs used in social sciences are the line graph and bar graph. The line graph is useful to show time dimension whilst a bar graph is suitable to indicate frequencies in data. In this study I have utilized tables, pie and bar graphs. This allowed for the comparisons between factors in a simplistic way.

## **4. QUANTITATIVE ANALYSIS OF QUESTIONNAIRE**

### **4.1 PROFILE OF TEACHERS**

The purpose of the following analysis is to give the reader a profile of the respondents so that analysis of the data can be contextualized.

#### **4.1.1 GENDER OF TEACHERS**

The sample consisted of 40 teachers, 24 males and 16 females. The respondents were asked to answer the questionnaire consisting of closed-ended questions and 2 semi-structured questions.

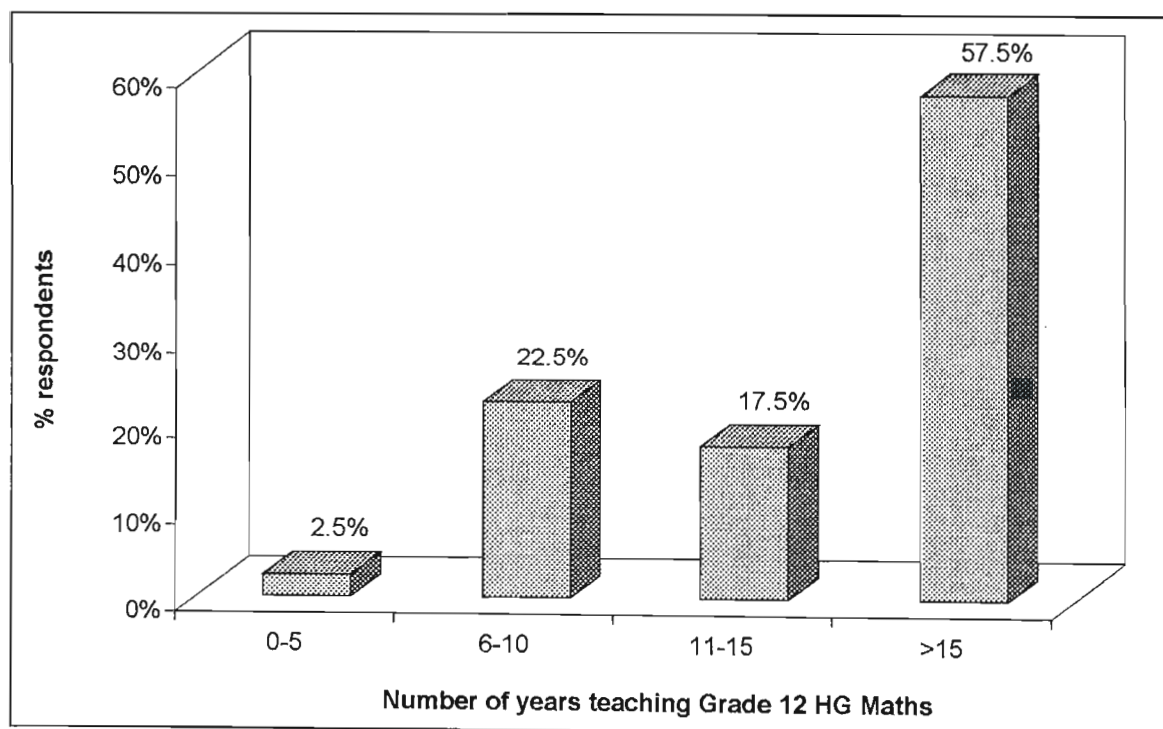
### 4.1.2 NUMBER OF HG MATHEMATICS CLASSES BEING TAUGHT

Since the research targeted Grade 12 HG Mathematics teachers, in order to ensure authenticity in the responses, a question was inserted to ensure reliability by asking the respondents to indicate the number of HG Mathematics classes they were presently teaching. The result of this was 31 educators (77.5%) were teaching one HG class, 5 educators (12.5%) teaching two classes and 4 educators teaching 3 classes.

### 4.1.3 DESIGNATION OF TEACHERS

From the sample, the majority of the respondents were Level I educators (57.5%) (teachers not holding a promotion post). The composition of the balance of educators were 13 Heads of Departments (32.5%) and 4 Deputy Principals (10.0%), providing a cross section of views in terms of rank.

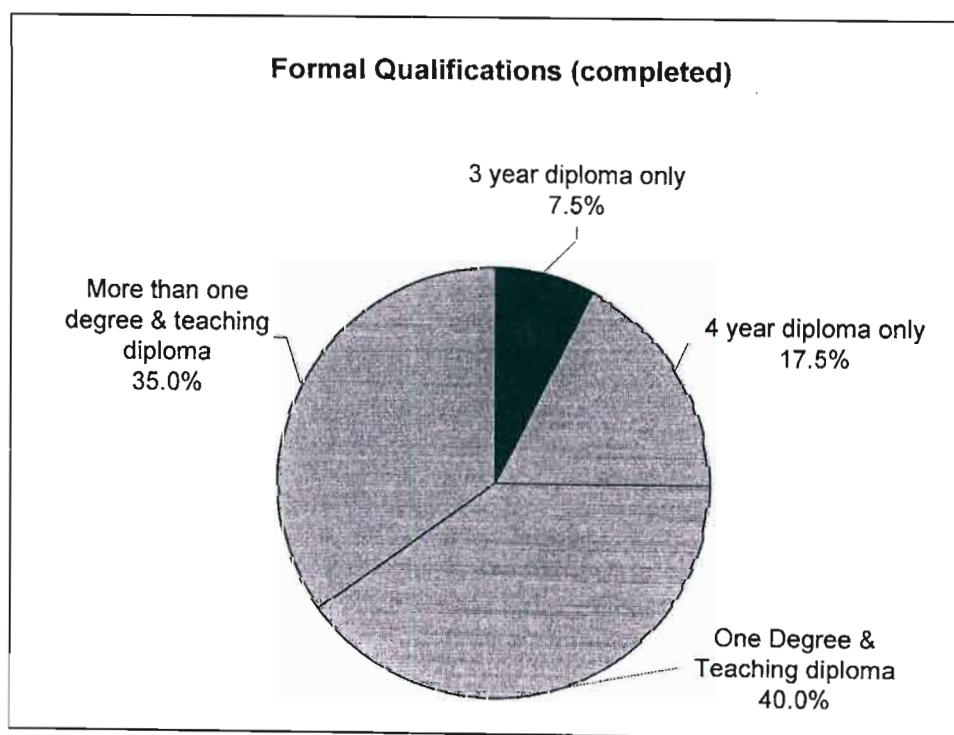
### 4.1.4 YEARS OF TEACHING EXPERIENCE



*Chart 4.1 Teaching Experience in Years*

Chart 4.1 shows that 57.5% of the teachers in this sample have more than 15 years teaching experience. This suggests a relatively mature group of Mathematics teachers who have a vast experience in teaching the subject. The data becomes more credible as these teachers can draw upon their vast experience on Assessment issues in the field of Mathematics when answering the questions. The data indicates that there was only one respondent who was in the 0 – 5 years teaching category. This could perhaps be that fewer newly qualified teachers are entering the profession. This could be attributed to the low salaries of teachers, the redeployment process and the better prospects offered in the private sector, especially in industry. Also the number of newly qualified teachers have been curtailed through the closure of colleges of education and the reduced intake at universities. This could definitely pose a challenge, in the future, for the education sector where the shortage of mathematics and science educators in the country has become critical.

#### 4.1.5 FORMAL QUALIFICATIONS

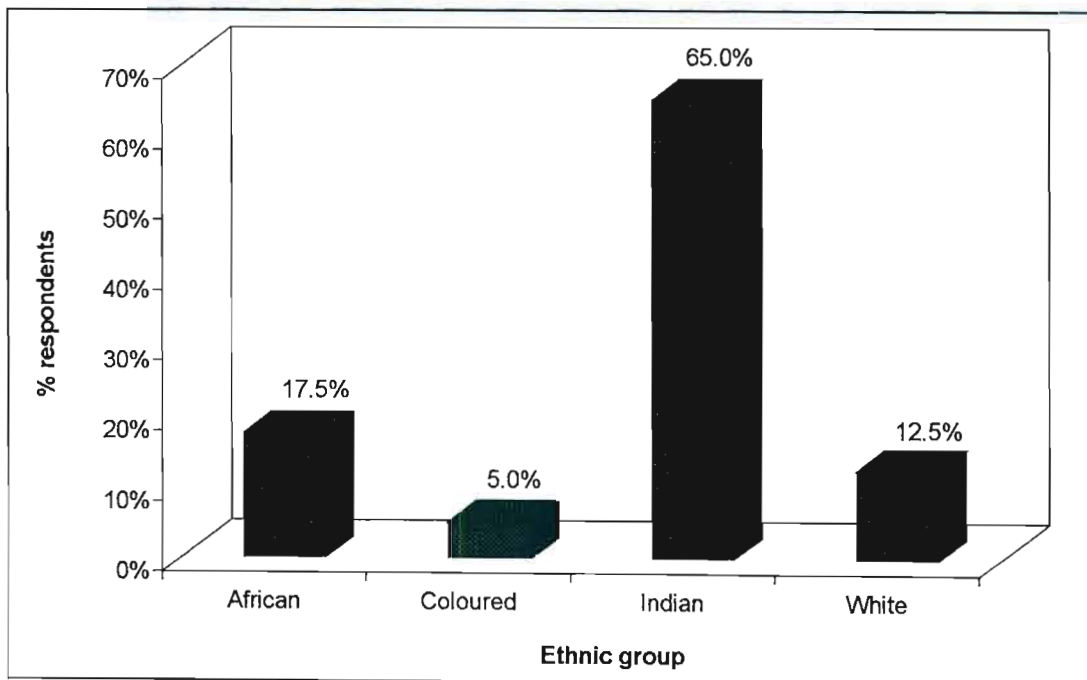


*Chart 4.2. Qualifications of Educators Teaching HG Mathematics*

Chart 4.2 indicates that most of the teachers (40%) have a degree and one teaching diploma. However, all the teachers have a diploma, which is the minimum

requirement to teach, while 75% of the sample of teachers have a degree. The introduction of 'broad-banding' in teachers' salaries in 1995 by the Department of Education, caused widespread dissatisfaction amongst teachers with high qualifications as the salary gap between a diploma only and degree qualified teacher was fractionally small. This created an attitude in the fraternity that it was not really rewarding to study further. The only remuneration for further studies was a 'once off bonus cheque' equivalent to 10% of an educator's salary scale. This may be a possible reason for educators not improving their qualifications.

