SECONDARY SCIENCE TEACHERS' METAPHORS:
A Case Study, Part 1

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This case study sought to gain insights into a group of secondary science teachers' conceptions of teaching through an analysis of their metaphors. In addition, lesson plans, classroom observations, and artifacts produced during the year-long Diploma in Education (Dip.Ed.) programme were analysed. The data were analysed by reading the metaphor in context and against its obvious meaning to allow multiple meanings to emerge, and by coding to determine patterns, themes, and significant events. The findings revealed the multiple interpretations of teachers' metaphors and also that teachers' metaphors were similar to and different from those reported in the literature. In addition, teachers' actions did not always match the behaviours implied by the initial interpretation of the metaphor. The mismatch was either positive or negative in relation to contemporary learning theories. The implications for teacher educators' actions are discussed.

Background

Research into the use of metaphors to provide insights into teachers' understandings of the process of teaching is fairly common practice among the educational research community in developed countries (see Bullough, 1991; Collins & Green, 1990; Dooley, 1998). For example, teachers have been asked explicitly to describe their metaphors of teaching/learning, or they have revealed their metaphors during conversations/interviews with researchers (Dooley). Some researchers have observed classrooms and the interactions therein to develop metaphors of teaching (see Collins & Green), and others have framed research based on common metaphors of teaching (Marshall, 1990).

The Oxford dictionary (1995) defines the word *metaphor* as "an application of a name or description to something to which it is not literally applicable." Further, it states that "a metaphor is a figure of speech that goes further than a simile, either by saying something is something else that it could not normally be called or by suggesting that something appears, sounds, or behaves like something else." Postman and Weingartner (1969, pp. 86–87) hone in explicitly to the role of

representation associated with metaphor. They use the word *metaphor* "to denote any representation of reality, especially linguistic representations." The above conceptualizations are all very general, but Collins and Green (1990, p. 77) apply the term *metaphor* specifically to the classroom context. They propose that "metaphors build a 'web of meaning' and make visible the dynamic and constructed nature of everyday life in classrooms." The metaphor is therefore a useful vehicle to help the "outsider" enter the private world of the classroom.

Perusal of the literature shows that research into teachers' metaphors is not common practice in Trinidad and Tobago. However, under the auspices of the Muster (Multi-Site Teacher Education Research) project, primary school teachers' metaphors of teaching were investigated and reported. A significant finding of this research was that the majority of metaphors of teaching held by the primary school teachers sampled tended to focus on the affective dimensions of the teacher's role. The teacher was often described in the role of nurturer/caregiver, as *responsible for everything* and as *martyrdom* (George, Mohammed, Quamina-Aiyejina, Fournillier, & Otway-Charles, 2001). Significantly, these metaphors depict an active role for the teacher and a role of dependence for the learner. The metaphor *teacher-as-nurturer* is, according to Berliner (1990), a commonly accepted metaphor of teaching at the primary level. In addition to the nurturing role, the primary teachers in the Muster project reported metaphors that focused on teachers' knowledge. However, the metaphors selected conveyed similar relationships between the teacher and the student. For example, the metaphor of *teacher as expert* conveyed the teacher in a role as actor and the student as passive recipient.

The metaphors described give an indication of the types of experiences that are likely to be provided in the primary classroom; however, there is no empirical evidence that there is a match between teachers' metaphors and their actions in the classroom within the primary schools of Trinidad and Tobago. One limitation of the Muster research was that there was no attempt to determine the level of congruence between teachers' metaphors and their actions in the classroom.

It is generally accepted, with support from developmental theories of psychology, that at the secondary level—a period of adolescence—the students are expected to develop their identity (for example, one of Erickson's developmental stages is that of identity vs. role confusion), to assert their independence, and to develop skills of critical and creative thinking. Yet, Berliner (1990) reported that *teacher-as-information-giver* was a common metaphor at this level in the USA. It seems, then, that there is a mismatch between USA teachers' conceptions of their role and

students' development needs. Are the same conceptions of teaching/learning held by secondary school teachers in Trinidad and Tobago? With the exception of James (2005), who analysed the metaphors held by a group of English (Language Arts) teachers, there have been no reports on metaphors of teaching held by secondary school teachers in Trinidad and Tobago in general, or those of secondary science teachers in particular. It is not known, for example, whether science teachers hold the same or similar views of teachers as their primary counterparts—as *experts—*and of secondary teachers in the USA—as *information giver*s. If they do and then they act upon their beliefs in a manner that is congruent with these perceptions of the teacher, then it becomes obvious that the consequences of their actions may be at variance with contemporary views about science teaching/learning and with the students' expectations of the system at the secondary level. In essence, as illustrated below, there may be an epistemological gap (Tsai, 2003) between students and teachers.

In a study that was done in the UK which investigated students' preferences for learning environments, Kinchin (2004) found that of a total of 349 responses from students in Years 7–9 (12- to 14-year-olds or lower secondary level), 11.2% chose an objectivist environment in which teacher is giver versus 88.8% who chose a constructivist environment in which they construct their own understandings as the preferred science classroom environment. The students' desires and expectations for participation and active involvement in the teaching/learning encounter seem to fit naturally with life in democratic societies. According to Dwight and Garrison (2003), in a healthy democracy, one would expect more equity, a decentralization of power, and a problem-posing pedagogy that enables active participation in an ever-evolving process. The active learner engages in metacognition, inherently questioning the privileged status of authority figures such as authors, curriculum planners, and teachers. However Dwight and Garrison (p. 715) cite Foucault who recognizes the gap between theory and practice. He states that "in a democratic society our system enforces a belief in totalitarian authority, thereby creating 'docile bodies' dependent on external authority for meaning and the essence of learning." Foucault's comment is a serious criticism of the education system.

In contemporary society where schooling has become compulsory, at least up to the primary level and in many places even up to the lower secondary levels, teaching within the formal school setting is a familiar activity to most, if not all, persons within the public domain. Yet, paradoxically, while seemingly familiar, much about teaching is private personal knowledge held tacitly by teachers. Little is known publicly

about what propels teachers to choose one activity over another, or to choose one way of proceeding over another. Yinger, cited by S. Johnson (1990, p. 469), captures the mystery that can be associated with teaching and learning in the formal setting, but advocates a study of teacher talk to gain insights into teacher knowledge. He says that "though much of the language of practice is embodied in thought and action and not spoken, the natural language of teachers and learners can give us clues to the way they organize their world." It is evident, then, that an investigation into science teachers' metaphors would provide valuable insights into the underlying beliefs that guide practices of science teachers in Trinidad and Tobago, and would also be useful inputs into the development of education programmes for science teachers.

This research investigates the metaphors held by a sample of untrained secondary science teachers, with experiences of teaching ranging from 3 to 20 years, who were enrolled in the Diploma in Education (Dip.Ed.) programme during the 2004–2005 academic year. Specifically, the questions that guided the enquiry were:

1. What are science teachers' metaphors of teaching at the beginning of the programme?

2. What views about teaching/learning do science teachers' metaphors suggest at the beginning of the Dip.Ed. programme?

3. What are the factors that influenced science teachers' choice of metaphor?

4. Do teachers' preparations for and actions in the classroom early in the programme provide evidence of the enactment of their espoused metaphors?

