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Co-teaching: Using Video To Identify Current Practices And Promote Teacher Discussion In Middle School Mathematics Classrooms

Kimberly Davis
University of Central Florida

CO-TEACHING: USING VIDEO TO IDENTIFY CURRENT PRACTICES AND PROMOTE TEACHER DISCUSSION IN MIDDLE SCHOOL MATHEMATICS CLASSROOMS

by

KIMBERLY E BRYANT DAVIS

B.A., University of Florida, 2001
M.Ed., University of Florida, 2002

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ABSTRACT

This study explored the co-teaching practices occurring within four middle school mathematics classrooms and the influence of video discussions on each co-teaching team. The study took place within three middle schools in central Florida. The study provides a clear picture of the current status of middle school co-taught mathematics classrooms. The research results were inconclusive in that the key components of co-teaching were not observed (co-planning, co-instructing and co-assessing) and the findings were similar to past co-teaching research indicating mixed results. Overall, concerns that emerged from the study were a lack of heterogeneous classrooms, clarity for the role of the special educator, inquiry-based based instruction, and individualization for behavioral and instructional needs. Encouraging findings were that teachers were willing to communicate to create richer content, instruction and assessment. In addition, one team showed overall growth and promise related to effective practices. From triangulation of the data teams were growing in the areas of communicating with each other, clarifying roles, building teacher relationships, and discussing student achievement. The hope for effective co-teaching lies in teams being given time to plan, dual preparation, and co-professional development to more effectively meet the needs of low achieving students and students with disabilities in mathematics classrooms. The findings from this study implicate that for co-teaching to be successful teachers need heterogeneous classrooms with both teachers having strong content knowledge, yet with clarity that the special educator's role is to provide individualized strategies for behavior and instruction while the general educator's role is to lead the content instruction. When this level of co-teaching emerges, perhaps further research will not be necessary.

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CHAPTER ONE: INTRODUCTION

Background: Need for study

With the reauthorization of the Individuals with Disabilities Education Act (IDEA)(2004) and the impending reauthorization of No Child Left Behind Act (NCLB) (2001) teachers must be better prepared for the changes implicated by the alignment of these two pieces of legislation. The NCLB mandates all educators must be highly qualified, stating:

> (i) the teacher has obtained full State certification as a teacher (including certification obtained through alternative routes to certification) or passed the State teacher licensing examination, and holds a license to teach in such State, except that when used with respect to any teacher teaching in a public charter school, the term means that the teacher meets the requirements set forth in the State's public charter school law; and
> (ii) the teacher has not had certification or licensure requirements waived on an emergency, temporary, or provisional basis (NCLB, Section 9101(23)(A), 2001).

IDEA mandates that students with disabilities are to be served in the least restrictive environment (LRE), which is commonly the general education classroom by highly qualified educators. In IDEA the LRE is defined as:

> To the maximum extent appropriate, children with disabilities, including children in public or private institutions or other care facilities, are educated with children who are not disabled, and special classes, separate schooling, or other removal of children with disabilities from the regular educational environment occurs only

> when the nature or severity of the disability of a child is such that education in regular classes with the use of supplementary aids and services cannot be achieved satisfactorily. (IDEA, Title I (B) Sec. 612 (a)(5)(A), 2004).

With the mandates that students be placed in the LRE and that students receive instruction from highly qualified teachers, general educators must be equipped to teach all students within the general education setting. Practically speaking, students with disabilities are to be included in the general education setting and special educators must be ready to work collaboratively with general educators to help all students learn through differentiating instruction, accommodating curriculum, modifying curriculum, and teaching learning strategies-general as well content specific (Dieker & Murawski, 2003; Laframboise, Epanchin, & Colucci, 2004). To achieve these goals, ultimately, all teachers must be prepared to collaborate as a team to ensure maximum learning outcomes.

Inclusion

The IDEA has increasingly emphasized inclusion since its inception and subsequent reauthorizations (Gable, Hendrickson & Tonelson, 2000)-beginning with the Regular Education Initiative in the mid to late 1980s (Will, 1986), moving to the mainstreaming movement (Wang & Baker, 1985), finally to inclusion in the 1997 IDEA and subsequent reauthorization of IDEA. Proponents of inclusion argue that the most natural setting for all children is the general education setting (Gable & Hendrickson, 2000).

The inclusive movement promotes students with disabilities receiving an education equitable to that of their non-disabled peers (Fitch, 2003). Students with disabilities should be instructed in a general education setting with students without

disabilities when appropriate (Choate, 2005). Ultimately, students with disabilities should be provided services that allow for the greatest opportunity for success through access to the general education curriculum in the LRE as mandated by NCLB and IDEA.

Serving students with disabilities in the LRE, which is commonly the general education classroom, means that special educators and general educators must work as a team. This need for a teaming approach applies to all content areas, including mathematic classrooms. Yet in the field of mathematics, this team approach may be a challenge unless the expertise of both teachers is embraced (Magiera, Smith, Zigmond, & Gebauer, 2005; Scruggs, Mastropieri, & McDuffie, 2007). Conceptually, the general educator, as a mathematics teacher, has the necessary content knowledge. On the other side, the special educator knows how to accommodate, modify, and differentiate instruction and provide learning strategies. Both teachers bring critical knowledge about learning to the table (Brownell, Hirsch, & Seo, 2004; Brownell, Ross, Colon, & McCallum, 2005; Laframboise et al., 2004; McLeskey & Ross, 2004). The goal is to combine the knowledge of the special educator and the content specialist, through collaboration, to teach all students allowing access to the general education curriculum in the LRE.

Mathematics Education

Instruction for students with disabilities in all content areas must adhere to these legislative initiatives of NCLB, including mathematics. With the instruction of all students in mind The National Council of Teachers of Mathematics (NCTM), the national professional organization for math educators, concurrent with other researchers within the field has called for massive reform (2007). This reform emphasizes reaching all learners, which echoes the sentiments of special education. These reform efforts in

conjunction with the ever-growing emphasis on accountability within education forces classroom teachers to look at mathematics and how to best teach students the essential content. Mathematics teachers need to reach a range of learners, from students who are diverse, to students who are gifted, to students who may have disabilities, with the last category having services mandated by IDEA (2004).

Mathematics, especially algebra, has proven to be a challenge for students with disabilities. Maccini and Hughes (2000) discuss the challenges students with disabilities face in mathematics, including experiencing considerable difficulty, having lower enrollment in advanced mathematics classes, and experiencing a lack of opportunities beyond high school. All students could benefit from the reform efforts of reaching all students that include student-centered classrooms, inquiry-based learning, and peer discourse. Other tools discussed in the mathematics education literature are also noted as effective practices within the field of special education, such as anchored instruction (Bottge, Heinrichs, Chan & Serlin, 2001), hands on learning, and group work (Maccini & Hughes, 2000). With the legislative mandates of IDEA emphasizing the LRE and with NCLB's focus on access to the curriculum, students with disabilities who are included in general education mathematics classrooms as well as their non-disabled peers can benefit from these reform efforts of reaching all students through effective instruction.

If students with disabilities are served in the general education mathematics classroom, special educators must understand students with disabilities' areas of weakness and be prepared to help them succeed. Mancini and Hughes discussed that the challenges of many students with disabilities face in algebra coupled with the weak mathematics foundations (experienced by students with and without disabilities) results

in challenges for all students. Both teachers, general and special educators, need to be prepared to collaborate and impact the learning outcomes of their students in mathematics while understanding their roles in collaboration, content, and learning strategies through professional development and other endeavors related to the changes in how mathematics is taught (Brownell et al., 2004; Brownell et al., 2005; Laframboise et al., 2004; McLeskey & Ross, 2004).

Co-teaching

One tool for collaboration in mathematics used to assist students in the LRE is co-teaching. Co-teaching continues to be studied, but co-teaching in secondary mathematics classrooms is a topic that is not well defined in the research literature. This lack of evidence is noted in the current literature on secondary mathematics in which only one study focused on co-teaching in secondary mathematics classrooms (Magiera et al., 2005). Preliminary conclusions about how teachers work together can be made based on the current literature, but the prevailing issue is special educators and general educators must become partners in the endeavor (Cook & Friend, 1995).

Statement of the Problem

Educators are required to be certified in all academic areas in which that teacher is solely responsible for instruction. Special educators typically are not certified in mathematics. Mathematics teachers are not typically certified in special education. By teaching together, students with disabilities are provided a highly qualified educational environment, which includes a content area specialist and a special educator. However, many question the validity of this service delivery model, co-teaching.

Purpose of the Study

The purpose of this study was to contribute to the research regarding co-teaching, focusing on middle school mathematics classrooms. The study explored the co-teaching practices within middle school mathematics classrooms and the practice of using video to analyze and for teachers to discuss the current status of these four team's practices.

Application to Practice

The study focused on teachers' disucssions of their practices via a videotape of instruction daily during daily planning focused on the role of two teachers from mathematics and special education. Regardless of the teacher's role, teachers should evaluate and reflect upon their practice within the classroom and as a result their responses, individually and as a team, should impact their instruction. By encouraging teachers to watch their practice via video, co-teachers were shown their current practices and given a chance to reflect on needed changes. Through these discussions, the researcher hypothesized the teachers would reflect and identify their strengths and weakness within a co-taught mathematics environment and enhance their practice.

Research Question

Question one: Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool?

Question two: Does using video to discuss a co-teaching team's practice during planning time in a middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class?

Definitions of Terms

Benchmark Assessment: Assessment used to provide information on student progress towards mastering the state standards and used to forecast student performance on the state achievement assessment ([participating school district], 2008).

Co-reflection: Co-teachers reflecting on video clips of their co-teaching practice together, at the same time, for the purpose of this study

Co-teaching: Also referred to as collaborative teaching, instruction of a heterogeneous group of students by a general education teacher and special education teacher in a general education classroom (Friend, Reising, & Cook, 1993).

E/BD: Emotional/Behavioral Disorder, a condition exhibiting one or more of the following characteristics over an extended period of time and to a marked degree, which adversely affects educational performance: an inability to learn which cannot be explained by intellectual, sensory and health factors; an inability to build or maintain satisfactory interpersonal relationships with peers and teachers; inappropriate types of behavior or feelings under normal circumstances; a general pervasive mood of unhappiness or depression; or a tendency to develop physical symptoms or fears associated with personal or school problems (U S Department of Education, 2004).

ESE: Exceptional Student Education (ESE) programs provide students with disabilities and students who are gifted the opportunity to receive a free appropriate public education in the least restrictive environment (Florida DOE, 2007).

General Education Setting: Classroom where content is taught by a content specialist

IDEA: The Individuals with Disabilities Education Act, legislation, The Individuals with Disabilities Education Act (IDEA) is the reauthorization of the Education for All

Handicapped Children Act (EAHCA) or Public Law 94-142 a federal law first passed in 1975; the federal law governing the educational programs for children with disabilities (US Department of Education, 2004).

IDEIA: The Individuals with Disabilities Education Improvement act, legislation (reauthorization of the original IDEA) (U S Department of Education, 2004).

Inclusion: State of education for students with disabilities being equitable to their non-disabled peers (Fitch, 2003); students with disabilities receiving instruction in a general education setting with their non-disabled peers (Choate, 2004); placing students with disabilities in full time general education classrooms with special education support services (Yssel, Engelbrecht, Oswald, Eloff, & Swart, 2007).

Independent practice: The phase of instruction that occurs after skills and strategies have been explicitly taught and practiced under teacher direction or supervision. Independent practice involves the application of newly taught skills in familiar formats or tasks and reinforces skill acquisition (Rosenshine, 1983).

LD: Learning Disability, severe discrepancy between normal or near normal potential and academic achievement in at least one of the areas of basic reading skill, reading comprehension, written expression, expressive language, mathematical reasoning or calculation, or listening comprehension, that is not primarily due to visual, hearing, orthopedic, cognitive, or emotional/behavior disabilities or to environmental, cultural, or economic disadvantage; "severe discrepancy" means at least 15 points on standard score comparisons of ability and achievement or a minimum of 1.75 standard deviation difference, taking regression and 1.65 standard errors of measurement into account (Florida DOE, 2007)

LRE: Least Restrictive Environment, the academic placement in which students with disabilities are educated with their non-disabled peers to the maximum extent appropriate (Hallahan & Kaufman, 2003)

Mainstream: A classroom which includes students with disabilities without the support of a co-teacher.

NCLB: No Child Left Behind, legislation; The current version of the Elementary and Secondary Education Act of 1965 (ESEA) -- the principal federal law affecting public education from kindergarten through high school in the United States (NCLB, 2001).

NCTM: National Council of Teachers of Mathematics, national professional association of mathematic educators; The National Council of Teachers of Mathematics is a public voice of mathematics education, providing vision, leadership and professional development to support teachers in ensuring equitable mathematics learning of the highest quality for all students (NCTM, 2007).

Non-inclusive setting: Segregated, special education placement (Baker, Wang, & Walberg, 1994).

Reflection: The process of raising and criticizing initial understanding of a phenomenon, construct a new description of it, and test the new description by an on-the-spot experiment (Schön, 1983).

Reflection-in-action: The process that allows reshaping what is being worked on, *while* it is being worked on (Schön, 1983).

Reflection-on-action: Thinking back on what we have done in order to discover how our knowing-in-action may have contributed to an unexpected outcome (Schön, 1983).

Reflective Practitioner: A ‘reflective practitioner’ is someone who, at regular intervals, looks back at the work they do, and the work process, and considers how they can improve. They ‘reflect’ on the work they have done (Schön, 1983).

Self-contained: Non-inclusive setting; segregated, special education placement.

Student achievement: for purposes of this study student achievement will refer to the progress a student makes towards achieving mastery of Florida’s state standards through the benchmark assessment.

Video reflection: Using video to reflect upon teaching practices, reflection on action.

Research Design

This study employed a mixed methods approach. Qualitative measures were collected throughout the study from evaluations, observations, and interviews of the study participants. Quantitative measures were collected through pre and post assessments of teacher perceptions using the Co-ACT.

Instrumentation

Over the course of the study, three major instruments and a researcher-developed list of questions were utilized (see Appendix B for guiding questions and Appendix C for interview questions). The three major instruments included the Colorado Assessment of Co-teaching (Co-ACT), Evaluating Learning Environments in Co-teaching Checklist (ELEC), and Teacher Roles Observation Schedule (TROS).

Colorado Assessment of Co-Teaching

The Co-ACT is the Colorado Assessment of Co-Teaching (Cc-ACT) (Adams, Cessna, & Friend, 1993). The Co-Act was designed to measure the critical components of effective general-special education co-teaching, and provided quantitative data outcomes

for this study. The CO-ACT was divided into three subsections: (a) Personal Prerequisites (15 items), (b) The Professional Relationship (9 items), and (c) Classroom Dynamics (14 items). Teachers rated items associated with each factor on two scales, one for importance in co-teaching, and another for presence in the co-teaching situation.

Evaluating Learning Environments in Co-teaching Checklist

The second instrument the, Evaluating Learning Environments in Co-teaching Checklist, ELEC, was used by participants to determine how they reflected upon their own co-teaching practices after viewing the five minute segment. The ELEC was used to evaluate co-teaching and will be used by the study participants. Murawski, Dieker, and Stanford (2006) developed this co-teaching evaluation. The tool assessed co-planning, co-teaching, and co-assessing environments. The tool also asked whether the practices are effective, evident, or not observed. The tool has space for comments and identifying information. The researcher developed guiding questions to assist with discussion and encourage reflection while using the tool (See Appendix B).

Teacher Roles Observation Schedule

The third instrument used was the Teacher Roles Observation Schedule (TROS). Waxman, Wang, Lindvall, and Anderson (1988) developed the TROS. The TROS was used for time sampling of the co-taught classrooms videotapes collected weekly. For this data analysis procedure the videotapes were edited into ten 30-second segments for each class period, and later coded using the TROS. Categories of time were used, as described in the TROS, and included: No Interaction, Interaction with Other Adults, Interaction with Student(s)/Instructional, Interaction with Student(s)/Managerial, Interaction with

Student(s)/Personal. In addition, incidents of correcting student behavior were also coded and analyzed. Interrater reliability will be established to ensure reliability of the TROS (see Appendix J for definitions of the categories of the TROS).

Interviews

Interviews with teachers were conducted at the conclusion of the study. The researcher developed questions based upon the research questions of the study. The research literature was also considered when formulating the questions. The questions were used to conduct a brief interview with teachers participating in the study. Teachers were interviewed separately (See appendix C for interview questions).

