

## Differences in Beliefs and Teaching Practices between International and U.S. Domestic Mathematics Teaching Assistants

### Contributed Research Report

International Mathematics Teaching Assistants (MTAs) and U.S. domestic MTAs are an indispensable part of mathematics departments regarding teaching a substantial portion of undergraduate students. Because MTAs' beliefs are significant to their pedagogical methods, this study examines the contrast between international and U.S. domestic MTAs' beliefs and teaching practices. This research aims to answer the following questions: 1) What are the differences in beliefs and teaching practices between international and U.S. domestic MTAs? and 2) How are MTAs' different teaching practices shaped by their beliefs? The goals of this study are to help understand international and U.S. domestic MTAs' different approaches to education. The results indicate significant differences between the two groups centered on how they taught students to understand definitions and problems and how they motivated students to learn mathematics. The findings also describe MTAs' beliefs in relationship with their teaching practices.

Keywords: U.S. domestic mathematics teaching assistants (MTAs), international mathematics teaching assistants (MTAs), beliefs and teaching practices

After the graduate assistantship program was founded in the late 1800s, several researchers increased their interests in mathematics teaching assistants (MTAs) regarding diverse roles in universities and their potential influence on undergraduate education (Belnap, & Allred, 2006; McGivney-Burelle, DeFranco, Vinsonhaler, & Santucci, 2001; Latulippe 2007; Speer, Gutmann, & Murphy, 2005). Because MTAs teach a substantial portion of undergraduate students, MTAs' teaching practices are major potential factors that directly influence the students' perspective on mathematics and achievement in mathematics education (Commander, Hart & Singer, 2000; Speer, Gutmann, & Murphy, 2005). International MTAs also have become an indispensable part of mathematics departments. In the last two decades, international MTAs have been counted as a high percentage of the teaching assistants' population in mathematics departments in the U.S. Being interested in MTAs, I studied the literature related to MTAs' instructional practices, which contends that a variety of factors influence teachers' practices. In particular, teaching assistants' beliefs strongly influence their teaching practices (Speer, 1999, 2005, 2008; Thompson 1984, 1992). Because McGivney-Burelle, DeFranco, Vinsonhaler, & Santucci (2001) and Twale, Shannon, and Moore (1997) suggest that different educational experiences and philosophies influence MTAs' beliefs and pedagogical methods, I believe that there are significant differences in beliefs and teaching practices between international and U.S. domestic MTAs. The aim of this research is to answer the following two research questions: 1) What are the differences in beliefs and teaching practices between international and U.S. domestic MTAs? and 2) How are MTAs' different teaching practices shaped by their beliefs? To adequately answer these research questions, definitions and classifications of beliefs from the literature were used. In mathematics education, researchers defined beliefs as personal philosophical conceptions, ideologies, worldviews and values that shape practice and orient knowledge (Aguirre and Speer, 1999; Ernest, 1989; Speer, 2005). According to their definitions, beliefs are classified based on beliefs about mathematics, teaching, student learning and students (Cooney 2003; Cooney et al. 1998; Cross, 2009; Ernest 1989; Speer 2005, 2008; Thompson 1992).

To obtain my theoretical framework, based on Crotty's description, I have the objectivism view in epistemology. Since phenomena have meaningful entities of consciousness and experience, respectively, researchers find the objective truth and meaning of certain phenomena (Crotty, 1998, p.6). When certain phenomena are verified, the statement becomes meaningful and truthful. Even though research is able to attain the cause of the origin by being verified, I believe it is impossible to be only verified by experience based on Crotty's explanation about postpositivism. Researchers can only uncover approximate truth of phenomena instead of not finding the accurate truth with certainty of phenomena in the human experiences (Crotty, 1998, p29). Therefore, as a postpositivist, I believe that knowledge is created by the approximate cause or truth of phenomena through uncovering. Although phenomena cannot be verified by accurate truths or meanings, the research of the phenomena is important for the postpositivism perspective because researchers will discover approximate meanings and truths. Thus, the research explains well the phenomena and provides opportunities for readers to understand and accept these as knowledge. It is hard to determine the truths of the differences even though I discover regular patterns of the differences between MTAs' beliefs and teaching practices. For example, we do not have tools to determine accurately MTAs' beliefs. In addition, their beliefs often are inconsistent with their behaviors. Even though my research will not be verifying truths of the differences, I am able to discover regular differences. Through

postpositivism and the uncovering of the differences in MTAs' beliefs and teaching practices, the answers to my research questions become knowledge and may help us understand what the differences in beliefs and teaching practices between international and U.S. domestic MTAs are.

