EXAMINING EFFECTS OF IMPLEMENTING AN EDTPA TASK IN AN ELEMENTARY MATHEMATICS METHODS COURSE

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This mixed-methods study examines effects of implementing a mock edTPA task on prospective elementary teachers' perceptions of teaching effectiveness. Results from the Mathematics Teaching Efficacy Beliefs Instrument document a significant change in participants' beliefs that they can effectively teach mathematics. Qualitative results illuminate participants' growing confidence in their understanding of elementary mathematics, their ability to recognize and attend to children's thinking, and their use of pedagogical tools and resources to support children's learning.

Keywords: Teacher Education-Preservice; Teacher Beliefs; Teacher Knowledge

Background and Purpose

Teacher preparation and initial certification are undergoing significant changes as a result of new policy. Teacher performance assessments, including edTPA, are at the center of these policy changes and play a consequential role in some states for prospective teachers' eligibility for initial certification. One teacher preparation program recently implemented edTPA, and data for this study were collected during the first semester that edTPA had consequences for program graduates. This study occurs in the context of a mathematic methods course preparing prospective teachers for the math task in the elementary education edTPA. Current research is suggesting that it is important for mathematics content courses to introduce the academic language needed to be successful with teacher performance assessments (Lim, Moseley, Son, & Seelke, 2014). However, a national survey conducted by Masingila, Olanoff, and Kwaka (2012) shows the majority of elementary mathematics content courses are taught by instructors in mathematics departments. Therefore, by default, teacher preparation programs must take the lead in preparing prospective elementary teachers (PSTs) for teacher performance assessments such as the edTPA.

This study examines how one elementary mathematics methods instructor prepared PSTs for edTPA through a focus on Cognitively Guided Instruction (CGI) as an approach to instruction. In the mathematics methods course, the final course assessment was the implementation of a mock edTPA task. It is hoped the findings of this study will provide insights into ways to prepare PSTs for successfully completing edTPA, while maintaining a focus on effective pedagogy in elementary mathematics. This study seeks to answer the following two research questions:

- What changes occur in elementary prospective teachers' mathematics teaching efficacy beliefs during a mathematics methods course implementing a mock edTPA task?
- What are the perceptions of PSTs about their mathematics teaching effectiveness upon completion of a mathematics methods course implementing a mock edTPA task?

Theoretical Perspective and Related Literature

edTPA is a standardized high-stakes assessment modeled after the Performance Assessment for California Teachers (PACT). PACT was developed by researchers and teacher educators at Stanford

University. The intent of edTPA is to move the measure of PSTs' effectiveness from an individual university responsibility to a state or national level (Sato, 2014). Several prominent organizations, including AACTE, CAEP, NCATE, and CCSSO, have supported the need for teacher performance assessment to predict PSTs' effectiveness. edTPA is composed of four teaching tasks designed to focus on planning, implementing, and assessing instruction based on a central focus selected by the PST. The fourth task concentrates on mathematics instruction, and PSTs are required to consider student's mathematical thinking to plan, implement, and assess instruction. PSTs are then evaluated on their ability to analyze their effectiveness as a mathematics teacher implementing instruction focused on student's mathematical thinking and learning.

