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Constructivism- Linking Theory with Practice among Pre-Service Teachers at the University of Trinidad and Tobago

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Abstract. In this paper, the authors investigated how the Year Two cohort of pre-service teachers in the primary specialization at the University of Trinidad and Tobago linked the theory of constructivism with practice in the implementation of their lessons during practicum. A mixed method approach was adopted and the sample included 108 participants. Data were gathered using multiple methods such as questionnaires, focus group interviews and reflections which facilitated triangulation of data. Findings revealed that most participants are familiar with the tenets of the theory of constructivism. Many pre-service teachers have applied the principles during practicum but others opted to engage in the traditional mode of teaching and learning. Participants' experiences are demonstrated in the following themes that emanated: 'active learning', 'sharing ideas', 'student centred and interactive learning', 'engaged in the learning process' and 'learning by doing'. It can be concluded that while some pre-service teachers were able to translate theory into practice, many of them found it challenging to change from a traditional frame of reference.

Keywords: pre-service teachers, constructivism, theory, practice

Introduction

The literature revealed multiple definitions of constructivism with variations based on the perspectives of various authors. This research focused on constructivism as a theory which explains how each child constructs meaning through the learning experiences provided by the teacher. The theory incorporates cognitive, social and radical constructivism. The research explored whether pre-service teachers have adopted a constructivist approach in teaching and learning during their practicum.

Situating the Study

At the University of Trinidad and Tobago all pre-service teachers in Year Two have been exposed to mandatory foundational courses such as 'Student Centred Pedagogy' and 'Psychology of Learning', in which constructivism forms a significant component, thus all pre-service teachers would have been introduced to constructivist-based theory and pedagogy. The study attempted

to discern the extent to which the theory of constructivism was translated into practice by pre-service teachers.

Literature Review

The Theory of Constructivism

There are multiple perspectives of constructivism such as cognitive constructivism, social constructivism and radical constructivism. Many definitions have been proffered including the following:

> The central principles of this approach are that learners can only make sense of new situations in terms of their existing understanding. Learning involves an active process in which learners construct meaning by linking new ideas with their existing knowledge. (Naylor & Keogh, 1999, p. 93)

The central focus of constructivism is that knowledge is conceptualized as a process in which the learner actively constructs meaning and learns through experience. Beyhan and Köksal (2013) note, "What is important in constructivist learning is how the individual makes meaning out of knowledge rather than adopting it" (p. 172).

Constructivism and Teaching

Teachers who use the principles of constructivist theory provide interesting activities for students so that they are engaged in active learning. Chaille (2008) maintains that "constructivism is the theory that *underlies* the choices and decisions you make about how you set up the classroom, choose the curriculum, and respond to the children's work and ideas" (p. 5). As facilitators of learning, teachers mentor and guide students to construct their own meaning (Piaget, 1970; Jones & Brader-Araje, 2002). "Learning is a constructivist activity that the students themselves have to carry out . . . the task of the educator is not to dispense knowledge but to provide students with opportunities and incentives to build it up" (von Glasersfeld, 1996, p. 7). A similar view is expressed by Hackthorn, Solomon, Blankmeyer, Tennial & Garczyn, 2011). Authentic experiences that are meaningful are provided for pupils so that they may explore, discover and solve problems based on their prior knowledge. Chaille (2008) notes that ". . . constructivism underlies all aspects of children's activities and experiences in the classroom" (p. 3).

Teachers also encourage learning by doing (Hackthorn, Solomon, Blankmeyer, Tennial & Garczyn, 2011) which includes problem solving activities, inquiry based learning (Kirschner, Sweller & Clark, 2006) and cooperative learning (Friend & Cook, 2010) so that pupils can be involved in direct engagement (Tobias & Duffy, 2009; Taber, 2016) to share, collaborate and negotiate with each other (Kagan, 1994; Johnson and Johnson, 1999). A conducive environment (Tobias & Duffy, 2009) and the necessary resources are provided to support learning for each individual student. Teachers promote cognitive and social development by using constructivist principles as students are scaffolded to their next level of learning (Vygotsky, 1970; Beyhan & Köksal, 2013).

