

# Assessment in Design and Technology (DT) in Mauritius

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## Abstract

*Assessment is recognised as a powerful tool to promote learning. Several authors claim that where high-stakes examinations or tests are involved in schools, unintended negative effects are leading to corrupting educational practices at all levels. With the recent reforms in curriculum design and implementation, the Mauritius Ministry of Education demands approaches to assessment that accompany the new vision of the curriculum, and claims that formative and continuous assessment must be given more emphasis. Despite the growing research interest in educational assessment, underlying teachers' decisions and perceptions which drives classroom assessment is under researched. An extensive review of the literature suggests that, no research has been conducted in the field of formative assessment or assessment for learning (AfL) in Mauritius secondary schools. This is the reason behind undertaking this study for my doctoral research, which is still in the planning stage.*

*An interpretative mixed-methods approach to research will be used to capture in-depth insights into ways in which Design and Technology (DT) educators apply AfL in their practice, in Mauritius state secondary schools. My intention is to first use a questionnaire to identify a range of teachers' demographic data, and their assessment practices. The focus group method will follow the questionnaire method to obtain more in-depth information about teachers' assessment practices. Observation will then be carried out to verify the actual behaviour of DT teachers. Informal conversation interviews will be used at the end of each observation to better understand assessment decisions. Secondary data such as personal and official documents will also be used to understand teachers' assessment practices. Finally, focus groups of students will be used to develop understandings of their perceptions of AfL in DT.*

**Key words:** *assessment, learning, design and technology, Mauritius.*

## Introduction

The paper has three main sections, introduction, literature review and methodology. The first section begins by providing a background of Mauritius, its education structure, the recent change in the curriculum framework and domains of learning at lower secondary school. Then the research problem, objectives and questions are presented. Finally, the significance of the study is discussed. The second section consists of a literature review on assessment for learning and an overview of Design and Technology in Mauritius while emphasising how assessment is conducted in the subject area. The third section of this paper presents the research paradigm and design, outlines data collection techniques, population sample, validity and reliability issues, and ethical considerations.

## Background of Mauritius

The Republic of Mauritius is an island in the Indian Ocean, with a surface area of 2,040 km<sup>2</sup> (The World Bank, 2015). The 2011 population census indicated that there were 1.233 million multi-ethnic people, and 1,192,300 lived on the island of Mauritius, 40,400 on Rodrigues Island and 300 on the Agalega Islands (Ministry of Finance and Economic Development, 2011).

The citizens of Mauritius are categorised into four main groups: the Hindus, the Muslims, the Chinese and the General population (Dindyal & Besoondyal, 2007). The latest census (2011) highlights the ethnicity/race group in Mauritius as follows: Indo-Mauritian comprise 68% of the population (17 % are Muslims while the rest are subdivided into Hindus, Tamils, Marathas and

Telugus all of Indian descent), Creoles or non-white Catholics of Africa 27%, Franco-Mauritian 2% and Sino-Mauritian 3%, (Ministry of Finance and Economic Development, 2013).

## Education System

The education system is based on the British system and consists of four main categories (Refer to Table 1): 3 years pre-primary, 6 years primary, 7 years secondary (3+2+2) and tertiary formal education (Ministry of Education and Human Resources, 2012). For students who fail the end of primary examination twice or who have reached the age of 12 but failed in the examination, a Prevocational Education stream exists which lasts for a period of four years and has a skills-based curriculum (Ministry of Education and Human Resources, 2014).