#### 4.1.6 ETHNIC GROUP



*Chart 4.3 Ethnic Distribution of the Respondents*

Chart 4.3 shows the ethnic distribution of educators who responded to the questionnaire. The majority of the respondents were Indians (65%) with the lowest being Coloreds (5%). Since 1994, with the ushering in of the new government, all public schools must follow a non-racial policy in terms of admittance and staffing. Realistically, it would take many years to see the demographics of schools changing. Hence we will continue to see schools that are dominant in one racial group. Although I attempted to target a distribution of schools amongst the various population groups,

the largest percentage of responses were received from Indian schools. Unfortunately, with a postal survey it is difficult to control the return distribution of respondents.

## **5. MATHEMATICS TEACHERS' VIEWS, EXPERIENCES AND PRACTICES WITH CONTINUOUS ASSESSMENT IN GRADE 12 HIGHER GRADE MATHEMATICS**

### **5.1 INTRODUCTION**

Continuous Assessment has been implemented in Grade 12 mathematics since 2000. It has become policy whereby every candidate in the Senior Certificate Examinations has to be assessed and given a Year Mark that is weighted at 25% of their Final Examination mark. In terms of Mathematics, several Guideline Documents and Workshops have been conducted to assist educators in assessing their learners (*Guidelines for Continuous Assessment in Mathematics HG & SG (2001)*, *Guide to grade 10/11/12 Mathematics Educators (2001)*).

With CA in place in Grade 12 for almost 4 years, this research reports on what are teachers' experiences and views on CA in Grade 12 HG Mathematics. The study also attempts to find out about their practices on the strategies of assessment in CA and problems experienced. In this chapter I will present the findings on these issues using data selected from the questionnaire (Appendix 1) completed by 40 Grade 12 HG Mathematics teachers.

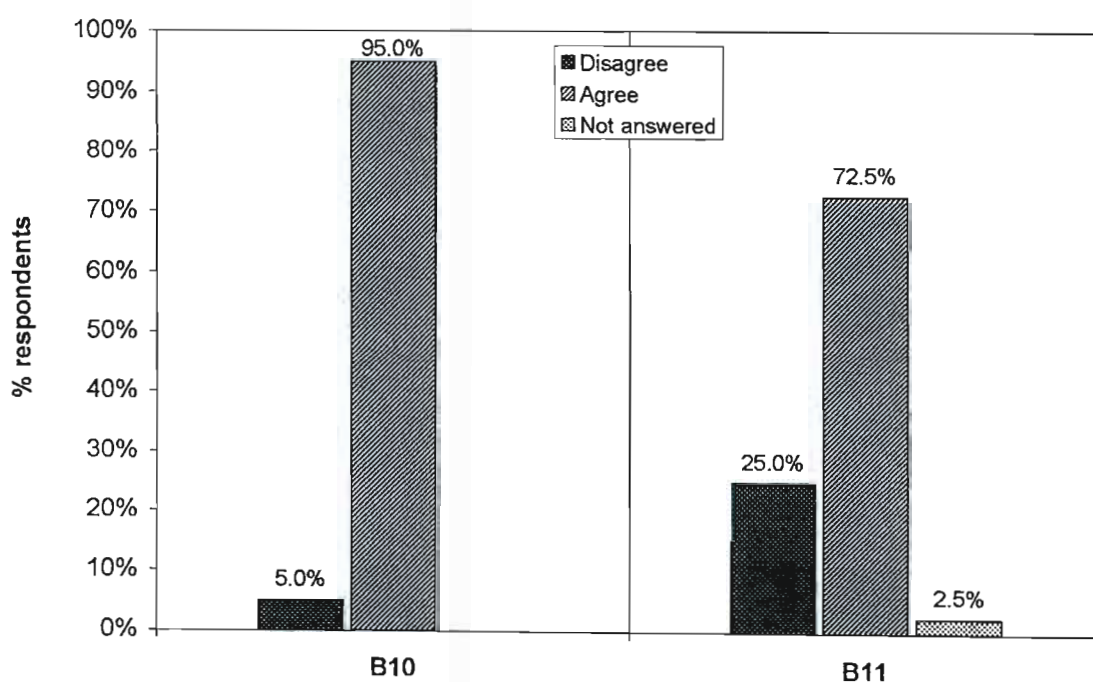
### **5.2 MATHEMATICS TEACHERS' UNDERSTANDING, VIEWS, PERCEPTIONS AND EXPERIENCES OF CONTINUOUS ASSESSMENT**

At the outset of the questionnaire a question posed to the respondents was “*Do you feel that assessment is a key issue in the area of Mathematics?*” It is encouraging to report that an overwhelming majority (97.5%) of the respondents agreed that this was the case. It was important to establish a benchmark in this regard as the entire research is based on Continuous Assessment in the classroom and it would give the

respondents some focus on the remaining issues related to CA. The above view is confirmed by a number of writers on assessment (Cohen et al 1996; Clarke 1996; Schoen 1993; Noam 1996).

Data in Charts 5.1 and Chart 5.2 gives us some indication of the difference between policy and practice in the implementation of CA in Mathematics. This issue was investigated by Ramsuran (1997), where she reported that there existed a distortion between policy and practice in the implementation of continuous assessment in general (such as teachers interpreting CA the same as a series of tests etc.).

Whilst 95% (Chart 5.1) of teachers agree that CA produced a change in policy in assessment in their schools, 72.5% (Chart 5.2) of the respondents agreed that their CA mark “*Whilst not completely, is still dominated by testing (Marking of right and wrong answers).*” The above statistics, whilst unable to be used as a generalization for KwaZulu-Natal Province, show that traditional methods of paper–pencil testing still dominate amongst the strategies for CA in Grade 12 Mathematics.



*Chart 5.1 The introduction of CA produced a change in the Mathematics Assessment policy*

*Chart 5.2 My CA mark, whilst not completely, is still dominated by pencil-paper tests.*

In a pedagogically sound application of CA, a combination of written and alternate strategies should be given priority as we want to assess learners in a variety of contexts so that their potential could be realized, preparing them for the advancing society we now live in. Now, by using mainly pen and paper testing, are we giving learners a fair chance?

The literature review shows the disadvantages of only using pencil-paper assessments in Mathematics in exposing a deeper understanding and thinking of learners. Also, when a child writes an answer down do you really know how he is thinking? These views are reiterated by Schoen (1993) who reported that if the assessment of learners is based on the traditional pencil-paper tests, then it is not preparing the learner for the workplace simply because assessment would be seen as only focusing on a particular aspect of a learner's development. Further, Ramsuran (1997:12) cites research by Cambourne and Turbill (1990), which revealed that abilities of students remained undiscovered due to inadequate assessment methods.

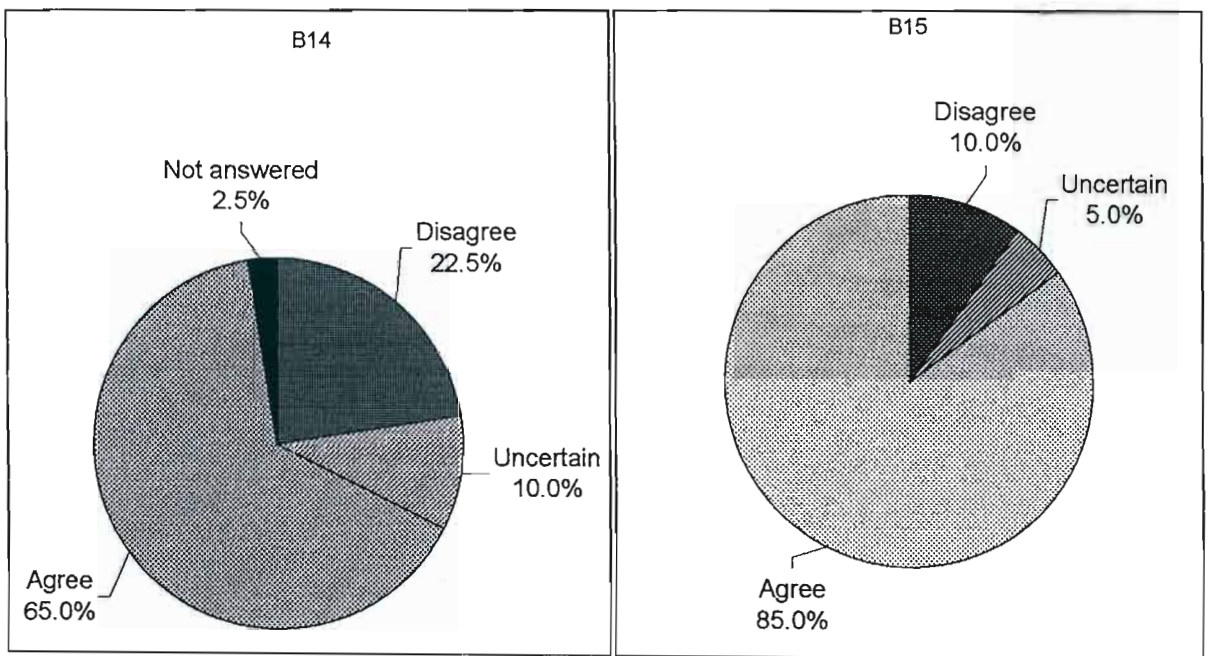
Another possible reason for this trend is the nature of the final examinations by the Department of Education. Twenty seven of the respondents (67.5%), feel that the examinations undermine the use of alternate strategies by the type of questions that are set in the HG Mathematics paper. Open-ended questions or investigative questions are rarely set, and questions that would extend a child's mind beyond thinking in terms of the syllabus are rare. This view is supported by Dietel et al (1991) who confirms that traditional tests lead to a narrowing of the curriculum and emphasis on rote memorization with little opportunity to practice of higher-order thinking skills. A comment of a teacher in the semi-structured questions was as follows:

*T1: A disadvantage lies in the fact that recommended CA assessments are not in line with the final assessment (exam)*

Ramsuran (1997) further cites Chacko (1997), who argues that examinations merely assess the learner's ability to reproduce knowledge and therefore the higher levels of cognitive, affective and psychomotor domains are neglected as they contain mostly lower order questions compiled from previous question papers.

