TEACHER EFFICACY OF

HIGH SCHOOL MATHEMATICS CO-TEACHERS

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ABSTRACT

High school mathematics inclusion classes help provide all students the access to rigorous curriculum. This study provides information about the teacher efficacy of high school mathematics co-teachers. It considers the influence of the amount of collaborative planning time on the efficacy of co-teachers. A quantitative research design was used, with follow up interviews for further explanation of the findings. The findings indicate a significant difference in the mathematics teaching efficacy between the mathematics and special education co-teachers. It also shows the lack of significant differences in efficacy when various collaborative planning times were considered. This examination points to several benefits, such as teacher support structures and adaptive shifts in instructional practices. Implications for future studies and school practice were presented, while considering the efficacy of co-teachers in inclusive contexts.

Keywords: efficacy; teacher efficacy; co-teaching, mathematics, high school; special education; collaboration; teacher collaboration; collaborative planning; co-teachers; MTEBI; TSES

All students should have access to the highest quality mathematics instruction. According to NCTM (2000), excellence in mathematics education requires equity when it comes to demanding high expectations and providing strong support for all learners. The reauthorization of IDEA (2004) requires districts to put students with disabilities in the least restrictive environment (LRE) by allowing them to be full participants in rigorous academics and general education curriculum and assessments (Jennings, 2007; Murawski, 2009; Smith, 2005). In addition, The No Child Left Behind Act (NCLB) of 2001 changed some of the legal requirements form having highly qualified teachers in the classrooms. Changing legal requirements and pressure to increase the academic achievement of all students necessitate a careful look at how schools plan to meet these demands. Current trends in education have shown that the creation and adoption of reform movements that support the delivery of rigorous mathematics instruction to all students is crucial for an educated workforce. Schools have adopted inclusion classes in order to address this need, which often results in challenging situations for co-teachers. Co-teaching is an effective means for providing the supplementary aid and services to students, with or without disabilities, who are taught in the general education classrooms (Jennings, 2007; Murawski, 2009; Villa, Thousand, & Nevin, 2008).

In an effective co-teaching partnership, both the general and special education teachers are responsible for the delivery of instruction in the inclusion classes (Alper & Ryndak, 1992; Bauwens, Hourcade, & Friend, 1989; Murawski, 2009). Bandura's social cognition theory provides the primary support for the study of teacher efficacy. However, Vygotsky's sociocultural theory provides a framework for the development of teacher efficacy in the context of the collaborative partnership between co-teachers of secondary mathematics inclusion classes.

Interactions with persons in the environment stimulate development processes and promote cognitive growth (Vygotsky, 1997). Co-teachers are able to share and work together to accomplish desired goals (Dettmer, Thurston, & Dyke, 2005). Bandura (1986) uses the triadic reciprocity model of causality to explain how learning can occur through the use of models within social environments, such as co-teaching. Learning is a process whereby information about the structure of behavior and environmental events are transformed into symbols that serve as guide for future actions (Bandura, 1986). Learning occurs either enactively when people perform actions or vicariously when they observe models of behavior (Bandura, 1986, 1997; Schunk, 2008).

Studies on inclusion classes provide recommendations for improving co-teaching practices at the secondary level (Dieker & Murawski, 2003; Eisenman, Pleet, Wandry, & McGinley, 2011; Gerber & Popp; 2000). Gerber and Popp (2000) recommend that co-teachers define collaboration and set partnership objectives around their service work. They suggest that co-teachers build consensus for multiple service delivery options and plan for program continuation even after the life of the partnership. Murawski and Dieker (2004) emphasized the importance of leadership support in co-teaching. School administrators may use their influence to form voluntary co-teaching partnerships and strategically schedule them. Teacher training is another important recommendation for improving co-teaching practices (Dieker & Murawski, 2003). Co-teachers come with different skills sets. Thus, it is important to engage the teaching pair in joint professional development opportunities aimed at improving their collective content and instructional expertise. Quality in-service programs must be provided to co-teachers for upgrading their skills in supporting inclusive learning communities and building their capacity (Villa et al., 2008). Collaborative planning is a potential source of teacher learning (Clark, Moss,

