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Mathematics Teachers' Understanding of Alternative Assessment as Applied in Junior Secondary Schools in Gaborone (Botswana)

A Research Report Submitted to the School of Education of the

University of the Witwatersrand in

Partial Fulfillment of the Requirements

For the degree of

Masters in Education

By

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February 2005

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DECLARATION

I declare that this research project is my own unaided work. All sources that I have used or quoted have been indicated and acknowledged by means of complete references. It is submitted for the Degree of Masters of Education (MEd) in the University of the Witwatersrand, Johannesburg and it has not been submitted before for any degree or examination at any university.

Botoka M Raboijane

_____

Signed on this_____ day of February 2004.

DEDICATION

This research report is dedicated to the following beloved people:

My husband Moabi Ali Raboijane.

My sons Thabo and Rona

My daughter Botlhale.

My parents Mr. and Mrs. S Ramadi

My late brother Bathudi Ramadi.

ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude and appreciation to my family for their unwavering encouragement and support throughout the trying period of my studies and research. My husband Moabi, my sons Thabo and baby Rona and my daughter, Botlhale who stoically endured inconvenience and hardship in their commitment to the realization of this research.

I owe the profoundest of gratitude to Winnie Mametse who has combined literary representation of the very highest quality with a deep durable friendship that I cherish. She has, quite literally changed my life.

My sincere thanks also go to my niece Gloria Ramadi and my niece-in-law Dimpho Theetso who contributed time and various forms of tangible help.

I further thank schools, which participated in my study. Without their cooperation I would not have been able to collect data for my study.

Most of all, I would like to thank my supervisor Dr Maropeng Modiba for her earnestness shown for my research that helped to sustain the input into this research. I also appreciate the level of confidence she placed on me. Her availability and promptness facilitated completing this research timeously and without unnecessary delays.

ABBREVIATIONS

BGCSE	Botswana General Certificate of Secondary Education
CD&E	Curriculum Development and Evaluation
CDD	Curriculum Development and Division
COSC	Cambridge Overseas School Certificate
DSE	Diploma in Secondary Education
JC	Junior Certificate
JCE	Junior Certificate Examinations
INSET	In-Service Education for Teachers
MCE	Molepolole College of Education
NCE	National Commission on Education
PRF	Pedagogic Recontextualizing Field
ORF	Official Recontextualizing Field
RNPE	Revised National Policy of Education
TCE	Tonota College of Education
UB-INSET	University of Botswana- In-Service Education for Teachers

ABSTRACT

An attempt to improve the quality of education in Botswana included an emphasis on alternative forms of assessment. This attempt however, has produced inconclusive results and the censure has often been on technical issues such as; lack of resources and overlooking the teachers' understanding of the proposed innovation. A naturalistic research approach was undertaken by this study to investigate whether or not teachers at junior secondary schools in Botswana were using formative assessment when teaching mathematics as advocated in the RNPE.

By employing the notion of *currere*, the study subjected three purposively sampled mathematics teachers drawn from three purposively sampled public junior secondary schools to an autobiographical process to reflect on their practices. The research methods comprised classroom observations and interviews. In the light of Bernstein's theory of pedagogic device, data was analyzed and interpreted. The findings of this study indicated that mathematics teachers' assessment strategies are still traditional. Their practices are influenced by many factors more especially by the need to make sure that students do well in the public examinations. Their understanding of these factors determines their receptivity to the proposed change. These teachers need to put themselves on the spot, and question their taken-for-granted aspects of their work. Only this way, would they become aware of alternative cause of action they need to take and can regard themselves as "critical public intellectuals."

Key Words: Alternative Assessment, Currere, Discourse, Pedagogic Device, Recontextualization, Power Relations, Social Control.

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Chapter One

Background to the Study

Introduction

Botswana since the nineties, has been involved in attempts to provide quality education. According to the Botswana National Development Plan 7 (1991), the curriculum should be concerned with (1) Individual development: The focus of education in the school and in the classroom should be upon learners, enabling them to acquire knowledge, skills, attitudes and behaviour that will give them a full successful life. (2) Social aims: education must relate to and reflect the values of the society of which it is part. Thus, education should strive at fostering the national 'essential principles': democracy, self-reliance, development and unity. The two combined would produce the national philosophy of *Kagisano,* meaning social harmony.

Within this broad national context, the Ministry of Education came up with an over ambitious mathematics syllabus for junior secondary schools and rigid requirements for a centralized examination system at the end of a three-year cycle. Innovations proposed in the report of the National Commission on Education (NCE) of 1993, which was a follow up of the National Development Plan 7 (1991-1997), address the noted poor quality of teaching. This document has changed the general educational situation in Botswana and, in particular, informed the aims and objectives of the mathematics syllabus in junior secondary schools (1996). It proposes:

i. Learner-centred methods in the facilitation of learning.
ii. Content relevant to the world of work.

iii. The use of criterion-referenced testing.

iv. Combining continuous assessment (course-work) and terminal criterion-referenced assessment for certification.

v. Placing problem solving, investigative work and project work at the centre of mathematics learning.

The intention is to encourage schools to teach and students to learn complex knowledge and problem-solving skills needed for future success. For example, through the newly mandated assessment system (alternative assessment), policy-makers believe they can communicate standards, motivate and monitor progress towards the attainment of those standards, provide useful feedback to all in the school community, and hold schools, teachers and students within them accountable for improved performance. The belief of policy makers is bolstered by research showing that traditional testing has encouraged teachers and students to focus on what is tested (Sheppard, 1995; Prophet and Rowell, 1990). Instead, assessment should be considered as an integral part of the entire teaching and learning process.

> Assessment is to be seen as a moment of learning, and students have to be active in their own assessment and to picture their own learning in the light of an understanding of what it means to get better (Black and William; 1998, 19).

Supporters of constructivist learning theory (Sheppard, 1995; Turker, 1993) have also highlighted the need for students to actively construct knowledge for themselves, engage in cooperative problem solving and acquire skills learned in the context of real problems. The implications for teachers are that they must facilitate this process by providing students with skills and learning environments, which are more conducive for such learning to take place. But the major dilemma, as articulated by Gipps is:

> …That there are increasing demands for testing at national level which must offer comparability, at the same time as our understanding of cognition and learning is telling us that we need assessment to map more directly on the process we wish to develop

> including higher order thinking skills, which makes achieving such comparability more difficult (1994, 12).

Unfortunately, in Botswana 'teaching to the test' has apparently resulted in a distortion of the curriculum for many students, narrowing it down to basic low-level skills. Mathematics teachers still continue to use some form of multiple-choice tests and structured questions to assess and evaluate students (Kesianye and Deurwaarder, 2000 and Tabulawa, 1997). Not much has changed in terms of the quality of teaching and learning in schools. There is general neglect of essential strategies, which are necessary for a formative assessment process that can improve teaching and related outcomes for students. It is now almost a decade since sweeping reforms in education were effected in Botswana but teaching in schools is still didactic and authoritarian, with little or no recognition of the learners' potential to actively construct classroom knowledge. Various reasons have been advanced to explain this lack of change. The most common explanations are related to technical issues, normally associated with the innovation delivery system. They include lack of resources, poorly trained teachers, large classes and an examination-driven (high stake) system.

To accomplish the shift from traditional forms of assessment to alternative assessment, the Curriculum Development and Evaluation department in the Ministry of Education through its Curriculum Development Division (CDD), has recommended that testing programs relying too heavily on multiple-choice and structured questions tests should be replaced with alternative forms of assessment. The general belief is that alternative assessments are likely to be more authentic or real in nature than traditional assessments and, therefore, more closely aligned with the true goals that teachers have for their students' learning. Alternative assessments are thought better at providing teachers and administrators with a more complete

picture of what each student might know and understand about mathematics - related skills or concepts rather than comparing the knowledge of individuals to a standard norm. Alternative assessment is also intended to help students begin to 'self assess' and take responsibility for their learning (Wiggins, 1993). It 1) includes alternatives to standardized or traditional tests for finding out what a student knows or can do; 2) is intended to show growth and inform instruction; 3) is criterion-referenced, not norm-referenced test (i.e. compares performance against established criteria or standards, not against a peer population; 4) is authentic when it is based on activities that represent actual progress toward a broad range of instructional goals (not just cognition) and reflects tasks of classrooms and real life settings; and 5) may include teacher observation, performance-based assessment, and student assessment (Boaler, 2001). This definition of alternative assessment shows clearly that, for the implementation of alternative assessment to be successful, a curriculum should not be examination-driven, as is the case in Botswana (Tabulawa, 1997).

Alternative assessment requires more from students than merely 'correct answers'. It requires the use of judgment and values and the development of personal, practical knowledge. The curriculum should become more meaningful for students as they see its relevance to themselves and their experiences. Increased student participation in assessment is expected to generate a feeling of purpose and sense of control in their own education. Alternative assessment is discovery-oriented; its flexible framework makes the curriculum less rigid and allows the students to explore the unexpected and to deal with the unpredictable. Assessment in this sense becomes a social process whereby individuals come to a greater understanding of themselves, others and the world around them.

Alternative assessment also affects curriculum decision-making by revising the role of the classroom teacher. This assessment concept can be viewed as a move toward teacher empowerment, for much responsibility for curriculum decision-making is vested in the teachers. Eisner (1990, 23) believes that "there is a temptation in the development of curriculum to try to create materials that will replace the need for teachers to exercise judgment", but the success of alternative assessment depends upon the teachers' ability to exercise professional judgement and sensitive and intelligent interpretation.

Among the various approaches that can be used to try to bring about changes in educational initiatives, the main strategies have been broadly classified into three types: (1) those that centre on problem-solving processes; (2) conceptual changes; and (3) some agents of authority or power over others (Morris, 1998). In a highly centralized educational system such as Botswana's, the change strategies employed in curriculum initiatives have always been associated with the third. Curriculum renewal tends to be imposed on teachers from the top, such as the Education Department. Teachers are rarely involved in planning and decision-making. It is often because of a lack of ownership in the curriculum renewal process that curriculum initiatives are found to be ineffective and mismatches exist between the teachers' taken-for-granted perceptions and the intended professional development initiatives.

In recent decades teachers have been inundated with pedagogical buzzwords such as constructivism, alternative assessment and active learning. These terms are the outgrowth of various educational theories that suggest that learning can be enhanced if the approaches are adopted in the classroom. But, often what appears on the surface to be very coherent and rational argument for a curriculum policy direction in schools

may never materialize or, if it does, the final result differs from what was envisaged. Whether one adopts Goodson's (1991) notion that curriculum theory, to be of use, must begin with studies of schools and teaching, or Apple's (1990) view that our ability to illuminate the interdependence and interaction of factors associated with curriculum reform is limited by political and cultural forces deeply embedded in the schools, the result is similar. Curriculum is necessarily a complex concept As Stenhouse (1976) puts it; it is theory and practice 'meshed' together. Therefore, according to Morris (1998), a curriculum renewal out of a problem-solving endeavor is most effective in bringing about changes through educational initiatives if it is responsive to a situation.

Travis (1996) argues that, unlike traditional tests, alternative assessments encourage students to think critically and draw their own conclusion to complex problems rather than asking them to select answers to short, discrete questions - often devoid of real-world context or application. These new assessments invite students to create extended responses, using multiple modes of representation. Alternative assessments minimize the importance of rigid time constraints and encourage students to use tools (such as calculators) to help them in solving novel problems. The process involves gathering information from a variety of sources to cultivate a rich and meaningful understanding of student learning (Travis, 1996). Its primary aim is to provide the necessary information to improve future educational experiences. However, it is vital that the assessment data be accurate and relevant to effectively make informed decisions about the curriculum. It requires taking the time to ask relevant questions that help evaluate the effectiveness of the teaching strategies and curriculum plans (Newmann, Marks and Gamoran, 1996). Vella, Berardinelli and Burrow also assert that an important purpose of assessment is "to determine if all of the learners

developed important knowledge, skills, and attitudes as a result of the program" (1998, 16). Ultimately, assessment is important to the educational process because it provides feedback on whether the course and learning objectives have been achieved to satisfactory level. Therefore critical to this change proposed in Botswana is the movement towards higher order questions. Turker (1993) suggested that students should be involved with exercises that require them to apply mathematical information and reasoning to situations similar to those they will encounter in the real world, or that approximate how mathematicians do their work. The focus involves helping students to become more self-directed in their learning plans and activities. Such direction can be accomplished only by employing what Giroux (1992) calls liberatory and emancipatory (empowering) pedagogies and thus provide students with lenses through which to view, perceive and understand reality. The pedagogies require assessment procedures that acknowledge students' needs, gifts and talents. Teachers must recognize that learners have varying degrees of independence in their study habits and desire relevance in the assessment of their assignments (Caffarella, 1993).

This learner-centred model encourages teachers to view their students as academic partners who work together to produce relevant and meaningful learning experiences. It requires teachers who are willing to change their standard teaching methods. Boud related that:

> they will need to become researchers of student perceptions, designers of multifaceted assessment strategies, managers of assessment processes and consultants assisting students in the interpretation of rich information about their learning (1995, 42).

Therefore, it is important that learning should be more individualized and offers significant connections to personal lives. Assessment procedures need to foster a

meaningful bridge between academic knowledge, skills and experiences of the classroom and the students' everyday life. Teachers are challenged to create assessment items that reflect respect for learners' experiences, while promoting growth.