Table 1 *Mauritius Education System (Mainstream)*

	Category	Age	Status	Pre-requisites	Number of years
1	Early child care	0 – 3	Optional	None	
2	Pre-Primary	3 – 5	Compulsory	None	3
3	Primary	6 – 11	Compulsory	Pre-Primary Education	6
4	Lower Secondary	12 – 14	Compulsory	Certificate of Primary Education (CPE)	3
	Upper Secondary	15– 16	Compulsory (SC)	Form 3 Certificate for School Certificate (SC)	2
		17– 18	Optional (HSC)	SC Certificate	2
5	Tertiary	18+	Optional	HSC Certificate	

## Curriculum framework

Major reforms have taken place in Mauritius in curriculum design and implementation from pre-primary to lower secondary. In 2006, the National Curriculum Framework (NCF) for Mauritius was presented through the document ‘Towards a quality curriculum-A strategy for reform’. Eventually, the Primary NCF was launched in 2008, the NCF for Secondary Education in 2009 and NCF Pre-primary (3-5 years) in 2010. The curriculum framework outlines a shift in approach from subject-centred to child-centred (Ministry of Education and Human Resources, 2006; UNESCO, 2010). According to the Ministry of Education and Human Resources (2008, 2009, 2014), the National Curriculum Framework will assist schools to meet the individual learning needs of all learners and provide them with a strong foundation for lifelong learning. In addition, with the emerging social and economic needs in Mauritius, the learners should be equipped with the necessary skills and knowledge to live harmoniously in a multicultural society (Ministry of Education and Human Resources, 2014). For example, new subjects such as bhojpori language, travel and tourism, entrepreneurship education have been introduced, and physical education is now examinable at School Certificate (SC) and Higher School Certificate (HSC) level.

## **Domains of learning at lower secondary schools**

There are seven domains of learning in the lower secondary schools in Mauritius. The subjects are grouped under the domains of learning according to their inter-relatedness and general outcomes. The domains of learning are:

- i. Languages: (English, French, Asian languages and Oriental languages)
- ii. Mathematics
- iii. Sciences (Physics, Chemistry and Biology)
- iv. Technology (ICT, Design & Technology, Home Economics, and Design, Clothing & Textiles)
- v. Health and Physical Education (Food and Nutrition, Human Development, and Physical Education)
- vi. Social sciences (History, Geography and Sociology)
- vii. The Arts (Visual Arts, Music, Drama and Dance)

## **Research problem**

In the last decade, a lot of emphasis has been laid on formative assessment (assessment for learning) and continuous assessment in the teaching and learning process in Mauritius. However, there has been little classroom-based research conducted to determine the effectiveness of formative assessment (assessment for learning) in Mauritius' schools. The Mauritius Ministry of Education has little research information to guide the practice and of improvement of the educational system.

## **Research Objectives**

This research study will attempt to explain how teachers approach assessment for learning in their practice while teaching Design and Technology at Form 3 level (13-15 years). The following research objectives have been set for this study.

- To explore and understand the AfL practice of Mauritius Design and Technology teachers working in state secondary schools.
- To explore students' perception of AfL.

## **Research questions**

The following research question, and sub questions will be used to address the objectives of this research study:

How effective is assessment for learning as practiced by Mauritius D&T teachers?

- What AfL approaches are implemented by Mauritius D&T teachers?
- What rationales do Mauritius D&T teachers use in the implementation of AfL?
- What AfL guidelines are provided to Mauritius teachers?
- What are student perceptions of AfL?

## **Significance of the study**

The findings from this research study will be useful to: (1) Teacher training institutions/universities as these bodies will have better indications of what to offer as modules and content in the area of assessment/evaluation; (2) Curriculum designers and developers who are also responsible for selecting approaches/types of assessment at the secondary school level; (3) Pre-primary, primary and secondary school teachers and student teachers willing to enhance

learning through assessment; and (4) Policy makers who decide about the models and approaches of curriculum and assessment techniques.

## Literature review

This section starts by providing a literature review on assessment for learning. Then, an overview of the subject Design and Technology in Mauritius is provided, while highlighting the assessment in the subject areas across all levels.