Goering, Herter, Lamar, Leonard et al., 1996; Eisenman et al., 2011; Hargreaves, 1996; Lalik & Niles, 1990). It opens up the discussions around pedagogical knowledge and provides opportunities for reflection and shared critique of practice (Clarke et al., 1996). Learning content-specific material from the general education teacher, sharing accountability, developing shared instructional practices through professional learning meetings, being physically accessible to the co-teacher and students in the co-taught classroom, and anticipating service needs and priorities with the co-teacher also helps improve co-teaching (Eisenman et al., 2011). Maccini and Gagno (2000) shared their recommendations on designing and implementing lessons for students with disabilities in a mathematics classroom. They proposed that teachers incorporate elements of effective instruction, such as use of manipulatives, real world connections, teacher modeling, guided and independent practice, monitoring of student performance, use of pro-active classroom management strategies, and group work. They also recommended that co-teachers create individualized mathematics instruction plans based on students' numeracy and literacy skill levels.

Researchers claim that teacher efficacy relates to student achievement as it results in teachers' efforts to adapt instructional practices that support student learning (Allinder, 1995; Almog & Shecktman, 2007; Ashton & Webb, 1986; Caprara, Barbaranelli, Steca, & Malone, 2006; Dembo & Gibson, 1985; Goddard, Hoy, & Hoy, 2004; Ross, 1994). Teachers with higher efficacy levels are more apt to plan engaging lessons and interact with students to encourage their participation in the lesson (Schunk, 2008). They are also more likely to use varied strategies to meet the needs of their students (Goddard et al., 2004). These educators work longer with struggling students (Almog & Shecktman, 2007; Dembo & Gibson, 1985) and are less likely to refer a difficult student to special education (Poddell & Soodak, 1993). When assigned to teach

special education students who were placed in the mainstream classes, teachers with high levels of efficacy are willing to involve special education students in class discussions and persist in educating them (Brownell & Pajares, 1996; Nunn, Jantz, & Butikofer, 2009), while maintaining better control of an inclusion class (Woolfson & Brady, 2009).

This study occupies a specific niche in the body of research as it attempts to provide information related to teacher efficacy and co-teaching in the area of mathematics at the high school level. It attempts to fill the void in the research as it examines the teacher efficacy and mathematics teaching efficacy of collaborative teachers of secondary mathematics inclusion classes across varying lengths of collaborative planning time. The following questions will be addressed.

Question 1. Is there a significant difference in teacher efficacy of mathematics teachers among the varied lengths of collaborative planning time?

Question 2 Is there a significant difference in teacher efficacy of special education co-teachers among the varied lengths of collaborative planning time?

Questions 3. Is there a significant difference in mathematics teaching efficacy of mathematics teachers among the varied lengths of collaborative planning time?

Questions 4. Is there a significant difference in mathematics teaching efficacy of special education co-teachers among the varied lengths of collaborative planning time?

Question 5. Is there a significant difference in teacher efficacy between mathematics and special education co-teachers?

Question 6. Is there a significant difference in the mathematics teaching efficacy between the mathematics and special education co-teachers?

METHODS

The study utilizes a quantitative research design with follow-up interviews. The quantitative data were collected from a sample of 77 secondary mathematics teachers and 15 special education teachers from a large, urban school district. At the time of the study, these teachers co-taught mathematics inclusion classes in 9th, 10th, or 11th grades. This was a sample of convenience derived from a pool of participants from specific school locations. Table 1 shows additional information about the participants in this study.

Table 1

Survey Participants' Teacher Demographic Information

	General Education Teacher	Special Education Teacher	Gender		Educational Attainment			
			Male	Female	Bachelors	Masters	Masters+	Doctorate
n	77	15	25	67	24	30	34	4
%	84	16	27	73	26	33	37	4

There were two instruments utilized in this study. The first was *Teachers' Sense of Efficacy Scale* (TSES) by Tschannen-Moran & Hoy (2001) and the second was *Mathematics Teaching Efficacy Belief Instrument* (MTEBI) by Enochs, Smith, and Huinker (2000). Without a valid single instrument available that could measure the teacher efficacy of collaborating teachers involved in a particular setting of co-teaching secondary mathematics inclusion classes, both instruments were utilized to capture the participants' beliefs about the subject. The *Teachers' Sense of Efficacy Scale* (TSES) is also called the Ohio State Teacher Efficacy Scale