Treatment Conditions

The study employed four co-teaching pairs (8 teachers). The participating co-teachers were required to evaluate their co-teaching practices before commencing the study. After the teachers evaluated their current practices using the Co-ACT, the teachers were provided with professional development on effective co-teaching practices to use within their middle school mathematics classrooms. Next the teachers were required to evaluate their teaching practices using the same instrument, the Co-ACT, at the conclusion of the study.

Each week the co-teachers were required to use video to discuss their practices. The procedures for discussions of the video to encourage reflection were for teachers to video tape one co-taught class period per week. The teachers were then instructed to watch a five minute clip together and reflect on their co-teaching using tools provided by the Research Team (RT).

The participants were provided with video recorders to tape the same co-taught class period each week. Based on these recordings, the co-teaching team evaluated one 5-minute segment, reflecting on their co-teaching practices. Their weekly discussion on their practice was captured on audio recordings. The RT then evaluated the teams' discussions. The evaluations by the co-teachers as well as their audio taped discussions and notes were submitted weekly to the primary researcher. The RT provided an evaluation form (ELEC) for the participating teams to use weekly. At least once a week, a member of the RT contacted the teams to answer any questions or concerns the team had as well as to keep open general lines of communication.

Research Timeline

This study took place over ten weeks. The first and last weeks were utilized for paperwork, introductions, and terminations of study procedures. The week prior to the beginning of the study, an introductory meeting was held with teams to explain the study and to fill out preliminary paperwork. The ending meeting with teams took place within two weeks after the completion of the study.

Data Collection Procedures

During week one participating co-teachers were required to attend a meeting to explain the study procedures, as well as to address any questions or to clarify any issues. The teams were provided with a brief professional development on co-teaching at this time. During this meeting, teachers were required to sign IRB approval forms and fill out an evaluation of their current teaching practices independently (See Appendix L for IRB approval letter and informed consent form).

Teams were instructed during weeks two through ten to video tape their co-taught class once a week and designate a time to evaluate their practice as a team. The co-teaching teams audio-recorded their discussion sessions. A member of the RT collected these evaluations along with the audiotaped discussion each week. Evaluation scores, video and audio coding were assessed weekly by the RT, but no data were shared with the co-taught teams. At the conclusion of the study, teachers were required to attend a final meeting. During this meeting teachers completed another evaluation of their teaching practices, using the Co-ACT.

Teachers were interviewed at the final meeting (see Appendix C for interview questions). All interviews were audio recorded.

Interrater reliability was employed for the co-teaching evaluations by the RT. The primary researcher observed and evaluated teams with an additional field observer for 25% of the data gathered. Interrater reliability was established at .80 or greater based on Fleiss (1981) in which .75 or greater is considered excellent agreement. Reliability measures were ascertained from each of the observation instruments for at least 25% of the data collected. Reliability also was conducted for at least 25% of the data gathered from teacher evaluations related to accuracy of entry into SPSS.

The reliability of all three instruments (TROS, Co-ACT, and ELEC) have been documented by the developers of the respective instruments and these measures are reported in chapter three.

Data from the Co-ACT, TROS, and ELEC were entered into SPSS. The primary researcher from the RT entered the data. A separate member of the RT ensured data were entered reliably by double-checking 25% of the entries, randomly selected.

The video clips were coded using TROS. The primary researcher coded all the data. A separate member of the RT coded 25% of the data independently to ensure interrater reliability. Interrater reliability of .8 or higher was ensured through this process. A protocol for using the TROS for the research study as well as for interrater reliability was developed. This protocol can be found in Appendix G.

The creators of the co-teach evaluation, the ELEC, established face validity of the evaluations for the participants. The co-teach evaluation has been determined to measure what it is intended to measure through expert validation and use by other teachers.

Triangulation also was employed in the study to ensure validity. Three instruments were utilized throughout the study: The CO-ACT (Adams, Cessna, & Friend, 1993), ELEC (Murawski, Dieker, Stanford, 2006), as well as the TROS (Huang & Waxman, 1992). Video and audiotapes also were collected. Videotapes were coded using TROS. Audiotapes were transcribed, yielding transcriptions for qualitative analysis. In total four items will be used in the analysis of data.

Data Analysis

All interviews and discussion sessions were transcribed on an ongoing basis. The transcriptions yielded qualitative data for outcomes. The video taped classes were coded using the Teacher Roles' Observation Schedule (see Appendix J for definitions of TROS terms). This instrument utilized time sampling, which yielded quantitative data. The evaluations teachers used to evaluate their own co-teaching practices were instruments developed by experts in the field of co-teaching (ELEC). The evaluations were analyzed as quantitative data. Qualitative data were analyzed using the constant comparative method (Glaser & Strauss, 1967). Quantitative data were analyzed using SPSS.

Triangulation of the data was achieved through the use of field notes, interview transcripts, and notes from teacher discussions, in addition to the quantitative data collected (Co-ACT, ELEC).

Independent Variable

The independent variable for the study was co-teaching.

Dependent Variable

The dependent variable was using discussion to encourage reflection on co-teaching practices. The study evaluated if discussing teaching practices on the video encouraged reflection and influenced current co-teaching practices.

Limitations

In qualitative research, the researcher is perceived as the instrument of the study (Rossman & Rallis, 2003). The researcher followed the established procedures for the study and stayed true to purpose of research while staying objective. Interrater reliability also aided in the coding of video, ensuring compliance to the study procedures.

One limitation was the generalizability of the results. Results may not be generalizable to settings with different constitutions from that of this research study.

The instrumentation used to evaluate the quality of co-teaching by the participants was a relatively new tool. The tool has been found reliable and valid by outside sources. Other teachers and school districts also have used the tool. This tool was a one-page document, which did not yield many details. The researcher provided guided questions (see Appendix B for guided questions) in addition to this tool to ensure more dialogue between the two teachers.

As with any study, teacher effects were a limitation. Since participants were selected on a voluntary basis, the researcher may not able to control for teacher experience or demographics. Unfortunately, these aspects were considered, but were not regulated.

Observer effects were a limitation. The researcher's biases can cause subjectivity. Interrater reliability should help combat this limitation. History and maturation also were a limitation. Teachers participating in the study varied in their teaching and life experience. These differences may impact the findings. Mortality was an issue. The researcher recruited more teachers than needed to prevent mortality but still two teams were not able to complete the study as planned. Spurious conclusion or making an incorrect assumption is always a possibility. Construct effects also are a limitation because what teachers label as "co-teaching" varies widely.

Threats to validity

Measures have been taken to reduce threats to internal validity. Since groups were measured over the same period of time, threats to history and maturation should be minimal. Since groups were studied based on pre-existing instructional settings, diffusion to treatment should be minimal.

Integrity of treatment was a threat to validity because within a typical school setting effective co-teaching as well as inefficient pairings were considered. Instrumentation was a threat to validity. The co-teaching evaluation Evaluating Learning Environment for Co-Teaching has only been used on a limited basis. Creators of the instrument have ensured confidence in the tool. The evaluation has been found reliable

through expert validation and teachers and educators in the public school setting have used both tools. Limitations were present in the partial use of the tool.

Attrition was another possible threat to validity. Until the study was complete, the threat of teachers withdrawing was ever present. The researcher attempted to be attentive to any issues that arose. Any threat to attrition was addressed through encouragement of teachers and appreciation of their efforts. The researcher continued to remind teachers of the importance of research to the field and the appreciation the researcher had for the teachers' participation. The researcher recruited a total of six teams but only four teams completed the study due to personal and professional reasons.

Steps were taken to ensure external validity as well. The results were developed to be generalized across subjects. Results may not be generalized to other settings due to the centralization of the location, central Florida area. Results should be generalizable across subjects, response measures and across times. Because these teams were across different times of the day and different schools, limited generalizability exists.

Conclusion

The alignment of NCLB and IDEA has reemphasized the importance of including students with disabilities with their non-disabled peers allowing access to the general education curriculum. Inclusion permits students with and without disabilities to learn together and co-teaching allows all students to benefit from two highly qualified professionals. The following chapters provide a review of the literature as related to this study and the associated research questions. In addition, presented is a research study of co-teaching in middle school mathematics classrooms. These classrooms all utilized video to encourage reflection on their co-teaching practices.

CHAPTER TWO: LITERATURE REVIEW

The purpose of this chapter is to provide a review of the literature pertinent to the proposed research study. First, a discussion of the legislation driving the push for inclusion and access to the general education curriculum is offered. Next, a discussion of co-teaching is presented. The discussion of co-teaching describes the current practice, the service delivery model, as well as the benefits and the criticisms of co-teaching at the secondary level. Next, a discussion of mathematics, especially mathematics education is presented. This discussion encompasses the difficulties students with disabilities face within mathematics, specifically in algebra as well as the field's responses to these difficulties. Then, a study of co-teaching in a middle school mathematics class is presented. Finally, a brief discussion of utilizing video to enhance teaching (i.e. as a professional development) and reflective practice is provided.

The alignment of IDEA and NCLB is compelling school districts and school officials to reevaluate how students with disabilities are being served in schools (Dieker, 2001). The IDEA requires students with disabilities be served in the least restrictive environment (LRE) and NCLB requires students to have access to the general education curriculum (NCLB, 2001; IDEIA, 2004). Many times schools provide students with disabilities access to the general education curriculum in the LRE within the general education setting, necessitating the practice of inclusion. If students with disabilities are to be included in the general education setting, general educators and special educators must work in partnership given that collaboration facilitates inclusion (Cook & Friend, 1995; Dieker, 2001; Dieker & Murawski, 2003; Friend, 2000).

No Child Left Behind's alignment with IDEA has affected teachers, special educators and general educators alike. One of the most recognized features of NCLB (2001) is the highly qualified teacher requirement. Highly qualified teachers are required to have a bachelor's degree, a full state certification (as defined by the state), and demonstrated competency in each core academic subject in which he or she is responsible for instruction (as defined by the state). In order for a special educator to be highly qualified he or she must be certified not only in special education, but also in any content area in which he or she is responsible for instruction (Brownell et al., 2004). These requirements have become problematic for special educators, especially at the secondary level (Brownell et al., 2004; McLeskey & Ross, 2004). Special educators are prepared and certified in special education; however, seldom are these professionals prepared as content specialist. Co-teaching is seen as a solution providing students with a highly qualified educator who is a content specialist as well as an educator who specializes in accommodations, modifications, and strategies to help students succeed (Brownell et al., 2004).

With the push for accountability mandated by NCLB, the notion of highly qualified teachers is an understandable principle. Schools are being held accountable at all levels, as are teachers and students. All students are being subjected to assessments based on the general education curriculum with the assumption that they are taught by highly qualified teachers. Hence, students with disabilities must have access to the general education curriculum that is taught by a highly qualified teacher in order to be adequately prepared for these assessments (Brownell et al., 2004). Teachers must be strong in general content in order to be effective at instructing students with disabilities

and preparing students for these assessments (McLeskey & Ross, 2004). Also, students with disabilities cannot be successful in these assessments if they have not been exposed to the same level of curriculum in effective methods of instruction as their nondisabled peers.

Based upon NCLB's requirements for accountability, schools often are choosing to use co-teaching to ensure all students have access to the general education curriculum (Carpenter & Dyal, 2007). In addition to the highly qualified teacher requirement, NCLB also regulates schools to implement practices that are scientifically-based. These requirements of NCLB and the ensued alignment of IDEA have increased the nationwide emphasis on ensuring all students and schools meet high standards (Lewis, 2004; Darling-Hammond & Berry, 2006). The result is an increase in demand for evidence-based practices, also referred to as empirically-based practices and scientifically-based practices (Brownell et al., 2005; McLeskey & Ross, 2004; Turnbull III, 2005).

The assumption of aligning NCLB and IDEA is that student achievement is likely to improve by providing students with disabilities highly qualified teachers, who are prepared to instruct and employ scientifically proven and empirically based learning strategies, such as graphic representations and mnemonics (Brownell et al., 2004; Ellis, Deshler, Lenz, Schumaker, & Clark, 1991). Subsequently, co-teaching could help not only students with disabilities, but all students by providing two highly qualified professionals-one equipped with content specialization, another (the special educator) equipped to provide intensity and individualization, as well as learning strategies (Dieker & Murawski, 2003). By providing students with disabilities two highly qualified

professionals their chances of achievement and success in an inclusive setting is believed to greatly increase.

Collaboration and Co-teaching

The following section will discuss collaboration, mostly in terms of co-teaching. A definition of co-teaching given by Cook and Friend (1995) will be detailed. Characteristics of effective co-taught teams at the secondary level also will be shared. The section ends with a discussion of benefits of this service delivery model.

Co-teaching, a form of collaboration, has become a commonly seen service delivery model, especially at the secondary level (Dieker, 2001; Dieker & Murawski, 2003; Kim, Woodruff, Klein, & Vaughn, 2006; Magiera & Zigmond, 2005; Mastropieri & Scruggs, 2001; Mastropieri et al., 2005; Rice & Zigmond, 2000). Co-teaching has gained popularity; however, the understanding of what co-teaching is continues to be debated. Cook and Friend (1995) defined co-teaching as, "two or more professionals delivering substantive instruction to a diverse, or blended, group of students in a single physical space" (p. 2). Cook and Friend in their article emphasize the four components of their definition. The first component being two educators, specifically a general educator and a special educator; however, they do recognize allied health fields (i.e. speech/language pathologists) as well as two general educators (i.e. an English teacher and a social studies teacher teaching an integrated block), as co-teaching. The importance of two educators being in a class together emphasizes the possibilities that arise from two professionals with different, but complimentary perspectives (Cook & Friend, 1995) impacting student learning outcomes.

The second component of the Cook and Friend definition indicates that both educators deliver substantive instruction. This role of delivery is not defined as observing or supervising, instead both. Both instructors should be actively involved in the instruction of all students. The third component is that the class includes a diverse group of students, meaning students with and without disabilities. IEP goals and objectives of the students with disabilities should be met within the inclusive setting with any necessary support being provided in the inclusive setting. The fourth and final component is the requirement that instruction is delivered in a single physical space. Cook and Friend emphasize that this does not mean an occasional separating of groups is prohibited; however, if instructors are coordinating instruction but delivering it to separate groups in separate locations on a consistent basis this would be considered collaborative planning (or co-planning) solely. All four components should be adhered to in order to ensure true co-teaching (1995).

Basically, co-teaching is a service delivery model, a means of delivering services to students with disabilities. Within this service delivery model students are served by general educators as well as special educators in the general education setting (Dieker, 2001), ensuring an exposure to a certified professional in special education as well as a certified professional in a content area or grade level. Co-teaching permits students to be included in the general education setting while receiving services in a discreet manner (Murawski, 2005; Spencer, 2005), permitting students with disabilities to receive instruction in a highly qualified environment by a certified special educator and a certified content specialist. Since many special educators, especially at the secondary level, do not have content certification this model has been used to satisfy the highly

qualified teacher requirement. Even if students with disabilities were to receive services solely by the general educator, the special educator would need to be consulted to ensure the students were receiving the services legally required by their individualized education programs (IEP) and to ensure success in the general education setting (McLeskey & Ross, 2004).

Dieker (2001) addressed the characteristics of effective co-taught teams at the secondary level. She provided a list of items that should be addressed when attempting to forge an effective co-taught environment in middle and high school settings. These items included conducting a preplanning session, preparing a positive environment, considering how academic and behavioral needs will affect the co-teaching process. Within the co-taught environment she learned that the academic and behavioral goals, role clarification, securing common planning time, setting a continuum of service options, and evaluating daily plans were critical.

Preparing teachers to work in a collaborative environment is considered important. A preplanning session allows co-teachers to become acquainted with each other, as well as, identify roles, discuss the curriculum, and philosophies of teaching (Bauwens & Hourcade, 1991; Gately & Gately, 2001; Keefe, et. al, 2004; Murawski, 2005; Spencer, 2005). Another aspect to aid in an effective start to a co-teaching team involves teachers being allowed to volunteer to co-teach (Friend & Cook, 1992; Zigmond & Baker, 1995).

Other preparations at the secondary level must be made in advance for co-teaching to be successful. Bauwens and Hourcade (1991) recommended teachers evaluate philosophical, theoretical, procedural, instructional, and evaluative processes before using

this service delivery model. Philosophical considerations including unity in the basic beliefs about students by both teachers. Theoretical considerations including beliefs that each educator has unique and specific skills to offer students in the delivery of instruction. Procedural considerations including negotiations as to how the classroom operates. Instructional considerations including determining what will be taught, how, and when. Finally, evaluative considerations including beliefs about how the effectiveness of the model will be determined daily, weekly, and monthly.

