MAKING A DIFFERENCE: INCREASING ELEMENTARY PRE-SERVICE TEACHERS' SELF-EFFICACY IN MATHEMATICS

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ABSTRACT

Institutions of Higher Education across the United States strive to improve the quality of teacher preparation programs. The institution where this study took place discovered an acute problem when preservice teachers were completing practicum-embedded mathematics coursework during a senior level practicum experience. Preservice teachers reported varying levels of self-efficacy in mathematics and self-efficacy in teaching mathematics, which presented significant challenges when working with elementary students in their field placements. The focus of this study was to investigate how teacher preparation programs can better prepare preservice teachers to teach mathematics in an elementary classroom. By more closely examining preservice teachers' self- efficacy in mathematics and examining specific strategies for increasing self-efficacy in teaching mathematics, teacher preparation programs can be more informed and bolster self-efficacy of teaching candidates. Findings from this study suggest growth in both participants' self-efficacy in mathematics and in teaching mathematics. These findings can shed light on how institutions of higher education can best prepare preservice teachers to be successful in an elementary mathematics classroom. This study can also be used as evidence of how universities use research to drive program development and improvements, which closely align with CAEP standards and expectations.

INTRODUCTION

Institutions of Higher Education across the United States strive to improve the quality of teacher preparation programs to meet the diverse needs of 21st century students. Preservice teachers (PT) are often required to complete practicum-embedded mathematics coursework as part of their programming. The National Council for Teachers of Mathematics (2014) assert that "students' understanding of mathematics, their ability to use it to solve problems, and their confidence in, and disposition toward mathematics are all shaped by the teaching they encounter in school" (p. 16-17). This places an enormous responsibility on teacher preparation programs to ensure that elementary teachers are equipped with research-based best practices that foster high-levels of self-efficacy and self-efficacy in teaching mathematics. Institutions of Higher Education (IHE) that prepare teachers must satisfy the standards set forth by The Council for the Accreditation of Educator Preparation (CAEP), The Council of Chief State School Officers and The Interstate Teacher Assessment Consortium (InTASC) to ensure their teacher candidates have the knowledge, skills and dispositions needed to be highly effective classroom teachers.

The institution where this study took place discovered an acute problem when PT was completing practicum-embedded mathematics coursework during a senior level practicum experience. Anecdotal records from professors, PT, and cooperating teachers in the field reflected varying levels of PT' self-efficacy in mathematics and self-efficacy in teaching mathematics. For instance, some PT strongly disliked mathematics and were terrified to teach mathematics to young children; and others felt confident in their own mathematics abilities but were reluctant to teach mathematics to children. PT stated they needed more research-based strategies when working with diverse populations. They struggled to differentiate instruction and implement culturally responsive pedagogy to help students build conceptual knowledge and understand the importance of mathematics in their everyday lives. According to Bates, Latham and Kim (2011), there is a direct correlation between PT' confidence in teaching mathematics, teacher self-efficacy, and student achievement. Hence, the researcher sought to investigate the following as part of senior level practicum-embedded coursework and field experience: 1.) What are PT' levels of self-efficacy in mathematics and; 2.) What are PT' levels of self-efficacy in teaching mathematics in the elementary classroom? These findings can shed light on how IHE can best prepare PT to be successful in an elementary mathematics classroom. This study can also be used as evidence of how universities use research to drive program development and improvements, which closely align with CAEP standards and expectations.

The institution of higher education referred to in this study is located in central Virginia, mid-Atlantic region of the United States. Pre-service teachers spend the majority of their field placement hours in a localized region surrounding the university. There are eight school divisions within a sixty-mile radius of the university. The demographics of the region include, school systems that serve high levels of students coming from economically disadvantaged communities. The authorities in local school divisions struggle to meet accreditation standards and Virginia Department of Education (VA DOE, 2016) data reflect that black, Hispanic, limited English proficient, and students with disabilities passing rates in mathematics are significantly lower than peers in passing minimum competency end of year standardized assessments. PT need to be prepared to meet the diverse learning needs of these students. Hence, a crucial need exists for IHE to examine self-efficacy in mathematics to identify possible clinical experiences that foster higher levels of self-efficacy, coupled with culturally responsive pedagogy, so PT are more prepared going into their field experiences and future classrooms. Furthermore, since teachers are models for students in terms of their levels of self-efficacy, then it becomes necessary to measure the teacher's level of self-efficacy with mathematics.

