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Connecting with the Caribbean

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Abstract: Teaching and learning can be a universal language. Our session will focus on the collaborative efforts between Old Dominion University and The Ministries of Education on the islands of St. Kitts, Dominica, Nevis, and Anguilla in order to provide professional development opportunities for primary school teachers in the area of mathematics. Specifically, the learning sessions concentrate on the use of manipulatives to teach conceptual understanding of mathematical ideas. Preliminary data will be presented and discussed that includes the technical process, teacher understandings and participation, and mathematics self-efficacy of the teachers.

Introduction

In a new global society, mathematical learning, conceptual understanding, and its application have never been greater. To be competitive, it is necessary that all students have opportunities and experiences with the

necessary support to learn significant mathematics with depth and understanding (NCTM, 2000). This is especially critical for the Caribbean Islands, (Anguilla, Dominica, Nevis and St. Kitts) who hold a multinational priority to improve the proficiency in mathematics among their student population, if they are to become relevant players in social inclusion, civic participation, and economic productivity (Bosch, Diaz, Druck, & McEachin, 2010). To reach this ambitious goal, the International Council of Science (ICSU), a non-governmental agency aimed to address issues in science and society, have recognized the need to develop and better prepare its teaching force so that they are equipped with a robust knowledge of mathematics content and culturally responsive pedagogy (ICSU, 2010). Specifically, the islands of the Caribbean proposed specific actions for the improvement of mathematics teaching and learning, one of which is the professional development of teachers that will link traditional educational experiences of the teachers with current trends in connecting lifelong learning and best practices in mathematical pedagogy and methodologies (Bosch, Diaz, Druck, & McEachin, 2010). Under the leadership of Mrs. Brenda Scanelli, several faculty members of Old Dominion University, set forth to establish a partnership with several islands of the Caribbean, including Anguilla, Dominica, Nevis and St. Kitts in order to provide professional development opportunities and experiences that highlight best practices for the teaching of mathematics, grades K-6.

Traditional and Alternative Pedagogical Approaches for Teaching Mathematics

Increased attention has been given to the mathematics education of elementary students because of their lack of preparation and ability to confront rigorous mathematics in the upper grades, and to compete in a globally expanding workforce. Because of the urgent need for students to be able to be competitive in 21st Century Skills, there has been a shift in the mathematics content knowledge needed to be mastered in the elementary grades (Hill, Rowan, & Ball, 2005). Furthermore, not only must teachers be knowledgeable and proficient with rudimentary arithmetic skills; they must also be capable of teaching more sophisticated levels of mathematics, including, problem solving, reasoning, making connections among mathematical ideas, and integrating mathematics with other content areas (Hill, Rowan, & Ball, 2005). With the current mathematics achievement levels of many Caribbean students, it is plausible to assume that many teachers may feel uncomfortable with the content knowledge now required, and their lack of understanding of how children learn mathematics (Hill, Rowan, & Ball, 2005; Hill, Schillings, & Ball, 2004).

There are two methodologies that appear to govern mathematics instruction: Traditional and Alternative. Traditional pedagogy focuses on procedural knowledge, memorization, drill and practice, with little, if any awareness of the conceptual meaning that guides a specific mathematical algorithm (Hiebert, 2003; Lubienski, 2001; Strutchens & Silver, 2000; Van De Walle, 2006; Watson, 2006). Haberman (2005, 1995, 1991) used the expression “pedagogy of poverty” to describe the ritualistic teaching acts and routines of “giving out” information, assigning problems for the students to work quietly at their desks, monitoring the student’s independent work, and assigning homework. Although not explicit to mathematics teaching, Haberman (2005, 1995, 1991) used the descriptor “pedagogy of poverty” to define traditional, ritualistic routines which are often practiced in urban classrooms and can be readily seen in the traditional mathematics classroom. Much of the literature contends that this approach to teaching mathematics is ineffective (McKinney, Bol & Berube, 2012; Strutchens, 2000). Haberman adamantly posited that the pedagogy of poverty appeals to educators that, whether consciously or unconsciously, have low expectations for themselves as teachers, and for their students as learners. He further stated that teachers who use habitual acts of mathematics teaching may be unaware of other pedagogic possibilities that position real teaching in the classroom. Haberman (2005) without reservation stated, “Unfortunately, the pedagogy of poverty does not work” (p. 50).