### Assessment for learning

During the third international conference on assessment for learning which was held in New Zealand in 2009, the following definition of the term assessment for learning was proposed. “Assessment for learning is part of everyday practice by students, teachers and peers that seeks, reflects upon and responds to information from dialogue, demonstration and observation in ways that enhance ongoing learning” (Klenowski, 2009, p. 264). This definition highlights that assessment for learning should be student centred and is a practice performed by teachers (by providing feedback, clarifying criteria, using rich questioning, amongst others), for students so that they can help themselves and one another to become autonomous learners.

Assessment for learning should promote learners’ autonomy (Marshall & Drummond, 2006; Taras, 2010). It is essential to inform students of the next step they need to take and present them with indications of how to improve. For assessment to support learning, teachers need to be gathering information about their learners’, and encouraging them to review their work critically (Assessment Reform Group, 1999). This practice should be carried out on a day-to-day basis through dialogue and interaction amongst students and the teacher.

Assessment for learning is usually informal, and conducted by teachers as part of their own teaching styles (Black, Harrison, Lee, Marshall, & Wiliam, 2003; Taras, 2010). When assessment is informal, issues such as validity and reliability are not important because informal assessment is not used for accountability or certification purposes but to support learning (Taras, 2010).

The Assessment Reform Group (ARG) (1999) provided seven characteristics of assessment for learning that promotes learning:

1. it is embedded in a view of teaching and learning of which it is an essential part;
2. it involves sharing learning goals with pupils;
3. it aims to help pupils to know and to recognise the standards they are aiming for;
4. it involves pupils in self-assessment;
5. it provides feedback which leads to pupils recognising their next steps and how to take them;
6. it is underpinned by confidence that every student can improve;
7. it involves both teacher and pupils reviewing and reflecting on assessment data. (ARG 1999, p. 7)

Klenowski (2009) notes that the principles of assessment for learning have been misunderstood through misinterpretations of words used in past definitions of assessment for learning and formative assessment. The illustrations of these definitions in educational policy documents led toward a distorted practice of assessment for learning (Klenowski, 2009). For example, some teachers were implementing assessment for learning superficially and without the active involvement of the students (Klenowski, 2009). Klenowski (2009, p. 263) reports that the phrase “deciding where the learners are in their learning, where they need to go and how best to get there” has been wrongly interpreted. For many, it means that teachers should regularly test their students to measure their attainment levels on the set national/state scales. Through this misinterpretation, the marks which were supposed to be indicators for learning have turned out

to be the goals for learning (Klenowski, 2009). The outcome then is that the assessment for learning takes the form of summative assessment.

### **Design and Technology in Mauritius**

DT in Mauritius has so far been restricted to boys only, with some exceptions (Ministry of Education and Human Resources, 2009). Six out of the 68 state colleges are mixed gender schools and only these schools offer DT to girls. The private aided secondary schools do not offer DT to girls irrespective whether schools are mixed or not, and only four private non-aided secondary schools offer DT to girls.

The subject DT has two main components from Form 1 to Form 3, namely Design and Communication (DC) and DT. The latter consists mainly of product design and practical technology, including topics such as properties of materials structures, tools, electronic and controls, mechanisms, ergonomics, and energy. On the other hand, DC consists of graphic products, covering topics such as development, freehand sketching, charts, presentation, drawing systems and geometry.

At Form 4 and Form 5 levels, two subjects are offered to students and termed DT and DC. At the beginning of Form 4, students are streamlined based on their option of subjects (science, technical, art and economic streams) and students opting for the technical stream have to choose between DC and DT in state schools. While in private-aided schools only DC is offered.

At Lower 6 and Upper 6 levels (HSC), DT is again reverted to one subject area. The subject is offered in both state and private-aided secondary schools. The syllabus for HSC has two parts: part one has core content and is compulsory for all students, and part two has three optional focus areas. For the part two, the schools and candidates are responsible to choose amongst product design, practical technology or graphic products. Students in state schools can choose any option; however, students of private aided school will normally opt for graphic products as they opted for DC at Form 5 level.