LITERATURE REVIEW

Self-Efficacy

According to Bates, et al. (2011), student achievement is directly correlated to PT confidence in teaching mathematics and teacher self-efficacy. For this reason, teacher educators must structure field experiences in ways to best build PT' self-efficacy in mathematics and in teaching mathematics if they are to positively impact their future students' mathematics achievement. In turn, institutions of higher education play an essential role in fostering PT' content knowledge and pedagogy, coupled with clinical experiences to advance their knowledge, skills, and teaching dispositions thus building higher levels of mathematics efficacy (Haverback & Scot, 2015). In addition, experiencing struggle, engaging in reflection, adaptation, and learning to be resilient are important parts of their training. According to Briley (2012), research suggests that mathematical beliefs play an important role in teaching efficacy of the PT, and mathematical beliefs were found to have a statistically significant effect on mathematics self-efficacy (p. 9).

It is important to clearly distinguish between a teacher's mathematics self-efficacy, (teacher's own beliefs in his/her ability to perform mathematics tasks) and a teacher's self-efficacy for teaching mathematics, (beliefs about one's own ability to teach others mathematics) (McGee & Wang, 2014). Albert Bandura, a leading researcher in the field of psychology, developed what is commonly known as Self-Efficacy Theory. Bandura (1997) refers to self-efficacy as "the belief in one's ability to influence events that effect one's life and control over the way these events are experienced" (p.77). Bandura suggested that self-efficacy and, therefore, teacher efficacy, are formed through four sources: emotional and physiological state, verbal persuasion, vicarious experiences, and mastery experiences. Bandura (1997) believed that each type of experience results in a different amount of growth in self-efficacy with mastery experiences reported to have the greatest impact of all. Therefore, how can teacher preparation programs better prepare PT to teach mathematics in an elementary classroom? By more closely examining PT' self- efficacy in mathematics and examining specific strategies for increasing self-efficacy in teaching mathematics, teacher preparation programs can be more informed and bolster self-efficacy of teaching candidates.

Teacher Practice and Field Experience

The research supports a greater emphasis on practice-based teacher education versus simple classroom instruction (McDonald, Kazemi, Kelley-Petersen, Mikolasy, Thompson, Valencia, & Windschitl, 2014). Practice-based teacher education has two central components. The most important for this study are the "range of pedagogical practices whereby novice teachers are engaged in representations, decompositions, and approximations of practice" (Anthony, Hunter, & Hunter, 2015, p. 11). In the university classroom setting, PT begin to practice and refine high-leverage teaching practices (HLTP), defined as a set of teaching practices with which novice teachers positively impact student learning (Ball, Sleep, Boerst, & Bass, 2009). For the mathematics classroom, practice-based assignments are invaluable in helping PT understand a variety of interactions (Zeichner, 2010) including using HLTP such as, tasks that foster problem solving and reasoning, using a variety of representations, facilitating mathematical discourse, asking purposeful questions, and building procedural fluency from conceptual understanding.

Training PT must now be combined with an understanding of the context for their teaching, which calls for culturally responsive pedagogy. "Culturally responsive pedagogy" (Ladson-Billings, 1994) is a call for "acknowledging and responding to the unique needs of all learners and providing equitable educational opportunities for all students. . . . empower[ing] students intellectually, socially, emotionally, and politically… to impart[ing] knowledge, skills, and attitudes" (p. 17-18). Characteristics of culturally responsive teaching include, but are not limited to, communication of high expectations, student-centered instruction, reshaping the curriculum, and the teacher serving as facilitator. Culturally responsive pedagogy is one factor that can impact self-efficacy in teaching mathematics.