Metaphors and Teacher Education

Metaphors have been used in many areas of human endeavour, for example, in setting problems in social policy (Schon, 1980), in developing scientific explanations, and in education. "Black believes that some metaphors can function as 'cognitive instruments'" (cited by Ortony, 1980, p. 5), by which he means that metaphors are tools for learning and for developing understanding. Furthermore, he argues that some metaphors do not merely reflect reality but actually shape/construct reality, in that they permit us to see aspects of reality that they themselves help to constitute. In other words, he believes that one of the benefits of using metaphors is that "something new is created when a metaphor is understood" (p. 5), that is, new insights and understandings about phenomena emerge, which allow interpretations of familiar

situations from new perspectives. Adding his support to the benefits of metaphors, Sticht (cited by Ortony, p. 16) posits that metaphors act as "indicators of comprehension, as frames of reference for producing text coherence, and as tools for creative problem solving" (p. 16).

Not surprisingly, along with the benefits of metaphorical language, there are also some limitations. For example, Schon (1980) posits that in social contexts "generative metaphors (metaphors which generate their own solutions) may result in a sort of cognitive myopia in which some aspects of a situation are unwittingly emphasized at the expense of other, possibly equally important, ones" (p. 6). In addition, Kuhn (1980) warns that in conceptualizing issues and solutions, metaphors can be as restricting as they are enabling; the former occurring when one attempts to fit the world into the model so described by the metaphor. Dooley (1998) provides evidence that when confronted with classroom realities some teachers may find it difficult to be guided by the metaphor of teaching that they have constructed, and it is plausible that the internal tension and conflict occurring will undermine such teachers' sense of efficacy. In spite of the limitations described, metaphors can be useful tools to help teachers to convey their understandings of teacher and teaching.

Lakoff and M. Johnson (1980) suggest that all language is metaphorical to one degree or another. They believe that all attempts to symbolize reality is metaphor—an abstraction, an "as if." In developing this argument, Korzybski, cited by Postman and Weingartner (1969, p. 87), insisted that the word is not the thing. He posits that whatever you *say* something is, it is not. Furthermore, in commenting about the difference between reality and a representation of reality, he believes that saying something about the world is not the world—the map is not the territory. Accordingly, he believes that we always wrestle with the question "What words shall we use to represent 'things?'"

Notwithstanding the limitations of the relationship between word choice and what the word chosen is meant to represent, teachers have been asked to describe their views of teaching and to represent their conceptions of the teacher. The literature reports the metaphors that teachers often use to describe teaching/learning at the elementary and secondary levels. Berliner (1990, p. 85) reports elementary school teachers most often subscribe to the metaphor of *teacher as mother earth*. At the high school level, "teacher as information giver was particularly descriptive." In a conceptual paper, Cohen and Lotan (1990, p. 78) report that the *teacher-as-supervisor* metaphor and the *student-as-worker* metaphor are not unusual in educational literature.

Investigations of teachers' metaphors are usually based on the assumption that there is a link between metaphor and action. For example, Bullough (1991) agrees with Connelly and Clandinin that the metaphor teachers use to describe themselves and their teaching shapes their practice:

It makes a great deal of difference to our practice…if we think of teaching as gardening, coaching, or cooking. It makes a difference if we think of children as clay to be molded or as players on a team or as travelers on a journey. (p. 44)

The assumption is that the teachers act in a manner that operationalizes the selected metaphor (see also Lloyd Yero, 2001–2002). Berliner (1990) proposes that the adoption of *teacher as information giver* at the high school level explains teachers' resistance to change in the classroom. Metaphors therefore reveal how teachers see themselves—their identity—and the dimensions of teachers' roles with which they identify. For example, by rejecting the inclusion of new technology, such as television, movies, or computers, the job of dispensing information is reserved for themselves. Accordingly, along with teachers' narratives, the literature highlights the use of metaphor as a vehicle to understanding teacher identity (Alsup, 2006; Kooy & de Freitas, 2007), since how teachers view themselves and how they behave are clearly elements of identity. Not unsurprisingly then, some literature (see Bullough) suggests that the teachers' metaphors guide them to those aspects of teacher education programmes that they choose to consider and those that are rejected. It is clear that there are implications of teachers' metaphors of teaching for the success of teacher education programmes.

This enquiry is embedded in teachers' metaphors and hinges on the tradition of thinking about metaphor as a frame of reference by which persons make sense of phenomena and by which new frames of reference emerge (Schon, 1980). It differs from the tradition of linguists and philosophers of language who view metaphor as an anomaly of language, which must be dispelled. Accordingly, this enquiry aims to build on the literature on metaphors within the context of education, and attempts to investigate how a sample of science teachers' metaphors reflect their conceptions of who is a teacher—their teacher identity—what teaching is and is not, and the implications for teacher education.

Outlining the Contextual Background
and the Research Process

This is an instrumental case study of the nine teachers who were enrolled in the in-service Dip.Ed. programme for whom I served as the science curriculum tutor. The science curriculum tutor is the person who is responsible for delivering two courses—"The Practice of Education" and "Curriculum Process"—as related specifically to the pedagogy of science education. This is the teachers' introduction to methods of teaching within the university setting. In the Republic of Trinidad and Tobago, the entry requirements for teaching at the secondary level are an undergraduate degree in an academic discipline and registration with the Teaching Service Commission. In other words, the participants who enter the Dip.Ed. are experienced teachers, but they have not been formally trained. In this case study, the participants' teaching experiences ranged from 3 years to 20 years. The teachers are employed in a range of schools, which comprise the secondary sector for students between the ages of 11 to 19 years. There are the traditional denominational seven-year schools that are generally thought of as "prestige" schools and there are the newer schools. At the time of enrolment of the cohort in the Dip Ed., the latter comprised the five- and seven-year government secondary schools, the three-year junior secondary schools, and the two- or four-year senior secondary/comprehensive schools and sixth form colleges. Data were collected from the nine teachers, but for some aspects of the study, six of the nine teachers were selected for a more thorough analysis based on the richness of the data available.

The first session of the Dip.Ed. usually begins during the last week of July each year and continues for a month, ending in the third week of August. During this period, the teachers attend classes full time at the university on Mondays to Fridays from 9:00 a.m. to 3:00 p.m. Upon resumption of school in September, the teachers return to their full-time teaching responsibilities from Monday to Thursday and attend the Dip.Ed. sessions on Friday. Alternate Friday sessions are conducted either at the university or as a "Field Day" at selected teachers' schools. On the scheduled field days, three teachers, including the host teacher, each teach a 35–40 minute lesson. In addition, a tutor also visits each teacher during prearranged one-on-one "school visits" during the term. One of the goals of the Dip.Ed. is the development of reflective practitioners. To this end, teachers engage in journal writing, assemble a portfolio, and complete lesson plan forms that include a section devoted to teachers' reflections of the lesson.