Many characteristics factor into the effectiveness of co-teaching at all levels. In addition to those previously mentioned, administrative support was found to be critical (Spencer, 2005). Administrators aided in facilitating important aspects of co-teaching such as planning, scheduling, as well as continued professional development in communication, interpersonal relationships, instructional strategies, and general skill development for the teachers (Spencer, 2005; Weiss & Lloyd, 2003). Ultimately, though the administrator should acknowledge that all teachers must be prepared to act as a collaborative team and need adequate support for success.

Effective co-teaching requires a collaborative relationship between two individuals that takes time to establish. Trent and colleagues (2003) described three phases of the co-teaching relationship-orientation, planning (i.e. technical aspects), and evaluation. These phases are described below.

The first phase, the orientation, entailed partners establishing rapport with each other (Gately & Gately, 2001). During this stage a sense of security and trust should be created. During this phase teachers took time to get to know each other professionally and somewhat personally (O'Brien, 2005; Trent et al., 2003).

The second phase is planning (i.e. technical aspects) (Gately & Gately, 2001). Planning is a vital part of the relationship at this phase. During this phase teachers joined forces to find the best co-taught model to implement for their situation. Mutually acceptable expectations were established as well as time and misunderstandings about teaching styles were clarified. Open and honest communication occurred during this second stage to help minimize hostile teaching environments, and was the time to specify roles, responsibilities, and sequences. This phase also yielded more communication, which helped to strengthen the relationship between the two educators (O'Brien, 2005; Trent; et al., 2003).

The third stage was evaluation (Gately & Gately, 2001). Teachers worked in partnership after lessons discussing what happened--what worked, what did not, as well as what to do differently the next time. The teachers discussed and questioned procedural issues and student outcomes (O'Brien, 2005; Trent; et al., 2003).

Benefits of co-teaching

This section reports the benefits of co-teaching in more detail. Benefits for students with and without disabilities, as well as the educators involved are included. Some benefits are shared by all students; others are exclusive to certain groups, as will be discussed.

Reported within the literature once the stage is set for a collaborative environment all-students with and without disabilities as well as teachers- benefit from effective co-teaching. Students with disabilities experience positive behavior models, higher levels of achievement, social supports, exposure to different teaching styles, and generalization of skills (Salend, Johansen, & Mumper, 1997). Students without disabilities experience a

model of what effective collaboration looks like and extra instructional support, as well as understanding and acceptance of students with disabilities (Kochhar, West, & Taymans, 2000). Teachers report benefits such as increased camaraderie, professional development, and reduction in stress and burnout (Dieker & Murawski, 2003).

The co-teaching model also allows special educators to provide direct instructional support to students with disabilities and the general educator (Cook & Friend, 1995). Since a special educator is working collaboratively with the general educator to instruct a heterogeneous group of students, students with disabilities are not singled out through pull out or segregated settings. The discrete manner in which co-teaching is administered is found in the literature to neither be embarrassing nor isolating to students with disabilities (Stainback & Stainback, 1984; Will, 1986).

Co-teaching ultimately is about students. Bauwens and Hourcade (1991) noted that co-teaching helped avoid the use of labels that resulted in stigmatization and devaluation of students with disabilities. Co-teaching also serves students who do not qualify for services, but demonstrate learning needs. All students benefit from two teachers within the classroom and the unique skills that each teacher brings to the classroom, be it content or specialized learning strategies and techniques (Weiss & Lloyd, 2003). Co-teaching increases access to a wider range of instructional options for students with disabilities, enhances the participation of students with disabilities within the general education classroom, and enhances the performance of students with disabilities (Zigmond & Magiera, 2001).

Research on co-teaching

The following section provides a summary of the current research on co-teaching. The studies described specifically focus on critical findings in the literature on co-teaching. Specifically highlighted is the one study on co-teaching in mathematics. The description of each study provided includes the subjects, setting, instrumentation and relevant findings.

Buckley (2005) investigated six teams of teachers who co-taught middle school social studies. The data collected included interviews of the teachers, observations of the classrooms, and reviews of IEPs. The study's investigation included how the teachers shared information about students with LD, how the social studies teacher used the IEP to provide accommodations, and how the teachers perceived their roles. The findings indicated IEPs alone were not useful to general educators. Individual Education Programs did not ensure individual needs of students were being met reliably. In Buckley's study special educators perceived general educators to be inflexible and unwilling to accept students with LD into their classrooms. Special educators viewed the general educators as the instructional and philosophical classroom leader who may or may not allow the special educator to be an active member of the classroom. General educators perceived special educators as overprotective, easy graders, and causing students harm by not holding them accountable. Other findings from Buckley suggested that establishing and maintaining collaborative relationships required teachers getting to know each other, being within close proximity, establishing a common philosophy, sharing responsibilities, utilizing effective conflict resolution skills, and having administrative support. Both team

members agreed that the general educator controlled the classroom and the special educator supplied accommodations/modifications and handled behavior management.

In another study on middle school co-teaching Karge, McClure, and Patton (1995) surveyed middle school resource room teachers. A total of 124 teachers were surveyed with a response rate of 80% (n=98). The survey outcomes showed that a combination of collaboration and pullout programs were implemented at these schools. In addition, even though the teachers used their planning time during the school day for collaborative teaching, much was still considered planning "on the fly." These resource room teachers reported that 40% of their time they spent collaborating with others, 53% reported participating in co-teaching, 62% reported providing modification for the classroom, and 54% reported tutoring students in the general education setting. Of the 98 teachers, 71% preferred a combination of consultation, collaboration, and pull-out, 22% preferred consultation, and 4% preferred pull-out services. The teachers suggested that the general educator's attitude and personality was the most important factor in the success of collaboration.

In a study focused on co-teaching, Trent and colleagues (2003) interviewed key stakeholders and collected artifacts from an elementary school. The study participants included an elementary teacher of LD, an elementary general education teacher, and the principal. The study entailed nine 90-minute interviews, five 90-minute observations in the co-taught class, and archival material (including memos from central office staff, plan sheets from teachers, strategy charts displayed in the classroom, student worksheets, and letters from parents). The data were collected over a two-month period. The findings included that students benefited from a co-taught environment. These benefits included

students with disabilities being able to generalize skills from the resource room to the general education classroom. Students with disabilities also exhibited improved behavior and academic performance in the general education setting. The teachers noted that the IEP goals for students were easily met and assessed. More students (with and without disabilities) obtained honor roll status (58% as opposed to 30%-40%). In addition, students without disabilities were exposed to strategy instruction. Parents also were pleased with the outcomes. Letters were received from parents of students with and without disabilities praising the program and requesting their child be placed into the program, next year.

Mastropieri and colleagues (2005) conducted a study of co-teaching that included observations ranging from one semester to two years. Data sources included extensive observation of class activities, field notes from researchers, videotapes of classes, interviews with teachers and students, as well as artifacts from participating classes. Subjects included 4th and 7th grade science classes; 8th grade civics; 10th grade world history; and high school chemistry. One finding of their research indicated special educators were perceived to be in a role as an instructional assistant when they did not have content knowledge, with this observation heightened in high school mathematics classes (Magiera et al., 2005).

In addition, the study conducted by Mastropieri and colleagues (2005) did not observe co-teaching as defined by Cook and Friend (1995) “two or more professionals delivering substantive instruction to a diverse or blended group of students in a single physical space (p.2)”. Within the study the researchers noted that the notion that general educators provided content knowledge while special educators contributed pedagogical

knowledge and learning strategies as equal partners was not found within the observations.

Wiess and Lloyd (2002) discussed similar findings in their investigation of five middle school teachers and five high school teachers. Teachers were instructed to complete a journal entry after each observation. Using the constant comparative method to analyze data the findings indicated the special educator served in more of a subordinate role. Similarly, Magiera and colleagues(2005) found little time was available for the special educator to deliver or modify instruction, which also reduced special educators to working more in the role of an instructional assistant.

Magiera and Zigmond (2005) investigated co-teaching in middle school classrooms. Middle school classes, grades 5-8, were studied from four middle schools in Western New York constituting eight co-teaching pairs. Classes ranged from 18 to 27 students. For the investigation, the IEPs of 18 students with disabilities were reviewed. Of the 18 students, 15 were labeled LD and 3 others were labeled Other Health Impairments, or OHI. In addition to the review of the IEPs, 84 observations of the classes were conducted. One finding of the study revealed students with disabilities received more individual instructional interactions in co-taught classrooms in comparison to the general education classrooms. Another finding of the study revealed general educators interacted less frequently with students with disabilities when the special educator was present in contrast to the belief that co-teaching provides students with twice as much instructional support.

Many meta-analyses in co-teaching have been conducted to reveal mixed findings with researchers citing that many studies lacked relevant, vital information for quality

research. Weiss and Brigham (2000) conducted a narrative review of research and found approximately 700 articles, books, chapters, documents, and dissertations on co-teaching or collaborative instruction. Of the 700, only 23 provided enough evaluative and interpretive information to allow the researchers to properly analyze their studies. Weiss and Brigham narrowed the search by only including studies in the United States with evaluative information, co-teaching as the subject of the evaluation, and included a special educator and a general educator. The meta-analyses resulted in six conclusions including that two vital aspects that were absent in the current research was to measures used and that participants predominately worked in schools where co-teaching was perceived as successful. The other conclusions found by Weiss and Brigham included that teacher personalities were a major variable, lack of a clear definition of collaboration and co-teaching, subjective reporting, and lack of instructional behaviors being reported for the special educator.

Murawski and Swanson (2001) also conducted a meta-analysis of the co-teaching research. Their initial search of literature realized 89 articles. Once the researchers eliminated articles that lacked data, less than half of the articles remained, merely 37. Of these 37, 15 were eliminated due to the lack of quantitative data and an additional 10 were discarded because the studies did not provide sufficient information to calculate effect sizes, leaving six studies to analyze. Of these six studies, none reported explicit measures of treatment integrity, leaving to chance whether the studies indisputably adhered to their reported interventions as described and the interventions were maintained as intended. Additionally, the findings were mixed indicating further research is needed. The authors stated in this article that more research is needed to establish co-

teaching as an effective service delivery model (Murawski & Swanson, 2001) overall indicating that insufficient data is available to declare co-teaching valid.

Additionally, Weiss (2004) pointed out the lack of research available to determine the instructional worth of the model and that acceptability of the practice was outpacing the research on the model's effectiveness in delivering appropriate instruction. Weiss identified that the field does not know if co-teaching provides instruction that is efficient and effective and if co-teaching meets the needs of students with learning disabilities. Little research has described what is happening instructionally in co-taught classrooms with even less research focused on student outcomes.

To add to that, Zigmond and Magiera (2001) also conducted an extensive review of the literature. Their initial search included articles published within the last 20 years in refereed journals that compared teachers' instructional practices, student engagement rates, or student academic progress in co-taught classroom with those in alternative special education service delivery models. Only four articles met the criteria in which the effectiveness of co-teaching was measured empirically and compared statistically with a control condition. Zigmond and Magiera (2001) argued that a large amount of research was available on implementation while there was not enough research available on logistics. Their review of the literature demonstrated the limited results available as well as the mixed outcomes of the existing studies.

Part of the issue with studying co-teaching is ensuring the treatment integrity (Murawski & Swanson, 2001). A possible solution to aid in treatment integrity would be a common adhered to definition of what is co-teaching, as well as a means to evaluate what is and is not co-teaching. A common adhered to definition could aid in establishing

the practice as empirically based. By providing specifically what is truly considered co-teaching in practice or adhering to the Cook and Friend (1995) definition-including all four components discussed prior, the validity of any research within co-teaching would greatly increase. The question of what is happening instructionally within the co-taught classroom would no longer be asked.

Asking for accountability for this method of instruction, the Division for Learning Disabilities and the Division for Research of the Council for Exceptional Children published a Current Practice Alert focused on Co-Teaching (Zigmond & Magiera, 2001). This alert cautioned that this service delivery model has not been well developed in the research. The division argued that the difficulty in researching co-teaching that will inform practice stems from factors that are difficult to control, such as the ability to randomly assign teachers; the variability in definitions of co-teaching roles; and the inability to use matched samples. The division was also critical in that a large amount of research was available on implementation while there was not enough research available on logistics. Both divisions cautioned that the results of the studies thus far are mixed. Findings focused on student outcomes were limited and indicated there were no convincing data indicating co-teaching's worth.

Scruggs, Mastropieri, and McDuffie (2007) recently conducted a meta-synthesis of qualitative research in a study of co-teaching in inclusive classrooms. This meta-synthesis included 32 original reports of qualitative research on co-teaching. The reports included 454 co-teachers, 42 administrators, 142 students, 26 parents, and 5 support personnel. The co-teachers taught in geographically diverse schools, including the Northeast, Mid-Atlantic, Southeast, Midwest, Southwest, and the West coast of the

United States, as well as Canada, and Australia. The studies represented a range of grade levels. The study involved 15 primary, preschool, or elementary classes; 14 junior high, middle school, or high school classrooms; 3 research studies included both elementary and secondary classes. Of the schools and classrooms represented, 8 were urban, 9 suburban, 4 rural, and 5 a combination of locations. One of the conclusions drawn by this study was that co-teaching was perceived as being beneficial for all students by administrators, teachers, and students. Another conclusion was that a number of conditions need to be present for the success of co-teaching including sufficient planning time and compatibility of co-teaching. Yet another finding was the dominance of the one lead, one support model of co-teaching, with the special educator often playing a subordinate role. Finally, researchers found that the use of teacher-led instruction was the predominate model leading to a lack of individualization and the special educator often acting in the role of an assistant.

The study details suggested a few commonalities. Many studies mentioned the inconsistency in what is considered co-teaching. Integrity of treatment was not always indicated or observed. Subjectivity in reporting was another issue that was a common variable within the studies. A final issue that was mentioned more than once was the absence of student achievement data on the service delivery model.

Co-teaching Controversy

Mastropieri and colleagues (2005) found in co-taught settings that students were receiving high quality instruction; however, students with disabilities were not receiving what is “special” about special education. Students with disabilities were not receiving individualized attention or the intensity of instruction typically seen in a special education

setting. Fuchs and Fuchs (1995) shared similar sentiments, doubting if the general education setting could ever provide what is “special” about special education. Dunn (1996) emphasized the “special” in special education (intensity of instruction and individualized attention) is needed not only for students with more severe disabilities, but those labeled learning disabled as well. Without these special interventions students with LD experience difficulty in their adult life (Dunn, 1996).

Co-teaching critics see special education losing what is special about special education. Special education has traditionally been seen as providing intensive, individualized instruction for students with disabilities. The special education research literature include practices that have been proven valid within special education (Ellis, et. Al, 1991). Several strategies such as drill-repetition, directed questioning, and sequencing have been identified in the literature and have been proven through research to increase student achievement. Strategy cues, mnemonics, controlling the difficulty or processing demands of a task, graphic organizers, and differentiated instruction also have been identified as effective strategies for use with students with disabilities. These practices were not always seen in the inclusive, co-taught classrooms in the various research studies (Ellis et al., 1991; Fuchs & Fuchs, 1995; Jitendra, 2002). Yet, the current status of the field is demanding outcome data related to co-taught environments at all level with a need for specific outcomes in areas often neglected such as the secondary level and mathematics.

Co-teaching has the potential to be a service delivery model that is beneficial to all individuals involved and can provide what is special about special education with clear role definition (Cook & Friend, 1995). In order for everyone to benefit, co-teaching

environments need to have variables that reflect effective practices and unfortunately not all co-teaching situations are effective. Key elements previously mentioned in several studies show that an effective co-teaching atmosphere must be developed to produce positive outcomes (Bauwens & Hourcade, 1991; Dieker, 2001; Gately & Gately, 2001; Keefe et al., 2004; Laframboise, et. Al, 2004; Murawski, 2005; Weiss & Lloyd, 2002; Zigmond & Magiera, 2001).

LD and Middle School

The controversy over co-teaching is a valid point. This section will discuss why students with LD experience difficulties at the secondary level and how co-teaching can potentially help. The section is followed with specific considerations for co-teaching in mathematics at the middle school level for students who are LD.