METHODOLOGY

Research Design

This study was guided by the following two research questions:

1. While enrolled in senior level practicum-embedded coursework, what are preservice teachers' levels of self-efficacy in mathematics?
2. While enrolled in senior level practicum-embedded coursework, what are preservice teachers' levels of self-efficacy in teaching mathematics?

This action research employed a quasi-experimental mixed-methods design collecting both quantitative and qualitative data. Complementary Design was used because it allowed the researcher to enhance, illustrate, and elaborate on the quantitative data rendered by the participants (Greene, Caracelli, & Graham, 1989). In this study, the quantitative data from the Mathematics Teaching

Efficacy and Beliefs Instrument (MTEBI) and Self-efficacy for Teaching Mathematics Instrument (SETMI) and the qualitative data from the focus groups helped detect PT' levels of self-efficacy in mathematics, and in teaching mathematics.

Participants and Setting

This study was conducted in Fall 2016 with all 61 PT participating in senior level practicum-embedded coursework, which included over sixty hours of field experience. Demographic variables included: 60 females, one male; all undergraduates in their senior year, age range 20-22; 56 Caucasian, 3 African American, and 2 Other. All participants were in the PreK-6 teacher licensure program. Classes and training were held on the university campus. Practicum experiences took place at elementary schools in the region surrounding the university (approximately a 30-mile radius from the university campus). The schools in this region serve predominantly economically disadvantaged communities and many have had challenges obtaining full accreditation status from the state board of education.

Measures

Pre- and post-data were collected from participants on the first and last day of the practicum-embedded course. Quantitative data were collected utilizing two professionally established instruments, the SETMI and MTEBI. Focus groups were conducted using a semi-structured protocol to obtain qualitative data. The SETMI, first created in July 2010, is aligned with Bandura's (1997) research on self-efficacy and Hoy and Woolfolk's (1990) proposition that teachers' efficacy was comprised of two different unrelated factors: teaching efficacy and personal efficacy. The SETMI consists of 22 Likert response items using a five-point scale. McGee & Wang (2014) investigated the construct validity of the SETMI using a rigorous scoring guide and confirmatory factor analysis and the "findings indicate that the SETMI is a valid and reliable measure of two aspects of self-efficacy: pedagogy in mathematics and teaching mathematics content" (p. 390).

Efficacy in teaching mathematics is measured by the MTEBI. The MTEBI was created by Enochs, et al., (2000) by revising their earlier published Science Teaching Efficacy Beliefs Instrument (STEBI; Riggs & Enochs, 1990) to be mathematics-specific. Its two subscales are consistent with the two-dimensional aspect of teaching efficacy. The Personal Mathematics Teaching Efficacy (PMTE) subscale addresses the PT' beliefs in their individual capabilities to be effective mathematics teachers. The Mathematics Teaching Outcome Expectancy (MTOE) subscale addresses the PT beliefs that effective teaching of mathematics can bring about student learning regardless of external factors. The instrument uses a Likert scale with five response categories (strongly agree, agree, uncertain, disagree, and strongly disagree) with higher scores indicating greater teaching efficacy. The results indicate high reliability (Chronbach's alpha = .88 for PMTE and .81 for MTOE) and represent independent constructs based on confirmatory factor analysis (Swars, S., Smith, S. Z., Smith, M. E., & Hart, L. C., 2009).

The researcher also utilized qualitative methods to gather data using a focus group protocol. As Rossman and Rallis (2003) theorized, focus group methodology assumes that people need to interact with one another to challenge their own thinking and to clarify their own beliefs, thus leading to an interactive discussion through open dialogue. PT volunteered to participate in focus groups by way of a Google Doc sign-up and the 30-minute focus group sessions were conducted by a graduate student trained in the use of the approved semi-structured interview protocol. In total, approximately 34% (n =21) of PT participated in the focus groups. The demographic composition of the group was: 20 females, one male; 17 Caucasians, three African American, and 1 other ethnicity; senior level undergraduate students; age range of 20 - 22 years old; and currently enrolled in the teacher preparation program for Pre-K - 6 licensure. Before systematically collecting data, the researcher obtained permission from all participants involved in this study, as well as the university's Institutional Review Board. Confidentiality was explained to each participant and to ensure anonymity, pseudonyms were used for all participants. Focus group sessions were audiotaped and recordings were transcribed for theme-emersion analysis by the researcher.

