Exploring Formative Assessment in Mathematics: Teachers' Authentic Experiences in Online and Traditional Classrooms

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Abstract

This study utilized a convergent mixed methods design to explore teachers' beliefs and experiences of formative assessments in mathematics conducted in traditional classrooms and the online environment. Data from questionnaires, focus groups and teacher interviews were analyzed from fifty (50) teachers, purposively drawn from the Victoria Educational District in South Trinidad. Results showed teachers' consensus on the importance of formative assessment, despite challenges in a summative-driven school culture. Time constraints and teachers' skill level often hindered the intended formative practices. Teachers also identified a need for structured mandates from administrative bodies to promote a formative assessment culture in classrooms.

Keywords

Formative Assessment, Feedback, Teachers' Beliefs, Experiences

1. Introduction

The National Council of Teachers of Mathematics (NCTM) has highlighted the important role of assessment in its six Assessment Standards for School Mathematics (NCTM, 1995) as well as its Principles and Standards for School Mathematics (NCTM, 2000). The second of the six assessment standards states that "assessment should enhance mathematics learning" (p. 13) while the Principles and Standards propose that the role of assessment in teaching is not simply to make decisions about whether student performances or particular teaching activities and strategies were successful or not; more importantly, assessment should drive teachers' decision making for improvement and help teachers to keep learning on course or on track.

In their seminal work, Black and Wiliam (1998) describe formative assessment as teaching and learning activities that are adapted to meet student needs based on feedback received from students. The goal of formative assessment is to allow teachers to obtain systematic evidence about student thinking during instruction and to use that data to adjust and adapt instruction to meet individual students' needs.

For the purposes of this study, a definition of formative assessment provided by the Assessment Reform Group (2002: pp. 1-2) in the UK is most appropriate. Formative assessment is defined as "the process of seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go and how best to get there". Formative assessment takes place during lessons, allowing for frequent assessments and as a result, timely instructional feedback. It occurs during teaching with the intent that the gathered information will be used to adjust future outcomes (Earl, 2003). Its main purpose is to aid or improve learning as it progresses, rather than simply assigning a grade.

Research has shown that formative assessment correlates positively with student achievement (Andersson & Palm, 2017; Black & Wiliam, 1998). An analysis of 23 studies, all of which applied systematic, rigorous, scientific procedures, showed that students who participated in formative assessment performed better on measures of academic achievement than those who did not (Klute, Apthorp, Harlacher, Reale, & Marzano Research, 2017).

Wiliam (2011) posits that formative assessment plays an important role in increasing teacher quality and student learning when it is viewed as a process rather than a tool. He emphasizes the instructional side of formative assessment and advocates the use of classroom questioning, learning intentions and success criteria, feedback, collaborative and cooperative learning, and self-regulated learning to engineer effective learning environments for students. According to Wiliam, assessment is an essentially interactive process, in which the teacher can find out whether what has been taught has been learnt, and if not, do something about it. Therefore, assessment should function as a bridge between teaching and learning. Formative assessment helps teachers collect evidence about the work of students in order to adjust their instruction to better meet students' needs on the spot or in real time.

Over the last two decades, formative assessment practices in the classroom have been considered an essential element to improving student learning (Black & Wiliam, 1998). Black and Wiliam (2009) proposed a theory of formative assessment which contains five interrelated elements of classroom practice that are critical features of formative practice: 1) clarifying and sharing of learning intentions and criteria for success, 2) strategic questioning, 3) feedback opportunities 4) peer assessment activities, 5) self-reflection for improvement. There is considerable evidence that self-assessment or self-reflection improves learning and helps students become more responsible and more independent by taking control of their own learning and assessment (Andrade, Du, & Mycek, 2010; Sadler

& Good, 2006).

Teachers' use of formative assessment in the mathematics classroom has been proven to be particularly effective in enhancing students' mathematics performance, as the learning goals in mathematics are strongly aligned. This implies that whenever students show a gap in their knowledge or skills and this is not corrected in due time, it will cause them to experience difficulties in mastering subsequent learning goals. Thus, students' mastery of mathematics should be frequently assessed in a formative way in order to provide timely instructional feedback that allows for an uninterrupted learning process.

Formative assessment enables students to take risks and try new things in the mathematics classroom without feeling any threat or fear, or having any interruption from their teachers (Eddy & Harrell, 2013). Formative assessment used during mathematics instruction was found to have larger effects than formative assessment used during reading and writing instruction. In mathematics, both student-directed formative assessment and teacher-directed formative assessment were found to be effective (Klute et al., 2017).

In addition, many researchers namely Cizek (2001) have discovered that there is a need to support mathematics teachers in their use and development of formative assessment practices because of a gap in the current development of formative assessment. Assessments for learning allow mathematics teachers and students to see their learning paths in a positive way, and reflect the students' learning as well as the teachers' instruction. Therefore, mathematics teachers urgently need to have knowledge about providing formative assessments and the ability to assess students' learning and their own classroom instruction (Fernandez, Cannon, & Chokshi, 2003).

