

INVESTIGATING INCLUSIVE TEACHING: Teachers' Understandings About Using Differentiated Instruction and Formative Assessment at a Primary School in Trinidad

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Abstract

As student academic diversity increases, more effective pedagogical interventions are required to meet learner needs. Differentiated instruction (DI) and formative assessment (FA) are interventions that provide information on students' learning gaps, thereby informing teachers' instructional strategies. Although these interventions are mentioned in the national primary school curriculum, inappropriate implementation reduces classroom effectiveness. This qualitative case study investigated teachers' understandings of DI and FA at a primary school in Trinidad, using a conceptual framework undergirded by the theory of situated learning. Data were collected from three teachers using interviews, observations and lesson plans. Research questions investigated were: how do teachers' understanding of DI affect their pedagogical practices and how do teachers' understanding of DI influence FA practices? Six themes emerged from the data for the former question and three for the latter. The findings suggest that teachers generally understood DI as learning styles rather than learning profiles. Misunderstandings about FA and challenges to consistent practice also emerged. Recommendations for clarifying misconceptions, supporting quality teaching, and conducting future studies are included.

Introduction and Background

Rising global levels of academic diversity in schools have heightened the need for differentiated instruction (DI) in classrooms. According to Tomlinson (1999), "Differentiation is a teacher's proactive response to learners' needs guided by the general principles of differentiation" (p. 15). Differentiated instruction involves clarification of curricula content that students are expected to learn. The pedagogical strategies which teachers use to teach/clarify the content are also important. Students should then be able to demonstrate what they have learnt through assessment. Boyle and Charles (2014) posit that DI is a process by which teachers adapt the

curriculum objectives, teaching/learning strategies, resources and assessment to match the educational needs of individual students. They further agree with Tomlinson (2014) that teachers can differentiate through content, process and product. A nurturing environment, responsive pedagogy and quality curriculum in the context of student readiness, interest and learning profile are also essential elements of the intervention. Formative assessment (FA) is also critical component.

According to Popham (2008), FA is a process which informs adjustments to instructional strategies toward achieving stated learning outcomes. Boyle and Charles' (2014) definition of FA goes beyond teachers achieving curriculum objectives. It includes teacher-awareness and comprehension of students' understanding and progress. They posit further, that attention to student thinking will result in lesson plan changes in alignment with how students understand and approach concepts. Thus, FA is an important part of the process as it allows teachers and students to adapt their actions in the teaching/learning process based on feedback. Therefore, FA cannot be an "intermittent" affair, as in weekly and term tests (Boyle & Charles, 2014, p. 13).

Locally, definitions and models of DI and FA are not explicitly stated in the national instructional toolkits and curricula guides. However, the Ministry of Education's Policy Document (2023–2027) highlights that "curriculum reform is an essential activity necessary for relevant curricula in a rapidly changing world" (Ministry of Education, 2023, p. 27). DI and assessment for learning/FA are among the six core components included in the primary school curriculum (Ministry of Education, 2023, p. 27).

The comprehensive Peters et al. (2008) report, which followed the Ministry of Education's commissioned study of the education system of Trinidad and Tobago, recognised student diversity, as a high number of students were suspected of having cognitive/learning disabilities in schools in Trinidad and Tobago. The report recommended, inter alia, the establishment of an assessment system and curriculum differentiation. The national primary school curriculum sought to address these recommendations for curriculum change (Curriculum Planning and Development Division [CPDD], 2013).

The purpose of this qualitative case study was therefore to explore teachers' understandings of the practice of DI and FA at a selected primary school. To contextualise the study further, perspectives on DI at the international, regional, and national levels were reviewed. FA practices are also examined.

Investigating Inclusive Teaching: Teachers' Understandings about using Differentiated Instruction and Formative Assessment at a Primary School in Trinidad

Differentiated Instruction in the International Context

Qualitative case studies conducted in the United States revealed that teachers generally held strong self-efficacious and positive beliefs about the impact of DI on student achievement (Hall, 2018; Morrison-Thomas, 2016). Hall (2018) unearthed the following major themes in her study: assessment, differentiated teaching strategies, students' diverse academic needs, challenges with implementation, curriculum issues, and professional training. Teachers found that there was a need for professional training, in light of their struggles with implementing differentiation to a widening academically diverse group of students. Generally, it was found that teachers' understandings of the intervention were based on their education, experience, and in-service professional development (Hall, 2018)

Niccum-Johnson (2018) also found DI to be useful in meeting the ever-changing needs of the expanding academically diverse student population. Findings by Cunningham (2015), King (2010), and Lange (2009) also revealed that teachers found differentiation to be useful in meeting the intellectual needs of a diverse number of students. Niccum-Johnson (2018) supported the view held by Hall (2018) that the successful implementation of differentiation required the collaborative support of well-trained teachers and administration.

The findings related to barriers included teachers' use of a limited repertoire of differentiation strategies, for example, small groups, individualised teaching, and literacy corners. Hall (2018) and Niccum-Johnson (2018) found that student behavioural issues negatively impacted the consistent use of the elements of DI. Other barriers included inconsistent and sometimes incorrect implementation of differentiation by teachers, even those trained in the intervention (Gordon, 2007; Morrison-Thomas, 2016; Niccum-Johnson, 2018). Lack of teaching resources was another issue that negatively impacted the practice. (Morrison-Thomas, 2016). King (2010), in a qualitative study, found that inconsistent practice of differentiated instruction was linked to time constraints for planning, increased student academic diversity, and limited professional training.

Differentiated Instruction in the Caribbean Context

Caribbean governments support the right to free public education. Consequently, policies and practices that promote inclusive interventions were formulated. The movement towards DI as an inclusive curricular intervention is also evident in St. Lucia (Mathurin, 2018), and in the US

Virgin Islands (Scott, 2021). It may be concluded therefore that greater attention is being given to inclusive education in the Caribbean.

Mathurin (2018), using a case study, investigated teacher experiences with the implementation of DI in five selected secondary schools in the northern district of St. Lucia. The findings revealed that 100% of the sample population of 20 teachers were fully trained in DI. However, Mathurin (2018) found that while all teachers provided working definitions and understood the importance of DI, only 55% used the intervention in their classrooms. These teachers found that they experienced success using various assessment methods, reteaching, flexible grouping, peer-tutoring and manipulatives. However, despite the positive experiences of some participants with the intervention, others identified barriers to implementation. Barriers included lack of support by school administration, lack of resources, difficulties with classroom management, large class sizes and limited time for planning (Mathurin, 2018).