(OSTES). Two researchers and eight graduate students, who were participants in the seminar on self-efficacy in teaching and learning at the College of Education in Ohio State University, created it. The Likert scale format from the Gibson and Dembo (1984) instrument and the expanded scale advocated by Bandura (1997) were referenced in the early stages of the creating the instrument. The TSES has three scales. They are efficacy in student engagement, efficacy in instructional strategies, and efficacy in classroom management (Tschannen-Moran & Hoy, 2001). The *Mathematics Teaching Efficacy Belief Instrument (*MTEBI) for pre-service teachers resulted from a small modification of the Science Teaching Efficacy Belief Instrument (STEBI-B). Essentially, the word "science" was replaced with "mathematics" with everything else remaining the same. This MTEBI instrument consists of 21 items with 13 items comprising the Personal Mathematics Teaching Efficacy (PMTE) subscale and eight items on the Mathematics Teaching Outcome Expectancy (MTOE) subscale. In this survey, participants choose one rating from a 5-point scale. The scales are labeled using the descriptors "strongly agree," "agree," "uncertain," "disagree," and "strongly disagree." Item analysis was conducted for the original 23-item scale and it was found that two items had item-total item correlations that were less than 0.30. These items were removed from the survey. Reliability analysis produced an alpha coefficient (Cronbach's alpha) of .88 for the PMTE subscale and .77 for the MTOE subscale. The MTEBI has two scales – personal mathematics teaching efficacy (SE) and outcome expectancy (OE). The survey also included questions about the collaborative teaching practices of the teachers such as gender, years of teaching, educational level, co-teaching experiences, and mathematics teaching experiences. Data were collected using a commercial online tool and was analyzed using SPSS, a common statistical software package. Statistical analyses including

independent *t*-tests and analysis of variance (ANOVA) were utilized to assist in the data analysis process.

Independent semi-structured interviews were conducted with members of three pairs of high school mathematics co-teachers who were selected using a purposeful sampling method. Table 2 shows some demographic information on the interview participants. Pseudonyms were used to maintain confidentiality. They were provided a set of guide questions ahead of time.

Table 2

Follow -Up Interview Teacher Demographic and Instructional Information

Teacher	Certificate Area	Years of Teaching Inclusion Classes	Years of Collaboration with Current Co-Teacher	Common Planning Time Provided
Team A				
Ms. Allen	Mathematics	9	3	No
Ms. Bennett	Special Education	7	3	No
Team B				
Ms. Carter	Mathematics	4	< 1	No
Mr. Dalton	Special Education	1.5	< 1	No
Team C				
Mr. Elbert	Mathematics	10	2	No
Mr. Ferguson	Special Education	2	2	No

The researcher had the flexibility to adjust the order of the questions and may not necessarily use exact wording during the interview (Merriam, 2009). The researcher used follow-up questions to clarify the meaning of shared statements between members of the same co-teaching team. This method was also used to determine the accuracy of the collected data. Permission to conduct the interviews at the school site was provided by each co-teaching team's principal. Interviews were audio recorded with the consent of each participating co-teacher. The purpose of the follow-up interviews was to gather information that can provide further explanations of significant results (Creswell, 2009). It was also intended to provide further exploration and clarification of unusual findings (Morse, 1991). The survey data was considered the primary source of data with the data from the interviews providing a supportive role in this study (Creswell, 2009).

RESULTS

In considering teacher efficacy, mean scores and standard deviations from the administration of the TSES subscales showed that both the mathematics teachers and special education teachers had mean scores that are less than half a point apart for the overall TSES and for each of the scales. The mean scores for the student engagement scale were lower for both groups as compared with the instructional strategies and classroom management. Independent sample *t*-tests were utilized to examine the data. The results found in Table 3 showed no significant difference in teacher efficacy between the two groups.