Primary school teachers in Trinidad are mandated to teach mathematics on a daily basis. These teachers are usually assigned to a specific class for at least one entire academic year and as such have prolonged pedagogical interaction with students of a specific group. Harlen (2007) argues that such teachers are in the best position to collect good quality data about student learning over an extended period of time and to make best use of it in their feedback because of their prolonged interaction with students when compared with secondary or tertiary educators, who generally deliver their subject matter to differently scheduled classes.

However, the dilemma which faces all teachers is that they are not provided with any kind of guidance or training on how to assess primary school students formatively and there are no definite instruments or a clear policy regarding how to assess pupils in a formative way (Kyriakides, 2004).

Black and Wiliam (1998), after reviewing a number of empirical studies, concluded that regularly conducted formative classroom assessment, when done using sound practices, had a positive outcome on student achievement and student self-worth. Wiliam (2011) suggested that the essence of formative assessment is the quality feedback provided by teachers to students throughout learning in order to support significant academic gains. However, current practices and

policies are not always in alignment with this paradigm. High stakes testing, report card grading, letter grades, and symbols given daily to students run counter to the principles of effective feedback that increases student learning Wiliam (2011).

1.1. The State of Primary School Assessment Practice Today

Despite this enhanced knowledge base about assessment, researchers have suggested that the state of primary school assessment generally reflects a restricted range of assessment practices, particularly those that emphasize traditional summative measures (Popham, 2005; Stiggins, 2008). Paper and pencil tests predominate in the system. Nevertheless, research suggests that it is actually the utilization of a diverse array of formative assessment methods that is most critical for promoting student success (Black & Wiliam, 1998).

Research undertaken in Trinidad and Tobago by De Lisle (2010) indicates that it is formative assessment, rather than the predominant summative measures, which provides the greater impact on learning. There is adequate evidence which suggests that in schools, classroom assessment mainly refers to tests, examinations and grading and is heavily perceived as such (Bezuk et al., 2001; Lissitz & Schafer, 2002; Van de Walle, 2001). School leaders seem to believe that one cannot assess without assigning grades (Lissitz & Schafer, 2002). Although summative tests predominate in schools as the main strategy for assessing children, teachers seem to have different views, skills and dispositions about tests and the assessment process. Such has been revealed in a study done by Morgan and Watson (2002) suggesting that different teachers interpret similar students' work differently.

The COVID-19 pandemic created significant challenges for worldwide educational communities, particularly in primary schools. Prior to March 2020, in Trinidad, teaching sessions were primarily conducted using a traditional or face to face mode of delivery. From March 2020, primary school teachers and students were forced to experience a change in pedagogical landscape from daily face to face classes to online learning in order to ensure uninterrupted delivery. At this present time in 2024, even though these pandemic restrictions have subsided significantly and the traditional mode once again predominates, many educational institutions have retained some components of online learning, particularly formative assessment exercises and activities in a blended approach with traditional delivery. As such, for a significant number of schools, formative assessment in a virtual environment remains a prominent reality.

In the aftermath of the COVID-19 pandemic, there has also been an increased use of the online platform as the preferred medium for student learning in the primary school. This is significant because evaluating student learning takes on a new meaning in online classroom environments where students and instructors do not share physical proximity (Vonderwell & Boboc, 2013). Online learning requires the reconstruction of student and instructor roles, relations and prac-

tices. Therefore, teachers need to be aware of effective strategies and techniques for formative assessment of teaching and learning in a virtual environment.

1.2. Purpose and Significance of the Study

This study sought to describe the experiences of formative assessment of practising teachers in the primary school system of Trinidad and Tobago. This research is therefore significant because by acquiring data on the prevailing beliefs, dispositions and practices of teachers in formative assessment, interventions can be created to strengthen effective practices that teachers already possess, and also to address misconceptions or inappropriate pedagogical and assessment practices that may hinder the success of curricula innovations in assessment.

The results of this study can also add to the extant literature on classroom assessment practices in mathematics and provide valuable research for the Ministry of Education in its quest to transform the education system.

2. Literature Review

2.1. Formative Assessment in Education

In assessment-oriented reform practice, there has been growing interest in the extent to which teachers use assessment as part of their teaching to promote improved student learning (Black & Wiliam, 1998). This is termed *assessment for learning*. From this perspective, assessment practically aids both teachers and students to plan for greater improvement in both teaching and learning strategies. Assessment serves the primary purpose of facilitating increased learning, rather than solely the purpose of reporting student performance. Black and Wiliam (1998) are two major proponents of this view which highlights the importance of using different assessment methods, as well as alternative assessment techniques to help students to recognize their potential strengths as well as weaknesses. Effectiveness of assessment is now judged by a new criterion that it should operate as assessment *for* learning rather than just assessment *of* learning.

Formative assessment may include some informal techniques that teachers commonly use, such as questioning learners and observing them through their participation in activities and judging their educational performance in either structured or unstructured ways (Black & Wiliam, 1998). It also involves the continuity of these assessment processes in different phases of the lesson and in a systematic manner. Assessment *for* learning helps teachers to construct a more valid picture of students' performance and learning abilities and provides supporting information which teachers can channel back into their own teaching strategies by planning for some specific individual, group or issue (Shute, 2008).