The findings of Scott (2021), in a study of 15 teacher-participants in the US Virgin Islands, were that there was inconsistent application of Weimer's learner-centred teaching theory in differentiated instruction. Teachers were expected to practise DI in a way that used more student-centred teaching strategies to empower students. The theory advocates placing greater emphasis on curriculum relevant to real life, increased autonomy of learners, and FA. Similar to the findings by Mathurin (2018), limited teaching resources was cited as a barrier to implementation.

Differentiated Instruction in the National Context

A review of the available research on DI in Trinidad and Tobago revealed that there is a measure of implementation of the intervention. The instructional toolkits (CPDD, 2013) list DI and FA in the specimen lesson plans provided, for example, in the Standard three kit (p. 88).

A study of the experiences of pre-service and in-service trained teachers was conducted by Joseph (2013) who investigated teacher understandings and the extent of classroom practice. Analysis of the data revealed that approximately 58% of the teachers sampled had some understanding of the elements of DI. Their understandings included the availability of resource materials, grouping of students according to readiness, reteaching and the use of peer-tutoring. However, less than half of the teachers had sufficient understandings about DI strategies. It was

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

also found that most teachers differentiated instruction in terms of process rather than content or product.

Other studies revealed different issues that negatively affected the implementation of DI. These included inadequate school infrastructure, heavy workloads (Beepot, 2017), limited classroom space, inadequate formal and informal professional training (Beepot, 2017; Sutherland-Kalisingh, 2017). Stephen (2014) also found barriers, such as a loaded curriculum and lack of support from school administration. Studies conducted by Beepot (2017), Joseph (2013), and Sutherland-Kalisingh (2017) sought to create a better understanding of teacher experiences with the implementation of the curriculum initiative in the national context. A review of the literature seemed to indicate that there is increased awareness about DI in Trinidad and Tobago. However, there are issues with its implementation, such as inter alia, the inadequate provision of teaching resources and support from school administration. It should also be noted that these studies did not highlight FA.

FA should be an important part of the differentiated classroom (Sousa & Tomlinson, 2011). High priority should be given to FA in teacher-planning because it supports the identification of students' learning needs. Thereby, it facilitates the setting of differentiated targets during lesson planning (Boyle & Charles, 2014). However, despite the benefits of FA, Boyle and Charles (2014), based on a questionnaire used to collect evidence of schools' prioritisation of FA, found that only 6% of the respondents stated that FA supplied an "accurate way to set targets" (p. 16). Studies by Boen (2010) and Droke (2013) showed that participants had low levels of understanding about the association between DI and FA in the response to intervention (RTI) framework. According to Boyle and Charles (2014), teachers have different ideas about the nature and purpose of FA.

This section mainly examined studies about teacher understandings of DI that were conducted internationally, in the Caribbean, and Trinidad and Tobago. The literature reviewed and the researchers' observations suggest the need for more research on teacher-raised issues, such as their understandings and experiences (Lange, 2009), regionally and nationally. Additionally, empirical evidence about the use of FA and the repertoire of differentiated strategies used for the spectrum of learners needs to be made available. This study is situated within that gap.

Statement of Problem

While teachers generally seem to appreciate the value and benefits of DI, they seemed to experience challenges that lead to inconsistent and/or inaccurate practice (Hall, 2018). Beepot (2017) and Stephen (2014) posit that lack of professional training could be a contributory factor in teachers' limited practice. In general, FA was also done sporadically, not necessarily resulting in instructional decision-making.

Peters et al. (2008) conducted a study of the education system in Trinidad and Tobago in 2007. They recommended the introduction of a more inclusive curriculum and assessment system (Peters et al., 2008). This led to the introduction of a new national primary school curriculum in 2013 that advocated the use of DI and FA. In the present study, the researchers investigated teacher understandings about DI and FA in one primary school in the Mahogany Educational District. Empirical evidence based on interviews, classroom observations and review of lesson plans suggested concerns with implementation of DI and FA.

Research Questions

The main research question of the study was: what are teachers' understandings about the practice of DI and FA in the delivery of the curriculum at a primary school in Trinidad?

The two sub-questions investigated were:

1. How do teachers' understandings about DI impact their pedagogical practices?
2. How do teachers' understandings about DI influence their FA practices?

Purpose of Study

The researchers sought to gain a greater understanding of the implementation of the 2013 primary school curriculum pertaining to the practices of these interventions. Fulfilment of this purpose could provide an insight into factors that scaffold or impede teachers' proactive responses to students' diverse academic needs (Sousa & Tomlinson, 2011; Tomlinson, 2014).

Significance

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

This study is significant as it provides some insight into the practice of DI and FA at a primary school in Trinidad. Nevertheless, the investigation provided insights into some teachers' understandings about these interventions that could be used to elucidate understandings about practice in similar settings. Capturing the essence of participants' understandings about the practice of DI and FA could lead to the amelioration of some of the issues that affect full implementation of these interventions in Trinidad and Tobago.

Literature Review

The Conceptual Framework

The researchers used situated learning theory (SLT) postulated by Lave and Wenger (2009) to undergird exploration of the literature on issues that arose from the problem statement, research questions, and methodology. The theoretical framework and findings in the literature facilitated the discussion of the results arising from the analysis of data and the implications/recommendations to guide future practice of DI and FA.

SLT recognises learning as a cognitive enterprise embedded in social participation. One example of the use of SLT is when teachers socially engage as learners in communities of practice, referred to as professional learning communities (PLCs). Further, Lave and Wenger (2009) placed learning in the context of lived experiences, for example teachers' understandings and experiences as they implemented DI and FA. They posited that each teacher's experience would be different as each interprets these interventions in his/her own way.

Teachers' understandings are critical to their own success and that of their students (Coburn, 2005). Therefore, an investigation into the barriers to such understandings is essential to gain insights into the implementation of DI and FA. Figure 1 highlights some of the factors that influence teacher understandings about DI and FA based on SLT and the literature.