Teachers function within frames of reference and they use these frameworks to formulate their plans, interpret their experiences and respond to classroom

events (Kennedy, 1999). From a very impressionable age pre-service teachers were 'conditioned' by traditional methods of teaching and learning, thus when they are encouraged to use an entirely different type of teaching, they are asked to shift to an entirely different frame of reference. The literature is replete with examples of the tendency of pre-service teachers to teach the way they were taught as students (Fosnot, 1996; Kennedy, 1999; McCrea, 2012). "The endurance of traditional teaching practice derives in part from the fact that teachers are highly likely to teach in the way they themselves were taught (Kennedy, 1999, p. 55). Pre-service teachers view learning as the acquisition of facts and perceive the teachers' roles as showing and telling students what they need to know (Fosnot, 1996; McCrea, 2012). There is therefore need to promote the self-efficacy of pre-service teachers (Flores, 2015), deconstruct their beliefs (Prawat, 1992) through "activity, reflection and discourse in both coursework and fieldwork throughout the duration of the programme" (Fosnot, 1996, p. 206). In addition, Kennedy (1999) notes,

> The apprenticeship of observation is an important omission from the received wisdom model of teacher learning . . . This apprenticeship gives teachers a frame of reference that allows them to interpret their experiences and gives them some ideas of how to respond to them. (p. 55)

Cognitive Constructivism

Piaget's (1970) cognitive constructivism proffers that learning is active cognizing whereby each child constructs personal meaning through his/her experiences. One of Piaget's (1970) principles is that learning is an adaptive process whereby children build on their previous experiences and this has implications for the way in which information is presented by the teacher. Piaget (1970) postulates 'learning by doing' which suggests that teachers need to provide hands-on experiences for students. The theorist believes that a learner assimilates and accommodates new knowledge into his/her existing schema, thus information is always reviewed and re-constructed in new ways (Selley, 1999; Tobias, & Duffy, 2009).

For Piaget (1980), interaction means "a cognitive subject that is dealing with previously constructed perceptual and conceptual structures" (von Glasersfeld, 1996, p. 5). Teachers must therefore provide meaningful activities which are related to the 'real' world, that is, students' social, cultural and language background to enhance cognitive development. However, while cognitive constructivism has contributed substantially to effective teaching and learning, a major critique levelled against the theory by observers such as Taber (2016) is that it fails to address the issue of subjectivity.

Social Constructivism

Social constructivism, advanced by the theorist Vygotsky (1978) emphasized the collaborative nature of learning and the role of the cultural and social environment. The theory advocates that learning takes place in a social environment in which there is dialogue, discussions and problem solving activities. Learning is seen as a social phenomenon and teachers employ

collaborative teaching and learning methods (Jones & Brader-Araje, 2002), so that teamwork and group skills are developed.

Cooperative learning, which involves positive independence, individual accountability, equal participation and simultaneous interaction (Kagan, 1994) forms key components of social constructivism. With cooperative learning activities (Slavin, 1990; McCrea, 2012), children are supported by each other or more knowledgeable others (Vygotsky, 1978; Tobias & Duffy, 2009).). Theorists Johnson and Johnson (1999) include face-to-face promotive interaction, interpersonal and small group skills and group processing as critically important criteria for constructivist activities. These cooperative learning principles are supported by commentators such as Beyhan and Köksal (2013); Naylor and Keogh (1999) and Taber (2016).