Table 3

Independent Samples t-Test – Comparison of TSES Scores of Mathematics and Special Education Co-Teachers

	t-test for Equality of Means		
	t	*df*	Significance (2-tailed)
Average TSES	.432	90	.667
Student Engagement	-.418	90	.677
Instructional Strategies	1.602	90	.113
Classroom Management	.025	90	.980

In considering mathematics teaching efficacy, data from the administration of the MTEBI subscales show that mean scores fall close to the middle of the 5-point Likert scale. This is true for the personal mathematics teaching and outcome expectancy scales. The score of the mathematics teachers were slightly higher than those of the special education teachers. The independent sample *t*-test was applied to the data and the results found in Table 4 showed that there is no significant difference in average mathematics teaching efficacy between the two groups (t (90) = 1.950, $p > .05$). However, a careful inspection of the result showed that the difference is close to being significant. The *p*-value is equal to 0.054, a value that is close to 0.05. There was a significant difference in the personal mathematics teaching efficacy scale for teaching mathematics between the two groups (t (90) = 2.399, $p < .05$) while there was no significant difference in the outcome expectancy scale for teaching mathematics (t(90) = .653, $p > .05$).

Table 4

Independent Samples t-Test – Comparison of MTEBI Scores of Mathematics and Special Education Co-Teachers

	t-test for Equality of Means		
	t	df	Significance (2-tailed)
Average MTEBI	1.950	90	.054
Personal Math TE	2.399	90	.019
Outcome Expectance	.653	90	.516

Analysis of Variance (ANOVA) tests were used to analyze if significant differences in teacher efficacy and mathematics teaching efficacy of the mathematics and special education co-teachers exist among the varied weekly collaborative planning times. Results revealed that there is no significant differences in the average TSES subscale scores of the mathematics teachers across the varied collaborative planning times ($F(6,70) = 1.031$, $p > .05$). Similarly, there were no significant differences in Student Engagement ($F(6,70) = 1.307$, $p > .05$), Instructional Strategies ($F(6,70) = .883$, $p > .05$), and Classroom Management ($F(6,70) = .465$, $p > .05$) scores of mathematics teachers across the varied collaborative planning times. These were also true for special education teachers. The results from follow up interviews showed that the co-teachers' were committed to setting aside some time for collaborative planning. This may explain the lack of significant difference in teacher efficacy across various collaborative planning times.

Results of the ANOVA showed that there is no significant difference in the MTEBI subscale scores of the mathematics teachers across the varied collaborative planning times ($F(6,70) = .417$, $p > .05$). Similarly, there were no significant differences in personal

mathematics teaching efficacy ($F(6,70) = .937$, $p > .05$) and outcome expectancy ($F(6,70) = .250$, $p > .05$) scores of mathematics teachers across the varied collaborative planning times. There were no significant differences in the average MTEBI subscale scores of the special education teachers across the varied collaborative planning times ($F(5,9) = .993$, $p > .05$). Similarly, there were no significant differences in personal math teaching efficacy2 ($F(5,9) = 1.482$, $p > .05$) and outcome expectancy ($F(5,9) = .924$, $p > .05$) scores of mathematics teachers across the varied collaborative planning times.

Descriptive statistics indicated that participating co-teachers planned between 30 to 60 minutes per week. An item on the survey provided the participants the opportunity to indicate if they are given a scheduled planning time within a week. A defined scheduled co-planning time is necessary as a time frame that is built into the school's master schedule where both co-teachers are provided a common planning time to collaborate and plan their lessons for the shared class or classes. The results found in Table 5 indicate that fewer than 50% of the participants were provided a scheduled collaborative planning time during the week. These results were

Table 5

Analysis of Data on Scheduled Collaborative Planning Time for Co-Teachers

Collaborative planning time provided	*n*	%	Performs instructional practices with co-teacher	n_S	%
Yes	37	40 %	No	6	16 %
			Yes	31	84 %
No	55	60 %	No	22	40 %
			Yes	33	60 %
	92		Total Yes	64	70%

compared with other responses which asked the participants to select instructional practices which they perform during their collaborative planning time. The results showed that of the participants who indicated that they were given a weekly collaborative planning time about 83.78% indicated some of the activities that they perform during this scheduled time. Approximately 16.22% did not respond to this question. On the other hand, of those who indicated that they were not provided the scheduled weekly collaborative planning time about 60% indicated that they collaborate with their co-teacher and that they perform instructional practices related to co-teaching. Approximately 70% of the participants indicated that they perform instructional practices with their collaborating teacher regardless of whether they were provided with a scheduled planning time or not. This showed that most of the participating co-teachers set aside some time to plan together even if a collaborative planning was not built into the school's master schedule. Results from the interviews showed evidence that supports this finding. Participants shared some of the creative strategies they used to be able to plan lessons with their co-teachers. Ms. Bennett, who was the special education teacher, shared:

> Unfortunately, we do not have the same planning. But because we have such a great relationship whenever she's on planning she'll come by and see me or whenever I have planning I'll go by and see her. And we discuss a couple of students at a time. Because we work so well together there have been times…she has called me at home to discuss some strategies we could possibly implement for some students or for the entire class. So we don't necessarily have a common planning time but we do make sure that we do get some time to discuss (Interview 1, 2/7/11).