Semi-Structured Interview Protocol:
1. How prepared do you feel to implement best practices in mathematics? Provide a rationale and experiences.
2. How prepared do you feel to differentiate mathematics instruction? Why do you say that?
3. What was the most beneficial part of your mathematics course-work and clinical experience? Why?
4. What did you learn about yourself as a future teacher of mathematics?
5. What did you observe about how children learn mathematics?
6. Teaching math to children can be__________.

The Study

A pilot study was completed in the spring 2016 with 21 participants. Changes were made from the pilot study to the experimental study based on outcome data and implementation recommendations. The number of participants in the pilot study was large because all preservice teachers enrolled in the university mathematics methods course were invited to participate. No participants from the pilot study (both quantitative or qualitative) were included in the actual sample of 60 participants selected for the study. The experimental study consisted of three main parts (professional development, writing and teaching a mathematics lesson plan, and teaching small group remediation lessons using the Informative Assessment for Data-Driven Intervention in Mathematics (IADDIM) framework). First, pre-data were collected prior to two five-hour workshops on best practices in elementary mathematics. Second, PT were required to write one complete mathematics lesson plan using a university template and incorporating NCTM and other components of student-centered mathematics (Van De Walle, 2012). They taught the lesson (and video-taped themselves teaching) while being observed by peers and coached by the university professor. Individual data-driven post-observation conferences were completed with the professor and peer observation group. While watching the video, PT completed an in-depth-self reflection protocol and wrote a reflective summary. Third, the PT utilized the IADDIM framework and facilitated a minimum of four small group lessons (twenty-minute each) using research-based strategies for teaching elementary mathematics focusing on the strands of mathematical proficiency. Throughout the semester, they completed approximately 20 hours of direct instruction in a university mathematics methods course and completed approximately 20 hours in a mathematics practicum setting.

Informative Assessment for Data-Driven Intervention in Mathematics

The IADDIM is an example of an assignment specifically developed to meet the instructional needs of PT in this region, incorporating high leverage teaching practices and culturally responsive pedagogy in teaching mathematics. Implementation of the IADDIM followed a specific step-by-step process. First, PT worked with their cooperating teacher to collect data from students who demonstrated a specific conceptual or procedural gap in a certain strand of mathematics. Second, he/she conducted a one-on-one student interview utilizing Marilyn Burns' (2015) structured interview protocol. By triangulating data from the cooperating teacher's anecdotal records, student work sample, and transcripts of one-on-one student interviews, he/she utilized the data to specifically identify the conceptual and/or procedural gaps hindering the students' performance in mathematics. Third, the PT thoroughly completed the IADDIM Planning Tool which includes: identification of a specific math standard, error pattern, behavioral objective; strategies for building conceptual knowledge, procedural knowledge, application/real-world connections, positive dispositions; and manipulatives used in the intervention lessons (see Figure 1). Credit is given to Jeane M. Joyner and Mari Muri (2011) for providing a model for adaptation for the IADDIM. Next, they worked with a small group of students regularly over a two-week period (not less than four times, but the frequency was determined by students' needs). PT wrote a brief reflective summary at the end of each lesson and used that day's lesson data to drive subsequent sessions. Finally, he/she submitted a formal write-up at the completion of each two-week intervention. Each IADDIM submission

Figure 1.
IADDIM Planning Tool

included a summary of the learners' characteristics; a template of the four targets for each learner; diagnostic, formative, and summative assessments; samples of elementary students' work; pictures of the sessions; and data tables with graphs to document elementary students' growth. Finally, the PT created a reflective summary regarding the impact of the intervention on both the elementary students and themselves as future teachers. This student-centered comprehensive plan incorporates many high leverage teaching practices and the overall process aligns with Ladson-Billings' (1994) characteristics of culturally responsive pedagogy.