During the first week of the course, as an introduction to the process of reflection, all science teachers were asked to write an autobiographical statement that described their journey towards becoming a teacher. This assignment is also used as an artifact that is included in the portfolio. During Week 2, the science teachers were given another assignment in which they were asked to write a metaphor of themselves as teachers (see the Appendix). The task was intended to have students construct their own metaphor, and so a list of metaphors comprising those that are generally reported in the literature was not presented to them. During the school term, teachers were observed in the classroom and on field days, and were also encouraged to submit lesson plans for review. The assessment for this course was a teaching practice examination (accounting for 75%); as well as the examination of a portfolio (25%), which included a portrait of themselves as teacher; and 8–10 entries from their journal that demonstrated significant growth points, which, in general, provided evidence of their growth and development.

The data from the metaphor assignment were analysed qualitatively to determine patterns and themes. In addition, each metaphor submitted was analysed to allow multiple meanings to emerge (a process of deconstruction) "by reading the text against its obvious meaning and intention, teasing forth the conflicts between sense and implication showing that the text never means only what it say or says only what it means" (Powell, 1997, p. 158), and so to interrogate the multiple/possible meanings of the teachers' understanding of teaching. To facilitate the process of deconstruction of the metaphor, the first two lesson plans and the accompanying teachers' actions in the classroom were analysed. In addition, portfolio productions and artifacts were analysed to gain deeper understandings of the meaning that teachers give to their actions in the classroom.

Findings

The research questions are used as the framework for presenting the findings below. To avoid repetition and for simplicity of presentation, the analysis is sometimes presented in relation to more than one research question.

Research Questions 1–3

1. What are science teachers' metaphors of teaching at the beginning of the programme?
2. What views about teaching/learning do science teachers' metaphors suggest at the beginning of the Dip.Ed. programme?
3. What are the factors that influenced science teachers' choice of metaphor?

Science Teachers' Metaphors

At the start of the programme in July, the nine teachers selected a range of metaphors to describe themselves as teachers. In the main, the focus of the metaphors was on teacher with learner backgrounded. Two teachers chose the metaphor of *sculptor*. The other metaphors that were selected were *gardener*, *house painter*, *eagle*, *peacock*, *mango tree*, *tree swaying in the wind*, and *sieve*. These metaphors, with the possible exception of the *sieve*, in general, foregrounded the teacher as actor/all knowing with the learner being acted upon. However, two teachers who selected the metaphors *mango tree* and *house painter,* in describing/explaining their metaphors, went beyond the teacher/learner interaction to include the other stakeholders, for example, the school administrators and the parents, and to include the notion of *teacher as developing/growing*.

The metaphors were interpreted as indicative of varying levels of teacher control associated with the teachers' role. One of the nine teachers likened the teacher's role to that of an inanimate object—a sieve. This example can be interpreted to indicate a somewhat passive role for the teacher, which suggests minimum teacher control, in contradiction to the idea that a sieve by its very nature controls the passage of substances. The idea conveyed was almost of the teacher as "just there" and almost incidental to learning. The other metaphors suggested a more active teacher role. Following are the teachers' metaphors, the views about teaching/learning that can be inferred from an analysis and deconstruction of the metaphor and other evidence gathered, and the possible influences on the teachers' choice of metaphor.

Levels of Teacher Control

The majority of metaphors seemed to suggest that the teachers in this sample recognized that the teacher/student interaction required/involved students as thinking, knowing beings. However, the metaphors projected a view of teaching on a continuum of teacher control from passive (the

sieve) to teacher control with some student input (*eagle*, *mango tree*, *sculptor 1*, *gardener*, *tree swaying in the wind*)—the latter being the most open to uncertainty and attempting to describe a systems approach—to teacher exhibiting authority and control with little student input (*sculptor 2*).

The analysis presented below begins with the metaphor of the *sieve*, which was selected by a male teacher who taught at a 7-year all-male "prestige" school. He expressed his inability to effect learning for all students and his feelings of "helplessness."

Helplessness

> *I am a sieve*
> When a topic is taught by me, some students will understand and some will not. Those that understand will always follow what is done in class as the school year progresses. Those that do not understand end up remaining in this state, especially when there is a time constraint for the completion of a syllabus. They can sometimes lose motivation and transfer this to other new topics. Hence they remain in a state of loss for the entire school year. I sometimes feel helpless to remove their affliction.

The teacher's expressed feelings of helplessness were not restricted to pedagogical skills (selection of strategies that facilitate concept acquisition and development). They were also related to classroom management, that is, to providing the type of classroom environment in which the benefits of selected strategies are optimized. The teacher's autobiography provided the context for his selection of the metaphor:

> Another influence on my teaching methods occurred during my first two years of teaching. I had very poor classroom management skills with one of my classes being very chaotic everyday, with only a few students doing any work. I asked one of my senior teachers for help. He told me to try to separate the disruptive ones if possible and with more experience, my management skills would improve.

His perception of the organizational structure of the school and the effectiveness of the procedures and systems for maintaining discipline were related to this "helplessness." In his autobiography, he had written:

> There were students who were disruptive and disrespectful in class. When they were punished by teachers, they did not carry out their punishment. The matter would be referred to the dean who also punished them, but they still would not carry out their punishment. The matter would be referred to the principal who

> usually did nothing to the students but gave them a talk. The students would then continue their ways knowing that they were immune to punishment. The dean might refer the matter to the children's parents who also usually would do nothing. Therefore the deans' hands were usually tied and the teachers' hands were tied even tighter. Hence, maintaining discipline and order in the classroom was my major challenge.

The feelings of helplessness also surfaced towards the end of the autobiography:

> During my first year of teaching, I wanted all of my students to succeed in their examinations. As time went on, I realized that this was an impossible task. All I can do is attempt to accomplish this knowing at the back of my mind that it will never happen.

By contrast, other teachers' metaphors suggested a greater level of teacher control and agency. The metaphors *tree swaying in the wind*, *eagle*, *sculptor 1*, and *gardener* reflect teachers' views that teaching involves teacher control with some student input. However, the teachers' understandings of their role and of teaching were not homogenous. The following metaphors can all be interpreted to acknowledge the importance of student input, but they vary in the teachers' response to student input. The presentation begins with the metaphor that implies most student input. This first metaphor is the only one that shows the teacher's susceptibility to change based on the student/teacher interaction. The metaphor (from a Sixth Form teacher—one who teachers students whose ages range from 17–19 years, during their sixth and seventh years of secondary schooling) seemed to capture the idea that students were thinking, knowing, active participants who contributed not only to their own learning but also the teacher's learning.

Reciprocity: Teaching/learning as discourse

Tree swaying in the wind

> I am the tree. The roots and trunk represent my core values and knowledge part of which is the content of my subject area. The breeze represents all the discourse that is going on between the students and myself, and I am swaying because the ideas and opinions of my students affect not only the teacher in me, but all the other aspects of me. I sway in the class, because I am not all knowing in my subject area and sometimes my students ask questions that I do not have the answer to and I do admit to not knowing. Sometime students may ask questions that make you … are a totally different view to what you think.

