# Assessing technology education in Botswana Junior Secondary Curriculum: case study of teachers' classroom practices

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**Abstract**

In1992 the Government of Botswana set up a National Commission on Education (NCE) to review Botswana's education system, and subsequently produced the Revised National Policy in Education. It suggested a move towards a more pre-vocational and practical orientation for all subjects, and proposed that education should be related to the world of work and promote skills such as problem solving, teamwork, computing, critical thinking and interpersonal skills. The policy raised the status of design and technology to one of the eight core subjects. It is to this end that the three-year design and technology Junior Certificate Programme was developed. The three year programme presents critical assessment challenges to teachers, starting (in the 1st year) with 'inward facing' formative priorities and developing (by the 3rd year) 'outward facing' summative certification priorities. These assessment concerns are the subject of this case study.

**Keywords**

**Introduction**

In 1992 the government of Botswana set a National Commission on Education (NCE) to review Botswana's education system. This second commission after the 1977 Education for Kagisano Commission on Education produced its report in 1993, hereafter referred to as the 'National Commission on Education Report – 1993', and subsequent to that was the Revised National Policy in Education (RNPE) (1994) white paper. The Revised National Policy on Education (1994) in Botswana suggested that a move towards a more pre-vocational and practical orientation for all subjects was necessary. It also proposed that education should be related to the world of work and promote skills such as problem solving, teamwork, computing, critical thinking and interpersonal skills. Such skills which were deemed to be relevant to take Botswana through to the new millennium, would help Botswana become technology oriented and boost its economy. The technological skills suggested were also regarded as crucial to enable the country's search for new engines of development and therefore bring about economic diversification. The policy also raised the status of design and technology to that of being one of the eight core subjects. It is to this end that the three-year design and technology Junior Certificate Programme was developed.

Design and technology is a very complex subject with many entities, and it is still evolving. It is very dynamic and encompasses complex concepts of problem solving or designing solutions for problems, innovation, imagination and flexibility. Its philosophy encompasses some desirable philosophies of general education such as the transmission of culture and way of life. This is evident in the following statement derived from the review of National Curriculum in England – the consultation material which is not in any way different from the three-year design and technology programme concept in Botswana:

"Design and Technology contributes to the school curriculum by preparing young people to cope in a rapidly changing technological world. It enables them to understand how to think and intervene creatively to improve that world, combining their knowledge with their understanding of aesthetics and function ... Pupils learn to become autonomous and creative problem solvers both as individuals and in working with others." (QCA, 1999)

The three-year Junior Certificate Programme in Botswana has implications for assessment; assessment at school level and assessment at national level. Rooted originally in the traditional technical subjects with a craft-orientation, the subject in Botswana emerged through technical studies in 1986. It was re-designated as design and technology in the early 1990s. These developments of the subject in Botswana have similarities with those of the UK, except that in the UK the subject emerged through 'craft, design and technology' in the late 1970s (Eggleston, 1996 and Kimbell, 1997). Intertwined with these changes was the transformation of assessment of the emerging subject within the Botswana National Curriculum.

Assessing technology however, is not an easy task. Recently, debates on assessment of technology education have evolved and are very contentious. This paper focuses on teachers' actions, understandings, thoughts and perceptions of their own classroom practices. Ethnographic research methods were used to gather the data using participant observation and interviews, and the paper provides written descriptions and discusses current practices of assessment in community junior secondary schools in Botswana. I examine how design and technology teachers construct meaning in their assessment through interaction with pupils in the classroom. I also report on how they make decisions about what is to be assessed.

**Emergence of continuous assessment in design and technology in Botswana**
Following the paradigm shift in policies (RNPE, 1994) continuous assessment was introduced in all schools. The Examinations, Research and Testing Division (ERTD) in the Ministry of Education, charged with the responsibility of National Examinations, identified continuous assessment to be of paramount importance in the students' final grading system. All programmes at the junior secondary level incorporated it, and all the schools are charged with the responsibility of ensuring that continuous assessment is carried out. A dichotomy therefore exists; should the classroom teaching of the discipline be directed towards the assessment procedures outlined by ERTD, or should the priority be for formative assessment? When is the right time to use the ERTD assessment instrument, and who should assess what, and with what instruments? Another way of stating the dilemma is 'should the philosophy of design and technology drive the emergence of curriculum, or should it be the ERTD assessment that drives the teachers interpretation of curriculum?'