In the field of mathematics education, numerous studies have linked teachers' pedagogical beliefs and pedagogical content knowledge to students' learning of mathematics (Peterson, Fennema, Carpenter, & Loef, 1989; Campbell, Nishio, Smith, Clark, Conant, Rust, DePiper, Frank, Griffin, & Choi,2014). PSTs' affect (e.g., emotions, attitudes, and beliefs) and knowledge undoubtedly also play an important role in learning, including successfully completing the edTPA Task 4. Teacher affect has been conceptualized as a continuum (Philippou & Christou, 2002). Feelings and emotions have been found to be short lived, highly charged, and unstable. Feelings and emotions are on one end of the continuum, with beliefs on the other end. Beliefs have been found to be more cognitive in nature and also more stable. One belief construct important to PSTs' learning in mathematics methods and eventual classroom teaching is teaching efficacy beliefs. Mathematics teaching efficacy beliefs have been considered as two-dimensional: involving personal mathematics teaching efficacy and mathematics teaching outcome expectancy. Personal mathematics teaching efficacy is the beliefs a teacher holds about his or her skills and abilities to teach mathematics effectively. Mathematics teaching outcome expectancy is a teacher's belief that effective teaching will yield positive student outcomes regardless of external factors. These beliefs impact PSTs' perspectives and understandings of subject matter, therefore this can impact how PSTs perceive and understand elementary mathematics content and pedagogy (Fives and Buehl, 2014; Philipp, 2007;Swars, 2005; Richardson, 1996; Pajares, 1992).

Cognitively Guided instruction (CGI) (Carpenter, Fennema, Franke, Levi, & Empson, 1999) is an instructional model focused on children's mathematical thinking. It is designed to support teachers' instructional decisions in ways that allow them to connect the informal knowledge of students' mathematical thinking with the formal mathematics. A majority of the instructional time in a CGI classroom should be dedicated to discourse (i.e., dialogic discussion about mathematics). During discourse, teachers make real-time decisions about children's knowledge and orchestrate the mathematical discussion through intentional questioning. Professional development focused on CGI has proven to enhance teacher's pedagogical content knowledge and shift their beliefs (Carpenter et al., 1989; Carpenter et al., 1993; Fennema et al., 1996; Swars, Smith, Smith, & Hart, 2009). Students in classrooms aligned with the pedagogy of CGI have also been shown to perform better on number sense tasks than peers not receiving similar instruction (Higgins & Parsons, 2010).

Methods

Participants and Context

The participants in this study were 33 PSTs enrolled in two sections of a 3 credit-hour mathematics methods course. Their ages ranged from 19-48 (30 females and 3 males). They were in the second semester of their initial teacher certification program at a large, urban university in the southeastern United States. The duration of the teacher preparation program was two years and used a cohort model. This teacher preparation program includes campus-based courses and a field component for the first three semesters. The PSTs attended courses two days a week and were in their field placement for two days per week. The field component followed a developmental model, progressing from prekindergarten through fifth grade during three semesters. The fourth and final semester consists of a full-time student teaching experience.

Course Design

As mentioned, the PSTs were enrolled in a mathematics methods course, which consisted of a 14-week semester and met one day a week for 2 and ½ hours. The instructor taught the course from a social constructivist perspective. The primary goal was to develop beliefs and practices that aligned with the practices described within the NCTM's *Principles to Actions: Ensuring Mathematical Success for All* (NCTM, 2014). The purpose of these practices is to integrate the content outlined in the Common Core State Standards (CCSS-M) with NCTM's curriculum standards and principles (NCTM, 2000). Therefore, the methods course used the practices in *Principles to Actions (PtA)*to frame course assignments and instructor feedback on those course assignments, classroom discourse, and learning activities during course sessions.

Learning activities in the course were focused on experiences that supported the PtA. For example, one principle states to "elicit and use evidence of student thinking" (NCTM, 2014). Therefore, PSTs were asked to conduct interviews with students in one-on-one settings during their field experiences. Once they completed the interview they would submit their final analysis for feedback and an assignment grade. As they continued to grow and have experiences with eliciting students' thinking, they were introduced to materials that would assist them in facilitating whole group lesson implementation. The students were then asked to select a central focus and anticipate students' potential strategies with a story problem they designed.

The final assessment component of this course was a teacher performance assessment (edTPA) mock task. This task focuses on how PSTs are able to plan, implement, and analyze elementary students' mathematical thinking. A central focus must be selected that allows students opportunities to develop conceptual understanding, procedural fluency, and problem solving knowledge. The PST must speak to these types of knowledge when they are analyzing the elementary students' mathematical thinking. The purpose of the mock assessment task was not only to familiarize PSTs with the evaluation process, but to introduce the academic language of the edTPA assessment, alongside the academic language of the mathematics content standards and principles for teaching.