While as educators, teachers have a duty to focus on the formative function of assessment, educational systems continue to be dominated by assessment for selection and certification purposes (Buhagiar, 2007). The widespread use of teacher generated information for both managerial and accountability purposes gives classroom assessment a summative dimension that is primarily

concerned with only summarizing information about student achievement at particular times.

Buhagiar (2007) claims that although assessment reform has now become a significant educational issue for decades in many countries, assessment practices have not changed much. The overall picture shows that it is hard to introduce effective formative assessment into classroom practice. The formative assessment scenario in many countries is thought of as weak practice (Black & Wiliam, 1998). Berry's (2011) work in Hong Kong SAR establishes the many difficulties that are faced when seeking to establish formative assessment in an examination-oriented culture.

2.2. Issues and Concerns about the Practice of Formative Assessment

Although many researchers view assessment for learning and formative assessment as effective strategies for enhancing student learning, there are several issues surrounding the widespread use of these approaches in primary schools today. Cizek (2010) identifies time constraints of teachers to develop and implement formative activities in the classroom. Buck and Trauth Nare (2009) found that teachers had concerns about finding time to give students feedback. Some teachers were still uncertain about how to continue instruction after receiving data from formative assessments and while they were aware of formative practices, they continued to assess mainly for summative purposes (Bennett, 2011). Black and Wiliam (1998) suggested that most teachers fail to have a clear understanding of the practice with no common agreement on how it should be used. Research has suggested that teachers lack the skill and knowledge to implement it (Bennett, 2011) and that formative approaches were not used to their full potential, but were reduced to mechanistically applying a set of principles (Swaffield, 2011). Elwood (2006) claimed that one of the problems in implementation is that often only certain "principles" of formative assessment have been adopted, without much consideration of the broader implications for classroom practice. Identifying teachers' assessment beliefs and experiences is a first step in creating a vision for the design and implementation of effective formative assessment practices in the classroom (Hammerman, 2009).

Formative assessment in the online environment has also faced many challenges. Kearns (2012) stated that special challenges exist in assessing student learning in online environments. These include the ongoing need to collect a variety of assessment data and consistently provide feedback, time management needs and adaptations resulting from the use of technology for communication. Webb et al. (2018) acknowledged that measuring affective learning in an online environment is extremely difficult and noted the presence of inconsistent feedback mechanisms among teachers.

A study conducted in Turkey identified common problems faced by instructors in the evaluation process (Yilmaz, 2017). Among these are the time and effort that are needed to prepare and evaluate formative tests and assignments online as well as teachers' inability to prevent cheating or other forms of academic

dishonesty on online tests. In assignments and projects, the integrity and validity can be severely compromised by students using the same assignments and copying from each other or copying and pasting random items found on the internet as representations of their own work (Yilmaz, 2017). Similar to the concerns emanating from research in Turkey are concerns about teachers' practice of formative assessment in Trinidad and Tobago.

2.3. Research Questions

1) What are primary school teachers' beliefs about formative assessment in mathematics?

2) What are the teachers' classroom practices in implementing formative assessment?

3) What are the major challenges experienced in face to face as well as in online formative assessment practices in mathematics?

4) In what ways do interviews and focus group discussions with participants help to elucidate quantitative differences in teachers' beliefs and perceptions about formative assessment practices in mathematics?

3. Materials and Methods

A convergent mixed methods design was adopted to provide a more in-depth examination of the complexity of the experiences of primary school teachers in using formative assessment in both virtual and traditional classrooms. This design involves collecting both quantitative and qualitative data separately but converging them during the interpretation and analysis stages. The quantitative aspect involved examining the responses of a sample of fifty (50) practising primary school classroom teachers to a questionnaire. Qualitative data derived from focus group and individual interviews complement and clarify quantitative data obtained by administering a questionnaire to a larger, more representative sample (Creswell, 2014). Narrative inquiry was used to examine personal experiences and perspectives of three teachers in separate one-hour interviews.

3.1. Participants

A purposive sample of fifty (50) in-service teachers was chosen from 10 schools in the city of San Fernando in South Trinidad, twenty-five (25) of whom were recently graduated teachers of the Bachelor of Education programme of the University of Trinidad and Tobago. These teachers were assigned to classes at different levels of the primary school, from infants to the Standard Four class level. Teachers were generally between the ages of 24 - 35 years, with a significantly lower number of males (7) when compared with females.

3.2. Data Collection

Data collection involved the use of questionnaires (administered both face to face and on-line), focus group interviews and individual interviews of three

teachers. Questionnaires were used to obtain demographic information as well as obtain data on differences in perceived levels of competence and formative assessment activities. Focus group interviews were conducted to obtain qualitative data for the study. The interview was guided by a six (6) item interview schedule which focused on specific issues of concern of formative practice. Focus group interviews aided in obtaining greater depth, focus and detailed description on the issues of interest. The focus group method of data collection provided for attaining some degree of triangulation to data acquired through the questionnaires and allowed for clarification of ideas concerning teachers' experiences. It allowed for obtaining more personal and in-depth information on teachers' reported classroom assessment practices. Focus groups also generated the opportunity to collect data from group interaction, which concentrates on the topic of the researcher's interest. Three individual interviews provided additional information about teachers' specific formative assessment practices in mathematics and challenges faced in online activities as well as face to face assessment practices.