This was consistent with Ms. Allen's testimony that they "get together in the hallway or discuss [matters] on the phone" (Interview 4, 2/16/11). Similarly, Ms. Carter shared that they "plan after

school, in between classes, via email. By in between classes [she] meant advisement [or homeroom time] as giving them a little bit more room for talking about things and getting things done before class" (Interview 2, 2/10/11). This was also supported by the testimony of Mr. Dalton, who was her special education co-teacher. He shared that "he would go in during advisement to look at the Powerpoints for the day" (Interview 5, 2/23/11). Mr. Elbert, who was the mathematics co-teacher, shared that they "sometimes meet before class [or] sometimes after class" (Interview 3, 2/14/11). While co-teachers in each team stated that they were willing to meet with their co-teachers for planning, it did not alleviate the challenges in not having a scheduled collaborative planning time. Mr. Dalton shared that "he had to choose between doing [his IEP] paperwork or co-teach" (Interview 5, 2/23/11). Even with challenges such as this, the participants were willing to find the time to co-plan with their collaborating teacher. Ms. Carter further explained that they "usually plan about once, maybe twice a week" (Interview 2, 2/10/11). Ms. Allen confirmed that "planning time is definitely important" (Interview 4, 2/16/11).

DISCUSSION

All students should have access to high quality mathematics curriculum. The task of teaching inclusion classes presents a variety of challenges, most especially if the subject is mathematics. From behavioral issues to providing instructional accommodations to students with individualized instructional plans, co-teachers of inclusion classes are required to plan and implement a variety of strategies to meet the needs of all students in their shared classes. They must collaborate with their co-teacher to learn content-specific materials, share accountability, develop shared instructional practices through professional learning meetings, become physically accessible to the co-teacher and students in the co-taught classroom, and anticipate service needs

and priorities with co-teacher (Eisenman et al., 2011). These practices are more noticeable at the elementary level as special education co-teachers demonstrate a more active participation in teaching classes because they are certified in all areas at this level (Cramer and Nevin, 2006). Special education teachers take a variety of roles in varied content areas at the high school level; lowest levels of lead teaching were observed in high school mathematics classrooms (Zigmond & Matta, 2004). They are challenged to possess some level of specialized content background especially when co-teaching courses such as science and mathematics. Studies have shown that teacher efficacy influences the amount of effort and duration that a teacher is willing to invest in addressing challenges in teaching inclusion classes (Almog & Shecktman, 2007).

Teacher Efficacy of Co-Teachers

The findings show that there is no significant difference in teacher efficacy between the mathematics and special education teachers in each subscale and in overall teacher efficacy results. The results from an independent sample *t*-test revealed that there was no significant difference in teacher efficacy between the mathematics and special education co-teachers. One possible explanation for this finding may be because each one brings a wealth of experience and expertise into the collaborative partnership. The mathematics teacher comes with the expertise needed to guide the lesson planning process so that students are able to access content standards for the co-taught courses. He or she may be experienced in using mathematics tools and manipulatives such as Geometer's Sketchpad or a graphing calculator and such may become a trainer for the special education teacher in using these tools. On the other hand, the special education teacher may bring a wealth of knowledge about accommodations and instructional modification strategies that will enable both teachers to adjust the lessons so that students with disabilities are able to access the curriculum. He or she may also share information about current

policies in teaching special education students. Both co-teachers may share their perspectives and teaching experiences in order to create well-planned lessons (Carpenter et al., 2007). The sharing of expert knowledge benefits both the general and special education students, as well as teachers. According to Yeo, Ang, Chong, Huan, and Quek (2008) teachers develop higher teacher efficacy as they mature in their years of professional teaching experience. The combination of experience and expertise of both co-teachers may be a contributing factor that resulted in the lack of significant difference between the teacher efficacy of mathematics and special education co-teachers. Also, the act of co-teaching may be positively reinforcing for both teachers as they are provided a support person who can assist them while they teach mathematics. This may especially be true for special education teachers as they are able to learn more mathematics concepts as a result of having access to the lessons that the mathematics teachers may model in the inclusion classes.