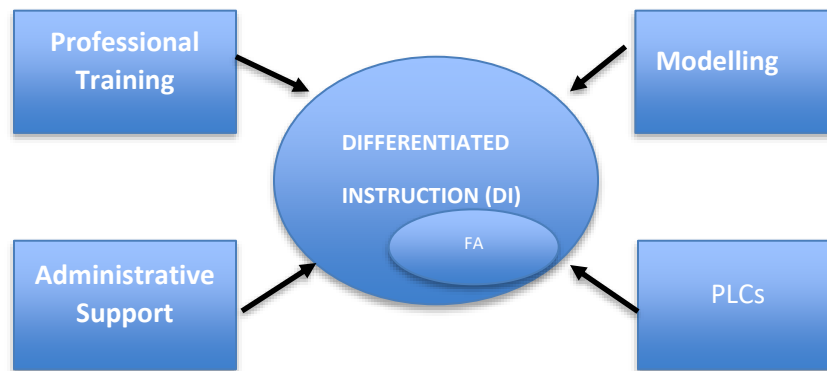
Boen (2010) makes the case for more professional training towards the integration of DI and FA in the RTI framework. Hall (2018) supports the call for professional training in DI (Figure 1). PLCs provide a framework for in-service professional training in both DI and FA leading to better understandings and practice (Figure 1).

Figure 1

Jessica Cunningham and Sabeerah Abdul-Majied

A conceptual Framework showing Factors that Influence Teacher

Understandings about DI and FA



Note. Professional training, administrative support and modelling were advocated for better teacher understandings about DI and FA (Beepot, 2017; Hall, 2018; Stephen, 2014). Professional learning communities as advocated by Lave and Wenger (2009) can be used to help teachers to improve their understandings of interventions, such as DI and FA.

Philosophy of Differentiation

Knowledge is socially constructed in both the cognitive activity of meaning-making and interpersonal relationships (Lave & Wenger, 2009). This means that each teacher should allow for an evolving understanding of the principles and strategies pertaining to DI, as he/she interacts with colleagues. Each teacher constructs his/her own understanding of differentiation, which could lead to the development of multiple realities. Observation and the reviewed literature seem to suggest that while the value of differentiation is generally appreciated, there were significant

Investigating Inclusive Teaching: Teachers' Understandings about using Differentiated Instruction and Formative Assessment at a Primary School in Trinidad

challenges that often resulted in inconsistent and/or inaccurate implementation (Gordon, 2007). While some teachers knew the philosophy, there were factors that impacted their understanding of the practice of DI. Gordon (2007) found that, while participants gave a superficial verbal definition of DI, deeper understanding was not evident in their instructional planning. Hall (2018), like Mathurin (2018), found that all participants claimed that they understood DI and its benefits to the students. Joseph (2013) found that, in Trinidad, while teacher-participants claimed some understanding of the elements of DI, implementation was mostly spontaneous rather than intentional.

Aims and Purposes of Differentiated Instruction

One important aim of differentiation is to address students' diversity in terms of learning profiles (Tomlinson & Moon, 2013). The teacher's goal should be to consider students' learning profiles as differentiation is used to create many ways for students to absorb, explore and demonstrate knowledge of content. Differentiation as an intervention facilitates teachers' proactive response to the needs of learners, guided by the principles of a quality curriculum, a nurturing environment and instructional strategies (Chapman & King, 2014; Tomlinson & Moon, 2013). Teachers could differentiate through content (facts and concepts taught), process (teaching methods), product (formative assessment) and effect of the learning environment according to students' readiness, interests and learning profiles (Tomlinson, 2014). Bender (2012) postulated that students should be exposed to a highly interactive, challenging and interesting curriculum.

Tomlinson and Moon (2013) posited that such a quality curriculum should have at least three fundamental attributes: clear goals, greater student understanding and engagement. Teacher-adherence to clear goals, as embedded in curricular standards, is another important hallmark of this quality. A high-quality, engaging curriculum leads to lessons which motivate students to make efforts at better understanding the content, thereby reducing the incidence of inattention, boredom and withdrawal. It should be noted that a quality curriculum would be buttressed by the differentiation model used.

Wood (2006) proposed the systematic assessment for inclusion (SAALE) model. This model provides a framework for decision-making on how to teach students in an inclusive setting, even those with special educational needs.

The concept of ‘mismatch’ (Wood, 2006, p. 188) is introduced as students reach a point of failure because of an incompatibility between teacher expectations and student ability in the teaching/learning and assessment environments. Friend and Bursuck (2009) proposed the identify, note, check, look, use, differentiate and evaluate (INCLUDE) model. This model emphasises teaching of pre-skills, careful selection and sequencing of examples in content and skills and deciding on the rate of introduction of new skills. Other essential hallmarks of this model are the provision of direct instruction to special needs students and providing opportunities for practice and review. Tomlinson’s model (1999, 2014) posited that differentiation is a teacher’s proactive response to learner’s needs, guided by general principles of a nurturing environment, quality curriculum, formative assessment and teaching strategies tailored to students’ academic variance. Further, teachers can differentiate through content, process, product and effect. All of this is done according to “students’ readiness, interest and learning profile” (p. 20).

Rose and Meyer (2002) proposed the universal design for learning (UDL) model. This model draws from brain research and the use of new media to propose that educators should strive for flexibility in three ways. These are (a) to represent information in multiple formats and media, (b) to provide multiple pathways for student action and expression, and (c) to provide multiple ways to engage student’s interest and motivation. Burke (2009) proposed a model that included attention to the multiple intelligences theory of Gardner (2004). This model allows for greater teacher-creativity as students’ learning styles are considered. However, the national primary school curriculum does not identify any particular model.

Nevertheless, the present study aligned the implementation of DI with the standards and benchmarks outlined in the 2013 national primary school curriculum, which outlines what is expected of students in order to meet the standards. Teachers should be familiar with both the mandated board statements of what should be taught –the standards (Burke, 2009; Chapman & King, 2014)- and benchmarks of what students should learn at each class level. The primary school curriculum (CPDD, 2013) provides standards and benchmarks for content and skills in English Language Arts, Spanish, mathematics, integrated science, agricultural science, visual and performing arts, values, character and citizenship education (VCCE) and physical education. The benchmarks were constructed to facilitate differentiation, as they can facilitate creativity in teaching strategies. As

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

teachers engage in differentiation, they should also focus on creating a nurturing environment.

Nurturing Environment

The principles which govern the learning environment in a differentiated classroom should be all encompassing, including the physical and affective environments (Bender, 2012; Tomlinson & Moon, 2013). In a standards-based differentiated classroom, all aspects of the environment should be designed to provide each student with positive, productive, and nourishing learning experiences. The affective aspects include appreciation for each child and teaching the whole child (Tomlinson, 1999, 2014). Teachers ought to remind students that everyone faces obstacles and that mistakes and failures are learning opportunities (Bender, 2012). Teachers should exert some effort in creating visually rich classrooms for the enjoyment of students while also reflecting their strengths (Tomlinson & Moon, 2013). A nurturing environment supports learning through differentiated teaching strategies, for example, multiple intelligences and tiered lessons (Tomlinson, 1999), graphic organizers, and learning/interest centres (Tomlinson, 2014).