3.3. Data Analysis

Procedures for quantitative data analysis involved the use of descriptive statistics to summarize and compare the data that emerged from the questionnaires. This included demographic data, and responses on survey items to perceptions of formative assessment practice. Procedures for data analysis of both the focus group and individual interviews included sorting and organizing the data, coding, constructing and reconstructing categories, generating themes and patterns and checking emerging theories. All focus group sessions and teacher interviews, which were audio-taped were transcribed to obtain verbatim accounts by teachers. As advocated by Creswell (2014), major common ideas emerged after comparing the data.

3.4. Limitations of the Study

The study focused on the beliefs and experiences of a specific group of fifty (50) in-service primary school teachers selected from ten schools within an urban community in Trinidad and Tobago. The social and cultural context in which the study was conducted is unique to the geographical area. As such, the findings of this study may not be generalizable to the entire country or to the entire teaching community.

4. Results and Discussion

4.1. Survey Results

All teachers who participated in the study were asked to share their beliefs about formative assessment as well as activities which define their practice. Fifty (50) teachers completed the survey. Table 1 below provides a summary of teachers' responses to survey items 5 - 13 which addressed **Research Questions 1-3** regarding

Table 1. Percentage of responses on survey items relating to formative assessment.

Survey Items	Teachers' Responses
I believe that teachers should always share the criteria and rubrics for mathematical tasks.	Of the 50 respondents, 42 indicated agreement while only 3 disagreed; 5 uncertain.
I introduce topic goals and objectives as a compulsory activity in my teaching.	40 out of 50 indicated agreement while none disagreed; 10 indicated uncertainty.
Teachers should create opportunities for pupil self-assessment in mathematics classes	All 50 respondents either agreed or strongly agreed with the statement.
I designate time in all my math classes for student self-assessment.	Of the 50 respondents, 15 indicated that they designated time always and frequently; 10 said sometimes; 25 indicated never.
Peer assessment in mathematics definitely improves learning.	32 respondents indicated agreement; 18 were uncertain of their response.
I designate time in all my math classes for peer assessment.	Of the 50 respondents, 15 did so always and frequently; 10 sometimes; 25 never.
Planning and implementing formative assessment is challenging for me.	41 out of 50 respondents agreed; 7 disagreed; no response by 2.
Planning and implementing online formative assessment is challenging.	44 out of 50 agreed; 6 disagreed.
I need help in developing formative assessment.	20 indicated agreement; 23 were undecided; 7 respondents disagreed.

teachers' perceptions about formative assessment in mathematics as well as major challenges experienced in implementing formative assessment in both face-to-face and online settings.

Table 2 summarizes the most preferred formative assessment techniques of the fifty (50) primary school teachers who participated in this study. Traditionally, the preferred formative assessment techniques have been pencil and paper open-ended mechanical and problem-solving tasks. However, this is not the preferred mode for online assessment. In subsequent interviews, teachers stated that open-ended tasks yield questionable data in the online environment and frequently need to be triangulated with oral questioning and explanation to ensure that they are authentic evidence of students' own work. As such, oral activities are the second most preferred formative assessment practice in mathematics classrooms.

4.2. The Following Is a Brief Account of the Experiences and Challenges of Formative Assessment of Three In-Service Teachers (John, Brenda and Rachel)

John's experience

John says: *I have always been thrilled by the idea that assessment could serve a greater purpose than only ranking students and preparing them to receive*

Table 2. Most Preferred formative techniques for face-to-face classes and online classes.

Assessment type	In-class activities	Virtual or on-line activities
Open-ended problem solving	20	
Oral questioning	15	
Written assignments	7	
Self-assessment tasks	3	
Peer-assessment tasks	3	
Group projects	2	
Online open-ended problem-solving activities		4
Online multiple choice		20
Online oral		10
Online Assignments		5
Online self-assessment tasks		5
Online peer assessment		5
Group online tasks		1
Total	50	50

report cards to take to their parents as a judgement call at the end of the term. As a recent graduate of the university, I had been assessed through many different formative activities in what has been called coursework. And while this has been worthwhile in the sense that student teachers are given feedback on their coursework performances in order to prepare them for the final examination or summative exam ahead, the feedback can sometimes be of a superficial nature since it may not always be timely, it is done in a more bureaucratic manner to fulfil regulations and mandates of the university, rather than the purpose of empowering the student and enabling him to self-reflect and subsequently do deep introspection into the causes of his misconceptions.

Sadly, I believe that this phenomenon of superficial formative assessment for the sake of generating "marks" indicative of one's performance also prevails in the primary school system of which I am now a part. I believe that much of the research on formative assessment and good formative practice has not filtered its critical details into the practices of teachers in the primary school. We do assess periodically and continuously; and we do provide feedback, mostly orally, to our charges, especially in mathematics, but critical elements are missing.