Purpose of the study

The purpose of this study was to investigate whether or not teachers at junior secondary schools in Botswana were using formative assessment when teaching mathematics. Their assessment strategies were considered as reflecting how they understood the changes proposed by the department of Curriculum Development and Evaluation (CD&E) in the Ministry of Education in Botswana. How they assessed and the rationale they provided for their practices were thus crucial for this study.

Research Question

The study attempts to answer the following question:

How do teachers use alternative assessment in the classroom?

Sub Questions:

1. What assessment tasks were teachers using during and at the end of their lessons?

   The primary purpose of this question was to describe what teachers really do, how they employ alternative assessment; their actions and artifacts they use.

2. How do teachers explain their assessment tasks?

The principal goal of this question was to capture how teachers understood what they did. Their views were to help clarify what they considered significant to successes and failures when using alternative assessment.

Rationale

The situational curriculum model proposed by, for example, Skilbeck (1984) suggests that major curriculum processes should involve analyzing the situation, defining objectives, designing the teaching-learning activities, implementing and evaluating the program of students' learning in a particular context. White (1989) proposed that the model might better be called a curriculum renewal model. He sees the importance of initiating curriculum renewal by teachers involved in specific school situations as an important starting point and relates the renewal processes to teachers' existing practices. The latter are viewed as essential to the nurture of ownership on the part of teachers involved in the renewal process. However, renewing existing practice without novel strategies, concepts, or perspectives to help explore the issue from a new dimension or deal with the problem with new strategies or solutions may perpetuate the basic problem. Therefore, theory is required in conceptualizing phenomena, understanding issues, and most important of all, offer alternatives to deal with the complexities and uncertainties encountered by teachers in their everyday teaching. As Sankey asserts, " marginalizing all theory is throwing out the baby with the bath water" and "it is simply naïve to believe that the practice of teaching can be cut free from theory" (1996, 72). The findings of this study will hopefully send a message to change agents and teachers that theory, though not a sufficient condition, is a necessary condition for a successful uptake of an intervention. With the aid of insights about existing teachers' understanding of alternative assessment, change

agents (in-service providers such as UB-INSET) will be able to design more effective interventions for the professional development of teachers.

International literature points to the importance of understanding teachers' pre-existing beliefs and practices. Richardson (1994) in Tabulawa (1997) points out that ignoring this in implementing change could lead to disappointing results. He argues that teachers' adoption of innovations or new practices depends on the degree to which assumptions inherent in the innovations are congruent with the teachers' beliefs. Richardson states that teachers' adoption/implementation of new practices is related to:

> Whether they fit the teachers' set of beliefs about teaching and learning, engage the students, and allow the teachers the degree of classroom control he or she feels necessary. If the activity does not work, it is dropped or radically altered (in Tabulawa; 1997, 6).

Thus one needs to know what teachers *think* and *know* about their practices to know what they are likely to accept or reject. This is an area grossly under-researched in Botswana and it is hoped that the findings of this study will make a contribution. Many examples of alternative assessment have been documented, but the writings in Botswana that detail the use of alternative assessment in mathematics classrooms, thus far identified, offer nothing in the way of descriptions of teachers' understanding of alternative assessments. There is a research void in this area (Herman and Winters, 1994). It is hoped that the findings of this study will spark debates on alternative assessment reform in Botswana.

Cornbleth advises that when we try to understand teachers' interpretations of innovations we must not only consider their pre-existing beliefs and practices but also consider conditions of classroom teaching. She writes that:

> It is unlikely that practice will change significantly without concomitant change in classroom conditions. These conditions encompass expectations or demands that teachers obtain students acquiescence to content coverage if not mastery, on an orderly manner, and foster student adherence to norms such as orderliness, busyness, efficient use of time and acceptance of teacher authority (1990, 86).

In classroom situations in Botswana, teachers emphasise attentiveness, formality and orderliness in their lessons to effect control (Prophet and Rowell, 1990; Tabulawa, 1997). The strategy has resulted in an efficient *transmission of knowledge.* Covertly it (strategy) works well in defining and maintaining the authority relationship in the classroom. In this way, the role of the teacher is that of 'clerk of the empire' instead of 'critical public intellectual' (Giroux and McLaren, 1989). There is little doubt that all the factors mentioned above do inhibit innovations in schools in Botswana. This study was undertaken as an attempt to show that changes require teachers to question traditional subject practices and classroom routines. New teaching technologies require them to reflect on the technical basis of their work, and the pedagogical assumptions of their practices. All this challenges their 'comfort zones'. The study was conducted to highlight to teachers, albeit on a small scale, that curriculum changes will only succeed if as individual teachers they understand and are prepared to reconsider their methods of teaching, the role of the students and the organization of the content they are teaching.

Research Design

As the study involves teachers' understanding of alternative assessment, it was appropriate to base it (the study) on a qualitative research methodology. The research topic itself necessitates discussion, probing and observing the participants. Qualitative research is often located in interpretism and the belief that reality is

socially constructed (Robson, 1994). It is used to describe what lies beneath the surface or phenomena and seeks to understand the perceptions and views of various stakeholders. It enables the researcher to gather data that illuminate everyday patterns of action and meaning from the perspective of those who are being studied (Worthen and Sanders, 1987).

Sampling Process

The setting in which this study took place was Gaborone (The capital city of Botswana) in three junior secondary schools, Alpha, Beta and Omega (pseudonym). These schools were purposively sampled because of being frequently involved in the development of the junior secondary school mathematics syllabus and also because they have easy access to the innovations initiating body: Curriculum Development and Evaluation (CD&E) department in the Ministry of Education. Merriam (1988) describes purposive sampling as being a way to discover and understand phenomena from a source known to provide the best possible information. The schools were also selected because they are clustered together and conveniently accessible to the researcher. One teacher drawn from each one of the three schools participated in the study. More details of what led to their participation are provided in chapter three.

Data Collection Procedure

Since the major focus of this study is on the teachers' choices and interaction with students, a naturalistic research method namely: non-participant classroom observation was used to obtain an accurate portrayal of the realities of teaching in a natural and conventional setting of the classroom. To further understanding of the choices and interactions identified, interviews were conducted. In short, the observation data was corroborated by data collected through interviews. Cohen and

Manion define triangulation as "the use of two or more methods of data collection in the study of the aspects of human behaviour" (1985, 254). Triangulation thus, helped not only to reduce the researcher's bias, but also contributed to increased clarity about what informed teachers' assessment practices.

- **Classroom observation**

Observation, as a qualitative method can either be participant or non-participant (Cohen and Manion, 1985; Worthen and Sanders, 1987). In participant observation, the researcher engages in the activities he/she sets out to observe and becomes part of the group being observed. In non-participant observation, the researcher does not participate in the activities. He/she investigates and observes someone else's behaviour and records it. The present study used non-participant observation. Through it, the researcher was able to establish the teachers' ways of doing things rather than relying on what they said they do. The assumption was that the tasks that the teachers designed would reflect what they understood to be alternative assessment. Cornbleth (1990) affirms that what teachers do in the classroom communicates messages about their conception of curriculum and meaning of knowledge. There was a schedule that guided the classroom observations.

The researcher initially intended to carry out four classroom observations of 40 minutes period per teacher. The first three observations were meant for habitualization and the forth was to be video-recorded. These three lessons were meant to enable the teacher and the students to get used to the presence of the researcher so that they could behave in their normal way. However, difficulties in obtaining a video-recorder compelled the researcher to observe only three lessons per teacher, the first two being

for habitualization. The third one provided a context or frame (and generate more questions) for the interview.

- **The interview**

This method involves data gathering through direct verbal interaction with the participants. Interaction with the participants allows them to open up and the interviewer, by making some gestures may make them more relaxed and likely to respond well, since this may have established trust. As Brown and Dowling (1998) explained, interviews would enable the researcher to explore issues in more detail and give opportunity for probing and prompting questions. Cohen and Manion share the sentiments when they write that interviews give space to "modify the sequence of questions, change the wording, explain and add to them" (1985, 271). For the present study, interviews as primary qualitative research instruments were used. The processes were semi-structured; following a pre-determined sequence of questions related to the research questions. The questions gave the researcher greater flexibility and helped interviews without reducing them to casual chat events (Cohen and Manion, 1985). The process provided further insights into teachers' preferences in terms of tasks and interactions. Emphasis was on how teachers interpreted their classroom world, and hence reflected how they understood their policy expectations.

Data Management

Data management uses a system to retrieve data sets (field notes and interview transcripts) and to assemble coded data in one place. This study adopted the manual data filing system, which is a procedure to identify and retrieve a particular set of the original field notes and interview transcripts. Field notes collected during classroom observations were later during the same day fully written up and were identified by

the persons observed Lesego, Neo and Pono (pseudonym). A similar process was carried out with interview transcripts. Several copies were then made to act as back up and were kept in a place where they will not be disturbed. Field notes were also taken during interviews to act as a back up for the recording.

Data Analysis Procedure

Data analysis is an ongoing cyclical process integrated into all phases of qualitative research. It is a process of selecting, categorising, synthesizing and interpreting data. Because of this, all data sources required reading and re-reading in order to develop the clearest pictures of the teachers' assessment practices (Lincoln and Guba, 1985). For the present study, data analysis was a process, which included making sense of interview transcripts and observations. The strategies employed were coding, categorizing and pattern seeking. Pattern seeking helped the researcher to make general statements about relationships among categories of data.

Organization of the Study

The report consists of five chapters. Chapter one is the background to the study, which covers the introduction-a preliminary review of the literature on alternative assessment, purpose of the study, the rationale and research design. In the next chapter, a literature review is provided as an initial theoretical referent for the study. Chapter three is an account of the data collection tools, methods chosen and how they were used. It covers a justification of the choice of the data collection techniques and also sampling techniques and problems encountered in collecting data. In Chapter four, an analysis of the data is given. Lastly, Chapter five the conclusion provides a summary of the findings, implications and reflections on; how Bernstein's theory of pedagogic device has helped the study to draw the conclusions, how currere and the

tools used helped to draw essential data, ethics of the research design and recommendations.

Chapter Two

Literature Review

Introduction

Tabulawa (1997) argues that teachers are purposeful sense-makers who constantly construct ideas in order to understand situations and events. They bring to the classroom their existing knowledge and prior experiences and these interact with their current observations and interpretations to give shape to their classroom practice. For teachers to incorporate proposed changes into their ongoing instructional practices, they draw on the knowledge necessary to implement the changes and the beliefs to support them. The recontextualization that occurs, helps the individual teacher's decision-making on appropriate strategies. Therefore, according significance to the personal knowledge that teachers bring to the classroom implies more of an active role of the teacher than a passive one in curriculum matters. It is thus useful to understand the knowledge and beliefs that guide teachers' practices. At the methodological level this involves getting "inside the teachers' heads" to describe their knowledge and beliefs about their teaching practices (Tabulawa, 1997).

Smith (1992) argues that, when teachers as one of the major participants in the curriculum development processes are involved in planning and decision-making, they widen the knowledge on the concepts and procedures that characterise their discipline or the proposed methods. Theory helps to develop a sense of how they understand issues:

> There is the sense in which theory entails a more thorough-going scrutiny in which our ideas are challenged by other people, in which

> we need to read books and test our thinking against the ideas to be found in them, where we acquire a historical perspective, wrestle with fundamental concepts that may not be peculiar to classroom practice but still affect the whole way the educational enterprise is conceived (Smith; 1992, 392).

The argument here is that teachers need the theory related to their subjects or the proposed methods (e.g. theory related to alternative assessment). It helps shape their conception of the disciplines they are in and ask themselves questions such as: are my current practices consistent with how people learn in my discipline? They inquire, not to eliminate alternatives, but to find more functional understandings - to create diversity, broaden their thinking and ask questions that are more complex. As Short also puts it, they can now claim that they 'know' as "inquiry is an activity which produces knowledge" (1991, 1).

Teacher research studies (Sankey, 1996) also revealed that teachers act according to their beliefs about the subject matter of teaching and learning. Explicating teachers' implicit personal theories and beliefs is, therefore, an essential first step in the curriculum renewal process. This is reiterated by Cornbleth when she asserts that the meaning teachers give:

> Are best understood within their structural and sociocultural contexts, not simply as individuals or personal constructions. The teachers' pre-existing beliefs and practices, the conditions of classroom teaching and the school district's goals and policies all seem to have shaped teachers interpretations (1990, 85).

Pinar et al. (1995) agree that teachers will have to put themselves on the spot, that is, they have to understand what has shaped them. They need to get involved in autobiographical reflection. For these authors the notion of *currere* helps to produce autobiographical reflection. Currere "is what the individual does with the curriculum, his/her active reconstruction of his/her passage through its social, intellectual, physical structures" (Grumet 1981 in Pinar et al., 1995). Pinar et al. (1995) argue that

for one to understand popular culture one must go through the four stages: *Regressive stage*-bring one's popular culture, in other words go to the past to find out why one is thinking the way one is. To what extent has the past shaped the individual as a teacher/student? Return to the past "to capture it as it was, and as it hovers over the present" (p520). *Progressive stage*-is a stage where one imagines the future that is where one wants to be. One envisages possibilities and discerns to mediate where images will be, and to do this one has "to look at what is not yet the case, what is not yet present" (p520). Pinar et al. (1995), note that the future, like the past inhibits the present. *Analytic stage*- one has dreams; now one examines both the past and the present; this will help one to distance "oneself from past and future so to be more free of the present" (pp 520). *Synthetical stage*-synthesize the present and the future to have a clearer sense of what should be in the present.