Radical Constructivism

Radical constructivists such as von Glasersfeld (1996) believe that each individual makes associations and constructs unique interpretations but the process of understanding is based on the person's subjective interpretation of the experience, thus suggesting that even though an experience may be identical, there is no way of knowing that the understanding or meaning constructed is the same. Knowledge is constructed from experience, ". . . because they are individual constructs, one can never say whether or not two people have produced the same construct (von Glasersfeld, 1996, p. 5). Researchers such as Riegler (2015) argue that for radical constructivists, the senses, which mediate the external, may not represent the configuration of objects or even interactions in a unified way, which makes 'reality' very subjective.

Co-teaching

Co-teaching has been defined in multiple ways but for the purpose of this research it involves team work of two persons to plan and implement lessons, as well as assess a class of students. This type of co-teaching is also referred to as 'team teaching' where the members of the team co-teach alongside one another and share responsibility for planning, teaching, and assessing the progress of all students in the class (Cook, 2004; Titus, 2013). In order to utilize this method of teaching while using constructivist principles, pre-service teachers communicated, collaborated, built trust and creatively constructed lesson plans with their peers. They became involved in cooperative learning activities (Kagan, 1994; Johnson & Johnson, 1999; Friend & Cook, 2010) to determine teaching strategies and students' activities in formulating their lesson plans. The pre-service teachers shared responsibility, set mutual goals and ensured combined ownership of the development and implementation of lessons.

In the process of planning their lessons they were engaged in constructivist learning by sharing ideas with their partners (Cook, 2004), cooperating teacher and practicum advisors. The aim was to build competency (Flores, 2015) and collegiality among themselves as well implement effective lessons to increase students' learning. They were expected to apply constructivist learning

principles in their classes and refine their technique and personal style (Kennedy, 1999; Taber, 2016) throughout the field teaching exercise in the classroom.

Purpose of the Study

The purpose of the study was to investigate whether pre-service teachers understand the theory of constructivism. It also attempted to determine whether the participants applied the theory of constructivism in their practical teaching. In addition, the research examined the experiences of the participants in the application of the theory.

Research Questions

1. Do pre-service teachers understand the theory of constructivism?

2. Do pre-service teachers apply the theory of constructivism in the implementation of their lessons during practicum?

3. What were the experiences of pre-service teachers in applying the theory of constructivism in their classes?

Methodology and Design

Sample

The sample included a Year Two cohort of pre-service teachers at the University of Trinidad and Tobago. The participants were enrolled as full-time students at the Centre for Education programmes at the Corinth Campus, in the southern part of Trinidad. In the second term of the academic year, the participants engaged in co-teaching, one day per week for three consecutive weeks during which each team planned and implemented six lessons.

Instruments

This research adopted a mixed method approach (Johnson & Onwuegbuzie, 2004) including both a qualitative and quantitative methodology and design. Mixed method research closes the gap between qualitative and quantitative research (Johnson & Onwuegbuzie, 2004). A questionnaire was used as the instrument to collect data. The instrument was pilot tested to determine the appropriateness of the items (Miles, Huberman & Saldana, 2014) and some of the questions were reworded for clarity which increased the validity of the data collection procedure (Creswell, 2012). The items included fifteen questions consisting of eleven yes/ no responses and four open ended questions. The questionnaire was administered to 130 participants and 108 responses were received. No coercion was used in the data gathering process as participants were informed beforehand that participation was totally voluntary.

Focus groups interviews using structured questions were conducted with five co-teaching teams to acquire one on one information about experiences. The interviews were audio recorded and transcribed verbatim. The transcripts were returned to the participants for verification of the data, thereby establishing accuracy and authenticity (Denzin & Lincoln, 2011). Pre-service teachers also

wrote reflections about their experiences and the practical application of constructivist teaching. The multiple methods of data collection allowed for triangulation as well as affirmed credibility and confirmability (Cohen, Manion & Morrison, 2007; Creswell, 2012).

Results

From the data, 96.2 % of the participants revealed that they understand the principles of constructivism. When asked if the theory of constructivism influenced their personal philosophy of teaching and learning 98.1% of the pre-service teachers answered affirmatively and 1.9 responded negatively. A total of 81.48% of them stated that they applied constructivist principles in the implementation of their lessons while 18.52% revealed that they neglected to do so.