With the change in our methods to online assessment instead of face-to-face classroom interaction, the opportunities for teachers to provide formative activities are available in a greater way because we can monitor an individual student's work through his online submissions of open-ended tasks, through his completion of multiple-choice quizzes and through his oral responses to questions posed during a mathematical activity.

But online assessment has its challenges. With primary school classes containing over 30 students each, it is difficult to attend to the needs of individuals on a case-by-case basis, and provide effective assistive feedback to address 30 plus unique misconceived ideas. I would like to provide feedback in the form of short private conferences or documented comments and online notes to specific students to address their specific needs... but when will I have time to teach? There seems to be potential in the ability to integrate teaching and assessment through online activities done with the class, but if we are to look at assessment as individual accountability and assessment as feedback for individual learning, it becomes a challenge. We must find ways to address the formative-summative gap and the Ministry of Education must help teachers by providing some structured mandate to ensure that this can be done. Maybe, with the shift to online learning in the teaching of mathematics, which is already a challenge, we might quicker embrace opportunities for professional development into how we can make what is summative very formative.

John's experience suggests that he is optimistic about greater use of formative assessment activities in mathematics classrooms in the primary school but he is cautious in terms of seeing systematic change.

Brenda's experience

Brenda spoke in great detail about the challenges faced with implementing formative assessment activities in mathematics in an online environment. She has also been a recent graduate of the Bachelor of Education Programme of the University of Trinidad and Tobago and has been enthused by the use of alternative assessment strategies in mathematics such as portfolios, journals, oral discourses and presentations as well as exhibitions of the processes undertaken in mathematics problem solving activities.

Brenda believes: *"Performance assessment" strategies are ideal avenues for formative assessment because they involve essential traits of formative assessment they require the teacher to share the goals or objectives of an activity and share the rubric for a math performance before students begin to work. Alternative assessment strategies present goals for students to be aware of and work towards. They involve assistive feedback which can be given by the teacher, given by their peers or even given by their own review and reflection. New assessment strategies in mathematics are based on the need to pose critical, strategic questions in order to stimulate the thinking process to go forward.*

Brenda believes that these "new" or "alternative" assessment strategies are ideally matched for use with formative assessment. Their purpose is served in a greater way by ensuring that students learn and enjoy learning rather than for assigning a mark. Brenda believes that teachers' dispositions towards these forms of assessment vary because they represent a paradigm shift from teacher centred or teacher-controlled activities to child-centred activities in math learning.

Brenda states: *It is the same with formative assessment. The purpose and the philosophy behind it are different. Formative assessments are for feedback, not*

feedback to parents, or for school records, or for promotion potential, but feedback for intrinsically driven self-improvement. Maybe we as teachers need to visualise formative assessment as an additional strategy for teaching, rather than a strategy for testing. Alternative assessment strategies serve the greater purpose of letting students know where they are in a deep and profound way; and knowing where we need to go afterwards. Traditional assessments like written term tests don't do this. We need alternative assessments for students to form their learning.

Brenda's experience suggests that formative assessment must be conceptualised as assessment for learning or assessment to help learning and advocated the use of alternative assessments, especially for online activities, as critical ingredients for effective formative assessment. Brenda's interview also yielded the suggestion that teachers need to be sensitized to all the processes of formative assessment in addition to assistive feedback-sharing of learning goals, strategic questioning and self and peer assessment as advocated by Black and Wiliam (1998).

Rachel's experience

Rachel has been a primary school teacher for the past twenty-five years. She described her introduction to using formative assessment as "*testing to find out what help students need*". Initially, she had a negative perception of it thinking that it was additional work and responsibility. She was not clear on the distinction between formative assessment and summative assessment. Her understanding of formative assessment practice only developed over a period of time from conceptualising it as a product or result rather than a process. Rachel credits the development of a clear understanding of formative assessment to working together with her peers to plan activities. She also credits it to training and peer discussion of samples of completed student work followed by proposals on how instruction should proceed thereafter.

She admits that her initial understanding of formative assessment was only linked to providing feedback on student performance to direct them to further goals. She acknowledges some major barriers in face-to-face classroom assessment practices as well as administering formative assessment in a virtual environment. These barriers include the lack of time to give students feedback on their performance, time for creating and implementing formative activities in the classroom and classroom disruptions or student misbehaviour and inattention to guidelines for self-examination.

Rachel is not very confident in her ability to undertake self and peer assessment activities; she also believes that they take much instruction time and these "innovations" distract from focus on learning activities. Open-ended written problems to be solved are the main type of activity used within class sessions to provide students with feedback online through written and oral comments. But Rachel is concerned of the impact these have on student's future performance in an online setting. She states, "*The process of preparing and assessing students online*

requires a lot of time and effort. In addition, it is difficult to ensure that all students are actively participating in online mathematical activities. They can be sitting passively at home or in a remote location, being assisted by others and it is difficult to ascertain the validity of their work, even through vigorous questioning."

Rachel believes that *online formative assessment is extremely difficult to conduct, lacks validity and is extremely time consuming.* This view is also echoed in Kearns's (2012) study which highlights challenges in assessing student learning in an online environment. Cizek (2010) also identifies time constraints of teachers to develop and implement formative activities in the classroom. Rachel's interview provided information which sensitised teachers to the new challenges of online assessment, while acknowledging that previous challenges of validity and reliability in formative assessment are yet to be addressed in the educational scenario.