Niccum-Johnson (2018) found that 56% of their research participants encouraged student participation in their learning while 83% frequently adjusted their teaching strategies to meet student needs. Over 80% of teachers seemed to have paid frequent attention to student nurture and environment. Cunningham (2015) found that there were high levels of mutual respect between teachers and students, as teachers intentionally provided for student learning through the provision of appropriately challenging tasks with scaffolding. It should be noted that while a nurturing learning environment is needed in all classrooms, Tomlinson (2014), posits that a nurturing learning environment is “key” (p. 15) to student success in differentiated classrooms. According to Bender (2012), it is especially needed for students with special educational needs. Researchers have also found that one of the principles of differentiation that can assist greatly with student motivation and learning is FA.

Formative Assessment

Assessment is the gathering of information about the effectiveness of the teaching/learning process for decision-making (Tate, 2016). FA is an ongoing process that gauges students' readiness for future learning, analyses their present performance, reveals gaps in learning, and provides

real-time feedback toward planned adjustments of instructional strategies (Popham, 2008). Teachers who differentiate instruction must have a working knowledge of students' academic progress to plan for their academic growth and development. Popham (2008) makes the connection between DI and FA by positing that FA provides real-time feedback toward instructional adjustments to meet the needs of students. As such, FA can be considered an essential tool in the differentiated classroom.

Data from the Niccum-Johnson's (2018) study revealed that while some participants used varying modes of assessment, 74% of the participants did not pay attention to the use of FA. Cunningham (2015) in his multi-method qualitative study found that two out of three participants sampled claimed some understanding of the concepts of pre-assessment and FA. However, only one participant listed relevant examples as evidence of this claim. The specific problem here would be the logistics of assessing students to ascertain their learning readiness toward charting a suitable course for their progress. It would seem that the answer should be a simple application of FA. However, there seems to be some lack of teacher understanding primarily about the nature and purpose of FA (Boyle & Charles, 2014).

Nevertheless, the benefits of FA include teacher-ability to keep abreast of student progress, address misunderstandings, and gauge the attainment of learning by students. The assessors/teachers can gather and record the appropriate data, see patterns, and customise future assignments accordingly. If FA is used effectively then students are motivated to learn. It is noteworthy that Bender (2012) and Friend and Bursuck (2009) agree that FA should be a staple in the assessment diet in the differentiated classroom. It would seem, however, that FA was sparsely practised. Niccum-Johnson (2018) found that teachers generally promoted critical thinking and problem-solving skills in their classrooms. However, learning needs were only determined through a variety of FA strategies, such as questions, portfolios, projects and the traditional pencil-and-paper tests (Tomlinson & Allan, 2000).

Differentiated Instruction: Barriers and Enablers

Lave and Wenger (2009) posit that conflict occurs in every sphere of human existence because of the multifaceted nature of the situated activity. This means that people in the same situation have different perspectives, interests, and understandings as they contribute to the discourse. Therefore, our use of the SLT- along with the reviewed literature- allows

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

for discussions on the negative and positive experiences of teachers as they implement DI in their classrooms.

The major barriers which impacted teachers' understandings about the implementation of DI were time to access and understand assessment data as well as application of the information gathered to actual practice. Evidence from the study by Gordon (2007) suggested that too few teachers used the data to inform differentiated practice. It was found that difficulties in implementation also occurred because of improper understanding and incorrect interpretation of differentiation (Morrison-Thomas, 2016). There were also issues with lack of uniformity in lesson plans, time constraints, heavy workloads, class population, increased academic diversity, and the lack of teaching resources (Hall, 2018; Peters et al., 2008). The culture of inadequate professional training and the lack of confidence in new strategies (Sutherland-Kalisingh, 2017) were also identified as barriers. Further, barriers included inappropriate assessment practices, teaching strategies, and limited teacher understanding of DI (Stephen, 2014). Hall (2018) also found that student diversity, challenges with implementation, lack of professional training, and curriculum issues were identified as barriers.

Differentiated instruction was also hampered by insufficient equipment, limited resources, time constraints (Beepot 2017; Morrison-Thomas, 2016), poor administrative support (Stephen, 2014), and student behavioural issues (Beepot, 2017; Cunningham, 2015). Lange (2009) found that teachers had difficulties in implementing DI because of the increasing attention given to standards-based education. Participants reported that lesson planning was time-consuming primarily because of the number of factors that teachers had to consider as they planned (Beepot, 2017; Mathurin, 2018). Another theme was the relationship between lack of experience and self-efficacy in the delivery of the standards-based curriculum (Joseph, 2013; Lange, 2009). New teachers found it more difficult to understand and implement DI.

While many barriers were identified, there were some enablers to DI. The literature revealed that supportive leadership was needed to provide opportunities and encourage greater teacher practice (Mathurin, 2018; Stephen, 2014). Gordon (2007) found that leadership modelling was crucial to teacher-practice. While teachers believed that DI was quite useful for students (Cunningham, 2015; Hall, 2018; Stephen, 2014), they saw the need for professional training and modelling for all teachers (Gordon, 2007; Hall, 2018). When clinical supervision by school leaders

Jessica Cunningham and Sabeerah Abdul-Majied

was explored, it was found that there were low occurrences of differentiation in the classrooms where clinical visits were not done (Gordon, 2007).

Methodology

Design ◀

This study reports on part of a larger study involving three schools with teacher-participants at the Standards one to three levels. The researchers used an emergent qualitative design inquiry (Merriam, 2009) to explore teachers' understandings of the implementation of DI and FA. The researchers were sensitive to the participants under study, as recommended by Creswell (2013) and Merriam (2009), and to their own "consciousness" (Stake, 1995, p. 41). Data collection in this qualitative case study was guided by the need to respect the naturalistic setting of the selected school.

Data Collection

Site Selection, Population and Sampling

The primary school curriculum which was introduced in 2013 is used as the national curriculum in all registered primary schools. This document mentions that DI should be used as a teaching intervention to meet the needs of all learners. In addition, the curriculum also recommends the use of FA as seen in the Standard three toolkit. In light of these recommendations, the researchers explored teachers' understandings about the implementation of DI and FA at a selected primary school in the Mahogany Educational District. The data used in this is from one of the three sites in the larger study.