In brief, *currere* seeks to understand the contribution that biography makes to one's curriculum work. It 'represents a wrestling of individual experience'. It is "a structure of meaning that follows from the past situations, but which contains, perhaps unarticulated contradictions of past, present as well as images of possible futures" (Pinar et al., 1995, 520). The four stages allow the past and the future to free the present. Currere helps individuals to intervene in the construction of their own consciousness. It makes them see curriculum as "an elastic proposal with ever shifting boundaries" (Kincheloe; 1999, 137). Where teaching is involved, these shifting boundaries do not occur in a vacuum. They occur within a discipline and this therefore implies knowledge selection, legitimization, transmission and evaluation (Bernstein, 1996).

The argument here is that pedagogy cannot be understood without an understanding of the structured, collective cultural interpretations of teachers and the discipline they are in. Teachers, like all other agents of the 'recontextualization field' of knowledge, are actively engaged in producing classroom practices and they shape classroom practices (Bernstein, 1996). We need inquiry tools that can help us understand how they foster a meaningful bridge between academic knowledge, classroom experiences and students' everyday life.

The real challenge for teachers is then to be responsive to students' needs in ways that go beyond satisfying legal requirements and the demands of public accountability by incorporating disciplinary and culturally responsive practices. Being responsive here:

> Means to be aware of and capable of responding in educationally constructive ways to the ways in which cultural patterns influence the behavioral and mental ecology of the classroom… a culturally responsive pedagogy builds on the premise that how people are expected to go about learning may differ across cultures (Ladson-Billing; 1995, 470).

Teachers do not solely control the classroom. Change cannot be found purely in modifications to their paradigm alone. Attempts at radical pedagogy and curriculum may well be resisted even when the intent is to offer the students enhanced educational outcomes. A focus on teaching and pedagogy without reference to the identities and experiences that students bring to the pedagogical relationship will always be focused on one half of the explanation and solution to resistance

A pedagogical framework such as that used in the 'productive pedagogy' debate, which is sensitive to cultural issues and difference and recognizes the capacity of students to engage in decisions about their own learning, can provide students with empowering educational experiences and allow them to construct a positive self-image as learners. Implied here is a sense of power over the process of education. It is

important to realize, however, given that classroom practices are culturally produced, that this sensitivity is part of the pedagogical relationship constructed between the teachers and the student. The pedagogising of knowledge is undertaken within agencies of recontextualization (Bernstein, 1996); hence curriculum reform is limited by forces deeply embedded in knowledge.

Bernstein (1996) whilst explaining how social position affects schooling and the curriculum, offers, in addition a language for the description of a pedagogic mechanism through which arrangements in schools and classrooms reproduce social inequalities. With this language he takes us from the process of transmission and acquisition of school knowledge to the process of recontextualization and the production of school knowledge. Furthermore his work enables us to theorize the process through which pedagogic modes of teaching, learning and assessment practices emerge, are institutionalized and are reproduced as positions. According to him, the process of knowledge recontextualization entails the principle of *de-location*, that is,

> Selective appropriation of a discourse or part of a discourse from the field of production and a principle of re-location of that discourse as a discourse within the recontextualizing field (p114).

In other words, in order for a segment of knowledge to be made suitable for the classroom or other site of formal instruction, it needs to be selected from an official discourse such as mathematics. This knowledge is then modified into a form adapted for a group of students situated in a classroom (or wherever) with its different contextual setting. Bernstein (1996) asserts that knowledge starts in its original context where it has been developed and then the knowledge producers (recontextualizers) select particular forms of knowledge on the basis of certain

societal values and put it into a new context; put it into official documents such as syllabus and textbooks. Bernstein (1996) calls this Official Recontextualizing Field (ORF). After knowledge has been recontextualized into ORF it is then taken up by the teachers in the site of practice and they recontextualize it again into what he calls Pedagogic Recontextualizing Field (PRF). The teachers' recontextualization is informed by factors such as pre-existing beliefs and practices, theories of instruction, conditions of the classrooms and national goals.

Bernstein's theory of pedagogising knowledge demonstrates that the selection, legitimization, transmission and evaluation of knowledge are reliant on principles of social control and distribution of power. This is at both the macro level of society (where knowledge is produced) and micro level of society (where knowledge is recontextualized and reproduced). He (Bernstein) describes the ordering and disordering principles of pedagogic knowledge as 'pedagogic device'. He argues that any pedagogic device elaborates the different classes of knowledge and attempts to regulate the available 'potential meaning'. Moreover it provides the possible pedagogic communication as well as the internal rules that regulate symbolic control. However, symbolic control reflects the existent power relations of an existent mode of production. Additionally, it is a condition for the production, reproduction and transformation of culture. Thus the field of symbolic control and its pedagogic devices provide appropriate pedagogic identities and forms of consciousness. Furthermore any pedagogic device especially the pedagogic device of the official educational system is socially constructed and historically differentiated.

This device constitutes the ensemble of rules or procedures through which knowledge is converted into pedagogic communication (classroom talk, curricula). It intends to

regulate the available classes of knowledge (thinkable and unthinkable) in order to construct and transmit the convenient school knowledge through hierarchically interrelated rules, namely: Distributive, Recontextualizing and Evaluative.

- **Distributive rules**

The distributive rules regulate the power relationships between social groups by distributing different forms of knowledge and thus constituting different orientations of meaning or pedagogic identities. In Bernstein's words, the distributive rules, "…regulate the relationship between power, social groups, forms of consciousness and practice" (1996, 42). They attempt to manage symbolic control, with the wider social field and therefore within the official field of education. In this frame the distributive rules intervene and distribute who may transmit, what to whom and under what conditions. This is what Thompson would call the *intentional* aspect of the symbolic form, that is:

> Symbolic forms are produced, constructed or employed by a subject who, in producing or employing such forms, is pursuing certain aims or purposes and is seeking to express himself or herself, what he or she 'means' or 'intends', in and by the forms thus produced" (1990, 138).

What is implied here is that, cultural content emerges through human intentions; a state of mind will always be manifested by intentions. However, the meaning of symbolic form is not always or necessarily identical with what the producer intended or meant in producing the symbolic form. The distributive rules always intervene and thus, these rules set the limit of a legitimate discourse.

- **Recontextualizing rules**

The recontextualizing rules regulate the formation of specific pedagogic discourse (these rules are for delocating a discourse, for relocating it, for refocusing it) from the primary field of production (intellectual knowledge) into the field of reproduction (more concrete and relevant knowledge). Through recontextualizing rules, a discourse is moved from its original site of production to another site where it is altered as it is related to other discourses, for example what appears to be coherent and rational argument for alternative assessment may never materialise or if it does, the final result may differ from what was envisaged due to the interaction of factors associated with curriculum reform. Thompson would call this a 'conflict of symbolic valuation' and he points out that:

> Such conflicts always take place within a structured social context, which is characterised by asymmetries and differentials of various kinds. Hence, the symbolic valuations offered by different individuals who are differentially situated are rarely of equal status. Some valuations carry more weight than others, by virtue of the individual who offers them and the position from which he or she speaks… (1990, 155)

Thompson contends that this process of valorization is rarely 'consensual or conflict free' because it arises due to the fact that attachment of meaning is political, individuals attach different meanings because they have different contexts. The recontextualized discourse in the end no longer resembles the original because it has been pedagogized or converted into pedagogic discourse or one may say the recontextualizing rules regulate the available 'potential meaning' and provide for the construction of specific pedagogic discourses.

Within the pedagogic discourse, which represent a body of school knowledge two particular discourses are embedded:

Instructional discourse, which provides the 'what' of the official school knowledge. It is more related to the primary field of production of a discourse (e.g. maths or theories of alternative assessment). At this point Bernstein argues that the important point is that the authors of relevant school knowledge (e.g. textbooks) are rarely the producers of the specific discourse. They are usually working in the field of 'recontextualization'. This means they intend to select the 'appropriate' specialised knowledge for the field of production. However, the point of selection is a social fact that demands decision and criteria. This would rely entirely on what Thompson would call conventionality. He argues that:

> To apply rules, codes or conventions in producing or interpreting symbolic forms is not necessarily to be aware of these rules or to be able to formulate them clearly and accurately if called upon to do so. These rules, codes or conventions are generally applied in a practical state, that is, as implicit and taken-for-granted schemes for generating and interpreting symbolic forms. They constitute part of the tacit knowledge which individuals employ in the course of their everyday lives, constantly creating meaningful expressions and making sense of the expressions created by others (1990, 140).

This again points to the 'conflict of symbolic valuation'. The agents such as teachers, working in the field of recontextualization select and organise according to the pedagogic discourse, texts from a number of knowledge bases or domains such as subject knowledge, teaching knowledge, content knowledge of the learners and knowledge of self. Thompson (1990) affirms this when he says, "how a particular symbolic form is understood by individuals depend of the resources and capacities they are able to employ in the process of interpreting it" (p153). In so doing they attempt to regulate what it means to take up and enact discipline specific pedagogic identities, such as teacher and student of mathematics. The conflict is rife in this field of recontextualization, in other words the agents of recontextualization struggle for control over pedagogic discourse that regulate the production of pedagogic contexts,

the relations between agents in these contexts, and the texts produced by these agents at the macro level of state policy formation and micro levels of classroom interaction.

Regulative discourse constitutes a discourse of social order, which provides the 'how' of the pedagogic discourse. Thus, it is related to theories of instruction. Regulative discourse incorporates social order, which regulates school knowledge and school practices. Bernstein implies that the dominant agents of the educational field select the 'appropriate' theory of instruction (e.g. assessment procedures). In this instance, relations of power are *systematically asymmetrical* (Thompson, 1990). Thompson argues that these dominant agents are bestowed with power in a durable way that excludes other agents.

- **Evaluative rules**

The rules of evaluation emerge when the pedagogic discourse is transformed into practice. Bernstein claims that evaluative rules are "…there for one purpose; to transmit criteria" (1996, 43). More concretely, evaluation is concerned with pedagogic practices and the structural features of communication (age, time, transmission /acquisition). These structural features produce insulation and differentiation between pupils, groups and school practice. In any case, evaluation attempts to control the transmission or acquisition of the available potential meaning. At this point, the evaluative rules express the functional logic of the distributive rules and bring into practice the intentions of the existent power relationships.

According to Bernstein, there are reasons that limit functional intentions and therefore the effectiveness of the pedagogic device in the process of the construction of relevant school knowledge for the field of production. They are mainly related to the ideological struggle, which functions within society. In particular, the struggle is

developed between ideologically/culturally different social groups of the wider society. Thompson agrees that:

> symbolic forms are received by individuals who are situated in specified social-historical contexts, and the social characteristics of these contexts mould the ways in which the forms are received, understood and valued by them (1990, 153).

It is obvious that any social group wants to control a device, which legitimizes and distributes specific forms of knowledge, through which forms of consciousness and pedagogic identities are constructed. This struggle is transferred with the pedagogic device and speaks through the device. Thus the device creates an 'arena' which limits its effectiveness.

In the process of regulation of the potential meaning and construction of school knowledge, the agents and factors that intermediate are:

- The state through its official pedagogic device
- The official agents of the ORF-which express the functional intent of the state
- The unofficial agents-which function within the primary context of the production of knowledge
- The unofficial agents of the PRF-they legitimize or challenge the selection of the official agents and reinforce the struggle within the educational field.

These agents and factors express sectional interests, produce ideological contradictions and weaken the functional intentions of the pedagogic device, as well as its regulations and impositions. Thus they limit the effectiveness of the device.

The existing diffusion of power and the multiplicity of intermediations that take place within the field of symbolic control, produce social struggle, which indicates the interrelationship between elements such as power, discourse, knowledge and communication, and, in turn, the interrelationship limits the functional intentions and

imposition of the contemporary pedagogic device. Teachers and students just like all other agents of the recontextualization field are actively engaged in producing classroom knowledge, and they shape classroom knowledge by resisting or complying. Although the state may have control of the curriculum, the teachers can decide what work they want to do and at what pace. In so doing, they are using their own definition of the pedagogic situation, relying on their own perception of what counts as teaching and learning. This is supported by Thompson when he says, how a "particular symbolic form is understood by individuals may depend on the resources and capacities they are able to employ in the process of interpreting it (1990, 147).

The Implications of Bernstein's Theory of the Pedagogic Device

In terms of recontextualization, the professional autonomy of teachers is bounded by regulatory frameworks such as curriculum assessment practices as well as conditions of teachers' work (e.g. employment status, accountability mechanisms, and flexible delivery requirements). At the level of individual learning activity, the texts produced by students for evaluation are dependent on available resources human or otherwise. Learning is recognized as "the transformation of understanding, identity and agency" and it is also identified as "involving a developing awareness, which results in growing customary practice, leading to reflexive social and self questioning and the transformation of habitus" (Lave and Wenger; 1999, 190). The development of reflexivity, and the capacity to develop critical awareness of the assumption that underlies practices:

> Should engender the potential for an individual and communities to (en)counter the trajectories of their lives and to enhance their capabilities; not simply to adapt to the dislocations of the contemporary condition, but also to engage with them (Boaler; 2001,73).