Very often preparation for Matriculation examinations is dominated by reviewing past year papers rather than real understanding of concepts taking place – similar to drill learning. Thus if we want to promote creative thinking and understanding in Mathematics, the Department of Education needs to look at the style of its external assessments.

Data in Chart 5.3 and Chart 5.4 reflect an analysis of Mathematics teachers’ views on workshops held by the Department in terms of CA in Mathematics.



*Chart 5.3 Teachers’ request for Workshops in CA in Mathematics*

*Chart 5.4 Teachers’ request for material on alternate strategies.*

A significant number of the teachers sampled (65%) agreed that they needed more workshops to empower themselves to implement CA, as explained in,

*T2 : There should be more concrete help from Department with respect to type of strategies.*

*T3 : More workshops are needed for Journal writing, investigations, research projects etc.*

The need for more workshops is confirmed by Ramsuran (1997) whilst Black & Dockrell (1984) view that when new assessment strategies are introduced this necessitates workshops.

The response is congruent with the findings where 72.5% of the educators confirm that they are still using pen and paper tests (Chart 5.2) as their dominant mode of assessment, implying that they are not fully implementing alternate strategies. There seems to be a strong request by educators for assistance in the new paradigm of assessment. It should be noted here that with few young teachers entering the profession (only one respondent was in the 0-5 year experience category), those who are in the system have been using mainly traditional assessment strategies such as tests and examinations and thus would need more orientation to change from this mode.

With regards to workshops, 85% (Chart 5.4) of the respondents felt the need for more resource material on the alternate strategies (e.g. investigations, journal writing. etc.). As commented by one respondent,

*T6 : Need more exemplars on projects and investigations and resources lean towards an OBE approach*

This may assist in empowering them to make the transition from pencil-paper testing to Continuous Assessment.

The next section looks at teachers' views and experiences of CA on teaching. The data reveals that 55% of the respondents sampled agreed that CA has led to a positive change in their teaching style (Table 5.5).

<b>ITEM</b>	<b>Strongly Agree</b>	<b>Agree</b>	<b>Disagree</b>	<b>Uncertain</b>
CA has led to a positive change in my teaching style in Mathematics	12.5%	42.5%	37.5%	5%

*Table 5.5 item analysis of questionnaire response: Impact of CA on Teaching style*

Ramsuran (1997:15) mentions the findings of Awomolo (1992) that claim that CA impacts positively on teaching and learning. Fifteen (37.5%) of the respondents disagreed with this statement with a further 3 (5%) indicating “uncertain”. This could

be attributed to teachers not receiving adequate workshops and materials, thus leading to them not having the basic understanding of the principles that underpin continuous assessment and knowing how teaching and assessment could be linked to impact on their lessons. It would be narrow to attest this situation only to lack of workshops as a range of lessons. It would be narrow to attest this situation only to lack of workshops as a range of factors such as workloads, lack of resources, ability level of learners or teacher confidence could lead to this. One needs to understand this in the context of our long history of using poorly developed assessment tools, particularly tests and examinations

The general pattern that has emerged from Table 5.6 and Table 5.7 is encouraging.

<b>B23</b>		
<i>Table 5.6 Item analysis on lessons prepared incorporating CA strategies.</i>		
	Frequency	Percent
Disagree	10	25
Uncertain	4	10
Agree	26	65
<b>Total</b>	<b>40</b>	<b>100</b>

<b>B22</b>		
<i>Table 5.7 Item analysis on assessing students more frequently.</i>		
	Frequency	Percent
Disagree	10	25
Uncertain	1	2.5
Agree	29	72.5
<b>Total</b>	<b>40</b>	<b>100</b>

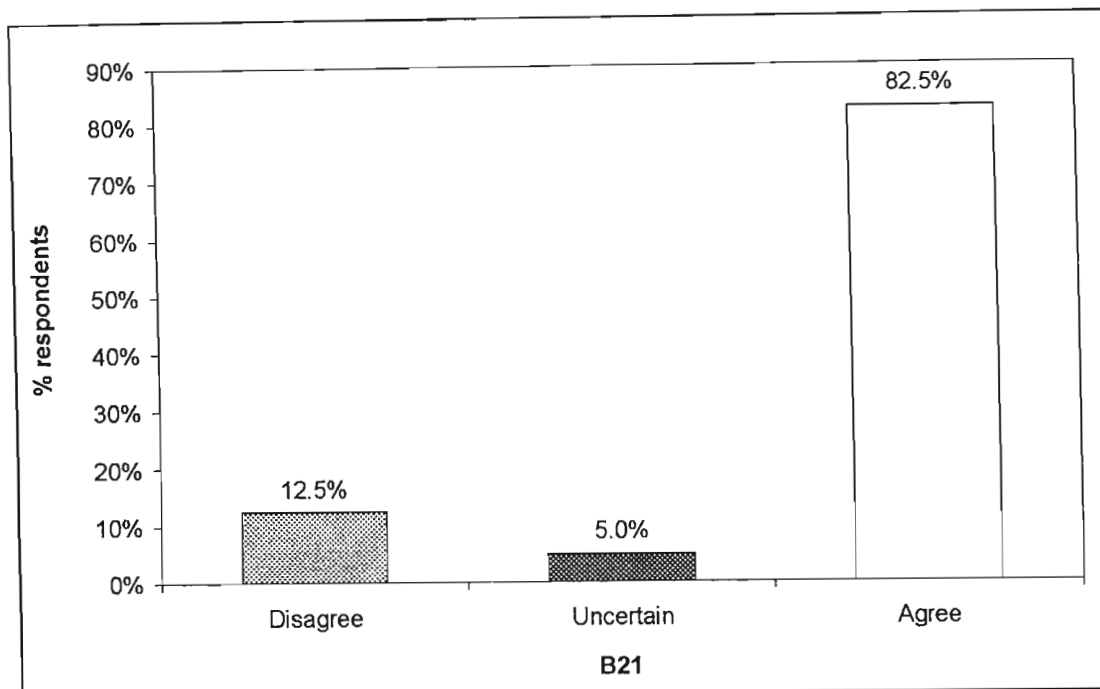
Firstly, 65% (Table 5.6) of the educators sampled, are preparing their lessons and incorporating CA strategies in them, despite the problems faced. This confirms Niss's (1993) view who states that CA takes place concurrently with, and is often integrated into the teaching learning unit of issue. This is also encouraging in view of the TIMSS-R report (1995/96), where about half of the teachers in South Africa were found to lack in terms of content knowledge, leaving these teachers poorly prepared (Howie 2000).

Secondly, a significant percentage of teachers indicated that they are now assessing their students more frequently than they did before (Table 5.7). This is explained in the semi-structured questions:

*T4 : It encourages the learners to do their work regularly*

*T3 : Pupils are now more consistent throughout the year in their work*

What is the quality and range of these assessments that are given needs to be investigated? On the positive side it confirms the potential of CA as reviewed in the literature.



*Chart 5.8 View of CA strategies (e.g. Investigations, projects, etc.) as being subjective*

A high percentage of teachers (82.5%) (Chart 5.8), are in agreement that CA strategies like (orals, journal writing, projects, group work, etc.) are difficult to use because they are a subjective form of assessment. Some of the comments in the semi-structured questions were as follows:

*T5 : Some types of assessments are very subjective in nature and difficult to quantify as Mark/level of performance*

*T7 : Need more assistance in devising rubrics for subjective assessments*

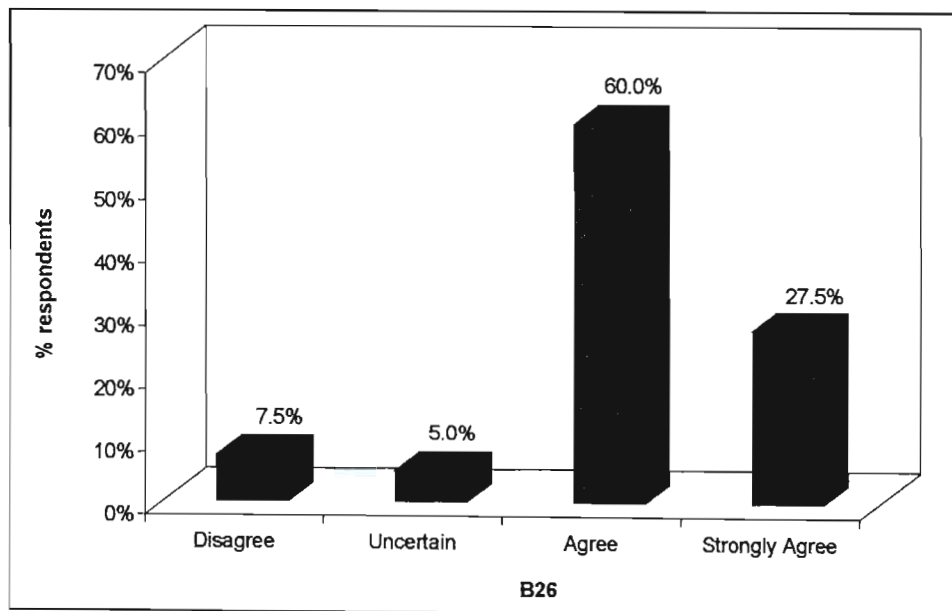
It could be the result of the need for more workshops in addressing alternate strategies in assessment to empower teachers in assessing strategies that go beyond just looking for a right or wrong answer. It is a paradigm shift.

Confirming the above revelation, we notice that 85% of the respondents are not in favor of the CA mark contributing to more than the external examination mark. Whilst the CA mark is moderated at cluster meetings, it would seem that teachers are apprehensive about increasing the weighting of this mark, which at present is 25% of

the final examination mark. This view could be due to varying standards that exist across schools resulting in inflated marks, lack of teacher experience in assessing alternate strategies, bias by teachers in evaluating, etc. With the introduction of FET in 2006, which sees the reporting of results in terms of levels of achievement from Grade 10 onwards, these issues have to be addressed by the Department of Education.