11

In elaborating the metaphor above, the teacher draws upon her "limited experience" but recognizes that students have ideas/thoughts that are independent of the teacher. It is plausible that the teacher's perceptions of the students' level of maturity (age range 17–19 years) influenced her view of teaching and learning. The teacher noted in her autobiography:

> In my limited experience, the delivery of the syllabus is made easier if I develop a rapport with my students…helps build bridges to a more respectful and open relationship.

In a similar fashion, in selecting the metaphor of the *eagle*, the next female teacher, with six years experience, acknowledges that students have the capacity for independent thought, and she believes that they should be given the opportunity at times to work independently of the teacher. However, she also believes that the students are not always capable of achieving the learning outcomes independently and, therefore, the teacher's role is to be vigilant and to monitor the students and hence to intervene when necessary:

Vigilance

> *I am an eagle*
> The eagle maintains a sharp focus on the eaglet, making it easier to detect the earliest sign of trouble. Similarly as a teacher, when I allow my students to go out to seek information on their own, I don't assist them at the first sign of trouble. I sometimes leave them to go through the learning process.

The teacher's autobiography, which indicated that students should be given the opportunity to work at their own pace, provided some insights into her choice of metaphor. The influences on her metaphor were related to her philosophy of teaching and were based on her own experiences at home and school:

> On entry into the teaching service, my philosophy was that children learn best when they are allowed to develop their own style of learning and allowed to work at their individual pace. This philosophy was influenced by my experiences at home and primary school. In primary school, I was a slow developer…. My teachers in school never made me feel stupid, they always left me to develop at my own pace. The same followed at home…. My parents never scolded me, nor did they punish me for performing poorly in examinations…. It was based on those experiences that I developed my philosophy.

In contrast to the above teacher's disposition toward student independence, two teachers selected the metaphor of *sculptor* to theorize about the role of the teacher and of teaching, and both teachers assumed that their role was to take responsibility for shaping the learner. However, each teacher's view was underpinned by very different assumptions about the nature of the learner. The first, *sculptor 1*, recognized that the students are not "uniform" and that their individual differences must be considered during the teaching/learning encounter. As illustrated below, teaching requires "teacher control with some student input," which contradicts the view that the *sculptor* has full control over the final outcome.

Students as individuals

Sculptor 1

The teacher selected the metaphor *teacher as sculptor* and explicitly identified her assumption that the teacher is in control of the students' development:

> This choice of metaphor is supported by the assumption that the teacher is responsible for moulding the learner.

However, the female teacher's elaboration on the metaphor shows that she recognizes the individual differences that her students bring to the teaching/learning encounter. In other words, *teacher as sculptor* deconstructs to reveal a role for student input:

> Learners are not uniform but are different types of media with which I work. A child may be clay, stone, marble or even 'junk,' all of which can be beautiful if worked properly.

Recognition of student differences was also found in the "letter to self" in which her expectations of the Dip.Ed. programme were outlined. Drawing upon her five years experience of teaching, she wrote:

> I want to be able to reach the more difficult students; those who find my approach challenging.

In a similar fashion, the *teacher as gardener metaphor*, as outlined below, can be interpreted to mean "teacher control with some student input."

Teacher in control: Meeting students' every need

In responding to the task presented, the teacher who selected the metaphor of a *gardener* stated her assumptions about teaching and learning explicitly. She said that the teacher is independent, controller, and provider while the student is dependent. It is evident that the teacher is referring to both the cognitive and affective dimensions of the

13

teacher's role. With respect to the former, it can be interpreted that the teacher's view is that knowledge is a commodity that is prepackaged and which the teacher dispenses. The affective dimension is also evident—the student is dependent, so the teacher must "tend to their every need." The statement can be interpreted to mean that students are not given opportunities to develop independence and to take responsibility for their learning.

> I am a gardener who tends to his plants in the nursery. For the time that I have them, I try to attend to their every need offering food and love.

The influence of the teacher's past beliefs on the selection of this metaphor was stated in her autobiography:

> I can now say that my initial teaching philosophy saw the students as a 'passive learner.' I, on the other hand was the teacher, the adult, the authority on the subject and definitely the one in charge. In other words, I firmly adhered to the sayings that **'Children must recognize authority,' 'Speak when spoken to'** and **'Be seen and not heard.'**

Interestingly, it seemed that the teacher's past beliefs had a greater impact on the selection of metaphor than her reflections upon her personal experiences of student-centred lessons as a student at school, her exposure to the discussions among trained teachers, and, as indicated in her autobiography, her actual practice:

> My philosophy of teaching now placed more emphasis on the student and that lessons should be fun in order for learning to be achieved. This trend of thought was in keeping with the discussions of trained teachers, the hub of conversation being student centered learning, multiple intelligence and its implication to learning to name a few.

Although seemingly contradictory interpretations of the teacher's comments are possible, the metaphor can reflect an amalgamation of views. In biological terms, the plant is a producer—an organism that combines disparate elements to produce a new material via photosynthesis. So that far from student inactivity and passivity that one may at first assume when presented with the *gardener* metaphor, the metaphor deconstructs to provide conceptual space for student independence. The *teacher-as-gardener* metaphor can be interpreted to mean that the teacher provides the externals—conditions and materials—and the student actively engages in making meaning (something new).

Accordingly, the *teacher-as-gardener* metaphor deconstructs to reveal active student involvement.

In contrast with the interpretations of teacher presented by the teachers who chose *sculptor 1* and *gardener* as metaphors regarding individual differences and student involvement, there was less student input conveyed in the description from the second teacher who chose the metaphor *teacher as sculptor*.

Teacher in control: Teacher shapes the students

The second teacher who selected the metaphor of sculptor and who has been teaching for four years thought of the students in terms of a single material, which she has the power and authority to shape, even in the context of student resistance or other challenges that can occur during the teaching/learning process:

> *Sculptor 2*
>
> A sculptor is a person who forms sculptures or forms representations of objects using for example clay. As a teacher, I consider myself to be a sculptor. My students are like the clay I use to mould into a beautifully shaped and decorated sculpture.

As the teacher elaborated on her interpretation of the metaphor, she admitted that the task of "moulding" was a difficult one in which there might be resistance or a challenge encountered—she described the material as "tough." Yet, in spite of this apparent opportunity for student input (in this context, some teachers might aim to involve students as a management strategy), the teacher relegated the students to a passive role. She expressed the view that the teacher is the authority and is the sole decision maker. She seems to believe that the teacher knows what is right and for whom. She wrote:

> Clay is a type of soil, which is generally tough and on its own assumes no form. However, it is full of potential since it can be used to make any type of sculpture the sculptor desires. The job of the sculptor is to decide what shape the sculpture will assume. In order to develop a good sculpture, the sculptor needs to know how much water to add in order to obtain the correct consistency.