The primary course goal was for PSTs to align their pedagogical beliefs and practices with the PtA teaching practices, and a secondary goal was for the PSTs to have a successful experience with the mock edTPA task. In order to meet these goals it is important to have a pedagogical model that integrates these theoretical ideas, so the primary text for the course was *Children's Mathematics: Cognitively Guided Instruction* (Carpenter et al. 1999). Cognitively Guided Instruction (CGI) was the approach to instruction selected to allow PSTs to construct ideas about student's mathematical thinking and problem solving capabilities, strengthen their own mathematical content knowledge, and to build their confidence teaching mathematics through implementation of CGI in their field placements.

As shown in Figure 1, this course began with introducing the Common Core State Standards for Mathematics (CCSS-M) to situate the relevance of CGI within PST's current field placements and future classrooms. Then, language and ideas in course learning activities and assignments immersed students in CGI. Students began with early number concepts and progressed through number and operations leading into algebraic thinking. As students became more familiar with the CGI framework and implementation materials, the course transitioned into the introduction of the mock edTPA task. The language and focus then joined the ideas of CGI with the expectation of the edTPA task. This task was broken into individual components to allow PSTs an opportunity to continue working with CGI as they merged these new understandings with a teacher performance assessment task. Therefore the course began with the language of the standards, immersed PSTs into the pedagogical model (CGI), and concluded with a teacher performance task (edTPA).

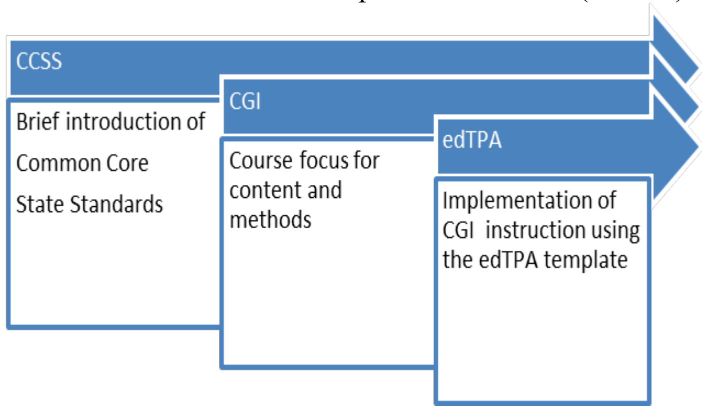

Figure 2. Course Design Overview

Data Collection

This study includes both qualitative and quantitative methods of data collection. Data collection occurred during one semester. The instructor of the course collected any materials related to coursework (i.e. course assignments, daily writings, etc.). Another researcher administered the survey data and conducted six interviews, without the instructor present at either of those events.

Quantitative data presented here were collected during the first and last day of the mathematics methods course using the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI). The MTEBI survey consists of 13 items on the Personal Mathematics Teaching Efficacy (PMTE) subscale and 8 items on the Mathematics Teaching Outcome Expectancy (MTOE) subscale (Enochs, Smith, & Huinker, 2000). The subscales address the two-dimensional aspect of teacher efficacy. The PMTE subscale examines the PSTs' beliefs about their abilities to be an effective mathematics teacher. The MTOE subscale examines the PSTs' beliefs about their abilities to increase student learning through effective mathematics teaching regardless of external factors. This instrument employs a five-item Likert scale, with a higher score correlating with teacher effectiveness. Possible scores on the PMTE subscale range from 13 to 65; MTOE subscale scores range from 8 to 40. These subscales have high reliability (Chronbach's alpha = .88 for PMTE and .81 for MTOE) and represent independent constructs based on confirmatory analysis.