Students with LD begin to have a difficult time in secondary settings for several reasons. In middle school content knowledge is heavier than previously experienced at the primary level. Traditionally, students are exposed to a variety of subjects all containing heavy content at the middle school level. The pace of instruction in secondary settings are a challenge for students with LD. Teachers are covering material at break neck speeds to prepare for standardized assessments and to cover the established benchmarks. The content draws upon prior knowledge and continues to build on knowledge as their secondary career progresses. Secondary settings become more demanding of students' time. Subjects are integrated. Due to these expectations, teacher attitudes towards students with disabilities being included in the general education setting may not always be positive, especially in light of high accountability standards. Co-teaching can help students with and without disabilities cope by providing a second

instructor who can help all students, but ensure students with the challenges are provided with learning strategies to adjust to these settings (Friend, 2007). The challenge exists in clarifying roles in subject areas where special education might have limited knowledge such as in mathematics.

Mathematics and special education

Secondary teachers have noticed that many students have difficulty in mathematics. One fourth of students with LD have been identified due to a discrepancy between math aptitude and performance. Secondary students with LD function at 2.7 grade levels below their non-disabled peers in mathematics, on average, many of whom perform at the 5^{th} grade level. Students with LD who have mathematics difficulties often experience difficulty especially when more abstract and advanced mathematics concepts are introduced (i.e. algebra and calculus). Students with LD are challenged by problem application, as well as basic skills and higher-level skills/concepts and problem solving. Students with disabilities are challenged to acquire and generalize mathematics skills and concepts. The challenges faced by students with LD that hinder their understanding of mathematical concepts include problems with language, attention, memory, and metacognitive skills, with self-regulation difficulties being most common. Research has found secondary students with LD who have challenges in acquiring mathematical concepts are successful with effective instruction in self-questioning, modeling, guided practice, and mastery criterion (Maccini & Gagnon, 2000; Miles & Forcht, 1995).

Co-teaching can support mathematics instruction for students with LD. This section provides a discussion of the challenges faced by special educators and students with disabilities related to mathematics. Followed by a summary of the challenges

students with LD face in secondary mathematics and why special educators should be involved in mathematics instruction. This section ends with a summary of Ma's (1999) work, the TIMSS study, and the unstable mathematical foundation of teachers and all students in the United States combined with NCTM affirming that all students have the right to learn mathematics.

A solid knowledge base in content aids student achievement and success in meeting curriculum standards (McLeskey & Ross, 2004). Many special educators participate in providing instruction across core academic subject areas. The challenge for special education teachers to meet the content knowledge requirement for each core content area can be overwhelming (McLeskey & Ross, 2004). This challenge may result in many children with disabilities receiving their primary instruction in core academic subjects in the general education classroom with the general education teacher solely providing instruction. General educators should provide the highly qualified services for students with disabilities by consulting or collaborating with highly qualified special educators.

Jones, Wilson, and Bhojwani (1997) discussed the challenges faced by students with LD in mathematics classes at the secondary level. The researchers identified six factors that confounded efforts to increase the effectiveness of mathematics instruction. These factors included: Students' prior achievement; students' perceptions of self-efficacy; content of instruction; management of instruction; educators' efforts to evaluate and improve instruction; and educators' beliefs about the nature of effective instruction. Jones and colleagues explained that secondary students with LD spent the bulk of their instructional time on very simplistic mathematical skills. Due to frequent failure and

frustration with instruction, the motivation level of students with LD to attempt complex tasks or persist in independent practice often was challenging. The researchers espoused improvement in mathematics education for secondary students with LD by depending greatly on their receiving better mathematics education while they were in the elementary grades. Students with LD need to be given more time and better-designed instruction in basic mathematical skills. These skills are prerequisites for efficient mathematics learning before progressing on to higher-level mathematics. Miles and Forcht (1995) espoused problems for students with LD acquiring mathematics skills as being more often than not in elementary school and persisting throughout the high school years. In effect, poor preparation in the lower grade levels limits students' access to higher level mathematics, such as algebra (Jones et al., 1997; Miles & Forcht, 1995). Higher level problem solving (e.g. algebra) is required for the successful completion of high school and for entrance into most postsecondary schools, but many students with LD have difficulty with these higher-level mathematics.

The necessity of special education teachers to aid in the preparation of students for mathematics, especially at the secondary level, is becoming even more essential. Secondary mathematics begins with algebra and builds upon this knowledge throughout the high school years. Algebra I is a challenging endeavor for all students, but especially for students with mathematical related disabilities (Maccini & Hughes, 2000). Algebra has been described as the gatekeeper to opportunities. Success in algebra is required in many states, including Florida, where students are required to pass competency tests that contain algebra or to pass algebra classes in order to obtain a standard diploma. One out of every three students with learning disabilities fails general education high school

courses, specifically in mathematics where students with disabilities experience considerable difficulty. Students with learning disabilities do not usually pursue advanced mathematics classes. Only 12% of students with mild disabilities take advanced mathematics classes. Students who fail to succeed in algebra likely do not obtain education beyond high school or cannot become qualified for advanced career options. Students who lack success in algebra or access to the subject matter account for the low rate of students with learning disabilities entering postsecondary education. Students must succeed in algebra if they are to proceed into postsecondary education. Skills acquired within algebra are necessary to enter most colleges. Students with learning disabilities enter postsecondary education at half the rate of their general education counterparts. Even if postsecondary is not a goal for a student, many well paying jobs and jobs with benefits necessitate the use of algebraic skills (Maccini & Hughes, 2000).

Special educators who are prepared to teach mathematics can help to ensure students are receiving the foundation needed to succeed at the secondary level. This means special educators who are prepared to help students establish a solid mathematical foundation throughout the primary years can help all students be successful in the general education setting. In addition, special educators who are equipped to help students who have reached Algebra I without a solid foundation, by helping the student succeed through strategy instruction and aiding the mathematics teacher in accommodating the curriculum can be a great benefit to all students as well. Teachers must learn specific mathematics strategies, such as problem-solving strategies with proven research-based and differentiated instructional strategies. Many interventions have proven to be successful in promoting success in algebra, but can only be used by teachers who are

knowledgeable in making changes occur. Bottge and colleagues (2001) used anchored instruction to improve problem solving and computational skills of small groups. Maccini and Hughes (2000) demonstrated that groups can learn and deploy a strategy using integers and CRA (concrete-representation-abstract). Allsopp (1997) emphasized the importance of using peer tutoring for students with learning disabilities within algebra classrooms. Other examples within the research include use of curriculum-based measures (Calhoon & Fuchs, 2003), peer-assisted learning strategies (Calhoon & Fuchs, 2003), instructional design (Gagnon & Maccini, 2001), and presenting algebra with real world applications (Bottage, 2001). These types of tools and strategies are the role of the special educator in co-taught mathematics classrooms.

Effective teaching of mathematics

Pairing the needs of students with LD with best practice in mathematics should be at the core of a co-taught environment. The NCTM emphasized a strategy to use in the mathematics classroom that of developing a community of learners. Communities of learners are established through collaborative discourse. Ball (1997) emphasized the importance of facilitating discourse within the classroom. The exchanging of ideas and sharing how knowledge is constructed is vital to student learning. Mathematical ideas and their meanings should be discussed in order to ensure understanding, examine validity of ideas and concepts, and correct misconceptions. The NCTM encouraged teachers to take on the role of facilitator, guiding group investigation through inquiry-based learning (Manouchehri, 2004). This type of environment is the ideal type of structure for two teachers to model a collaborative environment.

However, the need for educators to understand mathematics is critical in this type of environment, for general and special educators alike. Gregoire (1999) revealed that teachers of mathematics sometimes have flawed understanding of the subject matter (Gregoire, 1999). In an investigation by Ma (1999) the profound understanding of fundamental mathematics of teachers in China and the United States was explored. Ma found teachers from the United States primarily possessed procedural knowledge of mathematics, as opposed to the conceptual knowledge possessed by the teachers from China. Teachers from the United States were not able to discuss concepts behind procedures and all procedures were not performed correctly. The incomplete and flawed understanding of mathematics of American teachers affected the foundations students developed in mathematics. This demonstration fits the international standings held by both countries in academics. Students from China regularly outperformed students from the United States in mathematics (Ma, 1999). Research to this point has not investigated the level of conceptual understand of special educators related to mathematics in the United States.

The results from Ma's investigation are interesting in light of the Trends in International Mathematics and Science Study (TIMSS) and the current failure rate for many students with disabilities in mathematics (Gonzales, et al., 2004). The International Association assessed students from around the world on mathematics and science concepts for Evaluation of Educational Achievement (IEA). The major foci included an in-depth analysis of mathematics curriculum, an investigation of instructional practices based on teacher self-report, and assessment of students' mastery of the curriculum as well as their attitudes and opinions (Lindquist, 2001). The TIMSS study assessed grades

4th, 8th, and 12th in mathematics. The United States demonstrated disappointing results with 4th graders scoring above the international mean, 8th graders scoring about the same as the international mean, 12th graders scoring below the international mean (Cogan & Schmidt, 1999). Ma's work is not indicative of all students; however, with these results being reported for all students, one can only speculate as to the implications for special education.

Knowledge of how to meet the needs of students with disabilities can aid in effective instruction. Allsopp, Lovin, Gree, and Savage-Davis (2003) discussed the barriers to students learning mathematical concepts when the mathematics teacher lacked an understanding of students with disabilities. In classrooms where the mathematics teacher was unprepared, students with disabilities experienced attention problems, cognitive-processing problems, memory problems, and metacognitive deficits. Effective teachers, who were sensitive to disability issues identified the problem; applied instructional strategies (i.e. authentic and meaningful contexts); modeled; sequenced instruction to progress from concrete to representational to abstract; offered multiple practice opportunities; and monitored continuously; as well as realized improvements in students' abilities and confidence. These tactics could be helpful to students without disabilities through a co-taught model.

The need for students with disabilities to have the type of teacher identified by Allsop and colleagues (2003) is critical to future success. Many students in general education settings, including students with disabilities, have an unstable foundation in mathematics (Falkner, Levi, & Carpenter, 1999). Once students reach algebra, many find their lack of the skills to succeed frustrating, resulting in an increased probability of

dropout. Student failure in algebra has been attributed to poor foundations in mathematics and misconceptions within algebra can be detrimental (Baroudi, 2006; Falkner et al., 1999). Teachers who are prepared to identify the existing skills and weaknesses that students are bringing from their earlier years can facilitate students' success in algebra. Students' weaknesses and misconceptions need to be exposed. Remediation of earlier misunderstandings must be undertaken to avoid a negative impact on learning in the later years of secondary education (Gough, 2004). Teacher preparation in general and special education must guide teachers to understand mathematics conceptually in order to teach students effectively (Ma, 1999). Maccini and Hughes (2000) discussed skills related to algebra performance-basic skills and terminology, problem representation, problem solution, and self-monitoring activities. Importance lies in both general and special education teachers being prepared in a manner that ensures their understanding of these concepts in order to facilitate student achievement and to correct these misconceptions. Remediation in and attention to these skills can aid in success of all students in mathematics, especially in secondary settings.

Recommendation for inclusion in mathematics

Suggestions developed by NCTM for effective instruction take into account students with disabilities. These suggestions include promoting hands-on learning, such as the use of manipulatives; using instructional techniques, such as mastery learning, error corrections, scaffolding and modeling, and explicit strategy instruction; and using real-life applications (Gagnon & Maccini, 2001; Maccini & Gagnon, 2000). Graphic representations also were cited as helpful within the mathematics classroom. The use of

these strategies aid in the success of all students in mathematics classrooms (Jitendra, 2002) and should be a core component of an inclusive classroom.

The NCTM has made recommendations for learning and teaching mathematics since 1989 when it introduced Curriculum and Evaluation Standards for School Mathematics (1989). Since that time, NCTM has released Professional Standards for Teaching Mathematics (1991), and Assessment Standards for School Mathematics (1995). The current release Principles and Standards for School Mathematics (2000) was the latest update and extension of the recommendations for learning and teaching mathematics. These standards provide a foundation for what is to be taught in inclusive settings for all students.

Recently, NCTM introduced Curriculum Focal Points for Prekindergarten through 8th Grade Mathematics within their latest update of the Principles and Standards. The focal points provide a framework for organization of curriculum standards within a coherent, focused curriculum. Three focal points are identified for each grade level. The intention of the focal points was to build mathematical competency for all students based on the idea that not every student learns at the same pace. The development of these focal points provides a natural bridge for work across general and special education.

For instance the focal points in 6th grade include Numbers and Operations: developing an understanding of and fluency with multiplication and division of fractions and decimals; Numbers and Operations: connecting ration and rate to multiplication and division; and Algebra: writing, interpreting, and using mathematical expressions and equations. These focal points were still connected to the standards initially set forth by NCTM. The focal points were to be addressed in contexts that promoted problem solving,

reasoning, communication, making connections, and designing and analyzing representations.

The mathematics community currently is stressing the importance of pedagogy and identifying unique pedagogical needs of students with disabilities. The immediate challenge to the field now is gaining a better understanding about students with learning disabilities (LD). The category of LD makes up approximately 50% of the total student population served by special education (OSEP, 2004). Statistics indicate that mathematics educators will have an experience with students with LD at some point in their teaching career and most likely yearly. Mathematics teachers must be prepared with knowledge of students with disabilities and be equipped to instruct this population. Teacher preparation in mathematics should use strategies that have a research base and are known to have positive effects on students with learning disabilities, such as the use of direct instruction (Ellis et al., 1991), mnemonic strategies (Brigham & Brigham, 2001), and graphic representations (Brigham & Scruggs, 1995) whether in a self-contained or co-taught environment.

Research Example

The research on co-teaching within secondary mathematics classrooms is scarce; however, Magiera, Smith, Zigmond, and Gebauer (2005) studied this very phenomenon. This study entailed sending observers out to eight high schools throughout two Mid-Atlantic States, including urban, suburban, and rural settings. In total 10 co-teaching pairs of secondary mathematics teachers were observed. A total of 49 observations were conducted of these co-taught mathematics classes. The researchers found that the most common role assumed by both teachers was monitoring of independent practice-33 out of

the 49 observations. However, the second most common role observed entailed special educators assuming more of a supportive role while the mathematics teacher assumed the role of primary instructor-33 out of 49 observations. These findings were similar to those seen in other co-teaching studies. In 24 of the 49 observations, special educators assumed a role more of an observer than that of a supportive role. From a total of nine observations of team teaching, special educators were found to assume a primary role just three times, and teams only used small groups twice (Magiera et al., 2005).

The findings included observations about the classroom structure and co-teaching practices as well as comments from interviews of the teachers' perceptions. The observations of the teaching structures indicated that the co-taught classrooms followed the same format as a classroom with only one teacher. The format of the classes included reviewing homework, introducing new content/guided practice, followed by independent practice. This format offered few opportunities for a special educator's involvement (Magiera et al., 2005).

Another major observation from the study, teams had not been prepared to co-teach and did not have time to co-plan leading to "teaching on the fly" (Magiera et al., 2005). The findings indicated the teams were not co-teaching as no evidence existed of co-planning, co-teaching, and co-assessing as required for effective co-teaching (Murawski & Swanson, 2001).

The study also included interviews of the teams as to their perceptions of the co-teaching environment. One finding included the special educator's idea of how the classroom was structured. Special educators noted the difficulty of co-teaching when a general educator is highly reliant on whole group instruction (Magiera et al., 2005).

Magiera and colleagues suggested teachers should become equal partners in co-taught secondary mathematics classes. The emphasis does not lie in the special educator becoming a "quasi-mathematics teacher." Instead, the focus should be on explicitly teaching processes that help students with disabilities understand mathematical concepts, as well as increased use of small group instruction, and designed instruction to meet the needs of students. Magiera and colleagues encouraged from their work that teams receive professional development on co-teaching prior to beginning their work together (Magiera et al., 2005).

Reflective Practice

A core component of effective instruction whether co-teaching or not is reflection on practice. Reflection in terms of professional development and the use of reflection on action and reflection in action are core to effective instruction. This section ties together co-planning and co-teaching as a potential framework for reflective practice with another colleague. Studies highlighted in this section include the use of reflective practice to enhance instruction and a summary of the benefits of using reflective practice.

Teaching is typically seen as an isolated and private profession, marked by more separation than collaboration (Manouchehri, 2001). Teaching is typically practiced as an independent endeavor, operating behind closed doors, with teachers making decisions about their own teaching practices removed from collegial input (Manouchehri, 2001). Yet, the teacher education community is calling for more collegial interaction and peer discourse (Manouchehri, 2001) which could be an outcome of collaborative and co-taught relationships.