Yet, this interpretation of the metaphor began to unravel as other data were analysed. The following excerpts from the "Letter to self" assignment, the autobiography, and the caption for the autobiography reveal that there was implicit recognition of student diversity and of differences in learning style, which require knowledge of a variety of strategies for teaching:

15

> In my school I have had experience dealing with all types of students, for example disruptive students, rebellious students, those with academic disabilities and writing and other similar problems. I expect that this Diploma in Education will equip me with the necessary tools to handle such students. (*Letter to myself*)

> This entry gives information about me as a child and as an adult. It shows how I learnt at different stages in my life and which learning style worked best for me. (*Caption for autobiography*)

> As I grew older I realized a huge part of learning involved experiencing things for myself. Reading from a text book and listening to my teachers helped me in the learning process to some extent but actually seeing a process being carried out made understanding a lot easier…. I really enjoyed laboratory sessions for I felt it made Chemistry much more exciting and easier to understand. My Chemistry teacher at that time influenced me a great deal as a student. He had a very practical approach to teaching Chemistry and this made me look forward to his Chemistry class. When I looked back at his style of teaching and the impact it had on me as a student, I felt that I wanted to have this kind of impact on my students as well. (*Autobiography*)

The analysis above shows that views about the learner and teacher/learner interaction were the dominant concerns; however, the teachers' responses also captured their views about the nature of knowledge.

Nature of knowledge: Knowledge as dispensed

As teachers elaborated on the metaphors selected, most suggested that knowledge was a commodity that was dispensed by the teacher to the somewhat passive student. For example:

> *Sieve*

> I try to break this rock into pieces whereby each piece represents the knowledge I have imparted on a particular student.

> *Sculptor 1*

> The subject matter, which I routinely handle is simply one tool I can use to effect my purpose.

> *Sculptor 2*

> Just like the sculptor needs to add sufficient water to prevent the sculpture from cracking, I need to impart sufficient knowledge to

my students. This includes knowledge of an academic nature, social nature and moral nature…. I am assuming as a teacher I know just how much knowledge (subject matter) to impart to students so that they can become well rounded individuals.

Summary

The metaphors conveyed different foci for theorizing about teaching. For example, some metaphors focused mainly on self and on the developmental process of developing teacher self. Most metaphors focused on teacher-student interaction. However, they all revealed perceptions of levels of teacher control, a view of knowledge, and a view of the learner. It seems that those metaphors that characterize students as active, thinking individuals whose views should be acknowledged, and which may even lead to changes in the teacher, are more suitable to the secondary learning environment than those in which the students are passive and the teacher dispenses information. With respect to the science classroom in particular, the latter approach provides little opportunity for students to be introduced to the process by which scientists engage in the scientific enterprise and the outcomes of the scientific enterprise, such as knowledge construction, and for them to engage in this process.

It is evident, however, that although some of the teachers' metaphors may initially be interpreted to be focused solely on the teacher and, hence to suggest high levels of teacher control, the metaphor deconstructs to reveal teachers' recognition of individual learners' input in the teaching/learning process. This latter interpretation contradicts the original teacher-centredness implied. The analysis of autobiographies and journals often supported alternative interpretations of the metaphor and gave a more complete picture of teachers' conceptions of teaching and learning.

Classroom observations also provided another perspective on teachers' understanding of teaching and learning, and contributed to an understanding of whether teachers acted upon their espoused beliefs. In the following section, the findings on the question: "Do teachers' preparation for and actions in the classroom early in the programme provide evidence of the enactment of their espoused metaphors?" are presented. Throughout the rest of the paper, the teachers are at times identified by the metaphor that they selected.

Research Question 4

Do teachers' preparation for and actions in the classroom early in the programme provide evidence of the enactment of their espoused metaphors?

The data used to answer this question were based on the written lesson plans for, and observations of, the first two lessons taught. In preparing the written lesson plans the symbol *T* is used for Teacher's actions and *S* or *Ss* for Students' actions. The teachers' actions were analysed in reference to their espoused (explicitly stated) beliefs/conceptions of teaching. In instances where these beliefs were not stated explicitly, the actions were analysed in relation to my interpretations of the metaphors. Analysis of the data led to the development of three categories: "mismatch between the metaphor and teachers' action in the classroom," "mixed: match and mismatch," and "match between teachers' actions and the selected metaphor."

Mismatch between Metaphor and Action

The data obtained from three of the six teachers provided little evidence of the operationalization of their metaphors in the teaching of science. For example, the teacher who selected the metaphor *teacher as eagle* had expressed the view that there was a role for student independence in the classroom. She indicated that the teacher should be vigilant while providing opportunities for students to work at their own pace. However, the first two lessons were essentially teacher-centred designs of whole group teaching. The first lesson comprised teacher explanations with little student input, and the second was a guided discussion in which the teacher used questions to assist students in developing concepts. The first lesson on meal planning illustrates a didactic approach which is associated with a high level of teacher-centredness. It was designed as follows:

- T explains reasons for individual food groups being displayed in varying proportions on the food group chart.
- T explains that items from all 6 groups need not be consumed at every meal
- T explains the multi-mix principle using the 6 food groups
- T explains the 4 mix, 2 mix, and 3 mix principles and states which ones are recommended.

The teacher recognized the weaknesses of the lesson. In her written reflection at the end of the lesson, she wrote:

> Students were receptive to the lesson only during the introduction when students were shown charts of 6 food groups. As the lesson proceeded the students began loosing [sic] interest in the lesson by talking among themselves or sleeping. In reflection, the lesson was not student centered. Students got distracted. Lesson should have been based around students so that they would be more interested.

It is likely that the teacher was committed to the philosophy of teaching as described by the metaphor but, as an untrained teacher, she did not know how to plan her lessons, that is, the strategies required to put her teaching philosophy into action.

A similar mismatch existed in the classroom of the teacher who had selected the metaphor *tree swaying in the wind*. There was little student participation in this teacher's classes. Some insights into the contradiction between her espoused beliefs and actions came from the autobiographical statement. It is likely that the teacher's behaviour was influenced by the introduction of a new syllabus (CAPE Chemistry) and the ensuing insecurities with respect to the implementation of School-Based Assessment. The new demands of the syllabus paradoxically precipitated a reversion to "old ways of acting," likely drawing upon the part of the description of the metaphor that represented the "knowledge"—the tree and the roots:

> I still recall my first day…. I went into the class introduced myself and conducted my class using a lot of chalk, talk and equations…. With time, I became more comfortable in front of my students as my confidence grew, but I continued with the same old teaching method, the way I remembered being taught.

The teacher recognized the mismatch between her theorizing and her actions. She reflected on her actions in the classroom and produced a caption for the reflective entry. The caption and reflective statement are presented below:

> ### Caption
>
> From this entry I would like others to realize how easy it was to return to old habits of being teacher-centered.
>
> ### Reflective piece
>
> I find myself slipping into a more comfortable teacher-centered mode of teaching. CAPE is to be introduced to the Lower Six and the thought of SBA's are frightening me. I have never done

> SBA's before. Sometime I feel overwhelmed by the volume of work and during these times I find the easier and most comfortable way of teaching, the one I am accustomed with. I have all intentions of preparing and executing lesson plans that are student centered, but I find that preparing lesson plans is difficult.

If we proceed on the premise that the student-centredness inherent in teachers' espoused metaphors is desirable and is the standard by which we should judge their actions, then the above two examples reveal teachers' actions in a negative light in relation to their metaphors. The last example below also reveals a mismatch between metaphor and actions, but in a manner that leads to a more student-centred approach than is implied by the teacher's explicit rendering of the metaphor.