In 2009, it was proposed in the secondary NCF that girls in Forms 1 to 3 will be allowed to choose between DT, and design and textiles (Ministry of Education and Human Resources, 2009, p. 107). The secondary NCF highlighted that “to provide gender equity girls should not be debarred from taking design & technology with communication as the pathway” (Ministry of Education and Human Resources, 2009, p. 107). The document also mentioned that DC at Upper secondary is offered in a number of boys’ schools which do not have a workshop for technology, and that DC “can be carried out within a classroom with minimum equipment that any girls’ school should be able to afford” (Ministry of Education and Human Resources, 2009, p. 107).

### ***Assessment in DT***

Like other subjects in secondary schools, DT is assessed through formal end-of-term tests and end-of-year examinations. End-of-term tests are the preferred method of formal assessment and most schools recommend a minimum of three tests per term from Form 1 to Upper 6. End of year examinations are carried out by each school at Form 1 to Form 4 and Lower 6 (some schools combine 20 to 30% of terms marks for the end of year grade). End-of-year examinations for Form 5 and Upper Six are organised by Cambridge International Examination Syndicate (UNESCO, 2010). Mock examinations are also carried out for Form 5 and Upper 6 students before they take the final Cambridge international examinations which are also school based. Since 2008, a ‘National Assessment’ has been introduced at Form III level to evaluate the core competencies of students in numeracy, literacy, basic science and ICT (Ministry of Education and Human Resources, 2009), but DT is not amongst the subjects being nationally assessed.

Informal assessment also takes place in DT. The secondary NCF recognises that DT requires a holistic approach of assessment (Ministry of Education and Human Resources, 2009).

Throughout the years students have been assessed through a wide range of assessment techniques such as self-assessment, logbooks, portfolios, practical works and observations. The secondary school NCF highlights that formative modes of evaluation should be encouraged as these promote students' learning (Ministry of Education and Human Resources, 2009). Some teachers also use informal assessment such as practical works, classwork, portfolios and presentations to calculate end-of-term grades (for example one test and continuous assessment) and end of year examinations (for example 30% continuous works).

## **Methodology**

This section outlines the paradigm underpinning this research study, sampling of schools, teachers and students, research design, methods of data collection and ethical considerations.

### **Research paradigm**

A naturalistic approach seems to be most appropriate as this study deals with the direct experience of individuals in their natural settings where the researcher will aim to understand, explain and interpret social reality through the eyes of participants (Cohen, Manion, & Morrison, 2011).

This study adopts an interpretive paradigm and uses mixed methods research. The interpretive paradigm aims to understand the subjective world of the human experience (Cohen et al., 2011). Interpretive researchers plan to understand the participants' interpretations of the world surrounding them (Cohen et al., 2011). Mixed methods is being adopted in this study as the researcher seeks to converge and corroborate results from different methods studying the same phenomenon (Johnson & Christensen, 2012). For example, a questionnaire and then a focus group discussion will follow. In addition, the result of one method will be used to inform another method, such as the questionnaire results will inform participants' number of years of experience, and based on this information classroom observations will be carried out.

### **Research Design**

Case study is a research strategy which involves detailed examination of a sample of interest, which may include many themes and subjects, but is specific in focus (Gray, 2014). A case study seems appropriate for this study as the intention of the researcher is to provide a detailed analysis of three cases, in a specific focus (AfL in DT). In addition, the case study can combine the qualitative and quantitative methods, as well as data collection methods such as interviews, observations, surveys and records (Gray, 2014). The case study method is also appropriate when how and/or why question(s) are asked about a set of focused events and where the researcher requires no control over the behavioural events (Gray, 2014; Yin, 2014).

### **Data collection methods**

This research study will employ five data gathering methods that will be conducted in four strands.