Within these new relationships is the need for reflection on effective teaching practices as well as collaboration between two teachers. How this type of reflection might promote professional growth is an interesting concept to consider. Reflection is most often credited to the work of John Dewey (1933), who advocated for the use of reflective practice to promote professional growth. Schön (1983) further defined reflection as an interpretation of events by framing and reframing a problem. Out of these processes two categories of reflective thought emerged: reflection-on-action and reflection-in-action. Reflection-on-action refers to reflecting on a teaching practice after the fact. Reflection-in-action refers to reflecting on teaching practices during the event. Others have defined reflection within the literature (Osterman, 1990; Ross & Regan, 1993; Garman, 1986); however, Schön is the most commonly sited. The literature on reflection is saturated with the influence of Schön (1983) and his theory of reflective practice (Dieker, 1994; Dieker & Monda-Amaya, 1995), yet how this process of reflection changes with the dynamics of co-teaching is in need of further investigation.

Using a reflective approach provides teachers with a tool to foster self-actualization and to provide their own evaluation, praise, and criticism of their professional growth. Reflection has the potential of enabling teachers to examine their problems and create from these problems positive outcomes. Teacher reflection can be considered a type of professional development in which teachers use their skills and knowledge to affect teaching practices. As teachers obtain more experience and become more reflective, teachers become more effective. Teachers should be trained in reflection during teacher preparation (Manouchehri, 2001).

Peressini and Knuth (1998) emphasized discourse as important in teachers' efforts to increase their content and pedagogical knowledge. Discourse is important not only for students, but also for teachers. Peressini and Knuth (1998) suggested efforts be made to include teachers in viewing and analyzing video of their teaching practices as part of professional development activities. Peressini and Knuth (1998) stressed the importance of the mathematics reform movement, which was founded on the significance of fostering discourse and reflection. The use of video episodes within professional development supported the mathematics reform movement by encouraging discourse and reflection between colleagues (Manouchehri, 2001), including a co-taught partnership.

Since reflective practice is key to ongoing professional growth and is identified as a crucial component of professional development, the process of co-planning and co-teaching has a built-in model to reflect as a professional team. Growth in teaching related to reflective thinking comes from looking at the whole professional self instead of just the aspects with which one is confident, which can be a daunting and unfamiliar process. However, teachers' involvement in reflective practice provides opportunities to look at teaching practices and encourages cognitive change in beliefs and practice. Determining how these changes are permeated in co-reflective structures could provide insight into new forms of teacher growth and change.

Benefits of reflection

Benefits of reflective processes have been cited within the research literature (Garcia, Sanchez, & Escudero, 2006). The research illustrates the importance of providing teachers with a tool for making changes in their classrooms and schools; providing teachers with a method to evaluate the purpose and effectiveness of instruction;

and allowing teachers to think about how to apply the knowledge to make changes in instruction. Professional developments opportunities should be designed to engage teachers in collaborative investigation and reflective practices (Manouchehri, 2001). Reflection encouraged teachers to make changes in their classrooms and schools. Reflection also helped teachers evaluate the purpose and effectiveness of instruction, and how to think about how to apply past knowledge to change instruction (Dieker & Monda-Amaya, 1995). Reflection could be used with two colleagues, including co-teaching pairs to reflect upon co-teaching practices.

Manoucheri (2001) investigated peer discourse. Two preservice teachers were studied using journal entries based on observations of their cooperating field teacher, each other and observations by the research team. The journal entries in addition to observations were analyzed for the study findings. Manoucheri found collegial interaction and reflective practice affected one of the preservice teacher's classroom practices, but did not find these results with the other. Teacher disposition and beliefs were determined to have played a role in the study.

Finn (2002) investigated 16 Chicago public school teachers enrolled in a graduate class, a professional development class offered by Northwestern University's Center for Learning Technologies in Urban Schools. The class was an inquiry-based, technology-infused middle school science curriculum for five subjects-earth and environmental science, weather, biology, animal behavior, and physics. The study focused on two of the themes, so each teacher was using one of the two curriculums. During the video portion of each class, teachers showed a five-minute clip of a lesson from their instruction in their classroom. They were asked to review and reflect on the clip with their colleagues in the

course. One of the teachers participating in the study used suggestions from her classmates to construct ways to correct her students' misconceptions, which directly affected classroom instruction and student learning.

Issues that have come about within the co-teaching literature regarding integrity of treatment could be rectified with the use of reflection, which is one component of effective teaching practice. Reflective thinking within the co-taught classrooms is a concept not yet discussed in the literature but has potential to expand further teacher practice and student learning outcomes.

Video

A way to reflect on practice is through video to increase teacher skills at the in-service as well as pre-service level. This section highlights the finding of these studies on video reflection, which includes the benefits using video, the challenges that exist and the potential tie to co-teaching.

Smith (2001) used video case studies, or cases, for teachers to reflect on teaching practices. The study was conducted in a graduate-level mathematics methods course focused on proportional reasoning in the middle grades. The participants included prospective elementary and secondary school teachers completing a final requirement for a Master of Arts degree in teaching and subsequent certification. Reflection on these cases helped create generalizations that these prospective teachers would be able to access in their own classroom practice. Clark and Hollingsworth (2000) also used cases for purposes of reflection. Cases provided a common reference point and a shared experience, promoting discussion of teacher's actual practice.

Clark and Hollingsworth (2000) discussed using video cases contending that video offers more graphic and compelling forms of teaching practices. Video is able to capture more aspects of the classroom environment, a greater context, and more detail of the classroom practice. Use of classroom videotapes can help teachers reflect on teaching practices, especially unnoticed practices. Video can help facilitate discussion of teaching practices, and allow teachers to look into other classrooms to compare, contrast, and discuss professional practice. This use parallels the need for co-planning and evaluating in a co-teaching structure.

Sherin (2000) discussed the use of video clubs, which are groups of teachers who gather to watch and discuss their teaching. These teachers were able to closely examine classroom practices such as: student discussions, comments, questions; or interpret a lesson and understand what exactly happened within the classroom. Teachers are typically consumed with the pace of the class and taking time to reflect is not always feasible. Teaching involves keeping track of many simultaneous activities. Video clubs, Sherin noted, allowed teachers to review their practices and to receive feedback from colleagues in a safe environment. Teachers were offered an opportunity to review classroom interactions in ways that are different from their standard daily practices.

Likewise, Welsch and Devlin (2006) also encouraged the use of videotapes or video portfolios as a tool to encourage teacher candidates to reflect and to provide evidence of meeting teaching standards. Video assessments have the potential to improve teaching practices. Watching video of classroom practices allowed teachers to become more reflective in their teaching. Welsch and Devlin's study indicated pre-service

teachers were more accurate in reflecting upon student learning and effective teaching methods and activities than from recalling from memory alone.

Collings, Cook-Cottone, Robinson, and Sullivan (2004) studied pre-service programs and professional practice in hopes to provide students with more authentic experiences within their teacher preparation. Using video to capture professional practice sessions permitted a level of reflective learning and practice not otherwise possible. Baggerly's (2002) and Kivinen and Ristela's (2003) research intended to have students learn by doing. The instructors wanted the pre-service teachers to videotape their student teaching practices for reflection by self as well as with critical friends (other students in the program). The video allowed for prompt feedback to aid in professional development and teacher preparation. Students gained confidence in practices before actual performance of these tasks and learned to evaluate their practice and their peers'. These preservice teachers learned to recognize and vocalize their opinions of professional practice. Video was an effective way to capture professional practice for careful and thoughtful review (Collings, et. Al., 2004). In this manner video becomes an efficient pedagogical tool.

Video and Reflection

Teachers can reflect through various sources. One source which utilizes technology to review one's teaching is through video analysis. The National Board for Professional Teaching Standards (2007) requires portfolio entries that include a video recording component. Teachers must submit four video recordings documenting their efficiency as a teacher. This process is thought to aid in teacher reflection and

advancement of professional practice (National Board for Professional Teaching Standards, 2007).

Various studies have found the efficacy of using video in improving teacher practice. Rowley and Hart (1996) used video case studies. The video cases were actually developed over the course of their research. The video cases in Becoming a Star Urban Teacher is a series based on Haberman's data on identifying characteristics of teachers who are successful with urban students. The researchers conducted and videotaped in-depth interviews with 10 teachers from Dayton schools. The researchers then developed seven video case studies designed to promote reflective dialogue among practitioners. These case studies then were used extensively for fieldwork with pre-service, entry-year, and veteran teachers. The cases have been used for mentor teacher training, entry-year teacher support, as well as in the undergraduate teacher education program at the University of Dayton. The authors state that these case studies provided a valuable learning tool encouraging more reflective and professional practice. With a field like co-teaching, which is in its earlier stages of development, the need to reflect on practice is essential.

Conclusion

Even though proponents of co-teaching argue the benefits and critics argue the mixed results of the current research and a lack of research on the logistics of the service delivery model, one point of consensus among both groups exists, more research is needed in the area of co-teaching (Dieker, 2001; Laframboise et al., 2004; Murawski & Swanson, 2001; O'Brien, 2005; Stainback & Stainback, 1984; Trent, et al., 2003; Weiss & Lloyd, 2003; Weiss & Lloyd, 2002; Zigmond & Magiera, 2001). As aforementioned,

many studies have investigated students' and teachers' perceptions, but more research is needed on student achievement associated with co-teaching (Zigmond & Magiera, 2001), specifically in mathematics, especially in light of the alignment of IDEA and NCLB.

In conclusion, mathematics teachers have the content knowledge, and special educators know how to accommodate, modify, and differentiate instruction and provide learning strategies. Both teachers bring necessary knowledge to the mathematics classroom, yet how this knowledge is best utilized and enhanced through planning and reflective practice is not clearly articulated in either field. Therefore, the goal of this research study was to combine this knowledge in mathematics and special education, through collaboration to teach all students effectively with a secondary goal of enhancing practice through watching video to encourage reflection. By having a highly qualified mathematics instructor and a highly qualified special educator reflect as a team on their practices the hope was that all students could be provided equal access to the challenging yet critical general education curriculum in mathematics.

CHAPTER THREE: METHODOLOGY

The purpose of this study was to contribute to the research regarding co-teaching, within secondary co-taught mathematics classrooms. The study explored the co-teaching practices within middle school mathematics classrooms and whether review video of co-taught practices encouraged co-reflection and influenced instruction.

Research Questions

Question one: Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool?

Question two: Does using video to discuss a co-teaching team’s practice during planning time in a middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class?

General Research Hypotheses

Question one: Using teacher discussion of a videotape of instruction enhances the co-teaching team’s practice during planning time in a co-taught middle school mathematic class as measured by the Co-ACT, a self-report perception tool.

Question two: Using discussion of video on a co-teaching teams practice during planning time in a co-taught middle school mathematics class enhances the role of and use of strategies by the special educator in the mathematics class.

Settings and Population

The population and setting for this study included three public middle schools in the central Florida area that practiced co-teaching in mathematics classrooms. These settings were chosen based upon administrative support. After principals pledged support

and agreed to allow their teachers to participate in the study, teachers were contacted to volunteer to participate in the study.

Study Participants

The study participants were middle school mathematics co-taught teams from selected schools within the central Florida area. Teams were inclusive 7th and 8th grade mathematics classes across three schools. Four teams were ultimately recruited, resulting in a total of 8 teachers.

Sampling

The study employed a voluntary sample of convenience for selection of participants. The classes used were those that a special education and a mathematics teacher co-taught together at the middle school level. Three schools were selected.

The first school yielded one co-taught team, two teachers-a special educator and a mathematics teacher. The mathematics teacher is a Caucasian female who had taught for 3 ½ years. Her certification was in mathematics grades 5-9. She was in her 4th year of co-teaching. The special educator is a Hispanic female who had taught for 9 ½ years. Her certification was in exceptional student education grades K-12. She was in her 3rd year of co-teaching. The co-taught class had 24 total students with 13 students being labled as LD. This class included 12 boys and 12 girls. The ethnic makeup of the class included one African-American, 11 Caucasian, and 12 Hispanic/Latino students.

The second school yielded one co-taught team, two teachers-a special educator and a mathematics teacher. The mathematics teacher is a Caucasian male who had taught for 17 years. His certification was in mathematics grades 6-12. He was in his 4th year of

co-teaching. The special educator is an African-American female who was in her first year of teaching and co-teaching. Her certification was in exceptional student education grades K-12, middle grades integrated curriculum grades 5-9, as well as social science grades 6-12. The co-taught class consisted of 22 total students with 14 students being labeled as LD. This class included 13 boys and 9 girls. The ethnic make up of the class included 2 African-American, 13 Caucasian, and 7 Hispanic/Latino students.

The third school yielded two co-taught teams, four teachers-two special educators and two mathematics teachers. For the first team the mathematics teacher is a Caucasian male who had taught for 9 years. His certification was in mathematics grades 5-9. In addition he had certification in English 6-12 and gifted endorsement. He was in his 2nd year of co-teaching. The special educator is an African-American female who had taught for 4 years. Her certification was in exceptional student education grades K-12 and middle grades integrated curriculum grades 5-9. She was in her 1st year of co-teaching. The co-taught class included 24 total students with 15 students being labeled as LD. This class included 11 boys and 13 girls. The ethnic make up of the class is 3 African-American, 7 Caucasian, and 11 Hispanic/Latino students.

For the second team at the third school the mathematics teacher is an African-American male who had taught for 4 years. His certification was in mathematics grades 5-9. He was in his 3rd year of co-teaching. The special educator is a Caucasian female who had taught for 8 years. Her certification was in exceptional student education grades K-12 and elementary education grades K-6. She was in her 6th year of co-teaching The class make up for their co-taught class included 17 total students with 7 students with disabilities.

The years of experience among the teachers varied from this being their first year of teaching, to a teacher with 17 years of teaching experience. The mean for the group was 7 years of teaching experience, the median being 6 years teaching experience, and the mode was 4 years of teaching experience.

One of the first pieces of information collected from participants included demographics. In total eight teachers, four co-teaching teams, agreed to participate as a part of the research study. These subjects included three male participants and five female participants. Each team was given a code based on their entrance into the study. The codes included T for team and an assigned number for each team. The first experimental group's code was T1. The teachers were distinguished by S for special educator and G for general educator when needed (for items such as the Co-ACT which was filled out individually). Hence, T1S would be Team 1 special educator.

As far as the education of the participating teachers, half of the teachers held Bachelor's Degrees, the other half held Masters Degrees. Of the four teachers holding Bachelor's Degrees, two are special educators and two are mathematics teachers. Of the four teachers holding Masters Degrees, two are special educators and two are mathematics teachers. In T1 the mathematics teacher held a Masters Degree while the special educator held a Bachelor's Degree. In T2 the mathematics teacher held a Bachelor's Degree while the special educator held a Masters Degree. In T3 both the mathematics teacher and special educator held Masters Degrees. In T4 both the mathematics teacher and the special educator held Bachelors' Degrees.

The ethnicity of the group was diverse. All co-teaching teams included a Caucasian participant and a diverse counterpart. T1 included a Caucasian female and a

Hispanic female. T2 included a Caucasian male and an African-American female. T3 included a Caucasian female and an African-American male. T4 included a Caucasian male and an African-American female. Three of the co-teaching teams also included a male/female pair.

For two teams, this study occurred during their first year of co-teaching together (T2 and T4). The other two teams T1 and T3 co-taught together the year prior. Of these two, T3 will be co-teaching together again next year. Another interesting fact about T3 is that the general educator of the team was selected as teacher of the year for their school last year and the special educator was selected as teacher of the year for the current year. This fact was taken into consideration during data analysis.

The overall demographics of the participants are provided in Table 1 below.