The findings show a significant difference between the personal mathematics teaching efficacy of the mathematics and special education teachers. Two factors may have contributed to the lower mathematics teaching efficacy scores of the special education co-teachers. These are perceived level of mathematics content mastery and attitude towards not being labeled as the teacher-of-record for the co-taught class. This is consistent with the initial hypothesis that the special education teachers may not be as efficacious about their capabilities in teaching mathematics, especially at the secondary level, simply because of their limited content background. The overall mathematics teaching efficacy of the mathematics and special education teachers were not significantly different, however, the results were approaching significance. It is easy to pinpoint the gap in the content expertise of co-teacher of high school courses such as geometry, advanced algebra, trigonometry, or statistics as the main reason for the difference in

their mathematics teaching efficacy. Testimonies given by the participating special education teachers confirm the fact that they generally consider the mathematics teacher as the content expert and that they rely on them to lead the lesson planning process. This is consistent with Weiss and Lloyd's (2002) statement that in some co-teaching situations the general education teacher is considered as the content specialist. The findings were also consistent with those in other studies (Magiera et al., 2005; Mastropieri, Scruggs, Graetz, Norland, Gardizi, & McDuffie, 2005; Scruggs, Mastropieri, & McDuffie, 2007; Weiss & Lloyd, 2002) where the special education teacher usually took the supportive role in planning and delivering lessons. Another condition to consider is the fact that most special education co-teachers are not considered as the teacher-of-record of the inclusion classes. This may impact their level of mathematics teaching efficacy as they consider themselves as "the other teacher in the room" (Interview 5, 2/23/11). They enter the content teacher's room to share the accountability for the students they co-teach. However, this may not be easy because some of the content teachers may feel territorial about allowing another teacher to take charge of their assigned classes.

Teacher Efficacy Across Various Collaborative Planning Times

Comprehensive planning that focuses on content, assessment, and specific issues like classroom management can lead to a successful co-teaching partnership (Hang & Rabren, 2008). Scheduled planning time, agreement on shared duties, goals, and academic tasks, and open communication between these co-teachers also enable them to develop lessons that better address student needs (Hines, 2008). While there are benefits in scheduling collaborative planning times between the general education and special education co-teachers (Villa et al., 2008), in reality this may not always be the priority, especially at the high school level.

The findings show that the effect of scheduled collaborative planning time on mathematics teaching efficacy is not enough to cause a difference in teacher efficacy between the mathematics and special education co-teachers when the amount of scheduled collaborative planning time per week was considered. The data from the interviews and survey supports this finding. Having scheduled planning times may not be a major concern for co-teachers such that it impacts their teacher efficacy. The reason for this may be that co-teachers find time to plan together regardless of whether they have a scheduled planning time built into the master schedule or not. They set aside time to collaborate with one another outside of their regular teaching periods. Some of the creative ways to find time to plan include meeting during advisory period, before school starts, or after the dismissal bell rings. Others may briefly visit their co-teacher's room during their own planning time to present ideas about an upcoming lesson. Still some co-teachers who are comfortable with each other may plan lessons together via email or by calling each other on their cell phone at times that fall outside of the regular work day. Mastropieri et al. (2005) stated that a lack of scheduled co-planning time is not a barrier for actually co-planning with co-teachers as they set aside time to collaborate outside of their regular teaching periods. The findings of this study support this as 70% of the mathematics and special education co-teachers scheduled meeting times outside of the scheduled planning times, or lack thereof.

Most schools have adopted an inclusion model for providing support to their students with disabilities in general education classes. This approach to educating general and special education students in inclusion classes presents benefits as well challenges. One challenge is additional demand for collaborating teachers of these inclusion classes to collaborate together in order to provide rich educational experiences that meets the needs of all students. The results of

this study present some implications for supporting co-teachers of high school mathematics inclusion classes.