Strand one: Survey questionnaire and teachers' focus groups

Strand two: Teacher observations, interviews and secondary data (personal documents)

Strand three: Students' focus groups

Strand four: Secondary data (Public and private documents)

### ***Questionnaire***

The questionnaire will consist of two sections, section A with closed and section B with open questions. Section A will include nominal and ordinal level of data, while section B will collect

word-based data. It is the data gathered from the first section of the questionnaire that will reveal the teaching experience of teacher, and the second strand of the study will be based on this data. The first section of the questionnaire will be closed and structured, and will be used to observe and compare the patterns of assessment behaviours of teachers. The questionnaire will need to be piloted and refined to ensure that it elicits a full range of expected possible answers (Cohen et al., 2011). The section B will allow the teachers to express themselves and provide reasons for their behaviours in their own terms.

### ***Focus group***

A focus group is an interview with a group of individuals to examine, in detail, the opinion of the group on a focused topic being discussed (Johnson & Christensen, 2012). The focus group interview is useful as it complements other methods of data and can be conducted in relatively short period of time (Johnson & Christensen, 2012). The focus group method has been selected in this study to provide in-depth information and will be used to complement the survey questionnaire. The researcher will carry out focus group interviews with both teachers and students.

To ensure that all teachers participate in the focus group, the researcher plans to carry out the discussion in the teachers' respective schools. Thus, there will be 15 teachers' focus groups. There are multiple purposes of focus groups (Johnson & Christensen, 2012) and the main purpose of the teachers' focus groups is to obtain general background information about assessment practices of DT teachers in the Mauritius context.

With regards to students, only three focus groups will be conducted. Five students will be randomly selected for each group from classes in which observations will be carried out. The purposes of using students' focus groups are to learn about students' perception of assessment practices in DT and gather information that might also help to interpret previously obtained data from observations (Johnson & Christensen, 2012).

### ***Teacher observations***

Observation in research is defined as the action of witnessing the behavioural patterns of individual(s), to gain information about the phenomenon of interest, in a particular situation (Johnson & Christensen, 2012). One major advantage over self-reported methods is that the observer is able to record the actual rather than the intended behaviour of the participant (Johnson & Christensen, 2012).

Both qualitative and quantitative observation will be used. To gather qualitative data, the researcher will use a semi-structured classroom observation grid and record considerable amount of field notes related to the identified research questions. On the other hand, to collect quantitative data, an audio recording of all observations will be done and data such as the time spent by the teacher to interact with students will be coded at a later stage. A checklist will also be used, for example to count the number of students that were provided with feedback.

### ***Interviews***

An interview is a data gathering methods in which the researcher asks questions to the participant who provides data (Johnson & Christensen, 2012). The informal conversation interview which is the most spontaneous and loosely structured type of qualitative interview (Johnson & Christensen, 2012) will be used in this study. These face-to-face interviews will be conducted with three teachers, at the end of each lesson observation, in an attempt to have a better understanding of their assessment decisions due to the fact that there is no interview protocol in this type of interview, audio recording will be done to avoid the loss of valuable information (Johnson & Christensen, 2012).

### ***Secondary data***

Also referred as existing data, secondary data are those that have been recorded or collected usually by a different individual often for another purpose than the current research study (Johnson & Christensen, 2012). For this study, personal documents and official documents will be used. The personal documents that will be used are the teachers' documents, such as scheme of work, weekly plan, daily plan, posters and lesson activities. These personal documents will reveal how the teachers plan for assessment activities.

The researcher will also use the Mauritius Institute of Education's course (Semi-Government Teacher Education Institution) handbooks and module information sheets to analyse the content that have been offered during secondary teacher education in the module of assessment. These documents will inform what teachers have learned and whether they are implementing what they have learned in their assessment practices.

Other official documents to be used in this study are the quality assurance division (QAD) reports. The QAD is a department under the Ministry of Education and Human Resources, and Tertiary Education and Scientific Research which monitors secondary school teachers practice in Mauritius. An analysis of these reports will reveal whether the data collected by the quality assurance officers corresponds with the study's data in term of AfL.