The majority of pre-service teachers, 90.7%, reported that they employed hands on activities but 9.3 stated that they did not. The data showed that 89.8% of the pre-service teachers used cooperative learning while 10.2% mentioned that they omitted to do so, thus implying that they would have retained traditional modes of teaching and learning. A significant number, 75.9% explained that they utilized problem solving activities while 24.1% stated that they overlooked the approach during practicum.

Table 1: Responses from Questionnaire Represented in Percentages

Questions	%Positive responses	% Negative responses
1. Have you been exposed to Constructivism as a learning theory?	96.2	3.8
2. Do you know about Cognitive and Social Constructivism?	87.03	12.97
3. Are you familiar with Radical Constructivism	73.14	26.86
4. Have you been exposed to learning theories and student-centred pedagogy?	97.2	2.8
5. Has the theory of constructivism influenced your personal philosophy of teaching & learning?	98.1	1.9
6. Do you think that the constructivist theory is useful for practicum/ classroom practice?	95.3	4.7
7. Did you use Cooperative learning during your practicum?	89.8	10.2
8. Did you apply constructivist principles in the implementation of your lessons?	81.48	18.52

9. Was your lesson student-centred?	86.1	13.9
10. Did you have constructivist problem solving activities for your students?	75.9	24.1
11. Did you engage your students in hands-on activities	90.7	9.3

The experiences of some pre-service teachers are outlined below as the qualitative data cannot be quantified (Creswell, 2012). Common themes (Lichtman, 2006) that evolved include: 'active learning'; 'sharing ideas'; 'student centred and interactive learning'; 'learning by doing' and 'engaged in the learning process'. The themes are congruent with the reflections that pre-service teachers stated in writing, also with the focus group interviews as well as the answers to the open ended questions on the questionnaires.

The team members of the focus groups explained their experiences as follows:
Team A

> *Learning was effective because we did not use 'chalk and talk' teaching strategies. We involved the students in active learning through the use of manipulatives, guided instructions and guided questions. We also engaged them in peer activities to promote peer tutoring and . . . peer assessment. We also activated their schema about the concept by eliciting their previous knowledge at the beginning of the class which is important for the students making meaning . . . with regard to the concept and redounds to long term memory.*

Team B

> *Learning was indeed effective because of the level of participation and enthusiasm shown by students . . . sharing ideas. They were able to manipulate resources . . . engage in discussion and peer learning . . . and the assessments were completed with a high degree of accuracy by the majority of students.*

Team C

> *Our lessons were very student centred and interactive with the additional support of effective age appropriate resources. The lessons were student centred, eye catching and most important informative. When higher order questions were asked, the students responded brilliantly . . . and you realized the importance of involving them in group activities.*

Team D

> *Learning was effective because the students learnt from each other by exchanging ideas on how to do the activity . . . they were engaged in the learning process . . . We were able to assist all students by taking them from one level to the next according to Vygotsky's zone of proximal development.*

Team E:

> *Learning was effective as the students were able to learn by doing, not by the teacher telling them but by actively participating . . . based on student centred and interactive learning.*

Some reflections that students wrote, which are aligned with the themes that emanated from the data, include the following:

1. Students collaborated . . . they came up with their responses.

2. Students were given the chance to actively engage in the lessons.

3. Students were able to do the activities and were given the experience.

4. Students were more involved due to the new methods and the activities used.

5. The problem-based learning . . . and the constructivist strategies used were effective.

The findings revealed that all pre-service teachers are familiar with the theory of constructivism. Secondly, a significant percentage used constructivist learning principles and activities such as cooperative learning in their teaching during practicum. In addition, five themes about pre-service teachers' experiences which emerged are as follows: *'active learning', 'sharing ideas', 'student centred and interactive learning', 'engaged in the learning process, and 'learning by doing'*. However, a number of the participants indicated that they did not use constructivist principles of teaching and learning, for instance problem solving, in the implementation of their lessons and did not create activities for students to construct their own meaning. An 'outlier' that emanated from the study can be summarized in the following statement by one participant: *"Students were able to answer questions and the learning objectives were met . . . they understood the task because they did well in the evaluation"*. These responses indicate that some pre-service teachers perceive teaching and learning as product rather than process.