4.3. Summary of Focus Group Findings

Five focus group interviews were carried out with a smaller sample of individuals to obtain more detailed and descriptive data about teachers' beliefs and experiences. These interviews provided greater clarity, insight and data on the reported classroom assessment practices of teachers. Each group comprised six to eight teachers who provided responses to the following six questions:

1) Based on your classroom experience, what do you understand by the term "formative assessment"?

2) What strategies do you generally use in your schools for formative assessment in mathematics? Are there structures in the school to facilitate this?

3) How do you think formative assessment could be more effectively used in mathematics to help children's learning of mathematics?

4) What are the challenges of emphasising formative assessment in a school system that is referred to as examination oriented?

5) What would you as a practising teacher recommend to school administrators to create greater focus on formative practices at schools?

6) Share your views and experiences on strategies of groupwork, self-assessment and peer assessment which are advocated in the literature as critical ingredients of implementing formative assessment.

Teachers' beliefs about the nature and purpose of formative assessment or assessment for learning

There was general agreement that feedback is necessary for formative assessment and should be done on a regular basis. A common trend in these discussions was that participants in all of the focus groups chose to highlight the concept of feedback provision to children in today's classrooms without specifying specific ways in which it should be done or by whom. Participants agreed that feedback enhances learning and that there is need to provide constant feedback to children. Individuals stated that the benefit of creating a "culture of feedback"

is that it allows students to be part of the learning environment and to develop self-assessment strategies that will help with the understanding of children's own thought processes. However, participants indicated that the current structure of the educational system in Trinidad and Tobago does not allow for proper and effective feedback mechanisms.

It was reported that *assistive feedback to students is difficult when teachers are faced with the demands of a heavy workload, limited time frames for properly preparing children for official summative tests and other designated daily responsibilities. There is a need for a more rigid structure for the operationalization of assessment for learning in all classrooms. Unfortunately, structures are not present and it becomes burdensome for teachers.* Members of one of the focus groups concluded that the idea of feedback to one's students from frequent assessment is great in theory but more manpower is required to accomplish this effectively.

Teachers' beliefs about the presence of structure in the school system to facilitate formative assessment

Generally, the prevailing responses from individuals in the focus group interviews were that there was no fixed structure or pattern that teachers are mandated to follow with respect to ensuring that formative assessment practices are carried out, especially in the subject area of mathematics. A participant remarked, "*Largely, everyone does his own thing when it comes to assistive feedback.*"

Some practices which seemed better able to promote formative assessment included teacher/parent and student conferences, as mentioned by one teacher. At these conferences, the teacher noted errors and misconceptions during the students' mathematics activities, and addressed them in the presence of the parent at a stipulated time period. One teacher scheduled time slots for each parent and child, and allowed for an interactive experience among parent, child and teacher, so that the parent left with enhanced knowledge and skills to guide the student's learning and remediation at home. She noted however, that this was in reality an overwhelming experience because of the time factor for catering to a large number of diverse individual learning preferences and strategies. In this discussion, she was reminded by her colleagues that the type of feedback under discussion was one "*strictly between teacher and child in the mathematics classroom, to help the child on his own.*"

The general consensus was that if teachers are able to document strengths and weaknesses from their assessments in a detailed way, and use this information to shape subsequent teaching activities, then assessment would be effective by directing the teaching task based on feedback on students' learning needs. One teacher noted that while it did not exist in her school, a recommended practice to support the use of feedback would be to spend a scheduled period of time, after results of an assessment task are provided to pupils, allowing pupils to correct their errors and orally present these to the class. The time factor, neverthe-

less, was a great area of challenge to the success of this strategy.

In summary, the focus group responses suggested that many primary school teachers have varying perceptions of what the idea of assistive feedback through assessment entails. Teachers are generally driven by the philosophy and practices of formative assessment in their teaching experiences. In the primary school there is no standardized or overarching structure to facilitate formative assessment practices by all teachers.

Constraints of using assessment practices for the purposes of providing assistive feedback rather than only for promoting competition

The general conclusion was that this may not be an "either-or" situation. The essence of responses was that students are surrounded by a culture of motivation through marks, ranking and competitiveness. Thus, it may take quite a while to shift the cultural beliefs of our society about assessment. Teachers generally agreed that there needs to be a balance of both assessment for reporting and assessment for assisting. Teachers however stated that in reality this balance is almost impossible because our education system has trained teachers for many years under the paradigm that we assess students mainly to obtain "scores" or "marks" and to rank them.

Another argument put forward was that assessment for feedback is not always practical. Students look forward to receiving marks and ranking and this in itself provides the stimulus for self-assessment and self-corrective instruction. Within the discussion, one participant stated:

We need to discover new methods in which we as teachers can get students to study for both formative and summative assessments as both are equally important.