### **Population Sampling**

The main participants for this study are the DT teachers of Mauritius. There are around 205 DT teachers in 80 secondary schools in Mauritius clustered in four zones. In the first strand, this research study will focus on fifteen state secondary schools of three zones involving 40 teachers. The 40 teacher will fill a questionnaires and also participant in focus group discussions.

The non-probability sample will be used as the researcher has targeted a group of teachers which do not necessary represent the wider teacher population (Cohen, Manion & Morrison, 2007). Convenience sampling will be used, because educators will be selected based on the geographical location of the schools in the three different zones. Moreover, only state secondary schools have been selected because accessibility to the state secondary school is easier than private aided and non-aided school. The parameter of generalisability in this type of sample is negligible (Cohen, Manion & Morisson, 2007) as the schools and teachers do not represent the wider teacher population.

In the second strand, the survey questionnaire will reveal the academic background and teachers' experiences. Three teachers will be identified based on their experience (least, moderate and highest number of years of teaching experience), and observation and interview method of data collection will be conducted. Observation of around 10 classes per teacher will be done. The purposive sample will be used as those concerned are teachers of Design and Technology working in state secondary schools. In addition, only teacher working with Form 3 students will be selected for the observation and interviewing, as the researcher intends to shed light on how assessment for learning is taking place at a level where students are not involved in national examinations at the end of the year.

In the third strand, fifteen students will be involved in the three focus groups discussion. These students will be randomly selected from the three classes that the researcher will be observing.

### **Validity and Reliability**

Descriptive validity means "factual accuracy of the account as reported by the researcher" and interpretative validity means "portraying accurately the meaning attached by participants to what is being studied by the researcher" (Johnson & Christensen, 2012, p. 265). To ensure that descriptive and interpretative validity are achieved in this research study, the researcher will use



participants' feedback (interviews that will be conducted at the end of each observation session), and data triangulation with the multi data sources that will be collected and transcribed verbatim.

External validity is about "the domain to which a study's finding can be generalised" (Yin, 2014, p. 46). To achieve external validity (analytic generalisation), Yin (2014) proposes to use replication logic in multi-case studies. So, if similar results are obtained from the three cases in this study, it can be said that replication have taken place (Yin, 2014).

Reliability means that the procedures of this research study, for example the data collection procedures, can be repeated with the same results (Yin, 2014). Two strategies will be adopted in this research study to satisfy reliability procedures. The researcher will ensure that a case study protocol will be used and a database will be developed to document the procedures followed (Yin, 2014).

### **Ethical considerations**

Confidentiality is an agreement between the researcher and the participants, where the researcher accepts not to reveal private information to individuals who are not concerned with the research study (Cohen et al., 2011). Knowing that the island is small, and since the study is focused on DT teachers in a particular zone, this increases the risk of teachers being easily traced. Thus, information will be presented in such a way that readers will not be able to identify neither the zone, nor the schools and teachers. The approach in which the data findings will be presented is expected to maximise confidentiality.

The process of informed consent involves obtaining the permission of participants and responsible personnel of the educational institutions in which the study will take place and is also an opportunity for the concerned parties to learn about the particular research. Since the research study will take place in state secondary school of Mauritius, consent from the Ministry of Education, school principals (rectors), and heads of department will be sought. Consent will also be sought from parents and students' as the students will be aged between 13 to 15 years.

### **Conclusion**

This paper is a brief of my proposal for my doctoral research. The area of interest is assessment for learning in Design and Technology and will be conducted in Mauritius state secondary schools. This mixed methods research will use questionnaire, interviews, focus groups discussion, observation and secondary documents to collect data. Through this study, the researcher intends to find out if DT teachers are implementing the assessment knowledge and skills, gained during teacher education, in their assessment practices and whether examinations or tests are having negative effects on ongoing assessment practices at secondary school levels in Mauritius.

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