The graph in Chart 5.9 shows that an overwhelming majority of teachers are in need of being part of a communication network between themselves and colleagues in their area. Whilst it must be acknowledged that there are clusters or cell groups between schools, what can be interpreted here is that they are not effective.

Thus far they have been used mainly for the purpose of verification of the assessment strategies teachers are using in deriving their CA mark. The quality of the strategies are not looked at, nor is there much sharing of ideas on strategies, say on alternate assessments. This would probably go a long way in helping to ease the workload of teachers in CA.

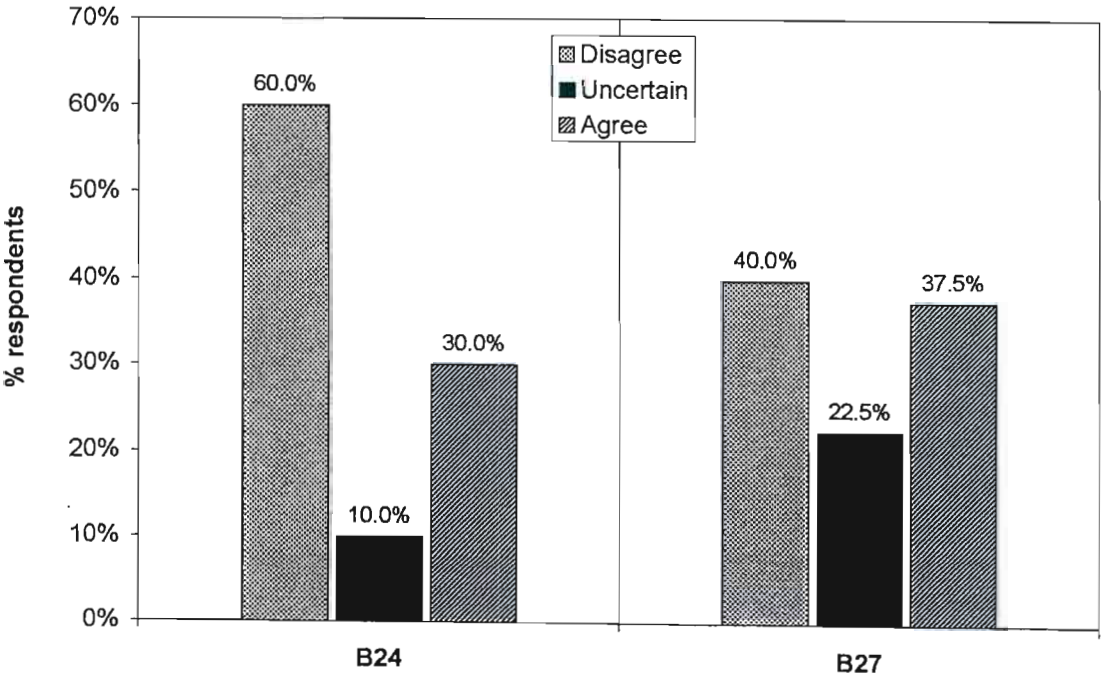


*Chart 5.9 Teachers Need for a Structured Network between themselves*

This is also congruent with the item: “*Not enough structures are in place to give guidance to schools in implementing CA,*” as 42.5% “agree” with this, with 30% “strongly agreeing”.

Data from Chart 5.10 reveals that 60% of the sample “disagree” that CA does not help learners to understand their Mathematics better, keeping in line with the literature of the potential that CA has for Mathematics. The result of this item hinges on what teachers view “understanding” in Mathematics as – “relational or procedural understanding.” An in-depth discussion on this follows later when I analyze the impact that CA has on conceptual understanding in Mathematics.

Information from Chart 5.11 shows that 37.5% “agree”, whilst 39.5% “disagree” in their response to CA improving their Mathematics results. Besides how well a learner understands his/her work, research shows that learning is a dynamic process, and thus factors such as teacher delivery in the classroom, resources, qualification of the teacher, the school’s dynamics, socio-economic factors of the learner, etc. plays a role in this, which goes beyond the scope of the study.

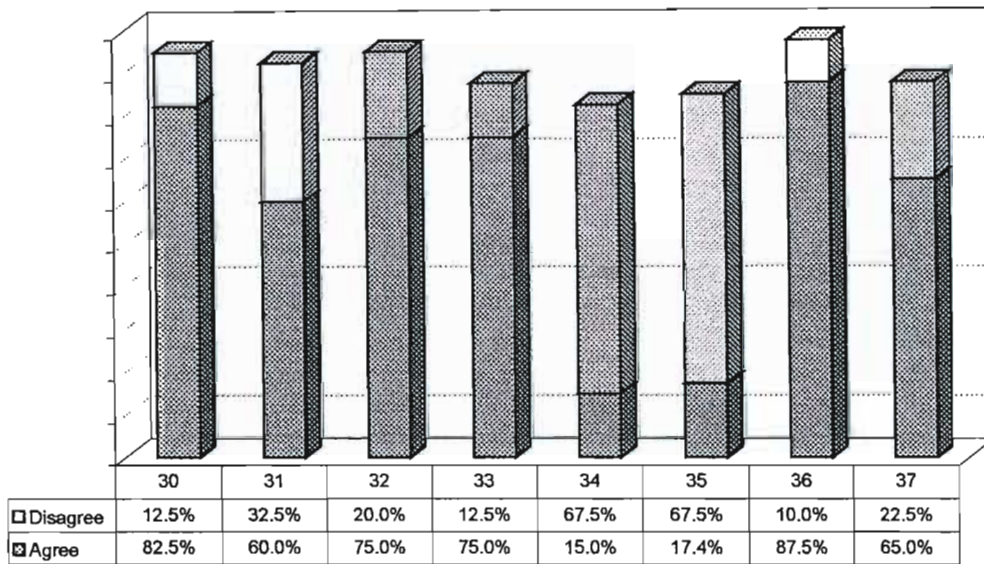


*Chart 5.10 Teachers’ view on CA not improving Understanding in Mathematics*

*Chart 5.11 Teachers’ views on improvement in Mathematics Results*

In the next section an analysis is provided on the challenges experienced by teachers in the implementation of CA in the Mathematics classroom. Chart 5.11 illustrates teachers’ responses to items in the questionnaire regarding problems in CA implementation in the classroom (Items 30 – 37).

Data from Chart 5.12, Item 31, reveals that 60% of the respondents indicated that they did not have sufficient materials on the CA strategies, especially the alternate strategies to guide them. This information is congruent with earlier findings where the majority of teachers expressed a need for materials when they attend workshops on CA in grade12. The lack of resources could stem from a historical problem created by apartheid education where schools were resourced (both human and material resources) disparately.



*Chart 5.12 Problems Experienced in Implementing CA strategies in the HG Mathematics Classroom*

KEY : CHART 5.12

- 30 : CA IS TOO TIME CONSUMING
- 31 : MY SCHOOL DOES NOT HAVE SUFFICIENT MATERIALS ON THESE
- 32 : UNREALISTIC EDUCATOR – LEARNER RATIO
- 33 : INSUFFICIENT TIME ALLOCATION FOR HG MATHEMATICS
- 34 : I DO NOT FEEL CONFIDENT IN USING THEM
- 35 : I DO NOT KNOW HOW TO DEVISE RUBRICS TO ASSESS THEM
- 36 : MY WORKLOAD AS A TEACHER HAS INCREASED AS I HAVE TO ALSO IMPLEMENT CA IN OTHER GRADES THAT I TEACH
- 37 : THE ONLY RELIABLE FORM OF ASSESSMENT IS THOSE THAT ARE WRITTEN IN A TEACHER’S PRESENCE

This has led to problems of inadequate resources, large classes, inadequate textbooks, etc. This also features in the Chart5.12, Item 32, where 24 teachers (75%) agree that the educator-learner ratio is unrealistic. If the full benefit of CA is to deliver quality learning, then this ratio has to be reduced. With the new Government in place since

1994, redress in education is taking place. It will take some time before previously inadequately resourced schools can attain some degree of parity with advantaged schools.

The government must realize that for quality education it has to prioritize the education budget. The future of the country lies in a skilled work force to meet the demands of the 21<sup>st</sup> century.

Another pressing problem that is cited by most of the teachers is that there is insufficient time allocation for HG Mathematics with 75% (Chart 5.12), Item 33, agreeing with this item. This was further reinforced in the semi-structured questions by responses like the following:

*T 2: An extra period should be allocated to Mathematics (6 periods is not enough with teaching incorporating CA).*

*T3 : Scope is too long in HG.*

*T7 : Period allocation for HG Maths is too few – the syllabus is very extensive. Implementation of the various aspects of CA becomes a problem due to time constraints.*

Consequently preference is given to tests and examinations as assessment strategies, since these can be easily accommodated in the learning program when compared to projects, journals, research assignments, etc. The latter forms of assessment take more time in terms of explanations, presentations and assessments. This is a problem faced by many HG Mathematics teachers. The Department of Education needs to look at this issue as policy makers to increase the norm time in HG Mathematics to allow for CA to be fully realized to benefit the learners.

Another feature, reflected in Chart 5.12, Item 36, is that most teachers agree that continuous assessment increases their workloads. This could be attributed to the increase in frequency in assessing and in the wide range of assessment strategies that have to be implemented as opposed to conventional forms like paper-pencil testing.

The comments of a few teachers from the semi-structured questions are elaborated below:

*T4 : Educators need to constantly record and compute marks*

*T5 : Assessing of different pieces of work takes time*

*T6 : Marking of the different pieces of work is time – consuming*

Other comments included were: the problem of educators teaching across other grades which also involves CA, as well as and the construction of assessment tasks for large groups of pupils. It is important to view this problem within the context of the changing South African schools environment. Some of these are the poor conditions of service, low morale prevailing amongst teachers, the increase in discipline problems, violence at schools and the erosion of the culture of teaching and learning at schools prevail.