The Mahogany Educational District, located in north-eastern Trinidad is responsible for managing 114 primary schools of various types (government, assisted denominational, private, and special schools). The researchers collected rich, thick data from one school in this district as recommended by Creswell (2013), Leedy and Ormrod (2016), and Yin (2014). Data collection was triangulated using interviews (individual and focus group), classroom observations, and a review of lesson plans. These methods provided in-depth data on teachers' understandings of their knowledge and practice of DI and FA.

The research site, the Apollon Primary school, located in the Mahogany Educational District, has 21 teachers and a student population of 234

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

students. There are 17 classes from Infant 1 to Standard 5. The teacher/student ratio is 1:11. Teacher-participants are described in Table 1, using pseudonyms.

Table 1

Study Participants

Participant	Name	Ethnicity	Gender	Years of teaching experience	Academic Qualifications
Participant 1	Mary	Afro-Trinidadian	Female	10	B.Ed
Participant 2	Susan	Afro-Trinidadian	Female	9	B.Ed
Participant 3	Elizabeth	Afro-Trinidadian	Female	6	B.Ed

The research site was selected using preliminary understandings about the interventions as the main criterion of study, according to Creswell's (2013) criterion for sampling. Teacher preliminary knowledge of the interventions was important because the researchers sought to explore teachers' understandings of practice. Participants could not be expected to provide information on perceptions, experiences or understandings about DI if they were not engaged in some level of practice, thereby "ensuring quality assurance" as recommended by Creswell and Poth (2018, p. 159). Therefore, the criterion information provided by the line school supervisor was important. Participant baseline information was collected to buttress information provided by the supervisor, using a questionnaire. The instrument used questions to gather baseline information about the definition of differentiated instruction in addition to teacher-knowledge, for example, about differentiated strategies used in their classrooms. Participants were asked to describe what DI meant to them and from whom professional support was sought to assist in their practice. The population consisted of six teacher-participants from the Standards one, two, and three classes. Purposive sampling was then used to select three participants

Jessica Cunningham and Sabeerah Abdul-Majied

from that population based on their responses to the questionnaire. The sample size of three participants (Table 1) provided adequate data to identify descriptive codes, in vivo codes and themes. These were used to perform a within-case analysis (Creswell, 2013). The researcher was careful not to make generalisations because of the use of the small sample size of three teacher-participants.

Data Collection Methods

The researchers conducted an introductory face-to-face interview with each participant to gather demographic information, such as years of teaching experience. The researchers collected data from each participant via interviews, observation, and review of lesson plans. The researchers used semi-structured interviews with open-ended primary and secondary questions to gather data for the two research questions. The first interview was done face-to-face with each participant. Thereafter, an in-person focus group interview was conducted at the school as recommended by Creswell (2013) and Merriam (2009). All interviews were recorded using a smartphone. Field notes were made as the interviews proceeded as suggested by Creswell (2013). Interviews allowed the participants to share their definitions of and understandings about DI and FA as well as to voice their ideas and thoughts about their practice.

Three sessions of classroom observations were done for each participant to collect data on the organisation of the physical classroom environment, teaching strategies used, and social interactions between students and teachers. Each English Language Arts or mathematics session observed by the researchers was 40 minutes long. Descriptive and reflective field notes were collected as the observations proceeded (Creswell, 2013). Guided by Merriam (2009), another data collection method used was the review of three lesson plans for each participant, using a checklist. The checklist included criteria such as the specific objectives, instructional strategies, nature and frequency of formative assessment strategies. This allowed the researchers to observe alignment between DI and FA strategies, and content. This was buttressed by observation of teacher actual practice as the validity of the study would have been significantly reduced if data were collected only from a review of lesson plans and interviews.

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

Ethics

The ethical behaviour of researchers is critically important (Creswell, 2016; Mertler, 2016) to protect participants from unscrupulous research practices. The researchers were guided by ethical practices for qualitative research. Ethical considerations included privacy protection, confidentiality, appropriate reciprocity and obtaining informed consent (Brinkman & Kvale, 2015; Miles et al., 2014). According to Leedy and Ormrod (2016), researchers should protect participants from unnecessary physical and psychological harm. Participant involvement in the research should be voluntary without any hint of coercion and/or dishonesty.

Teacher-participants experienced no physical harm in this study. There was also minimal psychological harm as all steps were taken to avoid embarrassment and other unpleasant situations for the participants. All participants were fully informed about all the major aspects of the research as it related to their involvement, including a declaration of risks (Diener & Crandall, 1978; Miles et al., 2014). The researcher sought and obtained informed consent using a formally prepared statement which prospective participants were invited to sign before data collection began (Leedy & Ormrod, 2016). Prospective participants were informed that their participation was strictly voluntary, and that the information shared was to be held in confidence and anonymity (Miles et al., 2014).

Another important concern was the accurate transcription of the interviewees' statements. The transcribed scripts were manually edited and compared to the recordings. In addition, the interviewees were given the opportunity to member-check their statements as interpreted by the researchers. These measures were taken to ensure the truthfulness and accuracy of the information shared during the interviews (Brinkmann & Kvale, 2015; Mertler, 2016). Steps were also followed to ensure the security, privacy and confidentiality of data collected as recommended by Miles et al. (2014). Approval was also sought and obtained from the UWI Research and Ethics Committee.

Data Analysis

Data analysis involved the organisation, description and interpretation of data (Leedy & Ormrod, 2014). Data collection and analysis were "interwoven" from the very beginning and continued throughout the study (Miles et al., 2014, p. 70). Additionally, the data transcription tool, Otter.ai, was used to transcribe interview audios. Thereafter, data from descriptive and reflective field notes, and lesson plans were analysed to

identify descriptive codes. In vivo codes were developed from the interview transcripts. The researchers also then generated provisional codes. These codes were then coalesced into major data chunks or themes (Creswell, 2013; Miles et al., 2014).

The researchers began analysis of the interview transcripts using in vivo coding (Leedy & Ormrod, 2016; Miles et al., 2014) to capture the essence of participant statements. Consistency in developing the conceptual and structural frames of the codes was followed (Miles et al., 2014) by consistently re-evaluating the codes. These codes focused the researchers and allowed for the development of themes and a within-case analysis. According to Miles et al. (2014), within-case analyses facilitate description, understanding and explanation of events in a single, bounded context or case.