**The purposes of assessment**
Reviews of literature (Black, 1998; Broadfoot, 1996; Daugherty, 1995; Gipps, 1996; Kelly, 1990; Wiliam and Black, 1996) indicates that there are three main classifications of assessment:

1. formative (supporting learning and helping the growth in learning) to allow feedback on progress of achievement
2. summative (for certification – giving individual judgement which can be used by institutions for selection, prospective employers, members of the public and for accountability)
3. evaluative (enabling the effectiveness of the teaching and learning process to be judged – seeking to know how good a teaching programme is).

Formative assessment occurs during the teaching and learning process while summative assessment takes place at the end of an educational process or the end of a phase of that process. The third purpose of assessment, evaluative assessment, is continual accountability component used to compare schools, districts or different areas. At times, this is used in the form of league tables to compare performance of teachers and schools.

Diagnostic assessment is concerned with the identification of obstacles and difficulties in learning and enabling appropriate remedial help and guidance to be given. It is subsumed in formative assessment. A fourth purpose of assessment is ipsative assessment which applies where the teacher or individual pupil evaluates his/her performance against his/her previous performance. The focus is on the improvement rather than achievement, and students are encouraged to support each other, minimising competition. Success and failure in a task is more related to effort than to ability (Gipps, 1996 and Riding and Butterfly, 1990).

All these four purposes of assessment are what design and technology teachers in Botswana should consider. The question that confronts the researcher is whether teachers in junior secondary schools are able to handle such issues in these areas effectively to inform their classroom teaching practices.

**Current practices in design and technology in Botswana**
Classroom based assessment in most cases in junior secondary schools is supposed to be formative (providing feedback and support for students) according to some Ministry of Education policies. The end of Year 3 is the terminal point of the programme and is assessed externally by the local examinations syndicate (for summative certification purposes). In practice the situation is different, there are regular summative assessment activities undertaken in schools by teachers. These are often performed throughout

the three years in the form of monthly tests, topic tests, mid-year examinations and end-of-year examinations. The school summative assessment is used to determine the best students who are given prizes at the end of term and during open days. This internal students' performance is also used to gauge and predict students' performance for the external Junior Certificate Examinations and used as 'high stakes' tests that dominate in education. The 'high stakes' tests in the form of summative assessment are believed by teachers to determine the life chances of their pupils.

*Year 1 procedures*
As outlined in the 3-year design and technology programme, Year 1 predominantly focuses on skills development, with teacher-prescribed tasks and projects based mainly on resistant materials. Year 2 marks the transitional year between the dominantly teacher centred Year 1 and dominantly student centred work in Year 3. During this year the focus is on community service orientation where students are introduced to design processes in context. The intent is to instil the spirit of teamwork and enhance students' autonomy at the very end of the year where design solutions occur in the form of individualised design tasks. Teacher autonomy (in deciding curriculum projects and making assessments) that exist at the end of Year 1 is then reduced to conformity by the end of Year 3 when ERTD procedures take over.

Similar to the reviews of Tabulawa (1998) on the study of geography teachers in Botswana senior secondary schools, the design and technology teachers at junior secondary level have scheme books containing schemes of work. These schemes of work prepared in the department enable those teachers who are teaching the same year group to cover similar content each term.

*Year 2 procedures*
In Year 2 (which is the main focus of this study) students are empowered to work as individuals through the design process approach. The process which is Eurocentric and taught principally as a mechanical process, follows the stages of designing that UK teachers would recognise. It is all in sequence and not interactive. The process appears designed to accommodate the teachers' aims which is to go through the process within a specified duration.