From an analysis of the data (Chart 5.12), Item 37, 65% of the sample indicated that they accept assessment tasks, taken in their presence, as being reliable. This can be contextualized where teachers are faced with learners copying tasks from brighter pupils given to them as they know the marks will be part of their final CA mark. Another problem is where learners download information from the Internet for project assessments and produce these as their own work. Distinguishing between authentic and plagiarized work may pose a problem for teachers. This is supported by the following responses from the semi-structured questions:

*T8 : Projects are not done sincerely/honestly- downloaded from the internet*

*T6 : The homework component is not reliable as the learners do not necessarily present their own work*

*T7 : Dishonesty of learners especially during assignments, group work, etc. is prevalent*

With the above problems experienced by teachers in the implementation of CA, it is not surprising that the survey revealed that 47.5% of the sample would still prefer the traditional methods of assessment to CA, with only 35% disagreeing. The Department of Education should view this with some concern as CA is the ethos of assessment and future educational policy in the country. The introduction of CA is an attempt to move away from this limited forms of assessment. More structured programs on CA should be devised by the Department of Education and research conducted on the problem areas to minimize these perceptions.

In the next section, the impact of CA on conceptual understanding in Mathematics is explored according to the responses of the Questionnaire designed for this study (Appendix 1). Barnes et al (1997:23), argues that there has been a steady stream of research on student learning. They say that “understanders” are those who tend to look for the global picture before exploring any detail. As they are intrinsically motivated they are likely to develop into deep problem solvers and to be creative and independent (Brown 1997:24).

In a paper by Pirie & Kieren (1992), entitled, “Watching Sandy’s Understanding Grow,” in Davis (1992:225), they focus on ‘understanding’ and ‘thinking’ in Mathematics and not on imitation or recall. This is seen as the modern approach. Thus I feel that it was important to focus a part of the research on this aspect in the light of CA, but it must be noted that the complexity of this aspect will require a more in-depth study.

Continuous Assessment is a shift away from assessing using only tests and examinations to determine whether a learner has grasped concepts and the content. By engaging learners in a multi range of assessment strategies as outlined in the literature (Webb 1993; Clarke 1996), it is envisaged that learners are afforded the opportunity to learn through a variety of contexts and more importantly to grasp concepts by understanding and not merely rote or drill learning.

Learning in Mathematics should not merely be facilitated by following a set of procedures, although the literature reviewed (Skemp 1976), shows that many teachers follow this for various reasons.

### **PART F**

**THIS SECTION RELATES TO THE IMPACT CA IS HAVING ON THE CONCEPTUAL UNDERSTANDING OF MATHEMATICS AMONGST YOUR LEARNERS.**

**WHAT IS YOUR RESPONSE TO THE FOLLOWING STATEMENTS ?**

- KEY: 5 = STRONGLY AGREE (SA)  
 4 = AGREE (A)  
 3 = UNCERTAIN (U)  
 2 = DISAGREE (D)  
 1 = STRONGLY DISAGREE (SD)

	SA	A	U	D	SD
	%	%	%	%	%
93. CA has improved my Grade 12 learners Understanding of concepts in the Gr 12 HG Mathematics syllabus	10	40	22.5	27.5	0
95. My learners problem solving abilities in Mathematics has improved because of CA	2.5	30	30	35	2.5
96. The use of CA in my Grade 12 Maths class has led to the development of a positive Attitude towards Mathematics by the learners	10	37.5	27.5	22.5	2.5
97. CA contributes to my Gr 12 learners Learning Mathematics through conceptual under- Standing rather than following rules	2.5	37.5	32.5	22.5	2.5
98. The performance of my learners has not Improved although I have been implementing CA	2.5	22.5	20	50	5
100. Using CA reduces opportunities for learners to Develop a deeper understanding of Mathematics Concepts	98	10	20	65	2.5
101. CA has led to enhanced thinking in Mathematics amongst my learners	2.5	27.5	32.5	35	2.5
102. CA has not contributed to my learners Working consistently throughout the Year in Mathematics	0	22.5	7.5	62.5	7.5

*Table 5.13. Item Analysis of Questionnaire Responses. Impact of CA on Conceptual Understanding of Learners*

T050177

The Table 5.13 represents data from the questionnaire establishing some views on the impact of CA on the conceptual understanding in Mathematics amongst learners.

Data in Table 5.13, Item 93, reflects that 50% of the sample agreed that CA has improved their GR 12 learners understanding of concepts in Mathematics and is encouraging. We are reminded of the words of Wessels (2001:2) who reiterates that *“Mathematics teaching should help learners to become independent thinkers who are capable of high quality mathematical thinking and who can understand and do Mathematics”* CA is part of this teaching style which can contribute to this.

To probe further on this issue, I included items in this section on problem solving, creative thinking, enhanced thinking, attitudes and long term success as guided by the literature review (Skemp 1996, Clarke 2003), to crystallize the views of the respondents on Conceptual Understanding of Mathematics through the paradigm of CA. The data from Table 5.13 shows that the responses were divergent, which suggested that CA is having a measured effect on the learner. This must be seen in relevance to factors mentioned earlier.

Further analysis of the data in Table 5.13, Item 95, reveals that 32.5% of the sample responded positively (agree) that their learners' problem solving abilities had improved through using CA, whilst a significant number (30%) of the respondents reflected that they were uncertain about this and 37.5% disagreed. This illustrates the divergent views of teachers on this item reflecting that more has to be done in terms of devising contextual problems and creative assessment strategies to help teachers. This is confirmed in the literature reviewed which showed that CA contributes to improving problem solving, (Ramsuran:1997).

Consistency is seen when analyzing the response of teachers on 'enhanced thinking' through CA in relation to the analysis earlier on problem solving, where the views were divergent. Thirty percent (30%) indicated in Item 101 that it led to enhanced thinking amongst their learners with 37.5 % disagreeing and a fair number, (32.5%) indicating “uncertain.”

It is encouraging to note that 40% of the respondents in Item 97 agreed that CA implementation has led to learners learning Mathematics through conceptual understanding rather than following rules. Alternate strategies like investigations, projects, research assignments, etc. are powerful in developing learning in this paradigm. This is reinforced by responses in the semi-structured questions, like the following :

*T8 : The different type of CA assessment allows for different skills not just memory recall*

*T9 : Learners are able to acquire a functioning knowledge of Mathematics that is relevant to daily living*

*T6 : Allows learners the opportunity to gain greater insight into topics covered*

Although teachers view the alternate strategies as important in contributing to the conceptual development of learner (Chart 5.14), they maybe experiencing problems in implementing them as explained earlier due to the lack of resources and workshops, etc. By overcoming this, it can lead to wider implementation of the alternate strategies which will be beneficial to learners. Chart 5.14 shows the accumulated rating by the respondents of some of the alternate strategies from “fair” to “excellent” in contributing to conceptual understanding.

<b>Alternate Strategy</b>	<b>Rating</b>
Research Projects	70%
Investigations	40%
Portfolios	72.5%
Tutorials	95%

*Table 5.14 Rating of the alternate strategies from “fair” to “excellent” in contributing to conceptual understanding*

Of interest as well is that 47.5% (Table 5.13), Item 96, of the educators indicated that CA has led to a positive attitude towards Mathematics by learners. Of concern is that 25% “disagreed” with this. A high number of teachers reported in the semi-structured

analysis that learners felt overburdened by CA as they had to meet the requirements for CA in the other subjects. This could have a negative effect on the learners in obscuring the benefits that CA is meant to have on them. Also the overwhelming emphasis placed on the external examinations in Grade 12 in terms of determining future career paths, places great stress on learners, leading them to put more effort on examination preparation which overshadows the contribution of CA. As we have seen that an analysis of the 2003 Matriculation results by Jansen (2003) show that high pass rates in examinations do not necessarily translate that quality education delivery has been achieved.

Very encouraging from the information in Table 5.13, Item 102, is that 70% of the sample of respondents indicated that CA has led to their learners working consistently in Mathematics. This represents one of the outcomes of CA which could see the further realization of improvements in conceptualization, attitudes, problem solving, etc. in Mathematics – which reflects the output of genuine Mathematics learning. The TIMSS and TIMSS-R studies provided evidence of the poor rating of the performance of South African Mathematics students internationally. It is hoped that this scenario will change with the introduction of CA in Mathematics. A positive sign is that in Item 98, 55% of the respondents agreed that their learners' performance improved with the implementation of CA.

In conclusion, the analysis shows that Continuous Assessment is having a measured effect (positive), on the understanding, attitudes and thinking of learners. As teachers are finding their way through this new paradigm of CA, which some are gradually implementing, it is hoped that this sustained endeavor will lead to Mathematics learners who are creative, logical, appreciative, and critical thinkers, preparing them for the 21<sup>st</sup> century.

## **6. CONTINUOUS ASSESSMENT PRACTICE IN GRADE 12 HG MATHEMATICS**

### **6.1 INTRODUCTION**

Having examined the views and experiences of teachers on CA, I will present the findings on continuous assessment practice using data selected from the questionnaire (Appendix 1) completed by 40 HG Mathematics teachers.

### **6.2 EVALUATION AND ANALYSIS OF DATA ON CA PRACTICE**

The literature reviewed emphasizes the need for assessment in mathematics to be ongoing, continuous, real world applications and aspiring to using a variety of strategies to unlock student potential (Noam, 1996; Clarke, 1996; Niss, 1993; Webb, 1993). Cooney & Badger (1990:506), reiterate the message from the Evaluation Standards about the importance of varying the kinds of information one must obtain about student's understanding of Mathematics; which can be obtained other than from paper-pencil tests. The implication of the literature review is that the traditional form of assessment serves only a narrow form of learning, compared to the alternate strategies. This is also confirmed by Malcolm et al (1999:39), who say that tests are limiting in that learners compete with each other, the examiner and the clock on questions that are often poorly connected to the real world. Also competence cannot be assessed adequately with pencil-paper testing than with a wide range of assessment strategies.

An analysis of the graph (Chart 6.1) reveals the following data trends.