Findings

The findings for research question one were derived mainly from classroom observations and interviews. However, lesson plans provided the repertoire of differentiated strategies proposed for use in the lessons. The findings for research question two were obtained from interviews, classroom observations and a review of actual questions and activities for FA included in lesson plans. The nature of the practice of FA was ascertained mostly by classroom observation. Interview data primarily provided information on the participants' understandings about FA and its connectivity to DI.

Research Question 1: Teachers' Understandings about DI

The themes teacher understanding about DI, student academic diversity, instructional strategies in classroom, teacher philosophy, and challenges with practice are highlighted in Table 2. Figure 2 provides some evidence of the physically nurturing environment.

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

Table 2

Summary of Themes, Provisional and In Vivo Codes for Research

Question 1

Themes	Provisional codes	In vivo codes
Teacher understandings about differentiated instruction	<p>Emphasis on relevance and meaning-making</p> <p>Learning styles</p>	<p>“Differentiated instruction is meeting the needs of diverse learners who may have certain challenges...”</p> <p>“It is using any tool in terms of hands-on materials, as well as methods to reach every level of learner in the class.”</p> <p>“I meet the needs of diverse students.... Children who may have certain challenges or may be as quick in terms of class participation.”</p>
Student academic diversity	<p>Provision made for weak students</p> <p>Slow students</p> <p>Average students</p> <p>Bright students</p> <p>SEN Students</p>	<p>“I have independent learners who grasp the concepts quickly and average students in the majority, along with one or two struggling who need individual attention.”</p> <p>“My class is pretty diverse”</p> <p>“They are very diverse. I have three... who are mostly visual. I have one who is a bit slower.”</p>

Themes	Provisional codes	In Vivo codes
Instructional strategies in classroom	<p>Teacher responses to diverse learners</p> <p>Use of manipulatives</p> <p>Peer-tutoring</p> <p>YouTube videos</p>	<p>“ Think, pair, share ...use of manipulatives”</p> <p>“ They love the internet and they love YouTube videos that deal with specific topics”</p>
Teacher-philosophy	<p>Individual work with students</p> <p>Inclusion</p> <p>Meeting learners' needs</p>	<p>“It is when an instructor can differ the way he or she teaches to bring out the most in their students. The teacher will not teach one way all the time. They can differ in process, content and product.”</p> <p>“I believe that as a teacher, it is my aim to do whatever is necessary to ensure that the students are able to get all the concepts.”</p>
Challenges with practice	<p>Inconsistent practice</p> <p>Time constraints</p> <p>Workload</p>	<p>“I had a learning station before, but that's a lot of work and you have to keep replenishing the stations....”</p> <p>“So, most of the resources for differentiated instruction, you have to create and its time to consider...”</p>

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

Figure 2

Photograph of a Classroom showing Aspects of a Nurturing Environment

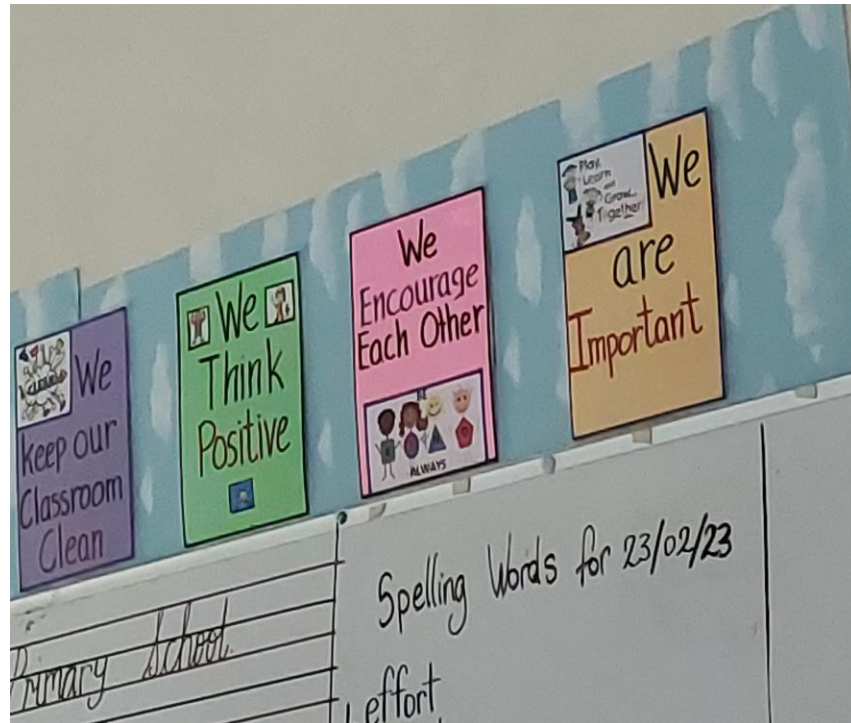


Table 3

Sample of Descriptive Codes for Research Question 1

Theme	Category	Descriptive codes
Student academic diversity	Category: Needs of learners (NL)	NL-SEN (special educational needs) NL – SL (slow learners) NL – AV (average learners) NL – AAV (above average)
Understandings about differentiated instruction	Category: Learning styles (LS)	LS-AU (auditory) LS-PT (peer tutoring) LS- INTE (interpersonal)
Instructional strategies	Category 1: Differentiated strategies (DS)	DS-FG (flexible group) DS-PT (peer tutoring) DS- LC (learning centre)
	Category 2: non-differentiated strategies (NDS)	NDS-GW (group work) NDS-GA (games) NDS-MS (music & songs)

Figure 3

Descriptive Code for/from Classroom Observation Field Notes

Students were asked to give sentences, for example, "I was singing when it started to rain."
Teacher asked different students to give examples including individuals who did not seem to understand the concept. Three students understood but the others did not. Teacher reviewed the concept. Teacher then used a poem,

THEME- DS

(Differentiated Strategies)

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

asking students to identify sentences in which 'was' and 'were' appeared.

Code DS-RT
(reteaching)

Note. Lesson on past continuous tense.

Understandings about Differentiated Instruction

All participants generally understood DI, as part of teachers' efforts to meet the learning needs of all learners. They understood that they should use different strategies to meet the learning needs of academically diverse students including those with learning challenges (Table 2). Participant two reiterated that "the teacher will not teach one way all the time. They can differentiate in process, content and product." However, teachers' understandings about differentiated instruction were generally expressed in terms of meeting students' learning styles needs (Burke, 2009) as evident in codes LS-AU, LS-PT & LS-LC (Table 3).