> *Gardener*
>
> I am a gardener who tends to his plants in the nursery. For the time that I have them, I try to attend to their every need offering food and love.

In response to part (c) of the assignment (see Appendix), the teacher's assumptions about the role of the teacher and learner were stated explicitly. She described the teacher's and students' roles as: "teacher-independent, controller, provider, student-dependent." However, the teacher's lesson plan shows that she did not "dispense information" as might have been expected from her explicit interpretation of the metaphor. Instead, her students were given the opportunity to synthesize ideas. This type of student activity is in fact congruent with the *gardener* metaphor, if the plant (student) is foregrounded. As the metaphor is analysed, the interpretation that the students play an active role in making meaning of the experiences provided is juxtaposed against the student passivity that is implied by the initial interpretation of the metaphor.

The following lesson plan for Form 1 on "Properties of Matter" reveals student active involvement in the lesson:

- T displays 3 balloons filled with (i) red beans (ii) water and (iii) air
- T asks for 3 volunteers to observe the balloons, feel, touch, smell to identify contents
- T introduces the topic of the lesson

Development:

- S engage in activity "How heavy am I?", etc. after which students make inferences/draw conclusions.

The explanation for the student-centred lesson that seemingly contradicts behaviours that might be expected at first reading of the metaphor could be linked to statements made in the teacher's autobiography and the caption for the "Letter to self":

> Inspiration for change first came from my experience in Secondary school with my most admired Biology teacher…. My attitude to students and my style of teaching changed trying to mirror some of these images. Classes now took the format of a lot of group activities, experimenting for discovery and observations. Students were more eager to come to classes…. My philosophy of teaching now placed more emphasis on the student and that lessons should be fun in order for learning to be achieved.

Caption for "Letter to myself"

> I started this Diploma in Education for a number of reasons. The main reason was to become a better teacher so that each child is given a fair opportunity to learn in my classroom. This piece talks about my expectations of this course and the hope that at the end of this course I would have started my journey of self-development.

It appears that in spite of personal experiences as a student and a teacher, the teacher's initial response to the metaphor assignment was to develop a metaphor that was meant to depict teacher as authority and students as passive. However, the use of the phrase "each child" as opposed to "the children" in the caption above implies that student individuality is recognized and addressed. Similarly, the teacher's actions in the classroom revealed another dimension of the teacher's theorizing about teaching and learning. It seems that old deep-rooted ideas about teaching and learning were expressed through the choice of metaphor and its explicit elaboration. However, in the classroom setting, during the interaction with the students, another set of ideas influenced the teacher's actions. It is evident, then, that whether the *gardener* metaphor is interpreted in a manner that reveals a match between metaphor and action depends on whether the teacher or student is foregrounded. The various interpretations can also lead to teachers' actions in relation to their metaphor that can be described as mixed.

Mixed: Match and Mismatch

For the teacher who selected *teacher as sculptor 2*, the actions were somewhat contradictory. Some of the data revealed aspects of a match and some of a mismatch between the teacher's interpretation of the metaphor and her actions in the classroom.

> *Sculptor 2*

The actions of this teacher can be interpreted as revealing mixed understandings of the metaphor. The teacher's selection of the metaphor was meant to depict students as a homogenous group. In the classroom, the lessons were enacted as whole group sessions, and the students were treated as a single unit, which is in alignment with the metaphor. However, by planning for practical work and small group work, the teacher provided a variety of learning experiences, which provided different learning modalities. The following illustrates. In the lesson entitled "Type of mixtures," students were engaged in group work based on specimens provided. They were also given the opportunity to collaborate and to express their understanding of the concept. The lesson was highly structured and well organized, and the teacher determined time spent on activities and, by her selection of tasks, the response that was expected:

- T brings sugar solution, chalk in water mixture and aerosol spray to class
- T sprays aerosol into air
- T asks students (i) if the aerosol in air is a mixture (ii) if the sugar solution is a mixture (iii) if the chalk in water is a mixture
- T explains that all are mixtures of different types
- Ss are placed in groups
- Ss are given 5 substances (each group)
- T asks students to class these substances into colloid, solution, suspension
- Groups are asked to present their results
- T and students discuss results

In the second lesson of this unit entitled: "Separating mixtures," there was also evidence of independent group work and practical activity, which meant that there were opportunities for student input. However, as in the previous example, the class was treated as a unit and the tasks presented required predictable procedures and responses that allowed the

teacher to maintain tight control. In addition, the teacher expected that each group would have contributed to the single overall class outcome:

- T shows Ss a sand and salt and water mixture
- T asks Ss if they can separate the mixture
- T states that mixtures can be separated by filtration, evaporation, and crystallization and that this is the topic of the lesson
- T asks Ss what is meant by the terms filtration, evaporation, and crystallization
- T and Ss discuss responses
- Ss are placed in groups and must separate the given mixture by filtration, evaporation, and crystallization
- T summarizes lesson

The teacher's actions provided opportunities for student active involvement through practical work and small group work. It is likely that these strategies were intuitively selected based on the teacher's conception of the nature of science and her own experiences of learning science.

The last two examples presented below can be interpreted to show a match between metaphor and actions.

Match between Metaphor and Actions

Sieve

For the *teacher as sieve*, his actions were interpreted to match the meanings suggested by the metaphor in terms of classroom management skills. The first observation of the teaching showed evidence of the teacher's overall inability to manage the teaching/learning encounter in the classroom. His actions can be interpreted in relation to the teacher's passivity/helplessness expressed explicitly, as well as to the image of being acted upon that is implied by the metaphor. The first session observed included a practical exercise. It was planned as follows:

Lesson: The use of the burette

Introduction: T shows Ss the use of the burette to test medicine for their correct compositions

Transition: T links use of the burette with accuracy

Development:
- Ss observe the features of a burette
- T demonstrates the use of the burette
- Ss deduce precautions to take when using the burette

- Ss in groups use the burette to measure out different volumes of liquid
- Ss in groups measure the same volumes using 50 ml beakers
- Ss compare the accuracies

Students were expected to work in small groups of three or four to become familiar with and to correctly use simple laboratory apparatus. The classroom session could be described as chaotic. Students were not given adequate instructions and those given were oral only, involving a series of steps. Procedures were not explained, time frames for completion of tasks were not established, work sheets for recording results were not provided, and the teacher attempted to speak above the level of noise in the class. Altogether, the teacher was ignored during much of the activity. However, the lesson plan provided evidence of the teacher's predisposition to involve students actively in the lesson by having them use the apparatus provided, and thus to gain practical hands-on experiences of scientific measurement. During sessions of this type, classroom management was critical. If the class were not managed appropriately, it is highly likely that feelings of helplessness would emerge due to the tension between the situated lived classroom experiences and the traditional image of teacher in control of a quiet, ordered classroom.

During the following two visits to the teacher's school, evidence of the lack of classroom management skills was again apparent. The lessons all catered for student involvement in practical work and in group work to facilitate active learning. However, at the start of the Dip.Ed., the teacher was unable to create a classroom environment that was conducive to productive learning in the context of high levels of student activity. The teacher's selection of metaphor may surprisingly be aligned to having students in control of their learning. But with this type of classroom there are challenges that teachers face in optimizing learning. The net result may be "feelings of helplessness" if classroom management in the student-centred environment is inadequate.