Clearly the beliefs, attitudes and emotions that teachers have about assessment will play an important role in the recontextualization and evaluative process. Teachers bring with them socially, culturally and historically embedded experiences. (In Thompson's' words, cultural capital). There can be a deterministic relationship between a person's theoretical understanding and skills and their application in classroom practice. This is because of the very powerful influence of their own positioning in any given context (Thompson, 1990; Brunner, 1999). Brunner asserts that individuals:

> Inhere in meaning making assigning meaning to things in different settings on particular occasions. Meaning making involves situating encounters with the world in their appropriate cultural context in order to know what they are about (1999, 149).

The sociocultural contexts of the teachers and students play a vital role in any teaching-learning situation. Therefore, pedagogical practice can be assisted by a greater understanding of the realities of these teachers and young people's lives.

In this study, it is taken up to investigate the influence of teachers' beliefs and values on their practice, with particular attention paid to how their beliefs impact on their role as assessors of learning. As assessors they set certain priorities in their professional practices. Their beliefs about assessment and its role in learning form a large part of these priorities.

As the preceding discussion illustrates, the effectiveness of assessment in any education system depends on recontextualization by agents in the Official Recontextualizing Field (ORF) and Pedagogic Recontextualizing Field (PRF). The meaning attached to it by the various stakeholders, students, teachers, policy-makers and society at large is crucial. Assessment practices, like any educational enterprise, are a product of values and beliefs held by individuals involved in the education

system, especially teachers. The implication is that any assessment reform efforts should take into account the values and beliefs held by practitioners with regard to the role of assessment in fulfilling educational goals. To teachers, educational reform can sometimes bring discomfort, hence challenging their senses of competence and efficacy, which in turn influences the quality of their instruction and which also bears upon those whom they teach and assess (Wiggins, 1993; Shepard, 1995). The authors here suggest the difficulty faced by teachers in the reform process, which may lead to their resistance to change. According to Shepard, "any attempt to change the form and purpose of classroom assessment to make it more fundamentally a part of the learning process must acknowledge the power of these enduring and hidden beliefs" (1995, 6).

Educational reforms of any kind often pose a challenge to teachers, and prompt teachers to question their professional efficacy. They are expected to abandon their traditional practices, which are their popular culture and implement innovations with newer assessment techniques unfamiliar to them, viz. alternative assessments. This creates a conflict between teachers' current pedagogical assumptions and emerging epistemologies about assessment and learning. While teachers' classroom practices are still embedded in the traditional framework in which assessment is viewed as an external entity to learning (Shepard, 1995), emerging trends show an advocacy for assessment procedures that are integrated into the learning process (Boud, 1995).

With the growing research evidence supporting the potency of modern assessment methods, that is, alternative assessments, mathematics teachers have little choice but to reconsider their educational values and underlying beliefs about assessment. Pinar et al. (1995) would say they have to put themselves on the spot and make an autobiographical reflection in order to rediscover the implicit beliefs that have shaped

the way they assess and through critical self-evaluation, try to let go of their popular culture. The question then is: how do mathematics teachers go about recontextualizing the knowledge as required in alternative assessment? How do they negotiate the transition from their old practices to the ones they are expected to adopt? To answer these questions the study subjected mathematics teachers in junior secondary schools in Botswana to the currere process to enable them to understand how their beliefs and history shaped their current assessment strategies, what needs to be done to their current assessment strategies to fulfil the requirements of alternative assessment and how their past and present could help satisfy the requirements and finally, they had to give a sense of what the outcome would be.

For alternative assessment to be implemented effectively teachers had to indicate an understanding of the concepts and principles that underpin the reform, its purpose and value. This revelation is related to the teachers' self-reflection and action (consciousness). In the light of Bernstein's work, to deal with the question of teachers' understanding is to deal with the process through which the pedagogic text is produced, acquired and assessed. The starting point would be to look into teachers' practices, i.e. read the dynamics of their classroom practices and then subject them to a process through which they not only reflect on their practices but also engage the four stages of currere for autobiographical reflection. The next chapter discusses how the process was designed. A qualitative research approach was adopted to collect, interpret and analyse data in this study.

Chapter Three

Research Design and Methodology

Introduction

Assessment is increasingly being viewed as a powerful learning tool that, in addition to measuring achievement, can also serve to enhance learning (Herman and Winters, 1994). By employing the notion of currere, this study subjects teachers to an autobiographical process through which they have to reflect on their classroom chosen tasks and explain how their nature and origins were consistent or not to what is crucial to alternative assessment. As the study involved teachers' understanding of alternative assessment, it necessitated observing them assessing students and discussing their classroom activities. This focus provided a very thick, rich, and detailed description, one that originated from the participants themselves (Geertz, 1973).

Research Approach

As indicated in chapter one, a naturalistic approach within a qualitative framework was used in this study. The approach helped the researcher in developing an understanding of individual teachers. According to Merriam (1988), qualitative research is mostly characterized by a focus on the complexities of human decision-making and behavior. It is suffice to say that qualitative research is located within the phenomelogical paradigm and follows the idea that all human life is experienced and indeed constructed from subjective point of view, and that research should seek to solicit the 'meaning' of events and phenomena from the point of view of participants. The potential of this approach is that, it enables the researcher to follow up the view of the participants.

Sampling Process

Since the study was aimed at investigating teachers' views about assessment choices, they were the principle sources of data. Brown and Dowling (1998) point out that, it is critical to have participants who are willing to participate so that they can give accurate responses. Thus on the 8th of July 2004, a letter explaining the study and who I was as a researcher was sent to the Ministry of Education (Department of Secondary Education) requesting permission to involve three public junior secondary schools in the study. It was signed to give official consent to conduct this research in the selected schools (see appendix K). After obtaining official consent, on the 16th of September 2004 a similar letter was given to the schools' heads for their consent (see appendix K). In School Alpha, the deputy school head signed on behalf of the school head as the school head was attending a meeting outside the school. In School Beta the school head signed to give consent. However, in School Omega the researcher had to wait for about two hours before she was told that both the school head and the deputy were unavailable for her. The researcher visited the school again the next day and the deputy school head signed on behalf of the school head to give consent. It was important to attend to ethical issues concerning the units of the education system, the teachers participating in the study, as a way of ensuring rights to freed involvement. Upholding the rights of the participants was very crucial and the researcher had to avoid being caught up in "moral predicaments, which may appear quite unresolvable" (Cohen, Manion & Morrison; 2000, 49).

In all the three schools, after consent was given, the researcher was immediately introduced to the heads of departments, who introduced her (the researcher) to the senior teachers of mathematics. The researcher also introduced herself in detail to the

senior teachers, that is, who she was, the purpose of her study and what would happen to the data. She also explained that she wished to work with teacher participants who have taught the mathematics syllabus for at least two three-year cycles. The senior teachers identified the teachers for her and they (senior teachers) introduced her to the teachers. Teacher participants were promised in writing absolute confidentiality with regard to any information that they would provide. Furthermore, the teachers who were requested to participate were informed of their right to decline; their participation was voluntary and based on professional trust. As practicing teachers, participants were informed that they would also benefit from the study because it helped them reflect on their practice and rethink their pedagogical assumptions. The study was to provide professional growth for them. Finally the consent of the teacher participants was obtained verbally and appointments were made. Although their consent was given verbally, they were each given copies of the letters that have already been signed by their schools' heads. These letters also explained that anonymity of schools and subjects were going to be ensured through the use of fictitious names. In this study, the ethical concerns involved the rights to privacy and anonymity of participants (schools and teachers). According to Cohen *et al.* (2000), privacy includes issues such as the manner in which the participant's "personal attitudes, opinions, habits, eccentricities, doubts and fears are to be communicated to or withheld from others" (p61). Anonymity refers to the protection of the participant's identity. Thus, in reporting the findings of the study, the researcher ensured that the names of the teacher participants were not revealed. In this way, it will not be possible for any other persons to identify the participants with any part of the information given in the study, more so that the nature of responses did not have any apparent uniqueness that could jeopardise their anonymity.

- **Schools**

The study took place in three public junior secondary schools in Gaborone. The city Gaborone is divided into four political constituencies, namely; Gaborone South, Gaborone North, Gaborone Central and Gaborone West, which is commonly known as G-West. The sample is drawn from Gaborone West (G-West), which has been further sub-divided into phases, G-West Phase 1, 2, 3 and 4 (see appendices F, G & H). The study took place in public junior secondary schools in G-West Phase 1 and 4. Phase 2 and 3 were not included, because they have no public junior secondary schools. Public junior secondary schools are government aided community schools. These schools admit children who have completed (successfully or unsuccessfully) a seven-year primary education. All public junior secondary schools are co-educational (boys and girls are taught together) with form one, form two and form three classes. The age range of the students is fourteen to nineteen. The subjects offered are divided into core (compulsory) and optional. The core subjects are: Mathematics, Setswana Language, English Language, Integrated Science, Social Studies and Agricultural Science. Students then choose one of the following combinations; Religious Education and Art, Religious Education and Design & Technology, Religious Education and Home Economics, Art and Home Economics, Moral Education and Art, Moral Education and Design & Technology or Moral education and Home Management.

The populace of the sampled phases have different socio-economic background. G-West Phase 1 has middle to low-income populace, while G-West Phase 4 has a high income Populace. School Alpha is in G-West Phase 4, School Beta is in G-West Phase 1 (Low-income area) and School Omega is in G-West Phase 1 (middle-income

area). Gaborone West was selected because not only it captured the diverse demographic representation of public junior secondary schools in Gaborone but also because the researcher resides in Gaborone West, therefore it was economic, particularly in terms of time, for her to reach the schools. These schools although in different socio-economic contexts were typical of public junior secondary schools in the country in their setting, structure, staffing and student intake. They were not "markedly dissimilar" from other public junior secondary schools in the country except in terms of students culture as they come from different socio-economic contexts. Wolcott (1973) argues that in a study, the typicality of the phenomenon under study or the extent to which it may be compared and contrasted along relevant dimensions with other phenomena in the same class increases the external validity of the findings.

All these schools had eighteen streams, that is, six Form One classes, six Form Two classes and six Form Three classes. There were at least seven hundred students and at least 35 teachers including the school head. In each school there were four mathematics teachers.

Schools' Profiles

School Name (pseudonym)	**Total number of students**	**Number of teachers including the School Head**	**Number of teachers in the Mathematics department**
Alpha	700	35	4
Beta	798	38	4
Omega	803	37	4

- **Teacher Participants**

A second sample comprised a purposive sample of one teacher drawn from each one of the three schools. The initial intention was to draw two teachers from each school. However, due to time constraints and other problems as explained below, only one teacher from each school was sampled. In School Alpha, mathematics teachers were blocked together (taught at the same time), which meant the researcher could only observe the second teacher after she had all her observations with the first teacher and this needed more time than she had. In School Beta, two of the four teachers had just joined the teaching service and the researcher felt that lack of familiarity with the classroom environment would cause the teachers to conduct their lessons uncomfortably. The senior teacher told the researcher that the third teacher was sickly and could not guarantee her availability even if she was willing to participate. The researcher decided to rule her out. She then made a decision that even in School Omega she would have one teacher participant for uniformity. Thus, the sampling was incomplete. "It means that some of the population members who are supposed to be on it are in fact not on it" (Moser and Kalton; 1979, 155). Moser and Kalton advise that if there are missing elements in the sample, the best way is to change coverage from the target population to a population that comprises only those elements in the sampling frame. These teachers could only be observed teaching Form Two classes because; (1) although they had Form Three classes, the Form Three students were not attending lessons as they were on 'reading week' preparing for their final external examinations (2) two of the teachers did not have Form One classes, so for uniformity, the researcher decided to observe the teachers teaching Form Two classes only.

The purposive sampling technique was used especially to maximise the number of positive responses. According to Merriam (1988), this technique involves identifying subjects or respondents who are more likely to satisfy the specific needs of the researcher as far as this study is concerned. The researcher chose to involve experienced mathematics teachers as participants. They all had a Diploma in Secondary Education, as it is a minimum qualified status required for teachers of junior secondary level in Botswana. These teachers also needed to be experienced in mathematics teaching. They needed to have gone through, at least, two three-year cycles. The researcher assumed that with this kind of experience, the teachers would have not only mastered the subject matter but also built a repertoire of assessment strategies. Field and Macintyre would agree and say, "to be experienced is to be in touch with self, others and the character of the circumstances in which they find themselves" (2001, 885).

These three teachers had their training at either Molepolole College of Education (MCE) or Tonota College of Education (TCE). MCE and TCE are the only secondary education teacher training colleges in Botswana. They offer a three-year Diploma in Secondary Education (DSE) to candidates who successfully completed Cambridge Overseas School Certificate (COSC), Botswana General Certificate in Secondary Education (BGCSE) or equivalent. The teachers were Lesego, Neo and Pono (pseudonym).

Teachers' Background Profile

Name of the teacher (pseudonym)	Gender	Age to the nearest year	Qualification	Where qualification was obtained	Years of teaching experience
Lesego (Alpha)	Male	33	DSE	MCE	10
Neo (Beta)	Female	30	DSE	TCE	8
Pono (Omega)	Male	31	DSE	MCE	9

As per the table above, all the participants had the necessary teaching qualifications, and they all had more than six years of teaching experience.