Student Academic Diversity

Participant one initially did not understand the term, student academic diversity. However, participants two and three understood the term to refer to students who were slow learners, average or above-average - codes NL-SL, NL-AV, NL-AAV (Table 3). Participant two described her class as being "Pretty diverse" (Table 2). She further stated that there were "Independent learners who grasped the concepts quickly," and "Average students being in the majority," along with "one or two struggling ones," who needed "individual" attention (Table 2).

Differentiated Strategies Used in the Classroom

Participants two and three seemed to have had better understandings about differentiated instruction than participant one. Strategies highlighted by these participants were 'think, pair, share' (Table 2), individualised work, reteaching (Figure 3). However, while participant one used reteaching, she generally used more non-differentiated strategies, such as codes NDS-GW, NDS-GA & NDS-MS (Table 3), in addition to use of puzzles and outdoor activities. The use of manipulatives was mentioned in the interviews, listed in the lesson plans and observed in practice for participants two and three. 'Exit slips' and 'learning centres' were

mentioned in the interview by participants two and three, respectively. However, learning stations were reportedly not used regularly.

Philosophy of Differentiated Instruction

All participants expressed the view that they should attempt to meet the needs of the diverse learners in their classes. Participant three indicated “I believe as a teacher, it is my aim to do whatever is necessary to ensure that the students are able to get all of the concepts at the end of the lesson.” All participants mentioned exposure of the students to extra work (outside class time) and reteaching as useful strategies to fulfil their philosophical positions. They also mentioned Gardner’s learning styles theory as the basis for the diversity of learners and differentiation (Burke, 2009). Hence, a mixture of differentiated and non-differentiated strategies was used by participants (Table 3).

Challenges

The main challenges mentioned by all participants were time constraints, lack of professional training, and administrative support. They reported that their knowledge and understanding of DI was usually provided through their own research (online) and collaboration with teachers who taught other classes. No mention was made of professional training sessions or administrative support for the practice of differentiated instruction (Gordon, 2007; Hall, 2018). In terms of time constraints, participant three reiterated, “So most of the resources for differentiated instruction, you have to create and its time to consider.” Participant two mentioned being “Stressed because of the time allotted to teach the curriculum.”

Nurturing Environment

Based on classroom observations, all participants placed significant emphasis on creating nurturing environments for their students. Participants were observed to be very pleasant and understanding with the students. Participants invited affirmation for the struggling students when they got the correct answers. Teachers sometimes practised individualised instruction to facilitate slower learners. Students were therefore motivated to participate in the lessons. The classrooms of participants one and three were generally quite large and very spacious. Teacher-made charts were affixed above the whiteboard and other walls in the classroom (Figure 2).

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

The wording on these charts could have motivated students to exert effort in their learning.

Research Question 2: Teachers' Understandings About FA

The findings in response to research question two are presented for participants one, two, and three using codes and themes derived primarily from interviews and observations, The following themes were developed from the codes (Table 4).

Table 4

Summary of Themes, Provisional and in Vivo Codes for Research

Themes	Provisional codes	In vivo codes
Nature and purpose of formative assessment	Attention to previous learning Assessment for learning Testing Record of marks	"You test to see if the students grasped it." "Well, you have to correct me if I'm wrong, It's actually assessing them with pen and paper or some type of material that you have used to test if they understand a concept."
Practice of formative assessment	Attention to previous learning Teacher questions	"Sometime, the struggling student has the knowledge but is not able to recognise the words or read" "They are given different types of worksheets and they completed them."
Frequency of practice of formative assessment	Closure of lesson Throughout the lesson	"It is where you test after a particular concept, like during a weekly test" "In every single lesson because I have a need to see if my children understand, in order to plan going forward."

Table 5

Sample of Descriptive Codes for Research Question 2

Theme	Category	Descriptive codes
Nature and purpose of formative assessment	Category: Rationale for formative assessment (RFA)	RFA-GSU (gauging student understanding) RFA – RC (reinforcing concepts)

Nature and Purpose of Formative Assessment

Participant one could not define FA while participants two and three had limited understandings about its nature and purpose. All participants reported that FA was beneficial in helping them gauge student understanding (code RFA-GSU, Table 5) throughout the lesson. Participant three said “You test to see if the students grasped it”, referring to the concept (Table 4). “If you recognise that the majority of the students did not grasp the concept, then you reteach” (Table 4). Participant two shared that FA is used “to gauge if more work should be done”. She also stated that if the teacher were “to only give the test at the end or term, then there may be gaps in learning.” Participants generally were not able to accurately demonstrate FA. There was little evidence in terms of the feedback cycle, actively engaging student understanding, or using a wider repertoire of differentiated strategies. Demonstrations of reteaching, while somewhat intentional, were not robust. Teachers did not really seem to fully understand the nature and purpose of FA (Boyle & Charles, 2014; Popham, 2008).

Practice of Formative Assessment

Participants generally used teacher-questions and interactive activities for FA. This is reflected in the response by participant two, who said, “Sometimes you can use interview and oral answers, rather than having the students read” from the paper. The response of participant two in Table 4, “In every single lesson because I have a need to see if my children understand, in order to plan going forward”, indicates some understanding about FA strategies informing instructional practice. The three participants were observed using different assessment strategies in their lessons to gauge student understanding and identify learning gaps. These strategies included games, puzzles, worksheets, teacher-questions and riddles. Worksheets and teacher-questions were the most frequently used, while games, puzzles and riddles were used less frequently. However, Boyle and

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

Charles (2014) indicated that some of the strategies used by the participants, such as worksheets, may not qualify as best practice for formative assessment.

Frequency of Use of Formative Assessment

All participants used questions throughout their lessons to gauge understanding for possible reteaching. The researchers also observed revision of concepts previously taught. Participants one, two and three were consistently revising and repeating the new concepts throughout their lessons. However, their responses to an interview question on when they used FA seemed to indicate limited understandings about the continuous nature of FA. Participant one said that she used it throughout the lesson while participants two and three mentioned FA as used as at the end of teaching the concept, for example weekly tests (Table 4), which is a more summative approach to assessment. According to participant two, "It is where you test a particular concept, like during a weekly test or after teaching a concept". Therefore, teachers' understandings about FA were somewhat converse to the findings in the literature. Cunningham (2015) and Mathurin (2018) found that while accurate definitions of FA were given, there was inaccurate practice. Participants in this study seemed to have sometimes confused formative and summative assessment in their interview responses. They also did not fully practise FA, since student feedback was not generally sought or was robust enough. The attempts at reworking differentiated strategies arising from FA were also weak.