There is little variation in teachers' approaches countrywide. Teachers concentrate more on the design process and very little on other content areas. The situation is exaggerated in Year 3 where teachers, because of the 'high stakes' effect, ensure that students are working on the major project (portfolio and artefact) which is externally assessed and contributes to the final junior certificate grade. This practice limits theory and other skills coverage in the quest for excellence. The driving force for this practice is the parents wanting reports showing marks in relation to the Junior Certificate Examinations grade.

The findings of this preliminary study suggest that teachers concentrate on generic design process skills to the detriment of other content areas of the programme, e.g. mechanisms, electricity and other technologies.

The practice has evolved that all junior secondary schools have monthly timed and written tests. Specific dates are set for testing students. However, the practice varies in detail, some schools assess students through projects which appear in the form of artefacts or design tasks as part of coursework. Most schools use monthly tests and examinations in addition to the Junior Certificate Examinations. The tests are objective, using multiple choice format, and short answer questions which can be easily marked, computed and grades awarded. Assignments are also provided as part of student activities either weekly or monthly in the form of essays or illustrated questions and sketches or as part of the portfolio. According to the teachers in the study, they mark students' work individually using individually devised marking keys for their own classes and there is no moderation of marks.

Most schools exclude the project marks in calculating their monthly test grade. Only a few incorporate the project marks, or take them as they are to represent a monthly mark. However this only happens if the project falls at the end of the month. Variances occur at the end of term when calculating the term mark. In term 1 the practice in some schools is to use the average of monthly tests to reflect on and report on the students' normative position, thus students' performance is gauged using written tests only. In other cases students' achievement is reported to parents using two columns in the report, mainly in term two and three. Two strands appear on the reports, i.e. term mark (which is the average of monthly tests) and examination

mark (which is either the average of mid-year examinations in term 2 or average of examinations – end-of-term and end-of-year). Averaging the term mark and examination mark determines the students' normative performance (performance against the peers). The teachers' responses suggest that the practice is perpetuated by the high aspirations of school heads, teachers and parents interests in *marks* rather than on the students' performance and progress.

Topic test marks and assignment activities marks do not contribute to reports to parents. The grades are buried in the scheme books for (assumed) teacher use: assumed in the sense that teachers are expected (as part of their teaching practice) to reflect on students' performances and make meaning out of the assessment information obtained.

*Year 3 procedures*
As required by ERTD, all students take summative assessment – the Junior Certificate Examinations, at the end of Year 3. These grades are used to report to members of the public, and these are used for selection for further studies and certification.

One could conclude that the assessment of students' performance in schools is a continuum of summative assessment (monthly tests and examinations) as these are regarded as very important by school heads who ultimately influence teachers to adopt the same opinion. Day-to-day students' coursework activities are neglected at the expense of monthly tests as teachers teach to the tests and cover theoretical content to adhere to school policies.

**Teacher dilemmas in assessment**
Through interviews with design and technology teachers, it appears that there is a tension in teachers' classroom assessment practices. Teachers' assessment activities and students' tasks are driven by external demands and/or external pressures. In consequence, formative assessment, which enables students to get feedback on their progress, and provides appropriate educational experiences for students' is shunned. The focus is on summative assessment of the level achieved, and the high stakes monthly tests have a high premium. It is clear from this study that (where it is used at all) teachers in schools have begun to interpret continuous assessment as summative, principally predicting students' performance at the terminal point – the Junior Certificate Examination.

The findings suggest that design and technology teachers give tests/tasks one after another and enter students' marks in the columns under a particular task, e.g. task 1, task 2 (which can be monthly tests). Then later add marks across the rows to gain the end of term mark or end-of-year mark. This concept of aggregation is chronicled in much literature. The table below is a schematic diagram of the process which forces teachers to record marks monthly. The table also shows where the averages of marks are recorded. Because of the slots (indicating months/teachers' responses) school heads compel teachers to launch monthly tests and record these marks. Failure to do so is an offence and is regarded as negligence of responsibilities.

Figure 1: Score sheet for recording monthly marks: an abstract from the Schemes and Records of Work done booklet (Ministry of Education).