Implications for Future Research and School Practice

There are limited studies available that present information about co-teaching at the secondary level. This study begins to fill this gap in research as it specifically utilized a sample group of mathematics and special education co-teachers at the high school level. Most of the studies on co-teaching utilized a qualitative approach in collecting data. This is an attempt to contribute to the field by using a quantitative research design in the studying teacher efficacy of high school mathematics co-teachers utilizing valid and reliable scales. Because of the special focus on teaching mathematics, this study also is unique as it discusses findings about the teacher efficacy of co-teachers as they teach high school level mathematics such as algebra and geometry.

All social support can improve teacher efficacy (Huang & Liu, 2007). There is an opportunity for district leaders and professional developers to look at providing adequate support to co-teachers so that they are provided information about research based practices that lead to effective co-planning and co-teaching. The findings revealed a significant difference in personal mathematics teaching efficacy between the mathematics and special education co-teachers. Opportunities to provide training sessions to help special education teachers gain conceptual understanding of mathematical concepts, especially at the high school level may lead to higher efficacy and other benefits to both co-teachers.

References

Allinder, R. (1995). An examination between the relationship between teacher efficacy and curriculum-based measurement and student achievement. *Remedial and Special Education, 16*(4), 247-254.

Almog, O., & Shecktman, Z. (2007). Teacher's democratic and efficacy beliefs and styles of coping with behavioral problems of pupils with special needs. *European Journal of Special Needs Education, 22*(2), 115–129.

Alper, S., & Ryndak, D. (1992). Educating students with severe handicaps in regular classes. *The Elementary School Journal, 92*(3), 373-387.

Asthon, P., & Webb, R. (1986). *Making a difference: Teachers' sense of efficacy and student achievement.* New York: Longman.

Bandura, A. (1986). *Social foundations of thought and action.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological reviews, 84,* 191-215.

Bauwens, J., Hourcade, J., & Friend, M. (1989). Cooperative teaching: a model for general and special education integration. *Remedial and Special Education, 10*(2), 17-22.

Brownell, M., & Pajares, F. (1996). *The influence of teachers 'efficacy beliefs on perceived success in mainstreaming students with learning and behavior problems: A path analysis*. (Research Bulletin 27, 3 – 4, Summer - Fall). Sanibel, FL: Florida Educational research Council, Inc.

Caprara, G., Barbaranelli, C., Borgogni, L., & Steca, P. (2003). Efficacy beliefs as

determinants of teachers' job satisfaction. *Journal of Educational Psychology, 95*(4), 821-832.

Carpenter III, D. M., Crawford, L., & Walden, R. (2007). Testing the efficacy of team teaching. *Learning Environments Research, 10*, 53-65.

Clark, C., Moss, P. A., Goering, S., Herter, R. J., Lamar, B., Leonard, D., et al. (1996). Collaboration as dialogues: Teachers and researchers engaged in conversations and professional development. *American Educational Research Journal, 33*(1), 193-231.

Cramer, E. , & Nevin, A. (2006). A mixed methodology analysis of co-teacher assessments. *Teacher Education and Special Education, 29*(4), 261-274.

Creswell, J. (2009). *Research designs: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage Publications Inc.

Dembo, M. , & Gibson, S. (1985). Teachers' sense of efficacy: An important factor in school improvement. *The Elementary School Journal. 86*(2), 173-184.

Dettmer, P., Thurston, L., & Dyke, N. (2005). *Consultation, collaboration, and teamwork for students with special needs*. Boston, MA: Pearson Education.

Dieker, L., & Murawski, W. (2003). Co-teaching at the secondary level: unique issues, current trends, and suggestions for success. *The High School Journal, 86*(4), 1-13.

Eisenman, L., Pleet, A., Wandry, D., & McGinley, V. (2011). Voices of special education teachers in an inclusive high school: Redefining responsibilities. *Remedial and Special Education, 32*(2), 91-104.

Enochs, L., Smith, P, & Huinker, D. (2000). Establishing factorial validity of the mathematics teaching efficacy beliefs instrument. *School Science and Mathematics, 100*(4), 194-202.

Gerber, P., & Popp, P. (2000). Making collaborative teaching more effective for academically able students: Recommendations for training and implementation. *Learning Disability Quarter, 23*(3*)*, 229-236.