DATA ANALYSIS

Quantitative and Qualitative Data

To ensure validity of the quantitative findings, data analyses were conducted by an external party using SPSS. Paired sample t-tests were conducted for pre- and post-data from both the SETMI and the MTEBI with a statistical significance set at less than or equal to .05. Cohen's d values were calculated for all statistically significant items. For the qualitative data, the researcher utilized Erickson's (1986) interpretative method of data analysis to categorize themes or assertions from the focus group transcriptions. According to Erickson, these themes emerge from an in-depth analysis, and in this case, of the transcribed recording of focus group interviews. These themes were validated by continually confirming or disconfirming evidence from the data corpus (Erickson, 1986). Several steps were employed to complete a systematic review of the data. The researcher identified themes with each focus group meeting. As themes emerged, key links and assertions were documented from participants' responses and conversation during the focus group. Statistical analysis was conducted using frequency distributions and descriptive statistics to represent relevant findings. Final assertions had evidentiary data to confirm the findings.

RESULTS

The Fall 2016 MTEBI results indicated 17 of 21 items were statistically significant. Effect sizes (Cohen's d) of .20, .50, and .80 were identified as small, medium, and large, respectively (Cohen, 1988). The study data yielded five items with medium Cohen's d values and ten items with high Cohen's d values. A few examples of data representing the high Cohen's d values were: knowing how and having the skills to effectively teach mathematics (even to a student who does not understand), understanding mathematics concepts well enough to effectively teach mathematics, effectively monitor mathematics activities, use manipulatives to explain mathematics concepts, and will continually find better ways to teach mathematics. Table 1 provides instrument questions and pre- and post-values for the 21 MTEBI items and indicates items determined to be statistically significant.

Table 2 provides pre- and post-values for all 22 SETMI items. Data further revealed statistically significant differences on all 22 items with large effect sizes for all 22. The highest effect sizes from fall 2016 were in the following areas: implement alternative teaching strategies (Cohen's d 1.88), motivate students who show a low interest in mathematics (1.63), help students value learning mathematics (1.57), discover and create mathematical patterns (1.55), as well as use a variety of assessment strategies and provide alternative explanations or examples for a confused student (1.52 each). Table 2 also indicates items determined to be statistically significant.

Table 1
MTEBI Fall 2016

Question	Pre- St Dev	Post- St Dev	P Value	Cohen's *d*
1. When a student does better than usual in mathematics, it is often because the teacher exerted a little extra effort.	3.88 .812	4.14 .826	0.015	0.31
2. I will continually find better ways to teach mathematics.	4.52 .620	4.92 .277	<0.001	0.84
3. Even if I try very hard, I will not teach mathematics as well as I will most subjects.	2.24 .843	1.72 .636	<0.001	0.70
4. When the mathematics grades of students improve, it is often due to their teacher having found a more effective teaching approach.	4.19 .612	4.38 .553	0.040	0.32
5. I know how to teach mathematics concepts effectively.	3.02 .839	4.28 .552	<0.001	1.78
6. I will not be very effective in monitoring mathematics activities.	2.16 .706	1.38 .610	<0.001	1.19
7. If students are underachieving in mathematics, it is most likely due to ineffective mathematics teaching.	3.43 .899	3.59 .879	0.253	
8. I will generally teach mathematics ineffectively.	1.79 .727	1.26 .545	<0.001	0.82
9. The inadequacy of student's mathematics background can be overcome by good teaching.	4.21 .556	4.35 .578	0.117	
10. When a low-achieving child progresses in mathematics, it is usually due to extra attention given by the teacher.	3.97 .677	4.10 .676	0.220	
11. I understand mathematics concepts well enough to be effective in teaching elementary mathematics.	3.53 .740	4.49 .566	<0.001	1.46
12. The teacher is generally responsible for the achievement of students in mathematics.	3.60 .829	3.86 .724	0.021	0.34
13. Students achievement in mathematics is directly related to their teacher's effectiveness in mathematics teaching.	3.74 .752	4.12 .663	<0.001	0.56
14. If parents comment that their child is showing more interest in mathematics at school, it is probably due to the performance of the child's teacher.	3.80 .659	4.15 .654	0.004	0.55
15. I will find it difficult to use manipulatives to explain to students why mathematics works.	1.95 .869	1.21 .401	<0.001	1.09
16. I will typically be able to answer students' questions.	3.88 .543	4.24 .513	<0.001	0.69
17. I wonder if I will have the necessary skills to teach mathematics.	3.55 1.03	2.02 .695	<0.001	1.73