Research Methods

Classroom Observation

Working as a non-participant observer, the researcher simply walked into the classroom with the teacher to be observed and took a seat at the back of the classroom but always next to one or a group of students. One reason for doing this was to make students feel that she was one of them. Lesego, in School Alpha, introduced her (the researcher) as a visitor, without explaining what kind of a visitor I was and told his students that she (the researcher) was going to be with them for a couple of days and that they would have to get used to her being there. Neo and Pono in School Beta and School Omega respectively, introduced the researcher as a colleague in the profession. They also informed the students that she (the researcher) was going to be attending lessons with them for a couple of days. In all the three cases, after being introduced to the students, the researcher greeted them in the vernacular. She said

dumelang bana meaning "hello children." They greeted back by saying *dumela morutabana* meaning "hello teacher".

In all the three schools the researcher observed three lessons per teacher, the first two being for habitualization and as such no observation recordings (field notes) were done. In the third lessons the researcher made field notes from the observations using the observation schedule (see appendix I) to structure her notes. Each teacher was observed teaching mathematics in two single lessons (40 minutes each) and one double lesson (80 minutes). All the three schools were operating with a seven-day timetable, that is, their lessons were scheduled in a seven-day cycle (day 1 to day 7) instead of a five-day cycle (Monday to Friday). In each school, lessons were observed within one cycle and they were consecutive but did not necessarily come in consecutive days. Each teacher was observed teaching the same class. They were all Form Two classes. However, they taught different topics: Significant figures, Linear equations and Trigonometric ratios (see the table below).

School Name ((pseudonym)	**Name of Teacher (pseudonym)**	**Class (pseudonym)**	**Number of students**	**Topic**
Alpha	Lesego	2 A	36	Linear Equations
Beta	Neo	2 B	37	Significant Figures
Omega	Pono	2 C	39	Trigonometric Ratios

The observations focused, in particular, on the classroom physical setting (see appendices A, B & C), artefacts used, student-student and teacher-student interaction.

The researcher also looked at the textbooks used, students' test papers and notebooks to see the types of tasks students were given.

The Interview

The study used an interview schedule that was semi-structured. It followed a pre-determined sequence of questions related to the research questions (see appendix J). The semi-structured interview guide was found to be the most suitable approach over the informal or structured interview. Informal interview would not have been appropriate as the study had pre-determined research questions. The structured interview would equally not have been appropriate because it has closed questions, which do not allow the interviewer to pursue issues that were not anticipated when the interview schedule was drawn (Patton; 2002).

The interview guide was divided into three parts. The first part of the interview was to obtain the background profile of the participants, that is; their age, qualifications, where they obtained their qualifications, the number of years of teaching experience (see table on teachers' background profile, page 38). The second part formed the core of the interview guided by questions that allowed probing and prompting. All the interviews were conducted after the third lesson has been observed, as they were to provide further insight into teachers' classroom practices and also to provide meaning to the third observed lesson.

Pono and Neo were interviewed immediately after their third lessons were observed. Pono was interviewed in the senior teacher's office at around 9.00 a.m. as he taught his double lesson (observed and recorded) from 7.20 a.m. to 8.00 a.m. His interview lasted for about twenty-five minutes. Neo's interview took place at around 1.00 p.m. Her lesson (observed and recorded) was from 11.40 a.m. to 1.00 p.m. This interview

took place in the staff lounge as almost all the teachers had gone and it lasted for about twenty-five minutes. However, Lesego's interview took place the day after the observed and recorded lesson on a Saturday at around 10.00 a.m. He could not avail himself immediately after the lesson because he had to attend to some personal matters. This interview took place in the researcher's car as offices were closed. Although Lesego resided on the school campus, he did not offer his place for the interview, and because the researcher did not want to waste Lesego's time by asking him to go to her place or a nearby restaurant, she settled for the car. This interview lasted for thirty minutes. The interviews were all tape-recorded with the consent of the participants and later transcribed for coding and analysis. Tape recording was used in order to save time and to allow the conversation to be natural.

For all the three teachers, the interview process was the same. The researcher started by thanking the teachers for agreeing to participate in her study. She then asked if she could audiotape record. Before they could agree, she explained that tapes would be kept confidential and that their sole purpose was to capture their responses accurately and the researcher assured them that once she was done with transcribing and analysis, the tapes would be erased. None of the teachers refused. The researcher once again, explained who she was as a researcher. The researcher then asked them questions that provided their background profiles. The core part of the interview then followed. Probing and prompting, where necessary, were used to help teachers clarify issues for the researcher. For example, when Pono was asked why he chose the type of tasks he was using, he explained that those were the examination types and he went on to explain that he had to do that because he would be blamed if his students did not do well in their final examinations. The teachers were then given a chance to ask questions and/or comment. Pono indicated that he would like to get in touch with the

researcher so that he could learn more about alternative assessment. Finally the researcher, once again thanked the teachers for their time.

Data Analysis

The researcher recognizes that mathematics teachers work within institutional structures and hence are subject to bureaucratic procedures that govern their professional practice. Consequently, their educational goals are often shaped by such political constraints, which in turn influence their perceptions of the education system. Thus, by assuming Bernstein's theory of pedagogic device, the researcher can explicitly express her ideological position with regard to mathematics teachers' professionalism and she considered expertise with the subject-content within the confines of policy as crucial to their classroom practices.

Once data was collected, it was managed by first transcribing all responses from the interview from the audio tape recorder onto paper. The researcher did this herself so that she could gain familiarity with the content of the interview and be "in a position to note subtler nuances in the responses of the interviewees" (Brown and Dowling; 1998, 172). The teachers' fictitious names (Lesego, Neo and Pono) were used to record each participant's responses. The transcripts were then read through and compared with field notes taken during classroom observations. Following Brown and Dowling (1998)'s argument that categories of analysis are primarily derived from the theoretical orientation of the study, data was organized into categories that made it easy to identify any relationship among different aspects and themes that the information yields. The task of the researcher was then to indicate which data fitted into these different categories (Brown and Dowling, 1998). Cohen and Manion (1985) assert that categorizing data requires a thorough scrutiny of the responses to deduce

the participants' meaning. The purpose of the analysis is to find ways of clustering units of relevant meaning into categories and illustrate how the themes from data represent the constructed categories. To do this the researcher reflected on data from of each individual interview using the constructed categories as a basis to demonstrate how the themes that have been elicited from data fitted into the different categories. The study identified four categories; teachers' views on their classroom organization, assessment tasks employed by the teachers, the value of these tasks as seen by the teacher and factors influencing their choices of such tasks. The next chapter offers a detailed account of what emerged from this process.

Chapter Four

Presentation and Analysis of Data

Introduction

As indicated earlier, for alternative assessment to be implemented effectively, teachers have to understand the concepts and principles that underpin the reform. In this study their understandings were measured through their self-reflection and action (consciousness). From the observations and interviews, the researcher found that the teachers acknowledged the benefits of alternative assessments even though it was clear that they relied mainly on traditional assessment practices. They justified their practices by pointing to the various institutional problems. From the classroom observations Cornbleth's (1990) assertion that classroom practice communicates messages about the teachers' conception of curriculum and meaning of knowledge, became clear. From the way the teachers assessed, it was possible to draw preliminary conclusions about their understanding of alternative assessment. The pattern of classroom interactions of the three teachers, Lesego, Neo and Pono showed little variation. All the three recapitulated on the main points of the previous lesson, or used a question-answer sequence. The latter being the most frequently used. The dominant feature of the lesson, however, involved the teacher lecturing at students and solving problems ('sums') on the board except in the case of Lesego. Students, who for the larger part of the lesson, sat quietly and orderly, listening to the teacher, worked out few questions on the board. The three teachers usually had their lessons concluded by giving students homework assignments from their mathematics textbooks. This also

applied to lesson introductions; either the teacher went over the "take home" problems, on the board or asked students to work out the problems on the board.

One other feature that appeared predominant in mathematics lessons was "mass teaching". Pono and Neo made minimal contact with individual students. Very little verbal interaction or dialogue could be observed between teachers and their students. The only form of verbal interaction that occurred in the lessons was in the form of the question-answer method. However, Lesego made attempts to allow interaction, between him and the students and between the students themselves. One other aspect of this mass teaching was the conspicuous absence of a 'culturally responsive pedagogy' (Ladson-Billing, 1995). The next section provides an in-depth analysis of what happened in each of the classrooms in which the study was conducted.

Classroom Settings

School Alpha: Teacher Lesego: Form 2A

Form 2 A had thirty-five students. Twenty-two were boys and thirteen were girls. Lesego had charted his teaching materials on a small notice board of about 2m by 2m and this board was labelled as "Maths Corner." The classroom was a base-room for Form 2 A. Other subjects were also taught in there. When the students got inside the classroom, they sat in arranged rows and columns of desks. Lesego began his lesson by asking students about their homework assignment. A few responded with questions about a particular textbook problem:

Solve these equations simultaneously: ***3/2 x + y = 4 and 2y + x = 6***

The students were asking about the fraction part of the problem. One of them said: *I am confused because the letters (variables) are just mixed up and the fraction part*

makes it worse. The teacher then demonstrated solutions to these linear equations. He made sure that they (students) understood the procedure. This is what he said:

> *You should always remember to align the variables and if there is a fraction involved clear it by multiplying everything by the lowest common multiple. It is as easy as that.*
>
> *Example: 3/2 x+ y = 4(equation 1) and 2y + x = 6(equation 2)*
>
> *Multiply equation 1by 2 to clear the fraction: 3x + 2y = 8*
>
> *Then align the equations: 3x + 2y = 8*
>
> *x + 2y = 6*

He then solved the problem and did three more similar problems.

Lesego then assigned a task for the student to work on in their "teaching pairs," (see appendix A). Members of these pairs sat near one another and they pulled their desks closer. This problem was more abstract and complicated than the problems the students had completed for homework Lesego suggested that they do it by sketching a graph and "making decisions" from the graphs. The task was:

> *Solve these equations simultaneously: y = 2 x + 3 and (y -3)/4 = x.*

As students worked on the problem, Lesego went around and gave help where it was needed.

He would also go to a pair observe it for a while; listening attentively to what they (students in the pair) were discussing and then he would interact with them. In one

instance, he asked a pair that was 'struggling' to reflect on the methods that could be used. He led them by questions:

Lesego: *What are the three methods that can be used to solve linear simultaneous equations?*

Students: *Substitution, elimination and graphically*.

Lesego: *Which one can easily be used here? Decide.*

He left them to attend to the whole class, and before he demonstrated the solution to the problem, he said:

> *When I was walking around, I saw all levels of thinking. Some of you were struggling with the graphs. Others had trouble with the procedures. Remember the test is on Monday, and while some of you did okay working together today, remember for the test you will have to work alone. Be sure you know how much you can do alone before Monday.*

Students were then given one more problem similar to the one they have been working on, and they worked on it in pairs until the end of the lesson. Lesego then gave them their homework assignment for the next day (six more problems similar to the problem they had worked on in class from the textbook). He added:

> *Your other assignment is to look at what you wrote down today about what you need to do. For example, 'I need to review linear graphs. So do that tonight also.*

Two aspects of this classroom observation are especially interesting from an assessment perspective. The first is that Lesego routinely observed and interacted with

his students as they worked in their teaching pairs, and he also emphasized ways students could self-assess. Lesego asked his students to remind themselves of their strengths and weaknesses as learners. She frequently asked them to write comments for themselves about the concepts on which they needed to do more work, or the procedures on which they needed practice. Lesego's strategy seemed to agree with a number of sources (Wiggins, 1993; Sheppard, 1995, Newmann et al., 1996; Travis, 1996; Boaler, 2001) that self-assessment is an aspect of alternative assessment. He suggested that students keep journals on their progress and invited them to be active participants in the assessment of their learning.

> *If you are having trouble with this, you need to write down; I need to study how to graph linear graphs. Be sure to write that down.*

The tests and quizzes written by Lesego were based on prescribed textbook problems. The researcher had requested him to give her a copy of the test that was going to be written on Monday, and copies of other tests and quizzes. The tests were used to determine whether students could carry out the procedures or algorithms they had been doing in class for the previous days. For example, one of the tasks in one of the tests was:

Question1: *(a) Prepare a table of values for the following equations:*

$Y = 3x - 2$ $Y = -x + 4$.

(b) Draw the graphs of the above equations.

(c) Find the x and the y intercept in each case.

These tasks did not include the higher-order thinking questions, nor did they include questions related to self-assessment. The researcher saw marked ones; she also managed to page through the notebooks of the students that had sat next to her. There were scores and or grades indicated and the teacher's also encouraging phrases such; "*splendid work, great improvement, you are getting there or you will get there"*. The assessment items were identical to the textbook problems except that they included different numbers that were assigned for homework.

School Beta: Teacher Neo: Form 2B

Form 2 B had thirty-eight students, eight boys and twenty girls. The desks in Form 2 B classroom were placed in rows and columns (see appendix B). There were no displays on the walls except for a 2004 calendar and a sweeping rota. Other artifacts observed in the classroom were textbooks and notebooks, brought by students. Neo began her lesson by asking students about the homework. She merely asked if the students managed to do the problems. They said 'yes', in a chorus. She then asked the students to swap their notebooks. The students were supposed to mark for one another and put up a 'total'. The exercises were in the students' prescribed textbook (Pyramid Book 2). Students had been given a list of numbers and had to find the number of significant figures in each case, for example, Question 1: 24, 240, 2400, 2040, 2004, 200400).