Summary

An analysis of the interview responses, observation, and review of lesson plans seemed to suggest limited levels of understanding about DI and FA. There was a level of confusion between expressed understandings and actual practices. While all participants seemed to have some understanding of DI, in terms of providing for the needs of diverse learners, it seemed to be limited to providing for the below-average and average, rather than the above-average students. Understandings also seemed to be limited to learning styles rather than learning profiles.

Teachers' understandings of FA in terms of practice seem to be limited to gauging student understanding but weak in other aspects. Responses to the interview questions, in terms of definition, nature, purpose, and frequency of formative assessment demonstrated limited

understanding. These limited understandings suggest that there may be a need for professional training in both DI and FA.

Discussion

While participants placed some effort into lesson planning and execution, they did not intentionally link DI and FA. Therefore, they generally did not necessarily adjust instructional strategies in response to data from FA. In addition, participants also placed greater emphasis on the below-average and average learners as compared to the above-average learners in their first lessons. These students reportedly got bored and thought that some of the strategies used for the below-average students were “too easy”. However, in the second and third lessons participants made some attempts at teaching at higher levels of Bloom’s taxonomy. This was evident in the stated specific objectives such as application and analysis in their lesson plans. These objectives required students to apply problem-solving skills, for example, to find the unitary prices for items by the village vendor or the stationery store.

There were also misconceptions about DI when it was narrowly defined as accommodation. According to Tomlinson (2001), differentiation should be used to provide for the needs of diverse learners. Friend and Bursuck (2009) supported this position by positing that all students can benefit from differentiated strategies, including above-average students. This was observed in the classes of the three participants as the strategies used in lessons two and three were appreciated by all learners including the above-average students. It is probable that increased research and collaboration lead to an improvement in teachers’ understandings in these lessons.

Participants seemed to understand the concept of student academic diversity and expressed it in terms such as “weaker”, “struggling”, and “bright”/ “more capable” learners, which they used to describe students’ intellectual capacity. However, the term, learning styles, was used rather than learning profiles in reference to student academic diversity. Participants made more provisions for the below-average and average learners in the first lessons but improved in providing for the above-average students in lessons two and three. The differentiated strategies used seem to indicate another inconsistency in practice since the repertoire of strategies was limited as in the findings of Hall (2018), Joseph (2013), and Niccum-Johnson, (2018). Participants mentioned the use of “exit slips” and “learning stations”/centres. However, the use of learning centres

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

was discontinued because of time constraints. Participants used some measure of individualised instruction and reteaching which suggested a more spontaneous process practice of DI (Joseph, 2013).

In terms of providing a nurturing environment, participants placed significant emphasis on both the physical and affective aspects. This evidently assisted students' learning because they seemed happy and excited to learn, especially when the practical activities were done. While participants went to great lengths to encourage the students to apply effort (Bender, 2012; Tomlinson & Moon, 2013), they did not seem to make intentional connections between DI and FA. Intentional teacher-connectivity between DI and FA would be useful and could lead to improved learning. Nevertheless, further research can be done into the role of the teacher in improving the nurturing environment for students. The resultant recommendations for strategies for the improvement of student motivation and learning would certainly be appreciated.

In terms of FA, there were some inconsistencies in teachers' understandings. Even though two participants attempted definitions of FA, they did not express accurate understandings of its practice and the need for continuous application. However, the participants understood the benefits of FA in terms of it assisting them to better gauge student learning (Tate, 2016). Inconsistency in understandings was observed as teachers mixed up formative and summative assessment in their interview responses. In addition, there was little evidence that teachers' conceptualisation of DI was influenced by their FA practices. This finding would merit more study in Trinidad and Tobago as to the reasons for this.

The evident disconnect between expressed understandings and practice suggests that there is a need for more in-service professional training and administrative support (Sutherland-Kalisingh, 2017). The use of PLCs, as postulated by Lave and Wenger (2009), would facilitate exposure to better understandings of DI and FA. The SLT contributes to a suitable framework for analysing their present understandings. It also provides an avenue towards improved understandings about DI and FA as participants in this study could engage in professional training and professional learning. Clarity could be provided through clinical supervision (Gordon, 2007), supportive leadership (Gordon, 2007; Mathurin, 2018), and modelling (Hall, 2018). The aforementioned recommendations could facilitate the embedding of cognitive experiences in social participation as postulated by Lave and Wenger (2009).

Conclusion, Implications, and Future Research

The findings of this study suggest that teachers' understandings of the components of DI and FA need further clarification and support. While teachers could express definitions and philosophical positions that address the issue of meeting the needs of diverse learners, there is a need for professional training, administrative support, and modelling to improve understanding and practice (Gordon, 2007; Hall, 2018; Mathurin, 2018). The efforts of the participants with the intervention should be complimented, especially the provision of nurturing environments.

There is also a need to give increased attention to critical thinking, as DI promotes robust pedagogy (Tomlinson, 2014). The findings and analysis of the data seem to align with the literature on the issues of time constraints and inconsistent understanding of practice; these seem to be major barriers that need attention (Hall, 2018; Niccum-Johnson, 2018). Analysis of the data revealed inconsistencies in both verbal understandings and practice. This was seen in the interview responses for the frequency of formative assessment by participants. This is different from the literature where correct definitions were given but inaccurate or non-practice was observed (Gordon, 2007; Mathurin, 2018).

The gaps in understandings that have been identified in this study would have negative implications for the practice of DI in the setting, in terms of student learning. Both the SLT and the literature provided a conceptual framework for the clarification of teachers' misunderstandings. The use of professional learning communities could lead to better teacher knowledge about and understandings of both DI and FA. Participants could be well on the road to improved practice if engaged in in-service professional training, professional learning communities, and modelling. A major issue seems to be the levels of social participation with practitioners who would have both academic and experiential knowledge in DI and FA. The inadequacy of guidance for teachers could be addressed through more clinical supervision and training through in-service workshops.

Future studies in Trinidad and Tobago should explore the issue of the impact of professional learning communities, as it relates to teachers' understandings and experiences with DI and FA, at multiple sites across the country. While time constraints, lack of resources and other issues can negatively impact the practice of DI and FA, it is teachers' inconsistent understandings that seem to have a more significant negative impact. Confused understandings can lead to inaccurate and inconsistent practice.

*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

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Jessica Cunningham and Sabeerah Abdul-Majied

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*Investigating Inclusive Teaching: Teachers' Understandings about using
Differentiated Instruction and Formative Assessment at a Primary
School in Trinidad*

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