18. Given a choice, I will not invite the principal to evaluate my mathematics teaching.	2.31 .928	1.40 .751	<0.001	0.91
19. When a student has difficulty understanding a mathematics concept, I will usually be at a loss as to how to help the student understand it better.	2.28 .739	1.39 .525	<0.001	1.43
20. When teaching mathematics, I will usually welcome student questions.	4.31 .681	4.72 .444	<0.001	0.71
21. I do not know what to do to turn students on to mathematics.	2.87 .791	1.52 .644	<0.001	2.00
Significance for p value from 2 tailed t-test <0.05; N=58				

Table 2
SETMI Fall 2016

Question	Pre- Std Dev	Post- Std Dev	P Value	Cohen's *d*
1. To what extent can you motivate students who show low interest in mathematics?	2.97 .849	4.18 .619	<0.001	1.63
2. To what extent can you help your students value learning mathematics?	2.98 .859	4.20 .679	<0.001	1.57
3. To what extent can you craft relevant questions for your students related to mathematics?	3.18 .950	4.16 .663	<0.001	1.20
4. To what extent can you get your students to believe they can do well in mathematics?	3.39 .754	4.44 .696	<0.001	1.46
5. To what extent can you use a variety of assessment strategies in mathematics?	2.89 1.12	4.31 .696	<0.001	1.52
6. To what extent can you provide an alternative explanation or example in mathematics when students are confused?	2.77 .931	4.11 .676	<0.001	1.52
7. How well can you implement alternative teaching strategies for mathematics in your classroom?	2.76 .935	4.28 .662	<0.001	1.88
8. Describe characteristics of numbers (i.e. whole numbers, fractions, decimals).	2.61 .875	3.74 .835	<0.001	1.32
9. Perform strategies for composing and decomposing numbers by manipulating place value in addition and subtraction.	3.07 .990	4.28 .733	<0.001	1.39
10. Perform strategies for composing and decomposing numbers by manipulating place value in multiplication and division.	2.71 .965	3.97 .795	<0.001	1.42
11. Express their reasoning.	2.68 1.07	3.56 .847	<0.001	0.91

12. Compare equivalence of fractions and decimals.	2.74 .974	3.62 .778	<0.001	1.00
13. Interpret inverse relationships between operations (i.e. +, -, *, /).	3.26 1.01	4.33 .681	<0.001	1.25
14. Represent numbers on a number line.	2.82 1.17	3.74 .947	<0.001	0.86
15. Collect, plot, and interpret data (on any type of graph).	3.34 1.04	4.33 .831	<0.001	1.05
16. Measure area and perimeter.	3.48 1.04	4.28 .739	<0.001	0.89
17. Move between enactive (i.e. unifix cubes) and iconic (i.e. bar model) representations.	2.39 .912	3.41 .901	<0.001	1.13
18. Identify a mistake in a completed solution.	2.16 .927	3.05 .884	<0.001	0.98
19. Measure the length of objects.	3.90 .882	4.64 .633	<0.001	0.96
20. Discover and create mathematical patterns.	3.19 1.01	4.49 .622	<0.001	1.55
21. Interpret variables in an algebraic equation.	3.34 1.16	4.16 .757	<0.001	0.84
22. Solve contextual word problems.	3.23 .913	4.20 .771	<0.001	1.16

* Two-tailed paired sample t-tests with significance set at < .05; N=58

Qualitative Results

Table 3

Emergent Themes Focus Group Interviews Fall 2016

Emergent Themes	Frequencies	Sample Verbatim Quotes
Teacher Efficacy- more prepared and/or confident	49	"I felt a lot more prepared working with manipulatives and learned how to gradually scaffold instruction when students didn't need them anymore" (AM4, p.1).
		"I didn't realize how and what a difference I could make on a student until now. Seeing the IADDIM results before and after and comparing it really made me realize, I can do this and I have the knowledge to make a difference" (C4, p.8).