The qualitative data consists of end of the semester semi-structured interviews that were conducted with six PSTs selected randomly from the 33 PSTs in the methods course. The participants were recruited through an email that was sent from the researcher conducting the interviews. The purpose was to elicit conversation around PSTs beliefs, course experiences, and the mock edTPA task. The interview protocol consisted of 11 multi-part questions.

Results

Research question 1: What changes occur in elementary prospective teachers' mathematics teaching efficacy beliefs during a mathematics methods course implementing a mock edTPA task?

Table 1 presents the Likert scale value means and standard deviations as well as those for the PMTE and MTOE subscales. Table 2 shows the analysis of dependent sample t-test, using an alpha level of 0.05. The Likert scale values on the overall MTEBI and the PMTE subscale show a significant increase in teacher effectiveness beliefs. PSTs became more confident in their beliefs about their ability to implement effective mathematics instruction. Therefore, mathematics teaching efficacy beliefs did positively change during the mathematics methods course. The change in scores on the MTOE subscale was not statistically significant, so the slight decline in mean scores should be interpreted as unchanged expectations for student outcomes and the statistically significant change for the overall MTEBI should be attributed entirely to the change in the means for the PMTE subscale.

Table 1:MTEBI Likert Scale Value Means, Standard Deviations, and Mean Differences

	Pre		Post		Change
Instrument	**Mean Likert Value**	**SD**	**Mean Likert Value**	**SD**	**Mean Difference**
MTEBI	3.54	0.48	3.75	0.40	0.21
PMTE subscale	3.55	0.64	4.31	0.46	0.76
MTOE subscale	3.53	0.61	3.32	0.68	–0.21

Table 2: MTEBI Dependent T-Test Results

Instrument	T-value	p-value
Overall MTEBI	3.12	.004*
PMTE subscale	7.93	.000*
MTOE subscale	1.91	.065

* Statistically significant difference in the mean for Pre vs. Post.

Research Question 2: What are the perceptions of PSTs about their mathematics teaching effectiveness upon completion of a mathematics methods course implementing a mock edTPA task?

The qualitative interview data indicate that PSTs recognize the importance to teaching effectiveness of assessing and understanding students' mathematical knowledge prior to and during instruction. "I think they should learn based off of what they know" (Participant # 2, interview, December 9, 2014). Another recurring theme was that effective teaching allows for multiple solution strategies to be considered, which was different from the PSTs' own mathematical learning experiences, "I use to think that there was just one way to learn math…. I don't really think that there is one way I saw kids [describes a variety of solution strategies]" (Participant # 3, interview, December 9, 2014). Also, some participants indicated they were able to be effective because they were introduced to resources that they could rely on in their own classrooms such as, "CGI interviews"(Participant #6, interview, December 9, 2014) and "formative assessment" (Participant #4, December 9,2014). Finally, others made general statements about their growing confidence, such as, "I have seen, from the beginning of this course to the end of the course, I have seen a progression in my own math…so I do feel more prepared coming out of it" (Participant #3, December 9, 2014) and "I was terrified to teach math…but now I feel a little more confident" (Participant # 2, December 9, 2014).

Discussion

With the limited research on how edTPA is shaping and changing teacher education it makes sense to begin with considering PSTs' teaching effectiveness beliefs during a time when they are preparing for an experience that will assess how well they are able to analyze their teaching effectiveness during a sequence of mathematics lessons and a re-engagement lesson based on their analysis of student assessment data. As teacher educators consider how to merge teacher performance assessments into their teacher education programs, this study is one example that if a pedagogical model such as CGI has been previously shown to shift pedagogical and efficacy beliefs, then edTPA can become a useful part of the overall methods course experience without unduly dominating such a course. The PSTs perceptions of their effectiveness proved to be strong because of their ability to implement CGI in their field experiences and come back to the university classroom to engage with creating the edTPA Task 4 documents. The field experiences and the shift in beliefs seemed to ease the potential tension about edTPA and how it should be completed during their future student teaching experience.

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