Another match between the teachers' interpretation of the selected metaphor and their actions in the classroom was revealed by *sculptor 1*. For example, *sculptor 1* had expressed concern for student diversity, acknowledging explicitly that students were different. Although there is no denying that this teacher was very much in control of the pace of lessons, of what was learnt, and of the final outcome of the lesson, as was depicted by some aspects of the teacher's interpretation of the metaphor, the lesson plans and the teacher's reflections also reveal a

primary focus on student difference and an attempt to deliberately cater for these differences.

> *Sculptor 1*
>
> This choice of metaphor is supported by the assumption that the teacher is responsible for moulding the learner. Learners are not uniform but are different types of media with which I work. A child may be clay, stone, marble or ever 'junk', all of which can be beautiful if worked properly.

Evidence of the teacher's initial attempts to address student diversity was her use of a multimodal approach to deliver a lesson on atomic structure and bonding. She used visual aids and engaged students in building models, along with the traditional teacher and student question and answer sessions.

In reflecting on the lesson, the teacher explicitly mentioned the concept of multiple intelligences (MI). She wrote:

> This is the start of my attempts to teach for MI. The use of models and diagrams made a huge difference in the reception that the topic got from the students. My students are usually intimidated by the abstract nature of bonding.

The first teacher who selected the metaphor of *sculptor 1* interpreted the metaphor to convey her understanding and acknowledgement of student difference. Her actions in the classroom also demonstrated that she attempted to cater for student diversity.

Summary

For two of the teachers, there was evidence of a match between teachers' interpretations of their espoused metaphors, their teaching plans, and their actions in the classroom. In two of these cases (*sieve* and *sculptor 1*), teachers' intentions and actions were consistent with current learning theory that puts the learner at the centre of the activity, either by employing hands-on practical work or by catering to individual differences.

For four teachers, there was evidence of a mismatch between metaphor and action. Two of the teachers' theorizing (*tree swaying in the wind* and *eagle*) reflected underpinnings of contemporary learning theories, but these beliefs were not reflected in their actions. In the last two cases (*gardener* and *sculptor 2*), the teachers' theorizing was inconsistent, at times being explicitly traditional and at times reflecting contemporary theories, yet the actions reflected current theories.

The metaphors themselves facilitated multiple interpretations, each adding to the understanding of teachers' insights into teaching and learning. It was evident that for a number of these teachers the metaphors focused on the teacher, as had been requested by the task presented (see Appendix, Task a). However, interpretations of the associated learner role were embedded within the metaphor and these meanings often contradicted the teacher-centredness initially implied.

It is clear, then, that the selected teachers' espoused metaphors provided some insights into the teaching/learning interaction in their science classrooms. However, there were instances of mismatch between teachers' interpretations of the metaphor and their actions, which could, however, be interpreted as a match when the metaphor deconstructed. The analysis of the metaphor in conjunction with the analysis of the observations of classroom actions therefore provided evidence that deepened my understanding of the teaching/learning dynamics, and revealed the complex nature of teaching. These findings thus add to the body of literature on teachers' metaphors and emphasize the weaknesses of relying on one source of information, such as metaphor, though a significant one, for understanding the teaching/learning interaction.

Conclusion and Discussion

There were similarities and differences between the metaphors of the science teachers involved in this study and those reported in the literature. The similarities include, firstly, the range of metaphors selected, that is, there is no single metaphor of teaching. A second similarity is that teachers involved in this study selected metaphors, for example, *gardener* and *sculptor*, which are commonly reported in the literature (see Bullough, 1991; Tobin, 1990). The following from the literature illustrates. Developing the idea of the *gardener* metaphor with respect to a study on teacher change, Tobin (p. 123) ponders "if Peter could understand teaching in terms of a gardener nurturing seedlings, is it possible that he would tend to the individual learning needs of the students in his class?" Thirdly, the traditional understandings about the teacher's role and hence about teaching and learning that are usually associated with these metaphors, such as the role of *nurturer/caregiver* (George, et al., 2001) and *information giver* (Berliner, 1990) were noted in this study.

There are at least two plausible reasons for the similarities. Firstly, science teachers in Trinidad and Tobago, as elsewhere, have a similar range of experiences and knowledge that contribute to their conceptions of teaching and learning. Secondly, the science teachers may have

chosen metaphors with which they were familiar. It is likely that the unusual metaphors, for example, *sieve*, and *tree swaying in the wind*, reflected the creativity of the teachers. However, even with these examples, the similarities among these teachers' conceptions of an active student role when engaged in the teaching/learning encounter were revealed.

The science teachers' metaphors were focused on three of the four commonplaces of teaching as described by Schwab (see Novak, Mintzes, & Wandersee, 2000)—the teacher, the learner, and, to some extent, the context or milieu. The fourth commonplace, the subject matter, seemed to have had little influence on the metaphor selected. The science teachers involved in this case study seemed to have focused their theorizing on the interaction between themselves and the learners, and did not focus on their subject/discipline as the vehicle for the interaction. This is a somewhat surprising result because it is commonly reported that secondary school teachers are subject specialists who tend to make the subject matter their main goal. On the other hand, the literature reports that the primary teacher is a generalist whose focus is predominantly on the child. Berliner's (1990) report on metaphors of secondary and primary teachers as *teacher-as-information giver* and *teacher-as-nurturer*, respectively, reflect this thinking.

A possible explanation for the difference between the results of the present case study and findings in the literature regarding the secondary science teachers' focus is that the teachers involved in this study were experienced teachers enrolled in an in-service programme. Most of the research reported in the literature was done in developed countries and was based on metaphors of pre-service teachers. It is plausible that in this study, the teachers' personal experiential knowledge of interactions with students within the school context could have impacted on their responses. A follow-up study to determine science teachers' metaphors when the task is phrased explicitly to include the discipline, as done by Sam (1999) in the area of mathematics, would therefore be a significant contribution to our understandings. Accordingly, there are implications for the manner in which the task on metaphors is presented to future cohorts. Nevertheless, in spite of the limitations inherent in the more generalized question posed in this study, the investigation into science teachers' metaphors did provide important insights into their conceptions about teaching and learning.

Science teachers' metaphors revealed their theorizing about teaching and learning. With the original focus on the teacher, the metaphors deconstructed to reveal a component of student input and active involvement in the teaching/learning encounter, which seemed

appropriate for thinking about teaching and learning for students at the secondary level. Such conceptions in part address Foucault's concern (as cited by Dwight & Garrison, 2003) about providing democratic environments, and Tsai's (2003) concern about meeting secondary students' expectations of classroom procedures. Nevertheless, with each of the metaphors there was an element of teacher control, with the teacher as the centre of the teacher/learner interaction. According to Lloyd Yero (2001–2002), the focus on teachers' actions "casts students as passive receivers." However, it is plausible that this aspect of teacher identity could not have been avoided given the nature of the task used to solicit metaphors and given the power differentials that inevitably exist between teachers and learners.