Discussion

While a majority of respondents are familiar with cognitive and social constructivism, approximately twenty five percent are not familiar with radical constructivism. This suggests that the concept of radical constructivism (Reigler, 2016) has to be deconstructed during practicum so that pre-service teachers have a holistic orientation to constructivism. Most of pre-service teachers indicated that they used constructivist activities in the implementation of their lessons, which means that they were able to translate theory into practice. However, a minority continued in the traditional domain. The implication is that some of the pre-service teachers continue to be challenged with the translation of the theory of constructivism into classroom practice. Others may still be steeped in the ideology of traditional teaching and have difficulty applying constructivist principles of teaching and learning. This may be attributed to the ways in which they were taught by their former teachers (Kennedy, 1999; Kirschner, Sweller & Clark, 2006) or their frames of reference.

Another explanation is that pre-service teachers modelled their cooperating teachers who utilized traditional methods of teaching and learning. A further suggestion is that the pre-service teachers found it easier to plan and deliver

traditional lessons. It may also be an indication of their fears about failure or uncertainty about changing from a traditional frame of reference to a new mode of teaching and learning. In addition, there may be implications for self-efficacy, self-competence, self-confidence and the emotional challenges affiliated with being assessed by practicum advisors during the co-teaching practicum.

It must be noted that during their first year, the pre-service teachers in this study were exposed to "observation practicum" which consisted of observing their cooperating teachers in the conduct of their classes. They also experienced campus based practical sessions in which they were given the opportunity to teach in simulated classrooms. The lack of one hundred percent success in transitioning to constructivist practices therefore demonstrates the power of tradition and the difficulty associated with changing ingrained cultural patterns. As Titus (2013) notes, practicum advisors may need to shift their current paradigm of "knowledge for practice" . . . to . . . "knowledge of practice" (p. 13) which is more meaningful to pre-service teachers and this suggests a restructuring of teacher education programmes.

Conclusion

For successful constructivist practices, there needs to be continuous reflective practice and effective mentoring of pre-service teachers by practicum advisors in collaboration with cooperating teachers. Practicum tutors need to engage pre-service teachers in discourse to discern the difficulties of implementation, issues of time constraints, limitations and other individualistic concerns. Resistance to change from one frame of reference to another must be interrogated and the necessary intervention strategies employed. One suggested method to mitigate concerns and heighten transformation is to engage pre-service teachers in simulated activities on a regular basis.

Continuity is required if constructivist practices are to prevail. Those who used constructivist principles also need reinforcement to refine their teaching skills. For the traditionalists, a consistent reflective approach is necessary if beliefs are to be modified. Practice, observation, modelling and coaching need to be conducted throughout the duration of the programme to facilitate modification of pre-service teachers' perceptions, to assist those who are steeped in the transmissionist mode of teaching in the transition process, and to ensure the continuation of constructivist principles for teaching and learning.

Recommendations

The findings of this study imply that other pertinent aspects of classroom implementation of pre-service teachers need to be investigated in order to gain a deeper understanding of the issue of translating the principles of the theory of constructivism into practice. To this end, it may be necessary to examine pre service teachers' early experiences in teaching and learning. This investigation may clarify reasons for the continuation of the retention of traditional methods of teaching and learning by pre-service teachers whilst on teaching practice. During field teaching, pre-service teachers do spend a considerable amount of time being supervised or mentored by cooperating teachers, thus it may be

necessary to conduct an investigation into the methods of teaching and learning that cooperating teachers implement in their classes.

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