It was agreed that changing the focus of the purpose of assessment to mainly a means of providing assistive feedback would also require changing parents' perceptions of assessment. One respondent stated:

"*In today's competitive world, these perceptions may also be shared by future employers, universities and school administrators motivated by high scores and best performers and achievers.*"

In summary, while teachers agree that assessment must serve the purpose of providing assistive feedback to students, it is recognized that the competitive nature of assessment is not a matter over which teachers and schools have control.

Recommendations for creating greater focus on practices of assessment for learning in schools

Another intensely discussed issue was the potential of formative assessment to be given greater emphasis in schools and this reinforced some of the responses provided for the previous question which identified constraints of focusing on formative assessment practices.

Many individuals from within and across focus groups agreed that teachers need to be sensitized to a greater understanding of the value of formative assess-

ment. Three specific recommendations which were commonly shared were: 1) workshops should be planned through the educational districts of the country to educate teachers; 2) a review of the national curriculum to enable greater use of formative assessment practices by teachers of all levels; and 3) a mandate for formative assessment procedures to be documented by teachers in their record-keeping activities so that there is greater teacher accountability in the use of assessment procedures that aid learning rather than simply record the extent to which they have occurred.

It was agreed that if a greater focus is to be placed on formative assessment activities in schools, parents and other stakeholders must be sensitized and educated on the benefits of formative assessment so that they understand and appreciate the idea of assessment as a vehicle for providing assistive feedback through different activities.

There was consensus within all the discussions that teachers must use formative assessment strategies in the classroom to prepare students for summative assessments. In the focus group discussion, one participant suggested that "*alternative assessment methods like oral presentations are controversial when used as summative assessment strategies*". The view expressed was that when used as assessment for learning activities, they have an invaluable contribution to pupils' feedback and learning experiences. A summary comment was: "*We as teachers must ensure that formative assessments are adopted as whole school approaches by teachers if the whole institution is to attain success in summative assessments. Let the formative provide the feedback to enhance pupils' performance in the summative.*"

Beliefs about the use of group work as a formative assessment strategy

Almost all teachers interviewed were amenable to the use of group work for completing formative tasks. General responses indicated that group work is good because it allows stronger students to help weaker ones and allows the stronger ones to build on their own strengths. Teachers stated that it was good because it develops team spirit and cooperation which are important attitudes necessary for real world tasks. Group work in the primary classroom builds confidence and makes the teacher's task much easier. It gives responsibility to students so that they can evaluate themselves and others and provide scaffolding, rather than wait on the teacher's directions at all times. Group work helps to create a greater bond among students and strengthens their understanding of their peers.

Beliefs about self-assessment and peer assessment as formative assessment components

There were supportive as well as non-supportive views for the use of peer and self-assessment in the primary school mathematics classroom. One major caution as highlighted during discussion was that the process of self or peer evaluation is a strategy that must be taught by teachers first to their students and then practised; otherwise exercises in this task could become very superficial and lack any meaning. A substantial number of teachers in their groups never tried these

assessment strategies. In some focus group discussions, teachers found them to be very practical. They reported that they helped students and peers to understand where they went wrong and what improvement needed to be made with their work. The reported identified benefits were that students become more confident in themselves as they give themselves and their peers a score or a comment which they think is really deserved. Another reported benefit was when correction is done by a peer and feedback is given, students seem to remember their errors more; peer assessment encourages long term learning. Peer assessment allows students to self-correct themselves by highlighting their own strengths and weaknesses and making them self-directed learners.

Teachers were also very vocal in identifying limitations of peer assessment. Among the criticisms were the setback in students favouring their friends and showing bias in their feedback; the interaction of suitable as well as unacceptable student dispositions for engaging in this process; the impracticability of the process due to age level and maturity level of students. This seems to reinforce the first contribution made, "*we need to teach this process of assessment first before using it; otherwise, exercises in this task could become very superficial and lack any meaning.*"

4.4. Summary

In summary, teachers possess varied experiences of formative assessment in mathematics in the primary school. Generally, they acknowledge that it is a challenging and time-consuming task in terms of time for planning formative assessment as well as giving students individual feedback on their performance. Although teachers are aware of different formative practices, they hold differing views on the most appropriate methods for providing feedback. Survey responses yielded general agreement with philosophies or major guiding principles of formative assessment such as sharing of learning goals and success criteria as well as opportunities for peer and self-assessment. However, noticeable degrees of uncertainty exist in teachers' ability to implement these principles in their daily practice.

Most preferred formative techniques in the online environment involve multiple choice quizzes and oral feedback in online Zoom sessions in mathematics, while the "pencil and paper" solving of open-ended problems and strategic questioning are among the most common in the traditional "face to face" environment. The interview responses of three teachers highlighted different challenges faced in the primary system. Data from focus group interviews also illustrate that while formative assessment holds much potential both in the authentic and virtual classrooms, many issues exist, which hamper its accepted and universal use in primary schools today.

Table 3 provides a summary of qualitative responses to quantitative results emerging from the study. The Joint Display serves to answer Research Question 4: In what ways do interviews and focus group discussions with participants help

Table 3. Joint display of quantitative and qualitative results.