Neo stood next to the chalkboard and asked students questions. Most of the time students answered in a chorus. The class appeared to be 'free.' She would then confirm whether the answers were right or wrong. She wrote a couple of decimal numbers that related in some way, (0.24, 0.024. 0.0024, 2.40, 2.040, 2.004, and

2.0400) on the board and asked the students the question; *what is the number of significant figures in each one of the following?* She continued and said:

> *You now know that when a zero or zeros come after a non-zero digit, they are not significant, but when they are sandwiched by the non-zero digits, they are significant. I would like you to look at these numbers closely and tell me how many significant figures are there in each. You can talk to your friend next to you if you like.*

After about five minutes Neo asked the students to give her "the answers". The 'wrong' ones were ignored and the 'right' ones were acknowledged. She then wrote on the board, some rules regarding significant figures and asked the students to copy them down:

- In a whole number, the zero(s) appearing after non zero digit(s) are not significant: **2**00 (1sf), **23**0 (2sf),
- In a decimal number, the zero(s) appearing after non zero digit(s) are not significant: 0.**200** (3sf), 0.**230** (3sf),
- The zero(s) appearing before non zero digits are not significant: 0.**5** (1sf), 0.00**84** (2sf)
- The zero(s) appearing between non zero digits, are significant: **203** (3sf), **0.2003** (4sf), 0.00**309** (3sf), 0.000**6007** (4sf).

She called these rules 'a toolbox' and explained to the students how a toolbox operates or how it is used and then said:

> *You are going to use this 'toolbox' to answer the following questions.*

Whilst they were marking for one another, Neo would wander in the classroom. Occasionally, she would walk towards some students. After the students had done corrections, she wrote all kinds of numbers (whole and decimal) on the board and

asked them to work individually. As they worked, she walked around marking and advising them to use the "toolbox." At this time the researcher managed to have a look at some students' notebooks, chosen at random. The notebooks were marked in red either with a tick **(✓)** or cross **(✗).** Scores were indicated and sometimes with a comment such as: "good work or you are not serious". After Neo finished marking she said, let us look at the 'toolbox' once again. The students listened to her attentively. She ended her lesson by asking students to do an exercise on significant figures from their prescribed textbook as a homework assignment. The questions were similar to the ones done in class, that is, a variety of whole and decimal numbers. The task was to find the number of significant figures in each case.

School Omega: Teacher Pono: Form 2C

In Form 2 C, there were thirty-seven students, twenty boys and seventeen girls. The desks in Form 2 C classroom were placed in rows and columns (see appendix C). When the students arrived (from their agricultural science lesson) they straightened their desks and then sat quietly. There were no displays or artifacts that related to the topic: trigonometry or mathematics in general, visible in the classroom except for the calculators, textbooks and notebooks that were brought by students. Pono started his lesson by recapitulating on the main points of the previous lesson using a question-answer sequence. This question-answer sequence was highly formalized with Pono deciding on who spoke. He drew right-angled triangles on the board and marked the right angle and the other angle in each one of the triangles, and then asked the students to say which side is the hypotenuse, opposite or adjacent. After this he went over the homework assignment (which he referred to as 'take home') exercises on the board. Occasionally students were asked to work out the problems on the board. He

decided on who should go to the board. These 'take home' problems were in the students' prescribed textbook (Pyramid Book 2). One of the "take home" questions was:

> *A ladder 5m long leans against a vertical wall. The angle between the ground the foot of the ladder is 60°. How high is the wall?*

In the next part of the lesson, Pono once again drew different right-angled triangles on the chalkboard and showed the students how to calculate the missing angle. Students sat quietly and orderly, listening 'attentively' to the teacher. During this time, he made minimal contact with individual students and there was very little verbal interaction or dialogue. There was also no student-student interaction observed. The only form of interaction was in the form of a question-answer strategy, the teacher being the one who is asking questions and the students answering. The lesson then progressed with the teacher giving students a set of questions from the textbook (Pyramid Book 2). The first four were on formal mathematics and the next six were on real life situations. All the students had to do one question at a time before moving to another. They used calculators. The teacher, in the mean time, went around marking, making a tick (✓) or a cross (✗) for correct or wrong answers respectively. In most cases he did not explain to the students why their answers were wrong. The researcher looked at the notebooks of the two students she was sitting next to. Their work was almost identical in terms of procedures followed to solve a problem. In working out the question:

> *The longest side of a right-angled triangle is 10cm and the length of the side adjacent to the angle marked x is 5cm. What is the size of the angle marked x?*

Each one of the students started by making a sketch of a right-angled triangle, labelling it ABC. AC being the longest side, AB the opposite and BC the adjacent. Then they both wrote: SOH, CAH, TOA. They proceeded this way:

BC = adjacent AC=Hypotenuse AB=opposite

Cos x = 5/10 = ½

X = 60 (they both used a calculator to arrive at the solution)

When the lesson was left with about 20 minutes to finish, everybody was made to stop working regardless of whether he/she had finished. Volunteer students then worked out the questions on the board, with the teacher only commenting when a question was solved wrongly. It was common that the students would interchange the adjacent and the opposite sides. The teacher would simply ask a student to re-think or ask for another volunteer.

The students were then given another set of questions as a homework assignment from their prescribed textbook. Pono then cautioned the students that, they had failed the test he had administered earlier during the week (he said the median was 16%) and that they were all going to re-take it before he could give back the scripts. The researcher asked the teacher if she could have a look at the scripts. Most of the questions were real life situations; however, they were either in multiple choice or in short structured question formats. There were either ticks (✓) for right answers or crosses (✗) for wrong answers.

Reflection on Classroom Observations

In a nutshell, the observations indicated that mathematics assessment was traditional Teachers devised strategies for maintaining the (knowledge) provider-receiver relationships. They ignored incorrect answers from students and reinforced "right" answers through mass teaching. They asked closed-ended questions. These strategies tended to alienate the students, leaving the teachers as the dominant actor in the classroom interactional processes. No pedagogic differentiation (culturally responsive pedagogy) was also observed. This pedagogic mechanism could be said to be responsible for the reproduction of the educational and social inequality that was observed. All students had to be involved in one activity at a time before moving on to another. Activities therefore, tended to be routinized. Routinization of classroom activities inevitably led to predictable patterns of behavior and once this was achieved, it became easier for the teacher to manage the class, thereby enforcing and reinforcing his/her authority. Teaching and classroom management became almost indistinguishable from social control. This led to a further entrenchment of asymmetrical power relations and subsequently, to a congruent classroom pedagogical style. With his kind of classroom practice is such that the learners had little power and authority over their learning and assessment (Sheppard, 1995): the power and authority of decision-making and judgement of quality was beyond them. Thompson (1990) reiterates this when he says that in this situation, where there is 'systematic asymmetrical' power relations, students are subordinates.

At a deeper level, the classroom arrangement was an indication of the implicit assumptions (beliefs and values) the teachers held of the nature of knowledge hence the purpose (definitely not the constructivist). But while there is no question that the

classroom arrangement was consistent with the way assessment was perceived by the teachers, where the teachers were the centre of most activities the arrangement facilitated their visibility. If lesson activities were to progress unhampered, this centre (the teacher) was to be always on sight. Where there is 'visible pedagogic practice' (Bernstein, 1996), as it was the case in this study, teachers needed to monitor if students were not doing something else from what they were expected to be doing. Teacher visibility became a handy tool for making sure that they conformed, to one common goal. The rules of the regulative and instructional discourse are explicit (Bernstein, 1996). They were known to the teachers and the students. So the range of options available to both in terms of what may and or may not be transmitted in the pedagogical relationship was clearly bounded. Covertly, this 'visible pedagogic practice' inadvertently sustained traditional forms of assessment. Teachers' understanding of assessment informed not only their classroom practical knowledge but also their day-to-day classroom practices. However, policy expected them to view pedagogy as "democracy in action". This required them to change their control mechanisms but they continued to inhibit student participation. Classroom organization has not changed to reflect the view of knowledge being a social construct.

Having established the patterns of classroom practices, the study now turned to establishing how the teachers made sense of these practices. In the next section the study reports on the responses of the participants about their observed classroom practices in order to reveal the practical knowledge they used to guide their classroom practices. Reflection on experience is perceived as the vehicle, through which learning occurs (Boud et al 1985). These responses are also used to establish the

extent to which the interpretations made from the observations were supported or not by what the teachers thought.

Teachers' Reflections on their Practices

Teachers in this study referred to three main factors to explain their assessment choices and strategies: personal values, professional responsibilities and the public's expectation. They considered the factors not discrete, but connected, overlapping, and in many ways dependent.

Teachers' views on classroom organization

In Pono and Neo's lessons, all students faced the teacher and sat in nicely arranged rows and columns. This was also the case at the beginning of Lesego's lesson. This is what the teachers had to say about this arrangement when asked the question: Why do you make your students sit this way?

Pono: *I always feel in control when they are facing me. This also helps in detecting instances of misdemeanor.*

Neo: *It becomes easier to bring order in class in the sense that I am able to see who is not listening, who is doing something different from what is being done by the whole class.*

Lesego: *The intention is the students have to pay attention. It is a good arrangement because they have to face the teacher, since they have to get information from him/her.*

These comments illustrate the extent to which teachers were concerned with power and control. According to Bernstein (1996) power relations create, legitimize and

reproduce boundaries and spaces between the teacher, the students, discourses, texts, space and time and, socialize individuals into pre-constituted relations. The teachers in this study explicitly regulated the content, its sequencing and pacing and the discourse that constituted the learning context.

The students had no apparent control over these elements of pedagogy. Bernstein (1996) argues that, structural features such as time and space produce insulation and differentiation between students and school practice. This gives birth to undemocratic classrooms. These students are expected to work at the same pace and yet they do not have the same 'cultural capitals.' Thompson would argue that, these students cannot work at the same pace because "in receiving and interpreting symbolic forms" they "draw upon resources, rules and schemata which are available to them" (1990, 153) and these resources, rules and schemata may differ because these students occupy different positions in socially structured fields or institutions.

From the classroom observations, it became apparent that most forms of students' work are homework after the lesson while paper and pencil tests are most frequently used as a means to reflect students' achievement. The teachers were aware that these tasks were mainly concerned with the revision of mathematics knowledge through recalling as a way of improving students' performance often signaled by scores and promotion. For them, tests and examinations were essential as formal forms of assessment that will prove students' performance or make them study hard. When probed to find it these were the only forms of assessment they used, they said:

Lesego: *...In fact, I also give them quizzes that are small in scale. I ask them one question and they have to put the answer on a sheet of paper. No preparation is allowed because it all comes in a sudden. Before starting the lesson, I give*

them a quiz, but they have ten minutes for revision. Having some time for revision, their performance is much better.

Pono: *(Exams) One is held in the first term while there is another in the second term. Tests are held in between. The marks would be an indicator for class promotion, which they are all concerned about and they have studied hard for that.*

One of the teachers, Neo, affirmed that she also as a teacher benefits from the scores as well. She said:

As a teacher, I become more confident that my students have learnt something after I have made assessment and looked at the students' marks. This tells me I have been able to communicate to the students or not and this gives me an opportunity to do something about it.

In choosing this type of assessment, All the three teachers in this study pointed out that they were looking for, among of other things, ease of use and efficiency.

... what often happens is, there is a homework correcting time built into the period, so what you do, is you take advantage of the kids. You just have them exchange papers and if there are structured questions or whatever, it is pretty easy objectively to correct those things and, then the kids hand them in, and all you got is a number… So you thumb that down and you are done. Now if I have a kid do anything remotely creative or anything that involves actual thought, then somewhere I have to look at it and, to be perfectly honest, I have fallen down on the job there where maths is concerned.

The predominant concern among these teachers was to equip the students for public examinations (high stakes). Therefore they were not concerned about the process of knowledge construction, they viewed curriculum not as an "elastic proposal" but a 'finished product' that has to be internalized in order to meet the requirement of the public examination. This revelation became clear when teachers were asked about the aspects of assessment practices (tasks suitable for assessment purposes).

Neo: *I would consider whether the assignment could help them in the junior certificate examination (JCE) questions; were those that would possibly appear in the JCE? and that should be manageable for them.*

Pono: *The way I teach makes it possible for me to complete the syllabus in time. It is not time consuming like methods such as discussion, investigation and problem solving. The maths syllabus is broad and once you embark upon a lot of these new methods you may never finish the syllabus. This will limit students' choices in their final exams. They will then complain that they were not taught the "right things". To be honest with you, I have been taught this and I teach this way too and my students pass their exams.*

Lesego: normally give students tests that emulate final exams in order to familiarize them with what they should expect in the exams…they have to do well in their exams otherwise it will be the end of the road for them.

The public examination has a very strong influence over how assessment is conducted in mathematics at junior secondary school level. Homework problems and tests are commonly used, emphasize the assessment of mathematics knowledge by recall. The pressure created by summative assessment exists and it is considered as a primarily preparation of assessment during the year. Public examinations present more

dilemmas. In Botswana, this has been, and still is, the only form of assessment used as a measure of achievement in secondary schools. The objective of using examinations is to provide certification for students at the end of their schooling. One would be led to assume that the use of examinations is perceived as a fair method of assessment, or at least it was perceived as such by earlier assessment standards. However, Black (1995) argues that for assessment methods to be fair, they have to be valid and reliable. But public examinations can hardly satisfy these criteria for they are administered under artificial and restricted contexts (Black, 1995), which do not allow individual learners to demonstrate their full potential. Yet, loyalty to examinations seems to be so established in Botswana that teaching in general is dictated by standards of public examinations.