The percentage use of traditional (paper- pencil) strategies amongst the respondents are as follows:

Internal Examinations (90%), Class Exercises (97.5%), Class Tests (100%), Class Assignments (100%). The above data is in sharp contrast to the percentage usage of the majority of alternate strategies in the sample surveyed (Table 6.1),

for example:

Oral presentations	20.5%	Group Work	32.5%
Journal Writing	12.5%	Error Spotting	32%
Skills Tests	47.5%	Research Assign.	20%
Investigations	40%	Model Making	2.5%
Practical Demos.	2.5%	Learner Attitude	5%

*Table 6.1 Below 50 % usage of alternate strategies used in Grade 12 HG Mathematics*

It is, however, encouraging to note that for 3 of the alternate strategies, over 50% of the respondents indicated that they are implementing them (Table 6.2). These are :

Research Projects	77.5%
Tutorials	97.5%
Portfolios	80%

*Table 6.2 Above 50 % usage of alternate strategies in Grade 12 HG Mathematics*

To indicate the value of one of the alternate strategies, I cite the use of Portfolios, which 80 % of the respondents indicated using (Table 6.2). Smit et al (2000:28) explain that portfolios are used by people in the art and architecture sectors to present themselves to potential clients. Learners are getting a similar experience via this assessment strategy to showcase their work in Mathematics. More importantly, portfolios can support the learner's own learning process and at the same time allow the educator to gain insight into the learner's thought processes and content knowledge. Far more is gained from this method of assessment than can be derived from pen-paper testing.

Analysis of the information gathered shows that the implementation of the traditional strategies outweigh those in the alternate strategies. This draws a parallel to a study by Budaloo (2002:174) on Grade 8 Mathematics teachers use of assessment strategies

in Outcomes-Based Education. The case studies of 5 educators revealed that their assessment strategies are still dominated by traditional assessment strategies.

Data in Graph 6.3 shows the implementation of the strategies in CA in GR 12 HG Mathematics as declared by the respondents.

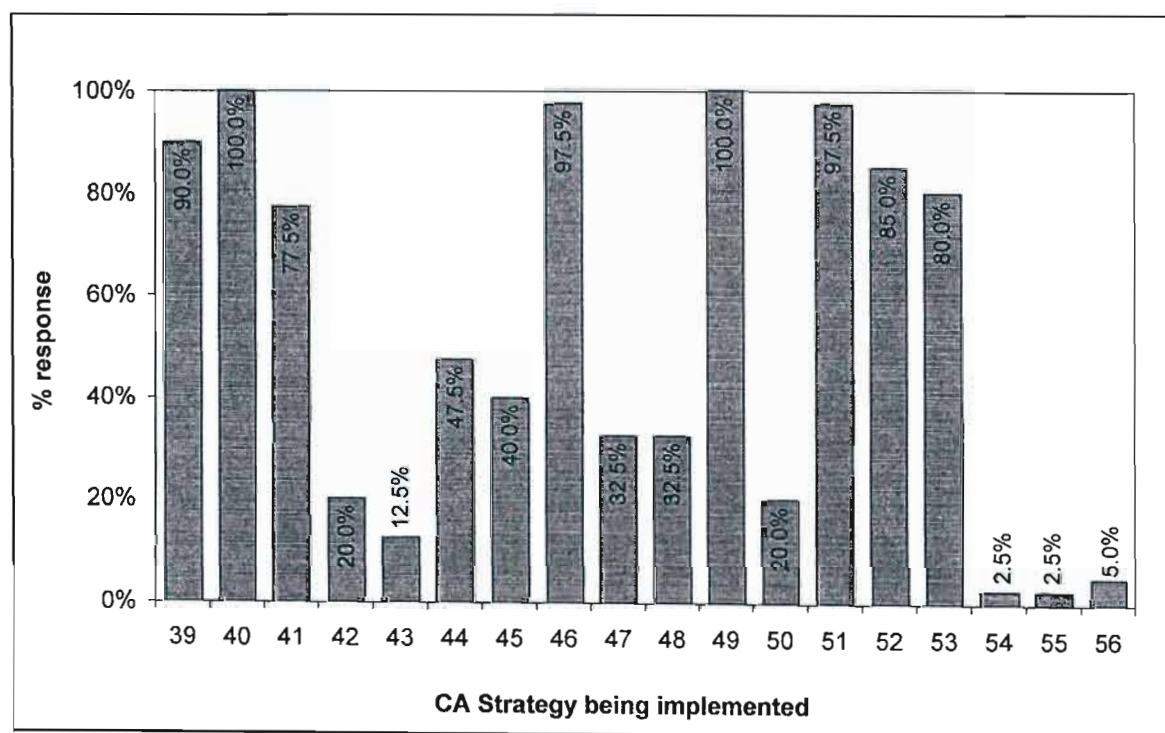


Chart 6.3 Implementation of the CA Strategies

KEY : CHART 6.3

- |  |                                       |                     |
|--|---------------------------------------|---------------------|
| 39 : INTERNAL EXAMINATIONS                     | 40 : CLASS TESTS                      | 41 : RESEARCH PROJ. |
| 42 : ORAL PRESENTATIONS                        | 43 : JOURNAL WRITING                  | 44 : SKILLS TESTS   |
| 45 : INVESTIGATIONS                            | 46 : CLASS EXERCISES                  | 47 : GROUP WORK     |
| 48 : ERROR SPOTTING                            | 49 : ASSIGNMENTS (EXT. OF CLASSWORK ) |                     |
| 50 : RESEARCH ASSIGNMENTS                      | 51 : TUTORIALS                        |                     |
| 52 : HOMEWORK STRATEGY                         |                                       |                     |
| 53 : PORTFOLIOS (COLLECTION OF LEARNER'S WORK) |                                       |                     |
| 54 : MODEL MAKING                              | 55 : PRACTICAL DEMONSTRATIONS         |                     |
| 56 : LEARNER'S ATTITUDE                        |                                       |                     |

The above results should not be seen in isolation but should be measured against the views of the teachers discussed earlier on and the problems with the implementation of CA. It is encouraging that attempts are made to implement all the strategies, with

some being a major part of the assessment strategies for GR 12 Mathematics as indicated. De Lange and Verhage (1997) point out that one of the principles of the Realistic Mathematics Education (Netherlands Education), is where methods of assessment should be such that they enable the learner to demonstrate what they know rather than what they do not know. I illustrate this by using Journal Writing as a strategy, where a learner communicates his/her ideas on a topic from his/her experience. This strategy allows a learner to demonstrate his/her understanding on what he/she knows, compared to a test where one would find a lot about what a learner does not know. The use of a variety of assessment tasks is also echoed by Malcolm et al (1999:39), where they point out that these help in a number of ways such as:

- ❖ *“different tasks have different appeal to different learners*
- ❖ *mixing the tasks give all learners a chance to work in their preferred way on tasks*
- ❖ *learners are obliged to develop their skills in a variety of ways, not only in those they excel*
- ❖ *the richness of experience and talent within the learners’ lives has a better chance of entering the learning domain*
- ❖ *variety adds interest to the day and week in classes.”*

Assessment in Mathematics is progressing to incorporate more than the traditional assessments, and the full rationale of CA will be realized by addressing concerns raised in the study.

## **7. AN ANALYSIS OF WORKSHOPS NEEDS ON CA STRATEGIES**

### **7.1 INTRODUCTION**

Having examined the practice of CA strategies in Grade 12 HG Mathematics of the sample, the analysis on the need for more workshops below triangulated the

information on those assessment areas which reflected a low response rate. This enhances the reliability of the information.

Budaloo (2002:174), in his recommendations reported that there are serious problems with regard to training of educators and the implementation of policies which the Department of Education has to revisit. This study too showed that the workshops needed to be based primarily on themes on CA strategies, covering issues on assessment in general, resource material on the strategies, trouble shooting on the problem areas regarding implementation of CA, etc. This is what will be needed to address concerns raised in the study- as per the responses given by teachers.

The following table deals with the responses of respondents on the need for workshops on CA strategies.

## 7.2 TABLE SHOWING THE PERCENTAGE RESPONSE TO THE NEED FOR WORKHOPS

### PART E

**Now which of the following strategies do you consider you need more Orientation in terms of workshops (regarding assessment, topics, Exemplars, rubrics etc.)**

	<b>% req. assistance</b>
75. Internal examinations	2.5
76. Class tests	2.5
77. Research Projects	72.5
78. Oral presentations	52.5
79. Journal writing	60
80. Skills tests	25
81. Investigations	57.5
82. Class exercises	5
83. Group work	27.5

84. Error spotting	22.5
85. Assignments (Extension of classwork)	7.5
86. Research Assignments	45
87. Tutorials	5
88. Homework Strategy	15
89. Portfolios (Collection of learner's work)	10
90. Model Making	65
91. Practical Demonstration	62.5

*Table 7.1 The Response Rate of Teachers to the Need for Workshops on CA Strategies*

An analysis of the data in Table 7.1 identifies 7 assessment strategies which reflect high percentage response rate compared to the other strategies listed. These are research projects, oral presentations, journal writing, investigations, research assignments, model making and practical demonstrations. It is important to note that all these strategies are alternate strategies advocated in CA, and correlate with the findings of the previous analysis (Chart 6.1) which reflected their low usage. It also triangulates with some of the views and experiences of teachers on CA analysed earlier.

Thus through sustained workshops with the provision of resource materials that teachers can become empowered and confident in meaningfully applying the alternate strategies in CA, where the requirement is needed.

## **8. SUMMARY OF FINDINGS**

The summary below provides information on some of the main findings of the study:

1. It was found that the majority of teachers agree that CA has been instrumental in producing a change in their assessment policy at their schools although this may be taking place at a measured pace.

2. It was found that CA strategies are still dominated by the writing of pencil-paper strategies and the detailed analysis of the implementation of CA strategies by Grade 12 HG Mathematics teachers confirmed this.
3. It is also important to note that some alternate strategies are being implemented whilst others show minimal use in the classroom.
4. The need for workshops based on alternate strategies was viewed by the majority as essential, implying that this would empower teachers in implementing a wider range of assessment strategies, than they are already doing.
5. There is also a strong request for resource materials at these workshops on the alternate strategies that would assist teachers.
6. Many teachers expressed that some problems existed in them implementing CA strategies adequately which related to the HG syllabus being too long, the unrealistic teacher-learner ratio, insufficient time allocation for HG Mathematics and an increase in their workload.
7. Many expressed that they would welcome the formation of structured networks in their areas allowing for communication on CA strategies amongst their peers, with a view of easing the workload.
8. It was found that learners and teachers are benefiting from CA, although this may be a measured progress in terms of it contributing to learners working consistently, having a positive effect on teaching style and lesson preparation, frequent assessing taking place, enhanced performance of learners, etc.