Quantitative Results	Qualitative Results	How Qualitative Approach helped to explain Quantitative Results
Beliefs about Formative Assessment in Maths *100% of participants believe that teachers should create opportunities for pupil self-assessment in Math classes *64% of participants agree that peer-assessment in mathematics improves learning	Participants in focus groups and interviews advocate for the use of alternative assessments measures in online classes e.g. self-assessment and peer-assessment Teachers in focus group discussions agree that assessment should serve the purpose of providing assistive feedback to students Almost all teachers believe that group work develops team spirit and cooperation as well as builds confidence in weaker students	Qualitative interviews confirm quantitative results about the importance of formative assessments in mathematics both in face-to-face modality as well as online settings. While participants agree that formative assessment should provide assistive feedback to students, they acknowledge the challenges of time constraints and other difficulties faced by teachers operating especially in the online environment
Classroom Practices in Implementing Formative Assessment *40% of the participants want help to develop formative assessments *50% of respondents admit that they never designate time for student self-assessment	Teachers interviewed indicate that there is no fixed structure or pattern for teachers to follow regarding how formative assessment practices should be conducted in schools. Some confess that this practice does not exist at their schools While some teachers engage in teacher/parent and student conferences, time constraint is a major deterrent in engaging students in this type of formative assessment.	Qualitative interviews highlight the need for teacher workshops to facilitate better understanding of the value of formative assessment. There is also the need for curriculum review to include formative assessment practices by all teachers at all levels in the school system; as well as greater teacher accountability measures in the use of assessment procedures that aid student learning
Major Challenges Experienced in Face-to-Face and Online Formative Assessment Practices *67% of respondents admit to experiencing difficulties implementing face-to-face formative assessment *88% of teachers find it challenging to implement online formative assessment	Respondents point to the time-consuming nature of formative assessment, due to heavy workloads Persons interviewed generally believe that online formative assessment is difficult to conduct, lacks validity and is extremely time consuming	Qualitative interviews corroborated quantitative findings on the need for formative assessment to be conducted on a regular basis. Participants agree that feedback obtained through formative assessment and communicated to parents, also facilitates effective intervention by parents on a continual basis rather than a one-off event in a term test report. There is the widespread view, however, that the existing structure of the Trinidad and Tobago education system does not allow for proper and effective feedback mechanisms.

to elucidate quantitative differences in teachers' beliefs and perceptions about formative assessment practices in mathematics?

5. Recommendations

Although teachers have a duty as educators to focus on formative strategies in their teaching, education systems are dominated by assessment for selection and

certification purposes. As such, whether or not teachers are disposed to assessment for learning practices, the decision to use them may often not always be just a matter of teachers' personal or professional choice. The school might be likely to demand written reports to generate assessment information for its own internal purposes and teachers may be compelled to "follow the line". The results of this study are congruent with the comments of de Lisle (2015) who investigated formative assessment practice in Trinidad and Tobago. He found that generally, programme planners' formative intent for assessment programmes is often not fulfilled. Formative assessment practices are not always congruent with teachers' pedagogical beliefs and practices. As teachers, a balance must be struck between the focus on standardized tests of learning and classroom assessment *for* learning. Wiliam and Black (1996) conclude that the ideal is a synergy between assessment *of* learning and assessment *for* learning, but there are fundamental differences between the two which make it hard to merge.

For success, there must be a new vision and a clearer understanding and acceptance of assessment for learning by all teachers. Greater professional development opportunities and increased research on current assessment for learning practices used in primary schools in Trinidad and Tobago are critical. According to Stiggins (2008), educators need to design and implement a more definite course of action that will enable all teachers to realize the promise of assessment for learning and to engage their students to become more active participants in their own learning while being assessed. We need to create a new culture of feedback on mathematics learning, create a more rigid and accountable structure for operationalization of assessment for learning in classrooms; and change the mindset of society that assessment is only about the purpose of reporting and grading and selecting. That seems to be the only way.

6. Conclusion

The findings of this study are congruent with previous research findings of Wiliam (2011), Stiggins (2008) and others who recognize the need for greater professional development opportunities for teachers in assessment literacy, particularly the phenomenon of assessment for learning.

Assessment literacy programmes provided to teachers must pay greater emphasis on the concept and practice of formative assessment as assessment for learning. Teachers generally seem to conceptualize feedback as the major and only component of assessment for learning practice and are generally vague in their understanding of the nature of this feedback to primary school learners and exactly how feedback will be used to shape learning in the future. It is evident that teachers need to be provided with a greater practical understanding of the practices of sharing learning goals, effective questioning techniques, especially using hinge point questions and facilitating self and peer assessment. This understanding is essential for teachers to successfully implement valid assessment for learning strategies in their mathematics classrooms. Based on the study, it

appears that teachers are still immersed heavily in the summative assessment paradigm which dominates the culture of assessment in primary schools in Trinidad and Tobago.

It is crucial that future teacher education programmes and professional development experiences are designed to provide teachers with contemporary insights into learning and assessment. Specifically, these initiatives should emphasize the acquisition of skills required to create formative assessment tasks that stimulate students' higher-order thinking abilities. This approach enables a critical evaluation of students' growth and progress towards educational goals that were previously perceived as elusive until now.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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