**What happens with the assessment information?**
What happens to this assessment information from students is not explicit. Teachers found it difficult to separate the purposes of assessment – formative assessment (for teachers) and summative assessment (for certification), because they expect to teach to the test. From my observations it was evident that summative assessment oppressed the formative domain as the literature suggests (Black, 1998; Kimbell, 1997 and Wiliam, 1993).

Also observed through interactions with teachers is the fact that teachers do not use assessment information to feedback and feed-forward into their teaching practices and planning. Teachers fail to use the assessment information to feedback to their practices and therefore modify the teaching and learning activities that they and their students are engaged in. Once a monthly test or assignment has been given, teachers put them aside and continue with what follows in the scheme of work. Little use is made of the assessment data.

Interpretations of the assessment performance also seems difficult for most teachers. Black and Wiliam (1998a) attempted to conquer this practice of classroom assessment behaviour by advocating strategies of combating this 'high stakes' syndrome which condones examination backwash effects.

The current classroom assessment practices of design and technology teachers accords with the reviewed articles by Black (1993) and Crooks (1988). In these surveys of formative assessment the authors summarised the overall practices into four areas and reflect on it as a weak practice.

- classroom evaluation practices generally encourage superficial and rote learning, concentrating on recall of isolated details, usually items of knowledge which pupils soon forget
- teachers do not generally review the assessment questions that they use and do not discuss them critically with peers, so there is little reflection on what is being assessed
- the grading function is over-emphasised and the learning function under-emphasised
- there is a tendency to use a normative rather than a criterion approach, which emphasises competition between pupils rather than personal improvement of each. The evidence is that with such practice the effect of feedback is to teach the weaker pupils that they lack ability, so that they are demotivated and lose confidence in their own capacity to learn.

Other authors have also commented on this practice and argued that teachers neither trust, nor use their classroom assessment results (Cizek, *et al*, 1995 and Hall and Webber, 1997). Black and Wiliam (1998b) commented that teachers' assessment focuses on low-level aims, mainly recall, and there is little focus on such outcomes as speculation and critical reflection. Senk, *et al* (1997) hold the same view. In the junior secondary schools in Botswana the practice I have observed suggests that students are implicitly encouraged to engage in these tasks to accommodate the teachers' perceptions and resist taking 'risks' which are inherent in design and technology and developing their cognitive designing skills and activities.

**Conclusions and issues for consideration**
In the schools observed, there appears to be a relentless dominance of summative testing without real appreciation of what the test data means. The study illustrates that there are variances in the design and technology teachers' assessment practices in junior secondary schools. These variables include content coverage and subject pedagogy and reflect different interpretations by teachers of what counts as proper teaching of design and technology and the appropriate assessment of student performance.

Wilders and Pitt (1999) in their research raised the question of 'why children should study design and technology'. To this question the authors provided three responses which the three-year junior secondary programme in design and technology tries to address. However, the nature of classroom assessment in the junior secondary schools does not reflect these three domains, and – crucially – the community project (which attempts to inculcate the spirit of teamwork) is ignored in this assessment process. The assessment of group work in the group community project has been abandoned as teachers (as well as the ERTD) were unable to develop effective procedures to examine these activities.

Design and technology education involves an organic process and has a powerful and vibrant philosophy that derives from its pedagogy. How then should students be assessed? This current study in Botswana has focused my attention on the following crucial questions:

  i.      what are the key qualities that should be the focus of assessment (and for whom)?
  ii.     how are teachers to decide on the standards that represent an appropriate level of quality?
  iii.    how are teachers to share (and hence make reliable) such standards?

I suspect that these remain the key questions in any nation that seeks to embed design and technology in its curriculum. In the context of Botswana I have now interpreted them into the following question related to the three-year junior certificate examination programme. How does the transition from inward-facing assessment (supporting students in Year 1) to outward-facing assessment (for certification in Year 3) change the teachers' practices or standards of assessment? How do teachers construct meaning for students through their assessment in design and technology?

These are now the critical questions for my continuing research.

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