Alternative approaches emphasize hands-on, participatory and inquiry driven instruction that highlight reasoning and problem solving skills, student discourse and discovery. Using manipulatives in the classroom to teach different mathematical ideals fall under an alternative approach (Hiebert & Carpenter, 1992; Wenglinsky, 2002). There is documented evidence that suggests alternative approaches allow students to develop a conceptual understanding of the different mathematical ideas (NCTM, 2000). Further, students tend to perform better on mathematics achievement assessments when alternative approaches for teaching mathematics are utilized in the classroom (Wenglinsky, 2002). The challenge begins with making teachers comfortable with the use of alternative approaches, such as the use of manipulatives, within the classrooms of the Caribbean schools.

Technological Connections with the Caribbean

Old Dominion University, located in Norfolk, Virginia, with several off-campus sites, is a public, doctoral research institution. ODU is recognized as an international leader in distance education, and was an original pioneer in Distance Learning, technology delivered instructional approach, beginning in the mid 1980's (ODU, 2014). Distance Learning, originally called TELETECHNET, was designed to provide quality instruction to areas that have limited resources for educational opportunities. Historically, course delivery was televised through interactive television, via a satellite broadcast system and on-line, one way video streaming. The delivery mode has magnified over the recent years, and now offers a variety of delivery systems, offered both nationally and internationally. Currently, Old Dominion University working with CISCO Systems to transcend the satellite broadcast system, high-definition, technology management system to enhance on-line offerings (ODU, 2014). Old Dominion University Distance Learning utilizes the two way video conferencing delivery system to provide professional development opportunities to teachers in the Caribbean. Additionally, ODU Distance Learning utilizes Kaltura, employing the flipped classroom model for teachers. This allows the Caribbean teachers to view the demonstrations of the manipulatives, view the interactive workshops, as well as viewing a master teaching using the manipulatives in an actual classroom with children.

Teacher Education, Workshops and Feedback

Significant charitable contributions of educational resources were made to the islands of Anguilla, Dominica, Nevis and St. Kitts. Follow up observations indicated that professional development would be helpful in the area of teaching with math manipulatives, if the benefit of this donation was to be fully realized. In collaboration with each island's Ministry of Education, a project developed where by faculty members of Old Dominion University and master teachers from the area prepared live and interactive training sessions on how to integrate approximately twenty-five different math manipulatives into the Caribbean math curriculum at the primary school level. The goal of the project is to establish a belief system within both the teachers and students that will facilitate greater creative teaching and learning of mathematical concepts and enhance student performance on standardized testing.

Some of the manipulatives covered include Cuisenaire Rods, Base Ten Blocks, Unifix and Counting Cubes, Number Boards and Counting Chips, Fraction Factory, Fraction Circles, Fraction Squares, Everyday Math Cards, Clocks, Attribute Blocks, Pattern Blocks, Geometric Solids, Dice, Dominoes, Tangrams, Super Tangrams, Pentominoes, Geo-boards, Algebra Tiles, to name a few. Overhead cameras were employed for demonstrating the fundamentals of using each manipulative for concretely teaching specific mathematical operations and concepts. Additional sessions were conducted on how to move from traditional to alternative pedagogical approaches in the math classroom, improving teacher observational skills, identifying varied styles of learning and assessing student levels of understanding of math concepts. Also discussed were teaching approaches aimed at developing a number sense in primary school aged students, integrating literature and language arts into the math curriculum for a holistic approach to solving word problems, and how to help students develop critical thinking and problem solving skills. Significant emphasis was placed on making math meaningful and relevant to everyday life for all students.

To date, over six interactive workshops have proved to be a successful means for enhancing teacher confidence and competence in using the math manipulatives. The format of these workshops has taken on an evolutionary process of its own. What began with just live and interactive, three hour sessions consisting of demonstrations, power point presentations, video presentations, and question and answer segments has now expanded into using a dedicated Kaltura web page to employ a flipped classroom model for teachers. Pre recorded teaching segments are uploaded to the Kaltura page, so that participating teachers may view the segments before the actual live workshop. Due to issues surrounding teacher release time, live workshops are reduced to one and one half hours allocated for questions, clarifications, expansions and discussion of the topic presented. Previously aired workshops are also posted on the website for reference for new teachers coming into the system, and for teachers needing to refresh their memory on how to teach with a specific manipulative

Another goal of this project is to use the benefit of technology to enhance collaboration and teacher training across great distances. The cost and time involved in conducting in person workshops makes it

impossible to reach large numbers of teachers amongst the islands and cover such a wide range of material. The project is expanding to include collaboration with one of the island teacher training institutions.

Needless to say, the Old Dominion University and the Caribbean Professional Development Partnership is vital to improving teacher education opportunities and experiences that will contribute to the professional growth of the participating teachers. Approximately 14,460 students from the islands of Anguilla, St. Kitts, Nevis, and Dominica will be taught mathematics through best practices of teacher education. The beauty of the project lies in the fact that everyone involved is learning so much through the process of collaboration.

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