9. A measured (positive) effect of CA contributing to conceptual understanding in Mathematics amongst learners was also reported, with contributions to problem solving, enhanced thinking and reduced learning of Mathematics from rules.

In a report in the *Mercury* by the South African Press Association (4:2003), Cassius Lubisi, the Chairman of the Council for Quality Assurance in General and Further Education and Training, said that the council found progress in the CA evaluation process, but believed that there was room for improvement. This is an apt confirmation in evaluating the findings of this study.

This chapter has focused on teachers' views and understanding on CA, their strategies they are implementing in GR 12 HG Mathematics, the impact that CA is having on the learners and also the problems experienced by teachers. The chapter that follows will present the limitations and recommendation to the study.

## ***CHAPTER 5***

### **LIMITATIONS AND RECOMMENDATIONS**

#### **1. INTRODUCTION**

I will conclude this report with the limitations and recommendations of this study and the potential for further research.

#### **2. LIMITATIONS OF THE STUDY**

1. A limitation of the study was that a stratified sample and sophisticated statistical techniques was not considered necessary in the context of the reasons mentioned in the research design of this being a mini-dissertation.
2. Despite the use of the small sample size, there is no reason to suppose that other Grade 12 HG Mathematics Teachers in the Ethekewini Region would hold different views from the sample.
3. With the above fact in mind, I need to mention that these findings cannot be generalized to the whole KwaZulu-Natal Province, but I am just reporting on the findings of my study.
4. The instrument used for data collection may have been too long.

### 3. RECOMMENDATIONS

From the findings of the study the following recommendations are made:

#### 3.1 RECOMMENDATIONS FOR EDUCATORS OF GRADE 12 HG MATHEMATICS

1. Educators need to make a concerted effort to take the initiative to implement a diverse range of alternative assessment strategies in the ethos of CA away from relying just on paper–pencil tests.
2. They also need to empower themselves about available alternate strategies by conducting research on their own from various sources, so that they can build confidence in their implementation and assessment. As Budaloo (2002:178) reporting on Schoen (1993:2), claims that *“a highly competent teacher will almost continuously assessing student’s understanding, motivation to work, their readiness to proceed to newer activities, their abilities to work together and so on.”*
3. Teachers need to utilize existing structured networks like AMESA or alternatively they can set up one in their areas, to facilitate communication amongst themselves to bring about a sharing of ideas in CA, dividing the planning of assessment tasks amongst each other and generally motivating each other. This would certainly help in relieving some of the workload they face in Grade 12 HG Mathematics.

4. At these structured networks and also on their own, teachers should see how they can bring in contextual problems (real world problems) into their assessment strategies, allowing for meaningful learning and promoting understanding of concepts. Discussions amongst peers certainly helps in finding novel and creative ideas, which are rich sources of experiences. It will also allow teachers to explore the curriculum more fully.
5. Teachers should structure themselves to become involved in the Department's policy making, especially in the areas of CA and workshops on CA, so that their concerns are addressed from their point of view. Workshops should just not become "talk shops." The Department will also not be viewed as policy implementers since teachers will have a say.
6. Teachers need to engage in research of their own (i.e. not only rely on Departmental workshops) in order to strive for improved and updated assessment strategies in their practice in the classroom.

### **3.2 RECOMMENDATIONS FOR POLICY MAKERS**

1. The study reveals that there is a dire need for support material in Continuous Assessment strategies for Grade 12 HG Mathematics, especially the alternate strategies as these have been recently introduced at Grade 12 level.
2. There is a need for regular workshops by the Department on Continuous Assessment Strategies to ensure its effective implementation at Grade 12 HG level. These workshops should empower educators.

3. It is important that the Department of Education utilize the services of educators competent in Mathematics assessment and policy makers in the workshops for CA so that maximum benefit can be derived by the educators.
4. Policy makers need to consider increasing the percentage contribution of CA towards a learner's final mark in Matric, from the present 25%, as public examinations are limiting as an instrument in gauging learning as pointed out in the literature.
5. The style of the External Examination paper in Grade 12 Mathematics, is content driven without allowing "expression" of the alternate strategies by nature of questioning techniques. There must be a change in style with open-ended questions, questions that explore higher order thinking etc.
6. Subject advisors should ensure that the Mathematics cluster groups, (network of teachers in an area), are functioning more than moderation meetings, but should also foster regular co-operation between teachers on assessment issues in Grade 12 Mathematics.
7. The Department of Education should consider increasing the allocated time (norm time) for Grade 12
8. HG Mathematics to allow for both maximum and quality implementation of CA.

9. There should be visits by subject advisors on a regular basis to schools to ensure that schools are adhering to the implementation of CA policy. Assistance should be offered to schools experiencing difficulties in its implementation.
  
10. In order to attract quality students to the teaching profession (especially in Mathematics and Science subject areas) greater incentives have to be offered by the Department of Education.
  
11. The impact of HIV/AIDS in the education sector will see the erosion of numbers in the teaching profession, requiring policy makers to urgently consider some innovative ideas to redress the situation.
  
12. There has to be more realistic incentives in order to encourage studying in the education field towards research and innovation.

### **3.3 RECOMMENDATIONS FOR LEARNING INSTITUTIONS**

1. The in-service programs offered to educators upgrading their qualifications at Higher Learning institutions should include programs on CA Strategies as part of their course structure to empower teachers.

### **3.4 IMPLICATIONS FOR FURTHER RESEARCH**

1. Further research could be conducted on the impact of CA on Conceptual Development in Mathematics learners in South Africa, through a longitudinal study.
2. An investigation can be conducted on the Attitudes of Learners towards CA as part of their assessment at Grade 12 Level.
3. More research needs to be done on CA in Grade 12 Mathematics as little research has been done on this in South Africa as suggested by the literature review.

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*APPENDIX 1*

**QUESTIONNAIRE**

# TEACHER SURVEY

The purpose of this survey is to investigate the views of Grade 12 Higher Grade Mathematics Educators and their understanding of Continuous Assessment in Mathematics, what strategies are being used and the effect it has on the quality of Mathematics Education. All information gathered will be treated with strict confidentiality, hence no names, schools or educators are indicated on the questionnaire. Please answer all questions. For each question followed by a box, place an X in the space provided. Do not write in the shaded areas.  
**THANK YOU FOR TAKING TIME TO COMPLETE THIS QUESTIONNAIRE.**

## PART A

### TEACHER INFORMATION

PLEASE PLACE A CROSS (X) IN THE APPROPRIATE BOX

1. DESIGNATION

Teacher Level 1		1	H O D		2	Deputy Principal		3
-----------------	--	---	-------	--	---	------------------	--	---

2. NO. OF YEARS TEACHING GRADE 12 HG MATHEMATICS.

0-5		1	6-10		2	11-15		3	> 15		4
-----	--	---	------	--	---	-------	--	---	------	--	---

3. SEX

Male		1	Female		2
------	--	---	--------	--	---

4. FORMAL QUALIFICATIONS (COMPLETED)

2 Year Diploma only		1	3 Year Diploma only		2
4 Year Diploma only		3	1 Degree and Teaching Dip.		4
More than 1 Degree & Teach. Dip		5			

5. CIRCUIT OF SCHOOL IN ETHEKWENI REGION

BEREA 1	K/MASHU/ INANDA 2	PHOENIX 3	H/DALE 4
NDWEDWE 5	L/TUGELA 6	MAPHUMULO 7	PHUMELA 8
DUR/CENT 9	CHATSWORTH 10	UMBUMBULA 11	

6. DO YOU CONSIDER YOUR SCHOOL TO BE

Urban		1	Rural		2	Not Sure		3
-------	--	---	-------	--	---	----------	--	---

7. ETHNIC GROUP AFRICAN 1 COLOURED 2 INDIAN 3 WHITE 4

103. NO OF HG MATHS CLASSES YOU ARE TEACHING?

1	2	3
---	---	---

## PART B

**WHAT ARE YOUR VIEWS AND EXPERIENCES WITH CA IN YOUR GRADE 12 HG MATHEMATICS CLASS ?**

**PLACE A CROSS (X) USING THE KEY BELOW FOR THE FOLLOWING STATEMENTS**

KEY: 5 = STRONGLY AGREE (SA)  
 4 = AGREE (A)  
 3 = UNCERTAIN (U)  
 2 = DISAGREE (D)  
 1 = STRONGLY DISAGREE (SD)

STATEMENTS	SA	A	U	D	SD
	5	4	3	2	1
8. I feel that assessment of learners is a key issue especially in the area of mathematics					
9. Before CA was introduced I used only paper-and-pencil testing					
10. The introduction of CA produced a change in the Mathematics assessment policy in our school.					
11. My CA mark whilst not completely, is still dominated by tests ie. (marking right and wrong answers)					
12. The nature of the final exams undermines the use of alternate strategies (eg. Investigations )					
13. I feel that CA has contributed to my learners working consistently throughout the year in Mathematics.					
14. The educators in our school need more workshops to empower themselves to implement CA					
15. The workshops should provide more material on the alternate strategies (eg. investigations, journal writing)					
16. The CA mark should not contribute more than the external examination mark of a learner.					
17. CA has led to a positive change in my teaching style in Mathematics.					
18. Not enough structures are in place to give guidance to schools in implementing CA.					
19. I find it burdensome implementing CA because of the lengthy Grade 12 Higher Grade syllabus.					
20. CA allows me to explore the Maths Curriculum in a more indepth way.					
21. In my view some of the strategies in CA are difficult to use because they are subjective (eg. Orals, journal writing, projects, group work, investigations, attitude)					
22. I now assess my students more frequently than I did before.					
23. My lessons are prepared to incorporate CA strategies in them.					

continued

**WHAT ARE YOUR VIEWS AND EXPERIENCES WITH CA IN YOUR GRADE 12 HG MATHEMATICS CLASS ?**  
**PLACE A CROSS (X) USING THE KEY BELOW FOR THE FOLLOWING STATEMENTS**