Table 1: Participant Demographics

	Participants							
	T1G	T1S	T2G	T2S	T3G	T3S	T4G	T4S
Race	C	H	C	A	A	C	C	A
Sex	F	F	M	F	M	F	M	F
Grade level	7	7	8	8	7	7	7	7
Position	GM	SE	GM	SE	GM	SE	GM	SE
Degree	MA	BA	BA	MA	MA	MA	BA	BA
Years of experience	3.5	9.5	9.0	4.0	4.0	8.0	17.0	1.0
Years Co-teaching	3.5	2.5	2.0	1.0	3.0	6.0	4.0	.5
Years with Co-teacher	1.5	1.5	1	1	2	2	1	.5

Key: C=Caucasian, H=Hispanic, A=African-American, F=female, M=male, GM=General Educator-mathematics, SE=Special Educator, MA=Master's Degree, BA=Bachelor's Degree

Table 2: Teacher Certification

Participant	Certification
T1G	Math 5-9
T1S	Exceptional Student Education K-12
T2G	Math 5-9, Elementary 6-12, Gifted
T2S	Exceptional Student Education K-12, Middle Grades Integrated Curriculum 5-9
T3G	Math 5-9
T3S	Exceptional Student Education K-12, Elementary Education K-6
T4G	Math 6-12
T4S	Exceptional Student Education K-12, Middle Grades Integrated Curriculum 5-9, Social Science 6-12

Most of the participants were familiar with co-teaching and had co-taught prior to this study. Interesting was the preparation these teams had undergone for co-teaching. During the initial meeting with T3, one of the teachers admitted to me he had been co-teaching for three years, but this was the first formal professional development in which he had been exposed. Other findings related to the type of preparation the participants had in regards to co-teaching (other than the professional development from this study) are provided in Table 3.

Table 3: Preparation and Professional Development

	Participants							
	T1G	T1S	T2G	T2S	T3G	T3S	T4G	T4S
Undergraduate Coursework		X						
Graduate Level Course work				X				
Student teaching				X				
District In-service				X		X	X	X
Building level in-service			X	X	X	X	X	
Other							X	
None	X							

Student Achievement

The researcher gathered data to provide a picture of the current student achievement levels within each of the participating co-taught classes. The researcher also ascertained data from a comparison class in which the mathematics teacher in each team taught individually but had students included in the classroom. The purpose of obtaining these comparison scores was to describe the achievement of students in the co-taught settings to those in the non co-taught setting. Not to provide a valid difference but to describe the type of students placed in the co-taught setting. The student achievement scores for all classes were reported as 1=needs much improvement, 2=needs improvement, and 3=on target using the same instrument across the schools used for this

study. The mean for all students in the participating co-taught classes was 1.98 while the mean score for students in the non co-taught class was 2.46. The means broken out by students within the classroom setting is listed in Table 4.

Table 4: Means of Student Achievement

Setting	Students	*n*	*M*
Co-taught	Students with disabilities	38	1.87
	Students without disabilities	41	2.10
Total		79	1.98

In order to compare these co-taught classrooms, a mainstream classroom from the participating general educators were selected to look at numbers, in terms of proportions and to compare student achievement. Table 5 demonstrates the disparity between the numbers of students enrolled in mainstream versus co-taught classrooms and how this disparity is reflected in student achievement scores.

Table 5: Student Numbers and Achievement in Mainstream Versus Co-taught Classes

Setting	Students	*N*	*M*
Co-taught	Students with disabilities	38	1.87
	Students without disabilities	41	2.10
Mainstream	Students with disabilities	6	2.50
	Students without disabilities	61	2.41

This sampling demonstrates that the co-taught classrooms participating in this study enrolled students with disabilities at a high rate, much higher than their mainstream counterparts.

Research Design

This study focused on the implementation of co-teaching and whether the use of video to discuss and encourage reflection on the practice increased implementation. This study employed quantitative and qualitative methods. An evaluation instrument allowed the co-teachers to evaluate their own level of implementation of co-teaching. Researchers used a time sampling record to evaluate teacher behaviors within the co-taught setting. Interviews were conducted at the conclusion of the study to gather impressions from the teachers involved in the study (see Appendix C for interview questions).

Treatment Conditions

Before commencing the study, participating co-teachers in the study were given professional development. This professional development took place during the initial meeting with teachers the week prior to data collection. This professional development was provided by the principle investigator in a lecture format providing tips and strategies for co-teaching in a middle school mathematics classroom. The professional development lasted approximately thirty minutes. This professional development was repeated individually for each co-teaching team and consistency was ensured through the use of a fidelity checklist (see Appendix K).

Weekly, one researcher evaluated each team's video tape as well as their audio taped discussions. To ensure Interrater reliability an additional observer evaluated 25% of the video tapes at various points throughout the study. Interrater reliability was established at .80 or greater based on Fleiss (1981) in which .75 or greater is considered excellent agreement.

Research Timeline

The timeline for the study was consistent across all teams. All teams began data collection at the same time and ended at the same time. Each week, every team videotaped a co-taught mathematics class period. The videotape of the co-taught class was then used by the team to discuss their current co-teaching practices using an evaluation tool provided by the RT. The discussion sessions were audio taped for review by the RT only. The evaluations and tapes were submitted to the RT every week.

The official study lasted nine weeks. The study commenced during the third nine weeks of school. Week one was used to introduce the study and to conduct necessary

paperwork and professional development on co-teaching. Weeks two through ten encompassed the official study. The official study ended on April 25, 2008 during the forth nine weeks of school. During week 10, a concluding meeting took place to finalize the study by submitting any additional paperwork or tapes, as well as to complete a concluding evaluation of co-teaching practices and conduct interviews. For teachers who could not participate in interviews during week 10, times and dates were set up for the following week to complete the interviews.

Table 6: Research Timetable

	Researcher	Participating Co- teaching pairs
Week 1	Professional Development, Explanation of Study	IRB signed pre-assessment of co-teaching
Week 2-10	Monitor teams, provide guiding questions, begin/continue transcribing and coding data	Video one class per week, discuss video with provided evaluation and questions, Audio record discussion, Submit data
Week 10-11 (in addition to above)	Conduct final meeting Conduct interviews	Attend final meeting, submit final data and paper work, participate in interview

Independent Variable

The independent variable for the study was co-teaching.

Dependent Variable

The dependent variable was using discussion to encourage reflection on co-teaching practices. The study evaluated if discussing teaching practices on the video effected co-teaching practices.

Instrumentation

Over the course of the study, the researcher used three major instruments, a researcher-developed instrument to collect demographic data (Demographics Sheet) as well as a researcher developed list of interview questions and guiding questions based upon topics presented in the special education and mathematics curriculum. The three major instruments included the Co-ACT, ELEC, and TROS.

Demographics Sheet

After researching the literature and noticing common factors reported, a demographic sheet for teachers to complete was developed. The demographic sheet asked the participating teachers ethnicity, grade level taught, position, certification, highest level of education and number of years teaching, co-teaching, and number of years with the current co-teacher. The demographic sheet also asked the type of professional development on co-teaching received by the teachers (see Appendix A).

Colorado Assessment of Co-Teaching

The CO-ACT (Adams, Cessna, & Friend, 1993) was designed to measure the critical components of effective general-special education co-teaching, and provide

quantitative data outcomes. The reliability and validity of the Co-ACT was established by Adams, et. Al. (1993). Adams reported the results of a study of the reliability of the Co-ACT. The study was conducted to identify necessary components of effective co-teaching and to develop a tool to measure effective co-taught relationships. Focus groups were initially conducted with experienced co-teachers to identify factors that contributed to effective co-teaching. After a pilot questionnaire was developed, analysis of the pilot questionnaire for content validity indicated 40 items that significantly discriminated between exemplary and non-exemplary co-teaching teams. Items were eliminated from the questionnaire, which were not seen to significantly discriminate between teams. Once developed the instrument was used in a known-groups study and it reliably distinguished between co-teachers who were rated by their supervisors (usually their principal) as very effective and those rated as ineffective. Through this process the CO-ACT was found reliable and valid. The instrument since has been used to evaluate co-teachers within professional development and as a one-time assessment of co-teaching implementation.

The CO-ACT is a Likert-style inventory that is designed to differentiate exemplary co-teaching teams from other teams. Teams are scored on three factors: (a) Personal Prerequisites (15 items), (b) The Professional Relationship (9 items), and (c) Classroom Dynamics (14 items). Teachers rate items associated with each factor on two scales, one for importance in co-teaching, and another for presence in their co-teaching situation. Regarding importance, teachers are asked, how much do you agree that each factor is important in co-teaching? Importance of each item is rated on a five-point Likert scale that ranges from strongly disagree (1) to strongly agree (5). Regarding presence, teachers are asked, how much do you agree that each factor describes your co-teaching

situation? Presence is also rated on a five-point scale that ranges from strongly disagree to agree. Average scores for exemplary co-teaching teams for each factor form a basis for comparisons of co-teaching teams.

The Co-ACT was used as a pre and post assessment for teachers to complete regarding their co-teaching implementation. The assessment demonstrated whether co-teachers valued components that lead to an effective co-taught environment. The assessment also demonstrated whether teachers perceived these components as being evident within their environment and to what degree. The initial assessment of teachers also was to indicate their current status. The post assessment indicated whether a change occurred in the teachers' perceptions over the course of the nine week study. The Co-ACT was also used as an indicator as to whether co-teaching implementation had changed to answer the first research question of "Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool?"

Evaluating Learning Environments through a Co-teaching Checklist

The second instrument used was the Evaluating Learning Environments in Co-teaching Checklist, ELEC. The ELEC is a co-teaching evaluation, which was used by the participants to examine their environment. Murawski, Dieker, and Stanford (2006) developed this co-teaching evaluation. The tool asks about co-planning, co-teaching, and co-assessing. The tool also asked teams whether these practices were effective, evident, or not observed during their discussion period. In addition, the tool allowed space for comments and identifying information.

The creators of the co-teach evaluation, the ELEC, established face validity of the evaluation by basing it on current practice and having used the instrument for over two years in a large school district. The co-teach evaluation has been determined to measure what it is intended to measure through expert validation and from use by other teachers and administrative leaders who were experts in co-teaching in this district.

The ELEC permitted teachers to self-asses their own co-teaching after discussion on a weekly video of their classroom practices. This instrument was filled out each week and submitted to the RT. By analyzing the ELEC in combination with any notes that were taken and the audio recording of the discussion post-teaching session helped to answer both research questions. The evaluation encouraged the teams to evaluate their own co-teaching implementation. The RT was able to review the co-teacher's discussion on their own co-teaching implementation, especially in relation to the Co-ACT and its subsections personal prerequisites, professional relationship, and classroom dynamics. The RT was also able to investigate whether mathematic concepts or other content related material or if mathematic specific strategies, accommodations, or modifications were addressed. Using the ELEC helped answer research questions one and two. Research question one asks, "Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool?" Even though this is a separate instrument from the Co-ACT, the ELEC was used to measure if the three important aspects of co-teaching (co-planning, co-instruction, co-assessment) were evidenced within their own implementation and discussion of their co-teaching practices. Question two asks, "Does using video to discuss a co-teaching team's practice during

planning time in a middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class?" Evaluating the current practice using the ELEC as well as any other notes submitted indicated the type of communication taking place between the two co-teachers and whether the specified communication is taking place.

Teacher Roles Observation Schedule

The third instrument used was the Teacher Roles Observation Schedule (TROS). Waxman, Wang, Lindvall, and Anderson (1988) developed the TROS to measure interactions within classrooms. Subsequent studies have found this instrument to be reliable and valid (Huang & Waxman, 1992).

The reliability of the TROS instrument was established by Huang and Waxman (1992) in a study of 62 math teachers in middle school settings. The observer reliability for the study was reported at 85% overall for 25 coded items, 99% for the setting, 96% for the subject, 84% for the nature of interactions, and 81% for the purpose. An overall interrater reliability estimate of 90% using the TROS for observations of 25 regular education teachers in middle school settings was reported by Hines (1995).

The TROS utilizes time sampling. For this study the videotapes were edited into ten 30-second "clips" for each class period, and later coded using the Teacher Roles Observation Schedule (TROS). Categories of time used, as described in the TROS, included: No Interaction, Interaction with Other Adults, Interaction with Student(s)/Instructional, Interaction with Student(s)/Managerial, Interaction with Student(s)/Personal. In addition, incidents of correcting student behavior were also coded

and analyzed. Interrater reliability was established at 80% to ensure reliability of the TROS.

The TROS enabled the researcher to determine if the participants' perceptions were reality. The researcher was able to observe the classroom and interactions within the classroom to determine if interactions were taking place, what types of interactions were taking place, and with whom these interactions involved. By analyzing interactions the RT was able to gauge if there was a change in interactions within the classroom over the course of the study. Changes in interactions may have influenced the co-teaching implementation in relation to the Co-ACT, especially in terms of personal prerequisites, professional relationship, and classroom dynamics. The TROS assisted in answering the first research question (Question one: Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool?)

Interviews

Interviews with teachers were conducted at the conclusion of the study. A researcher-developed list of questions was used to conduct a brief interview with teachers participating (see Appendix C for interview questions). Questions were developed from the current research literature. The questions asked were about the use of learning strategies and involvement in instruction. The literature indicates that co-taught classrooms do not always reflect the intensity and individualism characteristics of special education. The researcher wanted to ask questions which investigated these findings.

The questions provided more indication as to whether the findings from the Co-ACT were accurate. The interviews also indicated whether co-teachers addressed mathematics concepts as well as strategies, accommodations, and modifications in their discussion and planning. The interviews assisted in answering both research questions (Question one: Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool? Question two: Does using video to discuss a co-teaching team's practice during planning time in a middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class?).

Data Collection Procedures

As seen in the timetable (see Table 6), the data collection period lasted for nine weeks, the length of a grading period at the participating schools. Data collection commenced during the third nine weeks of school. The data collection began February 18 and ended on April 25, during the forth and final nine weeks of school.

An initial meeting with participants was scheduled the week before the beginning of the study. At this meeting participants were required to evaluate their current teaching practices using the Co-ACT. This form was filled out on site and collected.

At the initial meeting all teachers participating were given protocols for video recording as well as a protocol for video discussion to encourage co-reflection. The protocols were distributed to aid in reliability of data captured and collection, as well to ensure consistency in how the teams were recording and discussing their practice (see Appendix D and E respectively for video recording and video discussion protocols).

Each week the co-teaching pairs videotaped one co-taught mathematics class. The teams then reviewed five minutes of this taping using an evaluation provided by the RT. The teams were permitted to self-select the five minutes from their entire lesson in which they would discussion their level of co-planning, co-instructing and co-assessing based upon the ELEC. The co-teaching teams were also provided with guiding questions to assist in the dialogue, if needed. The discussion sessions were audiotaped for the RT. Each week a member of the RT collected the videotaped co-taught lessons, the evaluation, and the audiotape of discussion from each team.

As videotapes were submitted, the RT reviewed and coded the videos. The RT assessed the teams' practices using the Teacher Roles Observation Schedule (TROS). One researcher reviewed and coded the videos on an ongoing basis. A second researcher reviewed and coded 25% of the videotapes to increase validity by establishing Interrater reliability of the TROS at 80% or better. Interrater reliability was established at .80 or greater based on Fleiss (1981) in which 75% or greater is considered excellent agreement.

Following the last week of data collection, another meeting was scheduled with the participants. During this meeting participants were asked to once again evaluate their co-teaching practices using the Co-ACT, as well as to participate in a brief interview.

Validity and Reliability Measures

In order to ensure validity of the study outcomes the following measures were taken. Triangulation of data was used as the primary measure to ensure validity. Three major instruments were used within the study-CO-ACT, TROS, and ELEC.

Interrater reliability was employed for the co-teaching evaluations by the researchers. The primary researcher observed and evaluated teams with an additional

field observer for 25% of the data. Interrater reliability was established at 80% or greater based on Fleiss (1981). Reliability measures were ascertained from each of the observation instruments for at least 25% of the data collected. Reliability was conducted for at least 25% of the data gathered from teacher evaluations related to accuracy of data being entered into SPSS.

The reliability of all three instrument-TROS, Co-ACT, and ELEC-have been demonstrated by the developers of the respective instruments, as previously mentioned. For this study, the RT took steps to ensure the fidelity of the current study procedures.

Data from the Co-ACT, TROS, and ELEC were entered into SPSS. The primary researcher from the RT entered the data. A separate member of the RT ensured data were entered reliably through interrater reliability of 25% of the entries, randomly selected.

The video clips were coded using the TROS. The primary researcher coded all the data. A separate member of the RT coded 25% of the data independently to ensure interrater reliability. Interrater reliability of .8 or higher was considered acceptable. Interrater reliability was established at 80% or greater (Fleiss, 1981). A protocol for using the TROS for the primary research as well as for interrater reliability was developed. This protocol can be found in the Appendix G.

The creators of the co-teach evaluation, the ELEC, established face validity of the evaluations for the participants. The co-teach evaluation has been determined to measure what it is intended to measure through expert validation and use by other teachers.

