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**Does a Co-Learner Delivery Model in Professional Development Affect
Teachers' Self-Efficacy in Teaching Mathematics?**

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Abstract

A mixed method study is reported examining teacher efficacy regarding professional development in mathematics instruction for two groups of teachers: in building with peers ($N=17$) and MAT student co-learners in the classroom ($N=14$). An end-of-course survey, focus group interviews and pre-post data for the *Teacher Self Efficacy Scale* were used to investigate: 1. What is the difference in teachers' efficacy regarding mathematics instruction based on the professional development delivery system they experienced? 2. What are teachers' perceptions of their professional development with peers conducted on-site in district compared with professional development with peers and pre-service teachers at a university setting? Descriptive statistics, t-tests, ANCOVA, and thematic analysis were used. While the co-learner teachers tended to have higher self efficacy scores, the adjusted posttest means were not statistically different. Thematic analysis indicated that both groups were positive in their evaluations of their professional development. Implications for professional development are discussed.

Purpose

The purpose of this study was to examine if a co-learner delivery model of mathematics professional development for K-6 teachers affects teachers' perception of self-efficacy in teaching mathematics.

Theoretical Framework

Research regarding professional development suggests that in addition to introducing new concepts and pedagogical understandings in instruction, curriculum, and assessment, effective professional development must also prompt and guide teachers to "unlearn" the beliefs, values, assumptions, and

cultures underlying schools' standard operating practices (Dede, 1999) This shift is particularly important in mathematics pedagogy, since most teachers have learned a traditional mathematics curriculum and were not exposed to a curriculum steeped in the constructive, active approaches, which are supported by the National Council of Teachers of Mathematics. Many teachers hold deeply ingrained and strongly reinforced rituals of schooling from their own learning experience (NCTM, 2005).

Acquiring new beliefs and learning new strategies requires more than an informational interchange between facilitator and participants. It requires teachers to develop self-efficacy or confidence that this new learning of teaching beliefs and practices is relevant and supported by long-term support and organizational accommodations (AFT, 2002). In order to develop self-efficacy, teachers need to rely on the judgment of their capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated (Neitfield & Cao, 2003).

Gibson & Dembo (1984) described teachers' self-efficacy as including two factors. The first is Personal Teaching Efficacy (PTE), which is the confidence a professional possesses, which allows one to play an important part in student motivation and performance. The second is General Teaching Efficacy (GTE), which is the belief that student motivation and performance depends on external factors, and are outside of teachers' control.

This study is guided by the following research question:

- Is there a significant difference in influencing teachers' efficacy regarding mathematics instruction and pedagogy between teachers whose professional development instruction is with peers on-site in district and teachers whose professional development instruction is with peers and pre-service teachers at a university setting?

Methodology

The findings of the first stage of a quasi-experimental study using a non-equivalent control-group design will be reported (Gall, Gall & Borg, 2007). The treatment consisted of a course requirement in a Masters of Arts in Teaching (MAT) program. Each treatment lasted for 11 weeks with 2-hour sessions each week presented by the same instructor.

Teachers selected one of two different settings. The first setting (Group A) was conducted in a school building with their peers after school. The second (Group B) setting was conducted in a university classroom during the evening with MAT students and was organized in co-learning partnerships. Teacher participants in this group invited the MAT student co-learners into their classrooms for two hours per week as part of the MAT student's required fieldwork.

Sample

The two groups, Group A ($n=17$) and Group B ($n=14$) represented K-6 regular and special education teachers from an urban ring school with $N=293$ teachers.

Instrumentation/Data Collection

During and after the professional development course, several assessments were conducted. The first assessment, an end of the course survey, was aligned to Guskey's (2000) Five Critical Levels of Professional Development Evaluation (i.e., Participant's Reactions, Organization Support and Change, and Participants' New Use of Knowledge and Skills). The survey employed a 5-point Likert scale (High-Low) to rate course content, materials, instructor, and overall effectiveness of the course. The survey was followed by six open-ended questions, which focused on the most and least effective components of the course.

A focus group for each treatment group comprised the second assessment (Morgan 1997). Both sessions were conducted and audio taped by the same facilitators.

The final assessment used the *Teacher Self Efficacy Scale (TSES)* administered during the 1st and 10th session of the treatment. The 24-item instrument provided data regarding teachers' efficacy in Student Engagement, Instructional Strategies, and Classroom Management. Support for content validity came from the literature and the judgments of content experts; construct validity evidence for meaningful interpretations of the three dimensions was supported through confirmatory factor analysis (Heneman, Kimball, & Milanowski, 2006).

Tschannen-Moran & Hoy (2001) also reported ed alpha reliabilities for teacher data from the subscales and the total score ranging from .75 to .90.

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Data Analysis

After each focus group session, the facilitators debriefed with the researcher. The audio transcripts were transcribed by the researcher. End-of-course survey data were collected. The Classic Approach strategy of the transcript, focus group notes, and the survey responses allowed for the development of themes and placement of results into categories (Krueger & Casey, 2009).

A series of *t*-tests were used to compare the groups on the *TSES* teacher sense of efficacy pretest dimensions (alpha reliabilities of the data were .77, .79, .88 respectively). Analyses of covariance were used to analyze the adjusted posttest efficacy means.

Preliminary Findings

Both groups reported favorably for their professional development treatments. Reasons for the positive feedback varied. Participants in Group A stressed that the professional development delivery at the school site supported a collaborative atmosphere among the staff with topics introduced in the course discussed daily.

Participants in Group B felt that the treatment allowed them to work with another professional in their classroom. Many participants referred to the MAT student as a support in learning something new in instruction.

The *t*-tests indicated that there were no statistically significant differences between the two group settings for the three teacher efficacy pretest dimensions. ANCOVA was used to analyze the adjusted posttest means of the two groups.

While the university-based MAT students and classroom teachers organized in the co-learning partnerships setting tended to have higher posttest sense of efficacy scores, the small sample sizes contributed to the lack of statistically significant findings for these differences. At later stages of the research project, larger sample sizes will be available.

Potential Contributions

This initial examination of a co-learner model allows collaborative inquiry to occur; a major component in the institutionalization of any practice. Without collaborative inquiry there is a limited sense of commitment among colleagues. This often leads to teachers resorting back to familiar instructional teaching methods (Guskey, 2000).

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