The teachers in this study include scores from practices and daily assignment as preparation for the summative assessment. They believed that students would be motivated to apply more effort that is consistent if their work was scored and included grades. Two of the teachers in the study believed that students were affirmed and motivated by the feedback from the assessments. From observations, feedback was usually in the form of a score or grade, sometimes accompanied by a brief anecdotal remark (as observed the students' notebooks) usually some form of encouragement or phrase (e.g. good work but more effort necessary) or even working out corrections in class as was the case in Pono and Neo's classes.

Apart from homework and tests, other forms of students' work (such as portfolio, projects) were not common at the junior secondary schools. Neo and Pono neither reported nor were observed using portfolios, group assessment, journals, self or peer assessment (new forms of assessment). However, Lesego used self-assessment,

observation and interviews. Although the teachers said that they use group work, as part of instruction, none of them used group assessment to evaluate students' achievement. Lesego like the other teachers pointed out that he was aware that the assessment strategies he was using were not perfect. However, he felt that they were better than what he did when he was still a student and also better than what he used to do in the past. He was constantly adapting them as he went along. He considered his work as "work in progress."

The value of alternative assessment to improve teachers' assessment practices

As suggested by the theory on alternative assessments, the teachers supported the view that a larger variety of student works should be implemented to reflect students' achievement. One of the teachers suggested that assessment should look at a number of factors, like skills, attitudes and interest generated by learning mathematics.

Lesego: *Assessment should not be confined only to pencil and paper tests or exams. It is good if we can observe their performance in doing investigations within the class. I will find out their level of participation and interest and communication with other members.*

Apart from a wish for mathematics assessment to cover more diverse factors, the voice for de-emphasizing examination was also strong among the teachers. One of the teachers (Lesego) was aware of the fact that tests and examinations may not provide accurate portraits of students' achievement. He expressed his preference for formative assessment:

Lesego: *Tests are very important and I think the results in tests or exams are able to reflect students' abilities. The only problem is that some smart students do not*

have revisions. Thus, I try to pay more attention to their class performance instead of focusing on tests and exams. Class performance reflects their standard in a more appropriate way. I am not denying the importance of tests and exams, but they are a game of figures sometimes.

Teachers would also like to see balanced and diversified assessment tasks that reflect the creativity as well as other abilities for example, language:

Pono: *Diversified, on the one hand, their basic knowledge and skill could be measured; on the other hand, their creativity and potential could be developed through their own design. But the practice should be balanced so that they would not be good at one aspect but weak at the other. Adjustment according to the needs of students is important but not at the expense of their basic written and language skill.*

They called for emphasis on project work, developing students' thinking and independent learning ability and felt that project work could help students to develop their self-learning and thinking ability:

Neo: *I think the project reflects the learning of students in a clearer way. They can work as a group and they have to organize all the things by themselves. I am sure they will learn something during the process of data collection. This enhances and fosters self-learning ability among students. Project promotes active learning, attitudes of students and it benefits their self-learning. (How about the thinking ability?) Absolutely it will help them to develop their thinking. It requires lots of thinking, in doing the project such as the selection of relevant content, where to get the information and they have to embellish the report in a presentable way.*

Lesego: *They (projects) engage students more. Using one form of assessment permit me to witness the students' previously unknown abilities. I did not realize the visual part (of assessment) was so important until I started doing it, until I started having kids turn these out, I did not know how talented they were.*

Pono: *What I understand is that in many occasions we have to use a learner-centred way of teaching, whereby we engage students in a number of activities, not just telling them what to do. We have to use discovery learning.*

Although the teachers recognized the need for varied assessment to include a range of options to demonstrate the students' learning, they were quick to point that they have constraints.

Neo: *I would use projects, but we have very limited time in the classroom we cannot actually use projects…our syllabus states that there is supposed to be projects, but for now they have been withheld.*

Lesego: *I cannot even imagine 35 individual projects, truthfully! The multiple choice and structured question formats are the only ways (to get to the accountability I want) at this stage of the game. If I did projects I would be grading until I retire.*

Pono: *The way I teach makes it possible for me to complete the syllabus in time. It is not time consuming like methods such as discussion, investigation and problem solving. The maths syllabus is broad and once you embark upon a lot of these new methods you may never finish the syllabus. This will limit students' choices in their final exams. They will then complain that they were*

not taught the "right things". To be honest with you, I have been taught this and I teach this way too and my students pass their exams.

The constraints mentioned by the teachers cannot be ignored; they play an important role in the recontextualization of mathematics teaching and assessment. Teachers as recontextualizers in the PRF prioritize their classroom activities in accordance with their own definition of the pedagogic situation. They rely on their 'cultural capitals.' This limits the effectiveness of the pedagogic device (Bernstein, 1996).

Teachers have allowed long-standing traditions (popular culture) to dictate their assessment practices without even questioning the legitimacy of these traditions. In all the three schools, they work towards some policy of common scheming and testing, which requires them to have covered the same amount of content over the same period of time. They referred to the administrative requirements of completing schemes and records of work, which reflect records of content covered as well as monthly test scores or grades. This has led them to succumb to the pressure of meeting the fortnightly deadlines. According to Lesego although this is a mere formalities, it cannot be ignored. He notes:

I have observed that record books are a mere formality. The senior teacher simply checks that they have been handed in and that something has been scribbled, the content of which he does not verify, let alone go through. ... Funny though, I have not questioned the rationale behind this tradition that dates back to the inception of our education system. It is only now that I am starting to wonder.

Pono reiterated Lesego's observation that administration is more concerned with a record of numbers called students' marks, recorded every month, no matter what

those numbers are or what they mean. Or indeed what their source was. Consequently, these practices have implications for the type of tests that are used to assess the students. All the participants have noted that the traditional monthly tests serve very little purpose as far as students' learning is concerned. The following comment from Lesego bears evidence:

> *I have realized that tests serve very little purpose to many teachers, even school administrators, other than to keep the routines and the students occupied. Questions are set without bearing in mind that they are meant to search students learning with understanding*

And Neo also agrees when she says:

> *Tests are usually set in a manner that their marking will be easy and less time consuming. They may be made sub-standard so that the pupils are able to score high marks and fall fond of the subject teacher(s). They may also be made short.*

The current practices reflect a situation in which authencity of achievement is highly compromised. Bernstein (1996) would say the Pedagogic Recontextualizing Field (PRF) is found represented in the espoused pedagogic principles that those who influence pedagogic transaction bring to their practice. In other words the impact of the teachers' popular culture, as agents in the PRF, is critical to its manifestation in assessment practices. During their time as students, teachers internalised certain models of teacher behaviour, which they regard as ideal and worth emulating. As Lortie (1975) argues, teachers retain a definition of schooling and assessment from their own school days. It is the definition which teacher training more often than not, fails to wash out. The teaching experience, that teachers accumulate during their school days constitute their institutional biographies and it is these biographies that resist training at college and re-emerge in the classroom as the sources of pedagogical

knowledge. The teachers in this study indicated that they modelled some of their teachers:

Lesego: *Obviously there are teachers who influenced me and who I try to emulate in my teaching. My science teacher. He was conversant with his stuff and had a good way of imparting it to students.*

Pono: *When I teach, I follow examples of those I admired. One of them was my mathematics teacher at secondary. He was a free teacher who made everyone feel free in class. In terms of his teaching ability, he was very competent with stuff; he had good mastery of content. He used to give us what he called "toolboxes" and we found them handy. That is why I also design "toolboxes" for my students.*

In the above comments, teachers emphasize the value of mastering of content and imparting it to the students. Thus in their attempt to model their mentors, they reproduce the transmission-reception pedagogical style. The style that "internally excludes" students from being members of the "community of practice." But Lave and Wenger (1999) argue that full participation is a condition for effective learning as the students master the practice and for this to happen teachers have to give them an opportunity to participate in the construction of their own knowledge rather than giving them 'toolboxes'. Bernstein (1996) agrees and says in this transmission-reception pedagogical style, the regulative discourse does not attempt to label the students in terms of creativity, participation and level of initiative.

Proponents of assessment reform from traditional to alternative classroom assessment (e.g., Boud, 1995; Shepard, 2000) argue that assessment ought to be integrated within the normal teaching process such that, in addition to measuring students' conceptual

understanding, it also becomes a tool of enhancing learning. An analysis of classroom observations and responses from teachers participating in this study reflects pedagogical practices that still adhere to traditional epistemologies in which assessment is treated as an end to instruction, and where emphasis is placed on content coverage regardless of whether or not learning has occurred. Therefore, these practices do not cater for the academic needs of individual learners; they are not culturally responsive (Ladson-Billing, 1995), which break the fundamental principle of equity and fairness in education (Gardner, 1991; Gould, 1990).

Factors influencing the implementation of alternative assessment

In Bernstein (1996)'s terms, in the lessons observed the rule of the regulative and the instructional discourse were explicit and known to the teachers. The range of options available to them in the control of what was transmitted and received in the pedagogic relationship was both narrow and clear. The responsibility for deciding how to assess has been removed from sites controlled by teachers as recontextualizing agents in the Pedagogic Recontextualizing Field (PRF) into sites potentially controlled by the state (with its policies) in the Official Recontextualizing Field (ORF). At stake were the criteria for selection and organization of knowledge in the curriculum, hence the rules for navigating the acquisition of pedagogic identities and practices. This threw up tensions reflecting mixed messages produced with the CD&E department in the Ministry of Education (ORF) as well as tensions within mathematics teaching communities within the PRF about what constitutes good assessment.

The power relationship embedded in this tension is regulated by what Bernstein (1996) calls the 'distributive rules' of the pedagogic discourse, in which social groups distribute different forms of knowledge and thus, constituting different orientations of

meanings or pedagogic identities. For example, what appears to be a rational argument for alternative assessment as advocated for by the state (Botswana) is not materialising, because as the teachers recontextualize the discourse, the discourse is altered because that they prioritised their classroom activities in accordance with what they believed to be important in meeting the expectation of the education system, in this case, the students doing well in their examination, as cited by the teachers in this study.

Insufficient time was mentioned as one of the impediments in the implementation of classroom assessment in mathematics. Project work was viewed with scepticism and reluctance. There is an inherent fear of losing precious time for content coverage. Teachers feel the pressure to complete the syllabus to avoid disadvantaging their students in the final examinations. These constraints feature prominently in the professional practice of mathematics teachers in the three schools.

Bernstein (1996) would argue that teachers in this study as recontextualizers in the PRF, have selected and organised teaching and assessment texts from a number of knowledge domains and, in so doing they have regulated what it means to take up and enact discipline pedagogic identities. Although the state at its macro level may have control over the curriculum, the teachers at their micro level, decided on the sequencing and pacing of the texts. They were using their own definition of the pedagogic situation relying on their own understanding of what counts as good assessment.

Assessment reform is concerned with the negotiation of power and authority amongst stakeholders in the assessment process, notably the learners, the teachers, the parents, and the policymakers. Of greater importance, though, is the power struggle in the

classroom: between the teacher and the learners. The issue here is about how much control over assessment criteria should be given to each party, and whose interests the assessment process should serve. In arguing for the redistribution of power in the classroom, and as evident in this study, in traditional assessments the power of decision-making clearly resided with the teachers, while alternative assessments emphasised the need to give the learners some autonomy over their own assessment.

Alternative assessments have to be incorporated within the normal teaching process (Sheppard, 1995; Boud, 1995). The challenge on teachers is to develop appropriate assessment techniques and acquire skills to employ these new technologies in their classrooms without compromising the teaching and learning aspects of the lesson. However, this is a 'big ask' of mathematics teachers in Botswana, some of whom may not have the necessary skills to implement these new technologies. Smith (1992) would agree and say, the teachers need the theory related to the proposed methods, in this case the theory related to alternative assessment.

The revelations of the mathematics teachers in this study give an idea about teachers' level of understanding of alternative assessment in Botswana, however limited. Various demands on mathematics education discourse seem to be in play: the recommendations of the 1994 Revised National Policy on Education, public examinations, learners' academic needs and societal expectations. Mathematics teachers, with their professional inadequacies, are required to respond satisfactorily to each of these demands, which may often be in opposition to each other in one way or another. The RNPE recommends the adoption of classroom assessment in addition to public examinations. But, are teachers skilled enough to engage in authentic assessments?

The mathematics teachers' practices are influenced by many factors and their understanding of these factors will determine their receptivity to the proposed change. Teachers were put on the spot to question the taken-for-granted aspects of their work with the hope that they would become aware of an alternative cause of action. An autobiographical reflection on their part would be both emancipatory and empowering (Pinar et. al., 1995 and Giroux, 1992).

Chapter Five:

Conclusions: Summary, Implications and Reflections on the Study

Summary of the findings

The education system in Botswana is examination driven. This makes teachers have little control over the curriculum content they have to teach. For mathematics teachers, few have attempted to use alternative assessment, partly due to their ignorance in the value of this kind of assessment and partly because of the structural constraints. They are caught up in the race to make students 'pass' tests, and eventually 'pass' the public examinations, and they have very little idea of what it is they are assessing. In most cases, teachers have the interests of the learners at heart but they lack understanding and expertise alternative assessment and, worst of all, they feel restricted by legal requirements

> Thompson argues that, "in receiving and interpreting symbolic forms, individuals draw upon the resources, rules and schemata which are available to them. Hence the ways in which symbolic forms are understood, and the ways in which they are valued and appraised, may differ from one individual to another, depending on the positions they occupy in socially structured fields or institutions" (1990'153).