Triangulation also was be employed in the study to ensure validity. Three instruments were utilized-the CO-ACT (Adams, Cessna, & Friend, 1993), ELEC (Murawski, Dieker, Stanford, 2006), as well as the TROS (Huang & Waxman, 1992).

Video and audiotapes also were collected. Videotapes were coded using the TROS. Audiotapes were transcribed, yielding transcriptions for qualitative analysis. In total four items were used in the analysis of data.

Data Analysis

Data analyses were ongoing. The videotaped classes were coded as submitted using the TROS. The videotapes were edited into ten 30-second "clips" for each class period, to allow coding using the categories in the TROS. Categories of time use, as described in the TROS, include: No Interaction, Interaction with Other Adults, Interaction with Student(s)/Instructional, Interaction with Student(s)/Managerial, Interaction with Student(s)/Personal (see Appendix J for definitions of TROS terms). In addition, incidents of correcting student behavior were coded and analyzed. Interrater reliability will be established for the TROS using 25% of the data.

The CO-ACT was analyzed as pre and post assessments of co-teaching practices. These data were analyzed to assess any changes in attitudes of the co-teachers over the course of the study.

The ELEC was analyzed quantitatively as well as qualitatively. The measures on the instrument were quantified. The notes from the guiding questions and any notes listed on the tool were analyzed using the qualitative analysis.

Transcriptions from the audiotaped discussions as well as the interviews of the teachers were included in the qualitative data. Notes from the discussion session also were analyzed using qualitative means. These qualitative data were analyzed using grounded theory research, specifically the constant comparative procedure. This qualitative research analysis required the researcher to gather data, sort it into categories,

collect additional information, and compare the new information with merging categories. This method was espoused by Glaser and Strauss (1967). The method continually compared concepts with each other looking for emerging patterns and themes.

Limitations

Due to the fact that all participants were from the same area (the central Florida area), caution should be used when generalizing the results of this study. Results may not be able generalizable to other settings with different constitutions.

The instrumentation used to evaluate the quality of co-teaching by the participants is a relatively new tool. The tool has been found reliable and valid by outside sources. Other teachers and school districts also have used the tool. This tool a one-page document yields limited details. The researcher provided guiding questions to encourage more dialogue between the two teachers (see Appendix B for guided questions).

As with any study, teacher effects are a limitation. Since participants were selected on a voluntary basis, the researcher was not able to control for teacher experience or demographics. Unfortunately, these aspects were considered, but were not regulated.

Observer effects were a limitation. The researcher's biases involved subjectivity. Interrater reliability helped combat this limitation. History and maturation were a limitation. Mortality was an issue until the conclusion of the study. Spurious conclusion, claiming a conclusion as being attributed to an incorrect intervention, was also a possibility. Construct effects were a limitation because what teachers label as "co-teaching" varies widely.

In qualitative research, the researcher is perceived as the instrument of the study (Rossman &Rallis, 2003). The researcher followed the established purpose of the study and stayed true to purpose of research while staying objective. Interrater reliability also aided in the coding of video, ensuring compliance to the study procedures.

Quantitative procedures allowed for further analysis of data from each of the four settings. The data gathered were triangulated to answer the research questions and to contribute further information on co-teaching and mathematics in middle school classrooms.

CHAPTER FOUR: RESULTS

The primary purpose of this work is to contribute to the field the current status of co-teaching in middle school mathematics classrooms. The chapter provides the overall results of the study reminding the reader of the overall problem and purpose of the research. The researcher then presents the design, questions, data collection procedures, and data analysis. The findings from each instrument are synthesized followed by a discussion of each research question and how the data were triangulated to answer each research question.

Statement of the Problem

An educator is required to be certified in all academic areas in which that teacher is solely responsible for instruction. Special educators typically are not certified in content areas. General educators are not typically certified in special education. By teaching together, students with disabilities are provided with a highly qualified educational environment, which includes a content area specialist and a special educator. However, teaching together in and of itself does not imply co-teaching (Cook & Friend, 1995). The intended purpose of the study was to promote reflection on co-teaching by encouraging teams to discuss video reviews of their current practices during weekly planning periods.

Purpose of the Study

The study explored the co-teaching practices within middle school mathematics classrooms and the practice of using video to discuss and encourage self-reflection and co-reflection to influence co-teaching practices.

Research Design

The study employed a mixed methods approach. Qualitative measures were collected throughout the study from evaluations, observations, and interviews of the study participants. Quantitative measures were collected through pre and post self-report assessments of teachers' co-teaching practices.

Research Questions

Question one: Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool?

Question two: Does using video to discuss a co-teaching team's practice during planning time in a middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class?

Data Collection Procedures

Participating teachers were required to attend a meeting to explain the study and procedures, as well as to address any questions or clarify any issues. The teams were provided with a brief professional development on co-teaching at this time. During this meeting teachers were required to sign IRB approval forms and fill out an evaluation of their current teaching practices.

The teachers were then required to video record their classes once a week and designate a time to evaluate their practices as a team. The co-teaching teams audio-recorded these evaluation sessions. A member of the RT collected these evaluations along with the videotapes each week. Evaluation scores and video and audio recordings were assessed on an ongoing basis by the RT. At the conclusion of the study, teachers

were required to attend a final meeting. Each meeting was conducted individually. During this meeting teachers were interviewed and instructed to fill out another evaluation of their teaching practices, using the Co-ACT. All interviews were audio recorded.

Data Analysis

All interviews and team discussion sessions were transcribed on an ongoing basis. The transcriptions became qualitative data for analyses. The videotaped classes were coded using the TROS. This instrument utilizes time sampling, which yielded quantitative data for analysis. The evaluations teachers used to discuss their own co-taught instructional practices were analyzed as quantitative data. Qualitative data were analyzed using the constant comparative method (Glaser & Strauss, 1967). Quantitative data were analyzed using SPSS.

Independent Variable

The independent variable for the study was co-teaching.

Dependent Variable

The dependent variable was using video recording to encourage discussion on co-teaching practices. The study evaluated if discussing video taped teaching encouraged discussion and effected co-teaching practices.

Instrumentation

Over the course of the study, several instruments were utilized. The make up of the instrumentation included three major tools, as well as a researcher developed demographic sheet and a researcher developed list of questions (see Appendix B for guiding questions and Appendix C for interview questions). The instruments included the

Colorado Assessment of Co-teaching (Co-ACT), Evaluating Learning Environments in Co-teaching Checklist (ELEC), and Teacher Roles Observation Schedule (TROS).

Data Analysis

The researcher attempted to ask two overarching questions. Question one: Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool? Question two: Does using video to discuss a co-teaching team's practice during planning time in a middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class? The researcher hypothesized by instructing teachers to watch video of their practices, the co-teaching teams would truly reflect on their co-teaching practices and lead to increased scores on the Co-ACT as well as a difference in classroom interactions.

Colorado Assessment of Co-Teaching Results

Teams' Co-ACT scores did change over the course of the nine-week study. No individual participants' scores remained constant. Two of the teams' scores increased, one team's scores decreased, while the final team's scores were mixed. The Co-ACT was treated as a pre and post self-assessment of co-teaching conducted by the participants. The pre-assessments were collected at the meeting held the week before the beginning of the official study. Once collected the scores were entered into SPSS. These scores were saved and set-aside until the end of the study. At that time, the post-assessment scores were entered into SPSS. Descriptive statistics were obtained first, to get a general idea of where scores were at the beginning of the study and where the scores were at the end of

the study. Pre and Post Assessment Scores for the participants are listed in the table below (see Table 7).

Table 7: Co-ACT Pre and Post Scores

Participant	Co-ACT (Pre)	Co-ACT (Post)	Increase/Decrease
T1G	79	124	+49
T1S	163	174	+11
T2G	141	150	+9
T2S	169	153	-16
T3G	181	172	-9
T3S	185	168	-17
T4G	124	130	+6
T4S	61	136	+75

Key: T1=Team 1, T2-Team 2, T3=Team 3, T4=Team 4, S=special educator, G=general educator

The Co-ACT scores for both members of T1 went up. The general educator's scores went up more than the special educators', but both teachers' scores increased. Team 2's scores were mixed. The general educator's score of T2 went up; however his special education counterpart's scores declined. Team 3's scores went down. Both T3G and T3S declined in scores. The scores of both teachers in T4 increased over the course of the study. The special educator's scores increased the most in relation to the other participants in the study. The scores indicated mixed results from video discussions as measured by the Co-ACT.

Teachers Roles Observation Schedule

Since the analysis of the Co-ACT produced mixed outcomes, the researcher did a further analysis comparing the Co-ACT findings to that of the TROS. The TROS is a time sampling instrument used to code the classroom practices of the co-teachers within their co-taught classroom. The TROS was used to code data from the videotapes of each team over the 9 weeks. The RT coded each video weekly. The codes were entered into SPSS and checked for reliable data entry by an inter-rater for 25% of the videos. The analyses of the TROS data included a descriptive statistics test. Appendix I gives a detailed account of the observations from the TROS over the nine-week study. The summary of interactions from all teams can be found in Table 8.

Table 8: Total TROS Scores From Study

	Week									
	1	2	3	4	5	6	7	8	9	Total
Total Interactions-T1	67	83	112	88	73	107	116	104	82	824
Total Interactions-T2	103	80	112	89	64	66	67	76	25	682
Total Interactions-T3	109	69	68	66	100	73	88	84	76	721
Total Interactions-T4	75	53	83	103	71	73	92	76	77	703

Table 8 details the number of interactions the team exhibited during the nine-week study. Looking at the table, T1 exhibited the most interactions of all the participating teams. Team 3 exhibited the second highest number of interactions while T2 exhibited the least amount of interactions of any team per the TROS.

Over the course of the study, T1 predominately used instructional interactions with students within their co-taught classroom as opposed to the other interactions from the TROS. This level of instructional interactions indicated that the team spent most interactions directly instructing students. However the setting of these interactions were predominately towards the whole class, as opposed to the other settings from the TROS such as teacher's desk, student's desk, small group, traveling or other. The high level of interactions towards the whole class indicated a lack of one on one instruction within this category as might occur when providing individualized instruction to students with disabilities. The primary purpose for most interactions within the co-taught classroom appeared to focus on content. The focus on content indicated the team spent a majority of interactions instructing the students with a focus on the content of the lesson. The interactions were predominately that of explaining instruction to students. Explaining indicated that the team spent a majority of interactions talking to or with students. Summing up the interactions, the team spent a majority of interactions instructing the students, explaining and focusing on the content in front of the whole class. Team 1 exhibited the most interactions. Team 1's Co-ACT scores increased over the course of the study. This finding leads towards an indication that video did enhance this team's co-teaching practices but not to the level of highly individualized instruction or a clearly defined role for the special education teacher related to students with disabilities.

Over the course of the study, T2 predominately used instructional interactions within their co-taught classroom. The setting of interactions predominately took place towards the whole class. The primary purpose for most interactions within the co-taught classroom appeared to focus on content. The nature of interactions was predominately

explaining. In week 9, T2's level of interaction decreased to a low level due to group work between students requiring little teacher-student interaction. In summary the team spent a majority of interactions explaining and instructing focusing on the content addressing the whole class. Team 2 actually exhibited the lowest number of interactions. Team 2 also demonstrated a mixed result measured by the Co-ACT. The special educator's score decreased, while her general education counterpart's score increased. Whether or not the team found the video discussions helpful in their co-teaching practices is difficult to determine. Since the Co-ACT only provides the teacher's perception of their current practice and this team's perceptions were mixed, the remainder of the data from the study were reviewed to help determine whether the team found the video discussion helpful in enhancing their co-teaching practices.

Over the course of the study, T3 predominately used instructional interactions within their co-taught classroom. The setting of interactions predominately took place in front of the whole class much like T1. The primary purpose for most interactions within the co-taught classroom appeared to focus on content. The interactions were predominately focused on the area of commenting. In summary the team spent a majority of interactions commenting, instructing students in front of the classroom while focusing on mathematics content. Team 3 exhibited the second most interactions on the TROS. Team 3's Co-ACT scores, however, decreased. Whether or not the team found the video discussion helpful in enhancing their co-teaching practices is difficult to determine from these findings at this time. The data from the Co-ACT alone indicated that this team's practice was not enhanced by the use of discussions of video. However, the overall number of interactions by this team was high indicating both teachers were emerging as

an integral part of the classroom structure. The remainder of the data from the study were used to determine whether the use of discussion of video was helpful in terms of enhancing this team's co-teaching practices.

Team 4 predominately used instructional interactions within their co-taught classroom. The setting for interactions was predominately traveling. Traveling indicated the team spent the majority of interactions moving around the classroom, either from student desk to student desk or from the front of the classroom to other locations within the room. The primary purpose for most interactions within the co-taught classroom appeared to be responding to a student's signal. Responding to a student's signal indicated that the team spent the majority of interactions acknowledging students raising their hands or indicating the need for assistance. The nature of interactions was predominately listening, which means the team spent a majority of interactions listening to students or other adults. In summary, the majority of the interactions for this team was spent traveling around the classroom, listening and responding to student signals. Team 4 exhibited the second lowest number of interactions on the TROS. Team 4's Co-ACT scores did, however, increase. Whether the team found the video helpful in enhancing their co-teaching practices is difficult to determine. Since the Co-ACT is a self-report self perception tool, the increase in scores indicated their perception of their practice had increased and this team did appear to emerge as a team who provided more individualized instruction than the other co-taught teams.

To ensure reliability of scoring, inter-rater reliability for the TROS was established by having another researcher code 25% of the data and comparing the independent coding to the primary researcher. The RT randomly selected 25% of the data

collected for interrater reliability. In total 9 tapes were selected for review which was 25% of the total collected tapes (36). Table 9 shows the videos watched and the reliability established. Inter-rater reliability for the entire study was established at 87%, exceeding the target of 80%.

Table 9: Interrater Reliability for TROS

	Reliability
Week 1, Team 2	80%
Week 2, Team 2	91%
Week 2, Team 4	89%
Week 3, Team 1	85%
Week 4, Team 3	88%
Week 5, Team 1	84%
Week 7, Team 1	85%
Week 7, Team 2	98%
Week 7, Team 4	87%

Evaluating Learning Environments in Co-teaching Checklist and Reflections

The findings from the ELEC were analyzed and then compared to the Co-ACT and TROS. The ELEC was an instrument used solely by participants in the study. The information contained with the ELEC yields quantitative as well as qualitative data. The quantitative data included counting whether items related to co-planning, co-teaching, and co-assessing were effective, evident, or not observed from watching five minutes of

their co-taught classroom. Each team indicated on the ELEC if these items were observed.

Team 1 found the following were the most effective in their observations: evidence of data collection, evidence of technology, and evidence of varying assessments. The following items were consistently evident throughout the study: lessons provided differentiated instructional strategies and grouping. The most common items not observed were developing lesson plans that demonstrated both teachers having input and being actively engaged with all students. Table 10 below provides more data collected from the teams' weekly co-reflections. The table provides data from the teams' observations of co-planning (P), co-instructing (I), and co-assessing (A). These interactions were reported from the nine week study period. Team 1 observed aspects of co-planning, co-instructing, and co-assessing in 8 of the 9 weeks. Team 1 also exhibited the most interactions as measured by the TROS and both teachers' Co-ACT scores increased over the nine-week period. Data from the increase of scores from the Co-ACT and the consistency of the TROS indicated that T1's co-teaching practices were enhanced using the video to discuss their co-teaching practices.

Table 10: ELEC

	Week 1			Week 2			Week 3			Week 4			Week 5			Week 6			Week 7			Week 8			Week 9		
	P	I	A	P	I	A	P	I	A	P	I	A	P	I	A	P	I	A	P	I	A	P	I	A	P	I	A
T1	0	5	1	2	6	2	1	6	3	1	3	3	1	4	3	1	4	1	1	5	3	1	4	2	1	6	3
T2	1	6	0	2	5	2	2	6	0	2	5	1	2	3	3	2	4	2	2	5	2	2	6	1	2	4	3
T3	1	4	0	1	4	0	1	5	0	2	4	0	1	3	0	1	3	0	1	4	0	1	2	0	2	3	0
T4	0	0	0	0	1	0	2	0	0	0	1	0	0	1	0	0	0	0	0	2	0	0	1	0	0	0	0

Key: T1=Team 1, T2=Team 2, T3=Team 3, T4=Team 4, P=Co-planning, I=Co-instruction, A=Co-assessment

Team 2 found the following areas to be the most effective in their observations: materials (adapted) ready prior to the lesson, two or more professionals working together, and evidence of data collection. The following items were consistently evident throughout the study: lesson plans demonstrating both teachers having input, lessons providing differentiated instructional strategies, and student work reflecting what was taught. The most common items not observed were individual grading, criteria for grading, and a variety of grading options. See Table 10 for data collected from the teams' co-reflections on the ELEC. Team 2 observed aspects of co-planning, co-instructing, and co-assessment in 7 of the 9 weeks. Team 2 also exhibited the least amount of interactions as measured by the TROS. Team 2's Co-ACT scores were mixed over the nine week period. The quantitative data do not specifically indicate that T2's co-teaching practices were enhanced using the video to discuss their co-teaching practices.