- KEY: 5 = STRONGLY AGREE (SA)  
 4 = AGREE (A)  
 3 = UNCERTAIN (U)  
 2 = DISAGREE (D)  
 1 = STRONGLY DISAGREE (SD)

STATEMENTS	SA	A	U	D	SD
	5	4	3	2	1
24. The use of CA does not help learners to understand their Mathematics better					
25. CA strategies like Research Projects, help improve learner's knowledge in Mathematics					
26. There is a need for a structured network of communication between myself and fellow colleagues in my area (This will help to reduce work load)					
27. Mathematics results of my learners have improved through CA					
28. Despite the introduction of CA many teachers are still using very traditional forms of assessment					
29. The breakdown of the Department's CA policy caters more for tests and examinations than alternate strategies					
<b>I DO NOT USE MANY ALTERNATE CA STRATEGIES IN MY HG MATHS CLASSES BECAUSE:</b>					
30. It is too time consuming					
31. My school does not have sufficient materials on these					
32. Unrealistic educator - learner ratio					
33. Insufficient time allocation for HG Mathematics					
34. I do not feel confident in using them					
35. I do not know how to devise rubrics to assess them					
36. My work load as a teacher has increased as I have to also implement CA in other grades that I teach					
37. The only reliable form of assessment is those that are written in my presence					
38. I still prefer the traditional method of assessment to Continuous Assessment					

## PART C

**WHAT IS THE RANGE OF CA STRATEGIES THAT YOU ARE IMPLEMENTING IN YOUR HG MATHEMATICS CLASSES FOR ASSESSMENT PURPOSES AND GIVE THE FREQUENCY OF EACH ITEM PER YEAR ?**

**TICK YOUR CHOICE AND THEN INDICATE HOW MANY TIMES PER YEAR YOU IMPLEMENT THAT STRATEGY IN YOUR GRADE 12 HG MATHEMATICS CLASSES**

STRATEGY	TICK	HOW MANY PER YEAR?									
		1	2	3	4	5	6	7	8	>8	
39. Internal examinations		1	2	3	4	5	6	7	8	>8	
40. Class Tests		1	2	3	4	5	6	7	8	>8	
41. Research Projects		1	2	3	4	5	6	7	8	>8	
42. Oral presentations		1	2	3	4	5	6	7	8	>8	
43. Journal writing		1	2	3	4	5	6	7	8	>8	
44. Skills tests		1	2	3	4	5	6	7	8	>8	
45. Investigations		1	2	3	4	5	6	7	8	>8	
46. Class exercises		1	2	3	4	5	6	7	8	>8	
47. Group Work		1	2	3	4	5	6	7	8	>8	
48. Error spotting		1	2	3	4	5	6	7	8	>8	
49. Assignments (Extension of Classwork)		1	2	3	4	5	6	7	8	>8	
50. Research Assignments		1	2	3	4	5	6	7	8	>8	
51. Tutorials		1	2	3	4	5	6	7	8	>8	
52. Homework Strategy		1	2	3	4	5	6	7	8	>8	
53. Portfolio (Collection of learner's work)		1	2	3	4	5	6	7	8	>8	
54. Model Making		1	2	3	4	5	6	7	8	>8	
55. Practical Demonstrations		1	2	3	4	5	6	7	8	>8	
56. Learner's Attitude		1	2	3	4	5	6	7	8	>8	
		1	2	3	4	5	6	7	8	9	

## PART D

IN THE FOLLOWING TABLE RATE ONLY THOSE CA STRATEGIES TICKED IN PART C ACCORDING TO HOW YOU FIND IT PROMOTING YOUR GR 12 LEARNERS' CONCEPTUAL UNDERSTANDING OF MATHEMATICS

	Excellent	Good	Fair	Poor	Useless
	5	4	3	2	1
57. Internal examinations					
58. Class tests					
59. Research Projects					
60. Oral presentations					
61. Journal writing					
62. Skills tests					
63. Investigations					
64. Class exercises.					
65. Group Work					
66. Error spotting					
67. Assignments (Extension of Classwork)					
68. Research Assignments					
69. Tutorials					
70. Homework strategy					
71. Portfolio (Collection of learner's work )					
72. Model Making					
73. Practical demonstrarions					
74. Learner's Attitude					

## PART E

Now which of the following strategies do you consider you need more orientation in terms of workshops (regarding assessment, topics, exemplars, rubrics etc.)

PLACE A CROSS (X) IN THE TABLE BELOW.

	X
75. Internal examinations	
76. Class tests	
77. Research Projects	
78. Oral presentations	
79. Journal writing	
80. Skills tests	
81. Investigations	
82. Class exercises	
83. Group work	
84. Error spotting	
85. Assignments (Extension of classwork)	
86. Research Assignments	
87. Tutorials	
88. Homework Strategy	
89. Portfolios (Collection of learner's work)	
90. Model Making	
91. Practical Demonstration	
92. Learner's Attitude	

## PART F

**THIS SECTION RELATES TO THE IMPACT CA IS HAVING ON THE CONCEPTUAL UNDERSTANDING OF MATHEMATICS AMONGST YOUR LEARNERS.**

**WHAT IS YOUR RESPONSE TO THE FOLLOWING STATEMENTS ?**

KEY: 5 = STRONGLY AGREE (SA)  
 4 = AGREE (A)  
 3 = UNCERTAIN (U)  
 2 = DISAGREE (D)  
 1 = STRONGLY DISAGREE (SD)

	SA	A	U	D	SD
	5	4	3	2	1
93. CA has improved my Grade 12 learners understanding of concepts in the Gr 12 HG Mathematics syllabus					
94. The CA strategies do not allow exploration of Mathematics topics beyond the scope of the syllabus for my learners					
95. My learners problem solving abilities in Mathematics has improved because of CA					
96. The use of CA in my Grade 12 Maths class has led to the development of a positive attitude towards Mathematics by the learners					
97. CA contributes to my Gr 12 learners learning Mathematics through conceptual understanding rather than following rules					
98. The performance of my learners has not improved although I have been implementing CA					
99. Learners who continue with further Mathematics studies, will be more successful in passing because of CA					
100. Using CA reduces opportunities for learners to develop a deeper understanding of Mathematics concepts					
101. CA has led to enhanced thinking in Mathematics amongst my learners					
102. CA has not contributed to my learners working consistently throughout the year in Mathematics					



*APPENDIX 2*

**LETTER TO WARD**

**MANAGER**

**AND**

**RECOMMENDATION**

Mr S. Deonarain  
Burnwood Secondary  
Burnwood Road

28 JULY 2003

Attention : Mr. S.M Khumalo  
Ward Manager Mayville

Sir

I am an educator at Burnwood Secondary in the Mathematics field.

I am also studying part -time at the University of Durban Westville in the COMET programme specializing in Mathematics Education. Sir, part of my studies involve engaging in research in my field.

Thus I have chosen Continuous Assessment in Grade 12 for my research. My survey area that I have chosen is the Ethekwini region. I intend sending a questionnaire to approximately 100 schools in the region for the Mathematics Educator in order to obtain my data for the research.

Thus I am applying for approval from the Department of Education to conduct this research. I also enclose a letter of motivation from the University and a copy of the questionnaire.

I eagerly await your reply.

Thank you

Yours faithfully



S. Deonarain

RECOMMENDED : MR. D. B. KALIPANANDAN

*APPENDIX 3*

**LETTER TO  
REGIONAL  
SUPERINTENDENT**

Mr S. Deonarain.  
Burnwood Secondary  
Burnwood Road  
1 August 2003

Attention : Mrs. N.L. Ntuli

Regional Chief Superintendent : Ethekewini Region

Re: Application to conduct research in Schools in the Ethekewini Region

I am an educator at Burnwood Secondary in the Mathematics field.

I am also studying part –time at the University of Durban Westville in the COMET programme, specializing in Mathematics Education. Part of my studies involve engaging in research in my field.

I have chosen Continuous Assessment in Grade 12 for my research as this is a new paradigm in assessing in South Africa . My population target that I have chosen is the Ethekewini region as I am a teaching in this region. I intend sending a questionnaire to approximately 100 schools in the region to the Grade 12 Mathematics Educator in order to obtain data for the study. The sample will constitute schools from the different circuits found in the region. The name of schools and teachers will be kept strictly confidential and all respondents will be anonymous.


I am applying for approval from the Department of Education to conduct this research. I also enclose a letter of motivation from the University and a recommendation by the Subject Adviser of Mathematics (FET) – Mr. D. Krupanandan.

I assure you that the research work will not interfere with my duties as an educator.

I eagerly await your reply.

Thank you

Yours faithfully

 ( S. Deonarain ) Contact Nos : (S)– 2086842 Cell 0724704066  
FAX ( 2 0 8 6 8 4 2 )

*APPENDIX 4*

**COVER LETTER**

**TO**

**RESPONDENTS**

## CONTINUOUS ASSESSMENT IN GRADE 12 MATHEMATICS

Dear Mathematics Colleague ( Grade 12 HG )

My name is Suren Deonarain, a Mathematics educator at Burnwood Secondary School. I am also engaged in part – time studies at the University of Durban – Westville.( COMET PROGRAMME – Mathematics Education)

Currently I am engaged in conducting research in Continuous Assessment in Grade 12 Mathematics (HG ) classrooms.

The aim of this study is :

To focus on Mathematics Educators' interpretation and implementation of Continuous Assessment in Grade 12 HG and the impact it is having on the conceptual understanding of learners in Mathematics.

This study has been approved by :

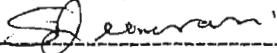
- \* The KZN Department of Education and Culture –eThekweni Region ( Office of the Regional Senior Manager- N.L. Ntuli (Mrs) )
- \* The Mathematics Advisor – (FET) – eThekweni Region (Mr. D.D. Krupanandan)

Colleagues, in order to make valid recommendations to Policy Makers and the Education Department, I appeal to you to fill the questionnaire honestly and reliably. The research will thus be beneficial to all concerned.

All information gathered will be treated with strict confidentiality, hence no names, schools or educators will divulged..

I thank you in advance.

Yours in Mathematics

  
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S. Deonarain