Goddard, R., Hoy, W., & Hoy, A. (2004). Collective efficacy beliefs: Theoretical developments, empirical evidence, and future directions. *Educational Researcher, 33*(3), 3-13.

Hang, Q., & Rabren, K. (2009). An examination of co-teaching: Perspectives and efficacy indicators. *Remedial and Special Education, 30*(5), 259-268.

Hargreaves, A. (1996). Transforming knowledge: blurring the boundaries between research, policy, and practice. *Educational Evaluation and Policy Analysis, 18*(2), 105-122.

Hines, T. (2008). Making collaboration work in inclusive high school classrooms: Recommendations for principals. *Intervention in School and Clinic, 43*(5), 277-282.

Huang, X. , & Liu, M. (2007). An analysis of the relationship between teacher efficacy, teacher self-esteem, and orientations to seeking help. *Social Behavior and Personality, 35*(5), 707-716.

Jennings, M. (2007). Leading effective meetings, teams, and work groups in districts and schools. Alexandria, VA: Association for Supervision and Curriculum Development.

Lalik, R., & Niles, J. (1990). Collaborative planning by two groups of student teachers. *The Elementary School Journal, 90*(3), 319-336.

Maccini, P., & Gagnon, J. (2000). Best practices for teaching mathematics to secondary

students with special needs. *Focus on Exceptional Children, 32*(5), 1-22.

Magiera, K., Smith, C., Zigmond, N., & Gebauer, K. (2005). Benefits of co-teaching in secondary mathematics classes. *Teaching Exceptional Children, 37*(3), 20-24.

Mastropieri, M., Scruggs, T., Graetz, J., Norland, J., Gardizi, W., & McDuffie, K. (2005). Case studies in co-teaching in the content areas: successes, failures, and challenges. *Intervention in School and Clinic, 40*, 260-270.

Merriam, B. (2009). *Qualitative research: a guide to design and implementation*. San Francisco, CA: Jossey-Bass.

Morse, J. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing Research, 40*(1), 120-123.

Murawski, W. (2009). Collaborative teaching in secondary schools: Making the co-teaching marriage work. Thousand Oaks, CA: Corwin Murphy, D. (1996). Implications of inclusion for general and special education. *The Elementary School Journal, 96*(5), 469-493.

Murawski, W., & Dieker, L. (2004). Tips and strategies for co-teaching at the secondary level. *Teaching Exceptional Children, 36*(5), 52-58.

Nunn, G., Jantz, P., & Butikofer, C. (2009). Concurrent validity between teacher efficacy and perceptions of response to intervention outcomes. Journal of Instructional Psychology, 36(3), 215–218.

Podell, M., & Soodak, L. (1993). Teacher efficacy and bias in special education referrals. *The Journal of Educational Research, 86*(4), 247-253.

Scruggs, Y., Mastropieri, M, & McDuffie, K. (2007). Co-teaching in inclusive classrooms: A meta-analysis of qualitative research. *Exceptional Children, 73*,

392-416.

Schunk, D. H. (2008). *Learning theories: An educational perspective* (5th ed.). Upper Saddle River, NJ: Pearson.

Smith, T. E. C. (2005). Idea 2004: Another round in reauthorization process. *Remedial and Special Education, 26*(6), 314-319.

Tschannen-Moran, M., & Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17*, 783 – 805.

Villa, R., Thousand, J., & Nevin, A. (2008). *A guide to co-teaching: Practical tips for facilitating student learning.* Thousand Oaks, CA: Corwin Press.

Vygotsky, L. S. (1997). *Educational psychology* (V. Davidov, Silverman R., Trans.). Boca Raton, FL: St. Lucie Press.

Weiss, M., & Lloyd, J. (2003). Conditions for co-teaching: Lessons from a case study. Teacher *Education and Special Education, 26*(1), 27-41.

Woolfson, L. & Brady, K. (2009). An investigation of factors impacting on mainstream teachers' beliefs about teaching students with learning difficulties. *Educational Psychology, 29*(2), 221-238.

Yeo, L., Ang, R., Chong, W., Huan,V., & Quek, C. (2008). Teacher efficacy in the context of teaching low achieving students. *Current Psychology, 27*, 192-204.