		"I learned that its okay to have fun and take risks… believe in your students" (AP3, p. 8). "I learned that all children learn differently, so I have to plan differently for different kids, and have a variety of strategies and manipulatives ready to go" (C4, p. 8).
		"I feel like now math is easier for me to be able to teach it and use best practices" (AM4, p. 1).
		"The more confident we feel teaching math, the more confident our students will be learning it" (AM4, p. 8).
IADDIM Planning Tool and/or Training	30	"I think that it is one thing to learn about best practice and it's another to implement it and see how powerful it can be for students" (AP8, P.3).
		"You can make your own IADDIM groups during class time to differentiate instruction for all learning levels" (N2, p. 9).
		"I love the real-world connections used in the IADDIM Planning Tool" (AM3, p. 10).
		"Using the IADDIM Planning Tool helped me create learning targets and taught me to think about "why" I was teaching this way…explain my rationale… conceptual and procedural knowledge…and how to motivate kids" (C6, p.2).
Ability to build elementary students' self-efficacy in mathematics	24	"The more confident I feel teaching the more confident our students will feel learning mathematics." (AM2, p.6)
		"I just think the IADDIM was so beneficial and so empowering and rewarding to hear students say they are smart and like math… I benefited from that in my confidence of teaching math as well" (C5, p.4).
		"I learned that a child's attitude towards math is reflected in how well they learn math" (AP3, p. 13).
		"I learned that children learn math through trial and error… they learn from their mistakes… I can guide their thinking" (N2, p. 10).

Table 3 describes qualitative data collected from two focus groups conducted in the Fall 2016. The researcher coded the transcripts using inductive analysis and as themes emerged, key links and assertions were documented. These themes were collapsed and quotes were used to more clearly elucidate the findings. The four emergent themes included:

1.) Efficacy: PT felt more prepared and/or confident teaching the IADDIM (N=49);

2.) Scaffolding Instruction: PT felt more confident teaching mathematics using concrete resources (manipulatives), semi-concrete, and abstract teaching methods (N= 44);

3.) IADDIM Planning Tool and/or Training: PT indicated that the IADDIM Planning Tool and mathematics training workshops were beneficial (N=30);

4.) Building Elementary Students' Self-Efficacy in Mathematics: PT asserted that the more confident they became teaching mathematics, the more confident their students became learning mathematics (N=24).

LIMITATIONS

While the findings of this study are encouraging, the researcher acknowledges the following limitations. Due to this action research occurring during a semester-long course, the participants were a convenience sample of elementary PT from one university; therefore, the generalizability of the findings is limited. The small sample size and demographics of the region also impacts generalizability. This study contributes to current research-based literature regarding specific types of field experiences that have the greatest impact on building PT' self-efficacy in mathematics and in teaching mathematics.

DISCUSSION

The focus of this study was to investigate how teacher preparation programs can better prepare PT to teach mathematics in an elementary classroom. By more closely examining PT' self-efficacy in mathematics and examining specific strategies for increasing self-efficacy in teaching mathematics, teacher preparation programs can be more informed and bolster self-efficacy of teaching candidates. Given the diversity in public education and especially in the region where this study took place, the need was clear that more research was warranted to gauge preservice teachers' self-efficacy in mathematics while participating in senior level practicum-embedded coursework. Findings suggest growth in both participants' self-efficacy in mathematics and in teaching mathematics. Data from this study indicate the PT must have field-based teaching opportunities so they can practice HLTP and culturally responsive pedagogy, experience struggle, engage in reflection and adaptation, while learning to be resilient as part of their training. Experiences such as engaging in professional development, writing lesson plans and teaching large and small group mathematics lessons, and implementing practice-based teaching strategies, through the field-based IADDIM assignment (required PT to interview, assess, and remediate mathematical deficiencies with a small group of elementary students) were experiences that participants stated had an impact on fostering self-efficacy. It is essential that teacher educators structure field experiences in ways to best build PT' self-efficacy in mathematics and in teaching mathematics if they are to positively impact their future students' mathematics achievement.