The analysis of science teachers' metaphors provided some insights into their beliefs about teaching and learning in science classrooms. However, some of the teachers' actions in the classroom revealed a different set of beliefs, which, at fundamental levels, contradicted the meanings espoused in their elaboration of the metaphors. In one case (*gardener*), the mismatch was actually in favour of contemporary theories of learning, which matches the deconstructed metaphor; in others, the teachers' actions were not congruent with the contemporary understandings stated. For example, the actions of the teachers who chose the metaphors *tree swaying in the wind*, and *eagle* showed that they were quite traditional in their approach to lesson delivery. It is therefore evident that the analysis of teachers' actions in context is essential to developing a deeper understanding of their metaphors and their conceptions of teaching and learning.

It is quite plausible that on receiving teachers' metaphors, teacher educators might focus on the central (commonplace/familiar) interpretation rather than peripheral and alternative meanings of the metaphor, and might expect certain attitudes and ways of behaving in the classroom, especially if the metaphor can be interpreted as being congruent with the theories the teacher educators espouse. However, teacher educators should be very careful of such interpretations. The results of this study show that a match between metaphor and action in the classroom was not always evident, in support of Dooley's (1998) findings. There are many possible reasons for this, including the many contextual and personal variables that can mediate teachers' responses in the classroom. Some of the variables include changes in curriculum, availability of resources, teachers' varied experiences, and the core and peripheral meanings that can be associated with the metaphor. Furthermore, as Sacks (cited by G. C. Johnson, 2001) indicates, the intergenerationality of metaphors may lead teachers to uncritical

reproduction of ideas that do not in fact match their actions in the classrooms.

In sum, the teachers' response to the metaphor assignment gave some insights into their theorizing about teaching and learning. However, to fully explore their notions of teaching and learning, teacher educators must obtain multiple sources of data, for example, journal writing, autobiographical statements, and, most importantly, their actions in the classroom. The data from these sources provide the context for reading the metaphor against its obvious meaning and hence reveal multidimensional and often contradictory views of teaching as the metaphors deconstruct. It is also recommended that the metaphor serve as a central referent in all reflective conversations. In so doing, teacher educators can help the teachers themselves to appreciate the tensions that might exist between the more commonplace interpretations of their metaphors of teaching and their actions in the classroom, and hence to understand more fully their own ideas about teaching and learning. As the process evolves, the teachers can be encouraged to develop metaphors that reflect their deeper understandings. In addition, these conversations should help teacher educators to better discern the effectiveness of teacher education programmes such as the Dip.Ed. programme.

References

Alsup, J. (2006). *Teacher identity discourses: Negotiating personal and professional spaces.* Mahwah, NJ: Lawrence Erlbaum.

Berliner, D. C. (1990). If the metaphor fits, why not wear it? The teacher as executive. *Theory into Practice, 29*(2), 85–93.

Bullough, R. V., Jr. (1991). Exploring personal teaching metaphors in preservice teacher education. *Journal of Teacher Education, 42*(1), 43–51.

Caputo, J. D. (1997). *Deconstruction in a nutshell: A conversation with Jacques Derrida.* New York: Fordham University Press

Cohen, E. G., & Lotan, R. A. (1990). Teacher as supervisor of complex technology. *Theory into Practice, 29*(2), 78–84.

Collins, E. C., & Green J. L. (1990). Metaphors: The construction of a perspective. *Theory into Practice, 29*(2), 71–77.

Dooley, C. (1998). Teaching as a two-way street: Discontinuities among metaphors, images, and classroom realities. *Journal of Teacher Education, 49*(2), 97–107.

Dwight, J., & Garrison, J. (2003). A manifesto for instructional technology: Hyperpedagogy. *Teachers College Record, 105*(5), 699–728.

George, J., Mohammed, J., Quamina-Aiyejina, L., Fournillier, J., & Otway-Charles, S. (2001). *Primary teacher trainees in Trinidad and Tobago: Characteristics, images, experiences, and expectations* (Monograph Series No. 6). St. Augustine, Trinidad: School of Education, UWI.

James, C. (2005). Themes and metaphors in the autobiographical narratives of new sector secondary teachers in Trinidad and Tobago: A case study. *Caribbean Curriculum, 12*, 57–87.

Johnson, G. C. (2001). Accounting for pre-service teachers' use of visual metaphors in narratives. *Teacher Development, 5*(1), 119–140.

Johnson, S. (1990). Understanding curriculum decision-making through teacher images. *Journal of Curriculum Studies, 22*(5), 463–471.

Kinchin, I. M. (2004). Investigating students' beliefs about their preferred role as learners. *Educational Research, 46*(3), 301–312.

Kooy, M., & de Freitas, E. (2007). The diaspora sensibility in teacher identity: Locating self through story. *Canadian Journal of Education, 30*(3), 865–880.

Kuhn, T. S. (1980). Metaphors in science. In A. Ortony (Ed.), *Metaphor and thought* (pp. 409–419). Cambridge, UK: Cambridge University Press.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago, IL: The University of Chicago Press.

Lloyd Yero, J. (2001–2002). *Metaphors in education.* Retrieved July 26, 2006, from http://www.teachersmind.com/pdfdirectory/Metaphors.PDF

Marshall, H. H. (1990). Beyond the workplace metaphor: The classroom as a learning setting. *Theory into Practice, 29*(2), 94–101.

Novak, J. D., Mintzes, J. J., & Wandersee, J. H. (2000). Learning, teaching and assessment: A human constructivist perspective. In J. J Mintzes, J. H. Wandersee, & J. D Novak (Eds.), *Assessing science understanding: A human constructivist view* (pp. 1–18), San Diego, CA: Academic Press.

Ortony, A. (1980). Metaphor: A multidimensional problem. In A. Ortony (Ed.), *Metaphor and thought* (pp. 1–16). Cambridge, UK: Cambridge University Press.

Oxford dictionary and usage guide to the English language. (1995). Oxford: Oxford University Press.

Postman, N., & Weingartner, C. (1969). *Teaching as subversive activity*. New York: Delacorte.

Powell, J. (1997). *Derrida for beginners*. Danbury, CT: Writers and Readers Publishing.

Sam L. C. (1999) *Using metaphor analysis to explore adults' images of mathematics*. Retrieved July 26, 2006, from http://www.people.ex.ac.uk/PErnest/pome12/article9.htm.

Schon, D. A. (1980). Generative metaphor: A perspective on problem-setting in social policy. In A. Ortony (Ed.), *Metaphor and thought* (pp. 254–283). Cambridge, UK: Cambridge University Press.

Tobin, K. (1990). Changing metaphors and beliefs: A master switch for teaching? *Theory into Practice, 29*(2), 122–127.

Tsai, C-C. (2003). Taiwanese science students' and teachers' perceptions of the laboratory learning environments: Exploring epistemological gaps. *International Journal of Science Education, 25*, 847–860.

Appendix

Task

a) Write a metaphor that captures you as a teacher.

b) Illustrate how this metaphor is translated into action in the classroom.

c) What are the assumptions about teachers, learners, subject matter, and context that underpin your choice of metaphor?