As a case study in a qualitative research project, this study uses purposeful sampling (Creswell, 2007, p. 125). According to criterion sampling (Creswell, 2007, p.127), based on three criteria, I selected my participants: twelve MTAs that consist of six international and six U.S. domestic MTAs at the University of Oklahoma. The first criterion was that MTAs were in the Mathematics department at the University of Oklahoma. The second was MTAs' nationalities, such as international and U.S. domestic MTAs. One of the two groups was U.S. domestic MTAs who were born in the U.S., completed high school in the U.S., and spoke English as their native language. The other group was international MTAs who were born outside of the U.S., completed high school out of the U.S., and were non-native speakers of English. The third was that MTAs taught their own class during the spring semester of 2010.

Through triangulating (Creswell, 2007, p.209), I employed three different data sources: observation, questionnaires, and interviews with a digital voice recorder. From these three research instruments, data were gathered with the following procedures: 1) Observations and making condensed field notes and expanded field notes, 2) Questionnaires, and 3) Interviews with the participants with a digital recorder and transcripts of the digital voice recorder. After teaching observations, data were collected by using the aforementioned preceding, followed by an interview to not influence the participant's teaching. First, I observed my participants' classes for one class period during the spring semester in 2010 at the University of Oklahoma. I did not participate in their classes and made condensed field notes. I gathered the data of the questionnaire and then interviewed them in my office or their offices. The total time of the questionnaire (less than 15 minutes) and interview (less than 45 minutes) was less than one hour. I provided the questionnaire first because my participants were able to readily think about their teaching practices and beliefs before the interview. The interview was semi-structured with 12 open-ended questions with a digital voice recorder. The interview questions were six questions about their teaching practices and six questions about beliefs. I took notes in shorthand during the interviews. In addition, I did appropriate reaction and follow-up to probe questions to elaborate meanings of their responses.

I conducted my research with the intent of finding patterns and finally identify salient themes by inductive analysis. I frequently looked over the expanded field notes from observations, transcripts from interviews, and questionnaires. Using NVivo 8, software for analysis, through the transcripts, I made twelve sections based on the number of interview questions. In addition, I put codes on the expanded field notes to find their pattern about teaching practices. From the questionnaires, I could support the data of beliefs on the transcripts. I identified tentative codes from the database and reduced and combined the codes as I continued to review and re-review my database.

From analysis of the data, I have found the significant differences in teaching practices and beliefs between the two groups centered on how they taught students to understand definitions and problems and how they motivated students to learn mathematics. The international MTAs believed that understanding concepts were fundamental to learn mathematics. If students knew and understood concepts, they could solve all kinds of problems. According to

the international MTAs' beliefs about teaching, they believed that teachers' abilities (background knowledge) and preparations of brief explanations of concepts were important for effective teaching of mathematics. In the literature reviews, beliefs strongly influence teaching practices. My results also support the statement. In addition, MTAs' beliefs about mathematics, teaching, students' learning, and students have close relationships with teaching practices. Thus, there is consistence between beliefs and teaching practices of international and U.S. domestic MTAs.

The international MTAs used problems as supplements to help students understand concepts because their intent was more for students to understand concepts, not problem solving. To help students to understand concepts, the international MTAs emphasized clear explanations of concepts and adjusted to the students' level. On the other hand, the U.S. domestic MTAs taught students to understand material by solving problems for students instead of spending much time explaining concepts. In addition, through solving problems, they showed that mathematics is useful and valuable. The U.S. domestic MTAs provided problems as much as they could that stressed main points because they wanted their students to understand concepts from the problems. In addition, the U.S. domestic MTAs believed that students were able to improve pattern recognition by solving many problems.

Regarding methods of how to motivate their students to pay attention in class and learn mathematics, the international MTAs used simple examples for motivation and asked students to solve them because the international MTAs focused on students understanding concepts. On the other hand, the U.S. domestic MTAs focused on explaining why concepts were useful and valuable to motivate students to learn mathematics. They stimulated students' motivation for learning mathematics and paying attention in class through explaining why these concepts are needed and why these problems are important. The U.S. domestic MTAs emphasized reasons to learn mathematics. Therefore, the different beliefs about mathematics, teaching, learning, and students significantly influence different teaching practices between international and U.S. domestic MTAs.

I anticipate that from the findings of the first research question, people in the academic community will gain an increased awareness of not only U.S domestic MTAs' but also international MTAs' teaching practices. In particular, the findings contribute to the academic community's knowledge of MTAs' practices and beliefs. The findings of the second research question provide opportunities to understand the relationships between MTAs' practices and beliefs, and support other researchers' assertions that beliefs have a noteworthy influence on MTAs' practices. In addition, I believe that this study will contribute essential resources for the body of knowledge about MTAs and the creation or adaptation of professional development programs for MTAs. By acknowledging international and U.S. domestic MTAs' different instructional practices and beliefs, mathematics departments will gain insight into the proper support needed by MTAs to improve their teaching methods. This information provides a good opportunity for readers to understand the differences between international and U.S. domestic MTAs' beliefs and teaching practices. This research will contribute to MTAs' teaching and knowledge, and will encourage faculty to be interested in the professional development of MTAs.

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