IMPLICATIONS

IHE and Education Preparation Programs are charged with the enormous responsibility of ensuring that elementary PT are equipped with data-driven, culturally-responsive pedagogy that foster high-levels of self-efficacy in teaching mathematics. The timeliness of this action research provides the opportunity for teacher educators to synthesize these findings and consider implications for university education preparation programs. When IHE are re-imaging their teacher preparation programs, an intentional concerted effort needs to be focused on practicum-embedded coursework. This assures that PT have the opportunity to engage in field-based authentic lesson planning and instruction; teaching with mathematics using manipulatives; implementing assignments like the IADDIM (that diagnose error patterns, build conceptual and procedural knowledge, real-world connections, and positive student dispositions towards mathematics); maximizing actual instructional time teaching; and overall, building elementary students' self-efficacy in mathematics. Through practicum-embedded coursework which incorporates professional development workshops, writing and teaching mathematics lessons (including coaching and in-depth reflection protocols) the university is meeting the vision of "Excellence in teacher preparation" (CAEP, 2015, Vision, para. 1) by providing rigorous and comprehensive education preparation programs to prepare PT for the challenges of the 21st century classroom.

RECOMMENDATIONS

How can teacher preparation programs better prepare PT to teach mathematics in an elementary classroom? By more closely examining PT' self- efficacy in mathematics and examining specific strategies for increasing self-efficacy in teaching mathematics, teacher preparation programs can be more informed and bolster self-efficacy of teaching candidates.

First, it is essential that PT have the opportunity to practice their pedagogy in a smaller setting with on-going support and feedback of tenure-track faculty in the teacher preparation program. This is not to minimize clinical field placements that afford PT the opportunity to augment their self-efficacy in teaching mathematics. However, before being tasked with the responsibility of differentiating mathematics for a classroom full of students, PT would benefit from scaffolded instruction beginning with small group teaching assignments.

Second, this research supports the importance of content specific methods course work that correlate with specific field assignments requiring students to directly teach lessons using best practices in mathematics. Specifically recommended is a data-driven intervention lesson planning tool such as the IADDIM; integrating conceptual knowledge; procedural knowledge; real world connections; and negotiating opportunities to build positive dispositions in mathematics. Students reported in interviews for employment that field-based assignments like the IADDIM experience and entire process of data-driven intervention and instruction was a "game changer."

> I feel significantly more prepared to teach math because I have been taught strategies to use, and I have practice with it. I feel the IADDIM helped the most because I was able to sit down with students and actually work with them to figure out strategies to help them learn. All kids can learn! (A41, p. 1)

Content specific methods coursework like the IADDIM assignment have shown a positive impact on elementary PT' self-efficacy in mathematics and in teaching mathematics.

Third, according to Bates, Latham, and Kim (2011), there is a direct correlation between PT' confidence in teaching mathematics, teacher self-efficacy, and student achievement. Hence, it is imperative that IHE examine their current teacher preparation programs to see if there are opportunities for (senior level) practicum-embedded mathematics coursework, and if so, what assignments are required in those courses. This research supports that IHE should investigate their PT' levels of self-efficacy in mathematics and in teaching mathematics in the elementary classroom. IHE can then use these data to drive program development and improvements by focusing on practicum-embedded coursework with content specific methods assignments (e.g. data-driven intervention lesson planning using a tool such as the IADDIM).

IHE have a tremendous responsibility to prepare our PT to meet the unique and diverse needs of all learners. It is essential that teacher educators structure field experiences in ways to best build PT' self-efficacy in mathematics and in teaching mathematics if they are to positively impact their future students' mathematics achievement. The researcher continues to seek out opportunities to use student-driven, course specific research to make program improvements so we may continue develop PT that are "change agents" for the future.

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