However, there was one teacher participant from this study who used self-assessment, interviews and observations. He indicated that he was committed to "keep refining" his assessment practices. He was aware, at least, of counterproductive assessment approaches he was using. From the findings of this study, it can be concluded that mathematics teachers in three schools rarely used formative assessment. Participants pointed out a number of constraints that impede the use of alternative classroom assessment. Most notably, they mentioned inadequate resources: time and large

classes as the major limitation to the adoption of classroom-based assessment practices. The nature of the examination-driven education system (ORF) is also another valid factor that dictates teachers' assessment practices. Teachers do not want to risk losing precious time for content coverage by trying out innovative assessments, as this would compromise the performance of their students in the public examinations. Their stand is supported by Black (1995) who observes that the model of assessment and testing that many teachers have is that established by their experience of public examinations. Such examinations are bound to have a strong influence on everyday teaching. Teachers are therefore caught up in a situation whereby, even if they had the motivation and expertise to try alternative assessment approaches, they will still be powerless to do so as a result of being expected to teach their students to 'pass' the examinations.

The findings of the study also point to the fact that Pedagogic change is not only about technical issues, it is mainly about active agents such as teachers in the PRF who with their "cultural capitals" recontextualize the centrally produced texts (ORF) resulting in what Bernstein (1996) calls a "discursive gap" between the intended curriculum and the lived curriculum. Teachers' classroom practices are informed by their conceptions and understanding of teaching, learning and assessment and of the context within which these have evolved. Their conception and understanding coalesce into their perceptions.

In general teachers had selected definite content to impart to the students, and there was clearly an order and sequencing in which the students were to learn. The pedagogical relationship was clear to all. Similarly the instructional discourse was clearly visible. In the context of Botswana, a learning culture in which power and

authority are shared between teachers and students seems a distant cry. The main reason being that the education system in Botswana is still predominantly examination driven. The success of the education system is judged by the performance of students in the examinations, which is taken as evidence that learning has occurred. Consequently, teachers' instructional and assessment practices are highly influenced by the need to make sure students pass the examinations at the end of their junior secondary education. Teachers have accepted examinations as a natural form of assessment and their primary concern was to design tests that emulate the format of the public examinations. The power of decision-making in the classroom remained with the teacher.

Ryan (1997) points out that, the use of public examinations removes responsibility from teachers for designing the final assessment of their students. He adds that teacher autonomy is threatened by centralized testing and the consequent enforcement of a centralized curriculum "limits the range of skills required in making curricular decisions" (1997, 167). This reduction in professional decision-making implies "a corresponding reduction in professional standing" (p166). Giroux (1992) would agree and say, it disempowers teachers and they end up being "the clerks of the empire" instead of being "critical public intellectuals".

Though the study involved only three teachers, which makes it impossible to generalise, classroom observations and the responses obtained from these teachers indicated some shared concerns about assessment in mathematics education discourse in Botswana (Kesianye and Deurwaarder, 2000). Teachers' revelations about their assessment practice and the situations in their respective schools, gave an insight into the kind of problems they faced in their professional practice. Their idea of

assessment covered only the value of summative assessment of students learning with little regard of its formative purpose. Assessments were mainly in the form of routine monthly tests and quizzes that were administered after considerable content coverage Teachers seemed to be aware that these forms of assessment contributed very little to enhance learning, but mainly because of institutional constraints, seemed powerless to adopt alternative classroom assessments.

Implications

Questions abound then if any reforms in assessment are to be implemented in Botswana: why do mathematics teachers perceive examinations as a more valid form of assessment? Is their apparent loyalty to examination-driven pedagogy indicative of their beliefs about assessment? Or, are they just powerless to break away from the traditions that have shaped societal conceptions of educational goals? The reforms proposed by the 1994 RNPE are aimed at improving the quality of education in Botswana. The main focus is therefore providing young Batswana access to quality education. The reforms are aimed at serving the academic needs of the learners.

Reflections on the Study

The value of Bernstein's theory of pedagogic device

Bernstein's theoretical framework has been invaluable in this study because it has provided the researcher with a set of conceptual constructs that were systematically applied in the analysis of data. The notion of the pedagogic device, more especially recontextualization, provided the researcher with a coherent lexicon of conceptual construct with which to describe, to discuss and to report on the impact of public examinations, as policy and pedagogy in determining pedagogic discourse

characterising the mathematics teachers' practices. The idea of recontextualization as a means of analysing teachers' understanding of alternative assessment shows that the symbolic control of alternative assessment is subject to alteration by other agents

The value of the notion of currere

Currere has been invaluable as it was a tool that the researcher implicitly used in order for the mathematics teachers to reveal their understanding of alternative assessment. It helped the study to obtain the data about how teachers negotiated the transition from the old practices (traditional assessment) to the one they are expected to adopt (alternative forms of assessment). The interview questions were such that the teachers had to go to their past, as they did, to find out why they were assessing the way they did. Through probing and prompting, they could see that their past (popular culture) was hovering on the way they do things now. This was valuable to this study because through their (teachers) revelations PRF was seen in action.

The ethics of the research design

Legitimation is a very important feature in any research. It refers to measures taken and used to justify any claims of truth or trustworthiness of the findings of a research project. All justifications constitute the criteria of *validity*, which determines the degree to which implications or inferences made from research findings can be accepted as true representations of the phenomena being studied (Cohen and Manion, 1985). Although many authors acknowledge its problematic nature (e.g., Cohen and Manion, 1985; Lincoln & Guba, 1985), validity cannot be dismissed as it serves a very important purpose of ensuring rigour in research.

This study employed ethnographic tools (observation and interviews) to collect data. There was flexibility in the manner in which participants in the study could critically

express their opinions on the topic being studied. Flexibility was essential and relevant in this case because the intention was to provide a context in which the participants could reflect on their professional practice, and hence make explicit their tacit beliefs and values about educational matters such as assessment. This helped to promote the authenticity of the responses of the participants.

Another threat posed to validity was the interpretive nature of the research approach. In this respect, there is a risk of promoting what Burdell and Swadener (1999) termed "possessive individualism", in which the investigator is preoccupied with his/her viewpoint and hence fails to see situations from the viewpoint of others. To minimise this risk, the research quoted the responses from teacher participants as much as possible such that their voices are significantly represented in the analysis. The small size of the sample of participants also posed the problem of generalisability.

It would have been ideal to involve all the mathematics teachers in the three schools to get to a convincing position on the pedagogic discourse. However, the limited number of teachers participating did not compromise the study because the teachers had similar 'cultural capital' in which they drew, in order to interpret the 'symbolic form.' The teachers had similar background in terms of where they trained and they also experienced the same institutional or structural constraints.

While observations notes (field notes) were made during lesson observations, video recorded lessons would have unveiled more detail about the lessons observed. In this study there was a single observer, (the researcher herself). Yin (1994) advises against the use of single observation. He states that a better procedure would be to have more than one observer in order to increase the reliability of the observational evidence. Thus, this might be a weakness of this design.Albeit, despite these possible weakness,

this design has very effectively indicated what are challenges for mathematics teachers to implement alternative assessment as expected by policy. The conflicting nature of the demands faced by mathematics teachers lead them to prioritizing their educational goals in such a way that it becomes difficult to judge if teachers' practices are a reflection of their educational values and beliefs. This leaves one to wonder about the future of mathematics education discourse in Botswana, considering global trends and technological developments. Is mathematics education discourse in Botswana consistent with contemporary society? Are mathematics teachers aware of the implications of the changing technological world on their professional practice? For this to happen, the recommendation is that these teachers be helped to brace themselves for the complexities emanating from global developments that required them to have sound educational values and beliefs to draw on when making decisions for practice in their classrooms. However, this will not be possible if teacher developers at both Pre and In-Service Education for Teachers levels are not equipped to prepare them for the new expectations. Finally, my view is that, providers at these levels be assessed to establish the extent to which they are capable for helping teachers acquire or develop the necessary cultural capitals to effect change.

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Appendix A: Classroom Physical Setting: School Alpha: Form 2A

Appendix B: Classroom Physical Setting: School Beta: Form 2B

Appendix C: Classroom Physical Setting: School Omega: Form 2C

Appendix D: Extracts From Junior Secondary Mathematics Syllabus

Appendix E: Map of Botswana

Appendix F: Map of Gaborone

Appendix G: Map of Gaborone West Phase 2

Appendix H: Map of Gaborone West Phase 4

Appendix I: Observation Schedule

a) The classroom physical setting.

- How is the Classroom organized?
- What artefacts/tools are used?

b) The pedagogic relationships.

- How does the teacher interact with students?
- How do students interact with each other?

c) The role played by the agents in assessment.

- What is the students' role?
- What is the teacher's role?

d) Assessment strategies employed.

- What assessment practices are employed?
- What is involved when these practices are used?

e) Tasks employed in recontextualizing alternative assessment.

- What kind of tasks are students engaged in?
- Who designed the tasks?
- What is the nature of questions and answers that are used in the classroom.

Appendix J: Interview Schedule

Thank you for agreeing to participate in this study.

With your permission, I would like to audiotape record this interview so I can have an accurate record of your comments. The tapes will be kept strictly confidential; their sole purpose is to improve the accuracy of my notes and the subsequent analysis. When I am done with the analysis they will be erased. Do I have permission to record the conversation?

Personal Details: School_____ Teacher_____

Gender: Male Female

Age to the nearest year: 20-25, 26-30, More than 30.

Teaching Qualifications: DSE, BED, BSC+PGDE

Teaching Experience: 0-5, 6-10, More than 10.

(to the nearest year)

I will use the phrase **alternative assessment** to mean the new forms of assessment that your syllabus talks about.

1. Aspects of assessment practice (tasks suitable for assessment purposes).

    a) How do you select mathematics tasks? (Characteristic you look for e.g. content, student interest). What are the key features?

    b) Do you assign different mathematics tasks to students based on their mathematics or writing proficiency? (What is the difference between the tasks you assign and how do you match tasks to students of different abilities)

    c) Do you use multiple choice and /or short answer questions? Why/why not?

2. Teachers' perceptions about new forms of assessment.

    a) What are your expectations?

    b) What are your concerns with regard to new forms of assessment?

    c) What are the major challenges facing new forms of assessment?

    d) What role do you play in assessment?

3. How have new forms of assessment affected your work?

    a) Your teaching load

    b) Your teaching methods

    c) The content of your teaching

    d) Motivation

    e) Your personality

    f) Are you expected to fulfill any additional roles as a result of new forms of assessment

That is the end of our formal interview. Are there things you wanted to say you did not have an opportunity to say?

Thank you very much for your time.

Le ka moso.

Appendix K: Letters Requesting Permission (Samples)

University of the Witwatersrand

School Of Education

Private Bag 3 Wits 2050

Johannesburg, South Africa.

Cell No.: 0027-726330941or 09267-71570500

Tel: 09267-3939695

----------2004

_____

_____

Dear Sir/Madam

RE: Requesting Permission to Conduct a Study in three Junior Secondary Schools in Gaborone

I am a Masters Degree student in the School of Education at the University of the Witwatersrand Johannesburg. As a partial fulfilment of the Masters Degree requirement, I am planning to conduct a study in your school on 'mathematics teachers understanding of alternative assessment'.

The study is in two parts, classroom observations and interviews. Only mathematics teachers will be observed and interviewed in each school. The interview will require about 20 minutes of the teachers' time. I intend to carry out this study between 4th October and 15th October 2004.

The observations and interviews will be arranged such that it will be at the schools' convenience. To maintain confidentiality schools will be identified by fictitious names, such as School Alpha, School Beta and School Omega. Teachers will also not be identified by their real names. The information gathered in this study, will remain confidential and will be used for educational purposes only.

I thank you in anticipation

Regards,

Mrs B M Raboijane

----------Cut along this line----------

Consent Form

I----------agree that the schools can participate in your study. I realize that no harm will be done to the schools and that this information will be used for educational purposes only.

Signed: ----------

Date: ----------

University of the Witwatersrand

School Of Education

Private Bag 3 Wits 2050

Johannesburg. South Africa.

Cell No.: 0027-726330941 or 09267-71570500

Tel: 09267-3939695

----------2004

The School Head

_____

_____

Dear Sir/Madam

RE: Requesting Permission to Conduct a Study in Your School: Myself

I am a Masters Degree student in the School of Education at the University of the Witwatersrand Johannesburg. As a partial fulfilment of the Masters Degree requirement, I am planning to conduct a study in your school on 'mathematics teachers understanding of alternative assessment."

The study is in two parts, classroom observations and interviews. Only mathematics teachers will be observed and interviewed. The interview will require about 30 minutes of the teachers' time. I intend to carry out this study between 4th October and 15th October 2004.

The observations and interview will be arranged such that it will be at your school's convenience. To maintain confidentiality your school name will be identified by a fictitious name, such as School Alpha. Teachers will also not be identified by their real names. The information gathered in this study, will remain confidential and will be used for educational purposes only.

I look forward to your school's participation in this study.

Regards

Mrs B M Raboijane

----------Cut along this line----------

Consent Form

I----------agree that my school will participate in your study. I realize that no harm will come to my school and that this information will be used for educational purposes only.

Signed: ----------

Date: ----------