Team 3 found the following areas to be the most effective in their observations: materials were ready prior to lesson, two or more professionals working together, and evidence of data collection. The most common item not observed for T3 was grouping. See table 10 with additional data collected from the teams' co-reflections.

The ELEC also yielded qualitative data in the form of notes. Not all groups left comments or made notes on the ELEC, as a matter of fact only one team left regular notes. Another team left notes on one occasion. These notes were analyzed with the co-reflections. Team 3 was the only team who left comments regularly and typically these notes related to the topic of the lesson. Examples of comments made were as follows:

"Both teachers participated with discussing requirements for FCAT projects. Students were given laptops."

"Today we shared teaching-[T3G] passed out homework and graded reports while [T3S] went over homework problems with the students."

"During the time period the gen ed teacher is teaching slope while ESE teacher is working with individual students."

Team 3 observed aspects of co-planning and co-instructing in 9 of the 9 weeks. The team never discussed aspects of co-assessment. Team 3 exhibited the second highest number of interactions as measured by the TROS and both teachers' Co-ACT scores decreased over the nine-week period. Data indicated T3's co-teaching practices were not enhanced using the video to discuss their co-teaching practices. The researcher considered the absence of co-assessing after the research protocol was designed to encourage collaborative assessment, ELEC and professional development provided. Since this team did not respond to these prompts over the 9 weeks an indication s that this team's co-teaching practices were not enhanced especially in the are of co-assessing. Team 4 found the following items to be the most effective in their observations: evidence of data collection. The following items were consistently evident for this team throughout the study: two or more professionals working together and student work reflecting what was taught. Team 4 found the following areas were not observed at one point in time or another during their observations: lesson plans, adapted materials, differentiated instruction, grouping, assessing, alternative assignments, and individual grading. Team 4 did not regularly observe any aspects of co-planning, co-instructing, or co-assessing. Co-planning was observed in 1 of the 9 weeks. Co-instruction was observed in 5 of the 9 weeks. Co-assessment was never observed. Co-planning and co-instruction were never observed at the same time and 3 of the 9 weeks none of these aspects of co-teaching were

observed. Team 4 exhibited the second lowest number of interactions as measured by the TROS and both teachers' Co-ACT scores increased over the nine week period. Data indicate T4's co-teaching practices were not enhanced using the video to discuss their co-teaching practices. The researcher considered the absence of co-assessing throughout the study after the study encouraged the practice of collaborative assessment as an indication that the team's co-teaching practices were not enhanced, especially in that targeted area. However, the teachers perceived an increase in implementation as demonstrated by the increase in Co-ACT scores over the course of the study. These teachers may have had false images of their currents practices based upon their reflections as noted in a past study on individual teacher reflection (Dieker & Monda-Amaya, 1995). See Table 10 for additional data collected from the teams' co-reflections.

Research Question One

The quantitative data gathered was used to answer each of the research questions. The first research question asked: Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool? This question can be answered by looking at all the data produced from the research study. The first data analyzed was from the Co-ACT (see Table 7). The Co-ACT scores triangulated with data from the TROS and ELEC on planning and discussion provided insight into differences amongst each team.

The Co-ACT is the instrument named specifically in the question. The analysis indicated that the scores on the Co-ACT were initially high, however three of the teachers' scores did decline from the pre to the post test. The group for which scores

declined included two special educators and one mathematics teacher, two of which were from the same co-teaching pair (T3). These scores declined by 9 points and 17 points. For the other five co-teachers, the Co-ACT scores increased 6 and 75 points. The overall consensus is the teachers' perception of their co-teaching implementation did increase, yet those teachers whose scores decreased leave room for further investigation.

The data from the TROS showed consistency throughout the study. This consistency indicated that teachers' behaviors did not change over the nine-week period from using the video to reflect on co-teaching practices. The researcher, however, noted that the TROS only reflects actions recorded on the video, which was said by at least one teacher to be somewhat restricted.

The quantitative data from the ELEC indicated teachers were discussing their co-teaching practices, especially in terms of co-planning, co-instruction, and co-assessing. Some teams provided evidence of observation. Some teams also were able to observe more of the items than other teams (i.e. some teams discussed more on assessment than others). The ELEC did provide evidence of discussion.

The qualitative data from the discussion notes and transcripts combined with the data from the interviews indicated teachers were discussing content and the needs of their students-with and without disabilities. The qualitative data also indicated that some teachers were using their discussion to alter the instruction within the classroom. Only one teacher indicated this was not the case. The transcripts indicated teachers were talking about accommodations as well.

When looking at the data specifically by teams, T1 increased in their Co-ACT scores. Team 1's TROS was consistent over the study, unlike the other teams, but was the

only team always had all three areas (co-planning, co-instruction, and co-assessment) present with the exception of the first week. The team's increase in score was not surprising considering the discussions this team participated in during their reflective sessions. Team 1 spent more time reflecting than the other groups. The discussions of the team also included detailed conversations about the classroom set up, classroom protocol, and personal issues. This team did provide evidence of reflecting. During the interviews, the special educator and general educator both indicated that the reflections helped in sharing roles within the classroom. Due to the reflections, the special educator began taking over the grading for the class. Team 1 appeared to have a strong vested interest in the study based on comments from the interview and wanted to make changes in their co-instruction.

Team 2 was split. The general educator increased his Co-ACT score, while the special educator's Co-ACT score decreased. Team 2's TROS was consistent over the study, as with the other teams. Team 2's ELEC and discussions were very limited. The general educator dominated the discussions. The special educator did contribute, but often with comments that were agreeing in nature and quite often consisted of "Um-hm" and "Yeah." During the interview, the general educator expressed sentiments of learning from the process and feeling the communication between he and his co-teacher had increased. The special educator indicated frustration with not be involved in the classroom and not feeling as involved as she would like to be. This disparity between comments could be a possible explanation for the difference in Co-ACT scores.

Team 3's Co-ACT scores decreased. The general educator's score decreased by 9 points, while the special educator's score decreased by 17 points. Team 3's TROS was

consistent throughout the study. Team 3's ELEC and discussions were limited. The discussion was dominated by the general educator with the special educator making comments that were sometimes inaudible. The general educator and special educator appeared to have a great working relationship when the researcher met with them to discuss the study. The teachers also worked well together on tape. The interactions appeared smooth and natural even though the special educator assumed more of a supportive role when observed in the video clips. Both teachers mentioned the study was beneficial and helped the two as a team grow and learn more about the service delivery model. The general educator mentioned during his interview that he was being more reflective in terms of the co-taught class and the students he and his co-teacher were serving. Both teachers' scores went down, however, the researcher ponders if this is due to more discussion in retrospect than provided at the beginning of the study and their realization of what should be occurring related to parity in co-teaching.

The scores of both teachers in T4 increased. The general educator's scores increased by 6 points, while the special educator's scores increased by 75 points. Team 4's TROS was consistent throughout the study. Team 4's ELEC and discussions were very limited. The discussion was dominated by the general educator. Team 4 participated in the shortest discussions of the study. Often times the discussions lasted maybe two minutes with limited issues discussed. The team discussed co-planning, co-instructing, and co-assessing; however, the discussions were limited. For example when discussing co-assessment, the general educator commented that "we don't do that." This team also provided interesting comments during the interview. The general educator regretted that the study did not pressure the team to plan more or to discuss more of their class specific

issues. The special educator emphasized that she wanted to be more involved in the classroom. The special educator's scores appeared to have increased substantially; however the special educator did not answer many of the questions during the pre-assessment for a couple of reasons. First, she did not feel she could answer some of the questions. The other questions she did not answer because she missed them on the pre-assessment (Co-ACT). During the post-assessment, the researcher emphasized the importance of completing the Co-ACT and asked the teacher to complete questions that had been left blank hence increasing the score.

The research findings across data research instruments indicated that the video discussion of a co-taught team's practice during planning time does enhance the level of co-teaching implementation in relation to the Co-ACT of two teams, decreased scores of one team and had mixed results for T2. Overall, the statements related to the use of video discussion were positive but with mixed results. Further investigation is needed.

Research Question Two

The second research question: Does using video to discuss a co-teaching team's practice during planning time in a middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class? This question was answered by looking at all of the data produced by the research study. The data from the ELEC and discussion notes were triangulated with the TROS, and the interviews to answer this question.

The quantitative data from the ELEC indicated teachers were discussing co-planning, co-instructing, and co-assessing. Discussions indicated co-teachers were discussing the three components of a co-taught classroom. The discussion sessions were

many times monopolized by the general educator, in one team there was parity within the conversations. This team, T1, spent more time discussing classroom and personal issues than the other teams. The special educator was not more involved in the instruction; however, there was parity within their discussions about the class. The other teams also did not demonstrate an increased role of the special educator over the nine-week study period.

The TROS did not demonstrate that the special educator was more involved in the classroom. The coding of the videos demonstrated a consistency of behaviors of the co-teachers. Unfortunately, the TROS did not allow for the special educators' roles to be separated from the general educators' roles. The researcher noted that within her field notes that the special educator never led a lesson and typically was seen in a supportive role when seen in clips.

The qualitative data from the discussion notes and transcripts combined with the data from the interviews indicated that special educators were involved with discussion of classroom instruction. One team was more involved, at least from the data gathered in this study, than the others in terms of more parity in the conversation and classroom planning. The other three teams discussed the evaluation process and occasionally the guiding questions, but did not have in-depth conversations like T1.

The interview revealed conversations had to be going on in regards to the classroom outside the recorded discussion. Some of the information provided in the interviews were not reflected in the transcripts of the reflective sessions. Many of the reflective sessions were general educator heavy and the special educator did not talk

much; however, during the interview the teachers discussed how communication was opening up in terms of the classroom, students, and instruction.

When looking at the data specifically by teams, T1's TROS were consistent over the study. The special educator's role was more of a supportive role throughout the study and the special educator was never seen in a leading role. Team 1's ELEC and discussion did indicate the teachers were both reflecting on the classroom and working together to improve instruction for all students in the classroom. When interviewed, both teachers mentioned the special educator taking over the grading responsibilities after beginning the reflective process. The teachers indicated the study helped open the communication between the two with regards to the class and the instruction of all the students. Based on these findings, this team had increased their practice; however, the increase in practice appears to be more of an opening up of communication and co-planning and co-assessing than focusing on co-instruction.

Team 2's TROS was consistent over the study. The special educator's role was more of a supportive role throughout the study and the special educator was never seen in a leading role. Team 2's ELEC and discussions were limited. The team did discuss co-planning, co-instructing, and co-assessing within their discussion. The interviews of the teachers indicated communication was beginning to open up between the two teachers. The general educator mentioned towards the end of the study he was beginning to feel he and the co-teacher were both being utilized within the classroom as opposed to earlier in the school year when the special educator served more as crowd control. Even though the special educator's role in instruction or use of strategies within the classroom did not

increase, the relationship between the two co-teachers was developing and hopefully moving through the phases many relationships, including co-teaching, progress.

Team 3's TROS also was consistent as with other teams. The special educator was never seen in a leading role. Team 3's ELEC and discussions were limited. The general educator and the special educator did discuss instruction and students. The special educator's comments were sometimes inaudible, but it was evident that she was very much involved with the students as well as her co-teacher and his instruction. The two teachers had a great working relationship which was evidenced by their tone and comments during reported discussions. The two teachers often dialogued back and forth and joked with each other together on tape as well as when the researcher met with the team on different occasions (i.e. professional development, equipment drop off). The special educator was very knowledgeable of the service delivery model. The general educator appeared to learn the most from the experience. Both teachers commented during their interviews that they were happy to have participated and found the experience beneficial. The general educator did mention an increased use of guided response; however, the special educator did not increase her role in instruction or use of strategy instruction within the co-taught classroom.

Team 4's TROS was consistent over the study, as with other teams. The special educator's role was more of a supportive role throughout the study and the special educator was never seen in a leading role. Team 4's ELEC and reflective sessions were very limited. The general educator did mention during the interview that the special educator did introduce some strategies into the class that were helpful; however, this was evidenced within the TROS or within the video clips.

The research indicated using video discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class did not enhance the role of and the use of strategies by the special educator in the mathematics class. This finding conflicts with the initial hypothesis that using discussion of video of co-teaching teams practice during planning time would enhance the role of and the use of strategies by the special educator in the mathematics class.

Qualitative Themes

Analysis of qualitative data was compared to the quantitative data to make final conclusions. The qualitative data came from the audio taped reflections from the teams as well as individual interviews from the participants. These audiotapes were transcribed and analyzed at the conclusion of the study. From the qualitative data many themes emerged. The research study focused on four major themes: growth of teams, role of special educator, relationship of teachers and student achievement and interactions. Provided is a discussion of each of these themes across the four teams. In addition a summary of the team's use of these areas are provided with unique examples from specific teams.

Growth of team

Growth of team indicated how the teams changed and developed as a co-teaching pair. Teams appeared to grow through increased communication. Sharing roles attributed to the growth as a team. Communication included discussion about the co-taught class, the students they served, as well as the content/lessons within the classroom. In addition to shared roles and communication, collaboration, mutual trust and respect, as well as understanding co-teaching all aided in the growth of teams.

Shared Roles. During interviews the researcher asked teachers to share their thoughts on co-teaching. The researcher noted that this question caused many teachers to pause and some appeared to choose their words carefully. The teachers appeared to be trying not to talk specifically about their current co-teacher, but to include those issues in a careful manner. One teacher, a general educator from T2, expressed that he didn't think co-teaching was as effective if one teacher was serving as crowd control; later, he expressed how his co-teacher served as crowd control during the beginning of the school year. Another teacher, the special educator from T2, noted co-teaching was good as long as the teachers worked well together and had a common goal. The data from the question indicated teachers felt as a team each teacher should have a role. The teachers also indicated that teacher personalities and dispositions can play a role in the growth of the team.

Communication. A separate question during the interview asked what the teachers liked most about the process, and many of the teachers indicated the discussion. The general educator from T3 said the discussion helped them realize what, "We needed to do better and what we are doing well together and what you can work on next time." The mathematics teacher from T2 noted that discussion is important and the process helped he and his co-teacher realize he was reflecting more than he realized. The general educator from T4 liked that he and his co-teacher were forced to find time to talk about the class. The special educator from T4 liked that she could see herself and how she interacts with the students.

Another special educator, from T1, really liked that they were discussing the students. She really enjoyed, "Sitting down and talking about our students and what

works and who's having difficulty and how can we make it easier." She also mentioned she enjoyed talking about the lessons and lessons learned by the teachers themselves.

When asked what was the most helpful part of the research study, the answers again varied. One teacher, the general educator from T3, reemphasized the discussion sessions, "actually sitting down and trying to find out what was beneficial for the students…" The mathematics teacher from T2 stated he "learned more about co-teaching." He also stated he "became more comfortable talking to [the co-teacher]." He also found he was focusing more on the students "and less on my timeline or chapter."

The mathematics teacher from T4 expressed, "We were happy to do it." Surprisingly the teacher expressed he wished he "would have liked more pressure…forcing us to plan more and try to focus on our needy students…something to make us plan a little bit harder for our needy students." He was disappointed that the study did not open the lines of communication more between he and his co-teacher. He wanted to talk more about specific issues that pertained to their students. The special educator from T4 indicated, "I am not as involved as I would like to be." She felt that would be more helpful to her and to all the students in the classroom. For T4, the communication lines needed to be opened more than the study encouraged, which may have lead to their lack of growth as a team.

Collaboration. Teams discussed the increased collaboration that came with the process of watching the video of their class in order to discuss co-teaching practices. The special educator from T1 noted she found the collaboration that came with the process as

most helpful. She found her team was “able to analyze what we were doing.” This collaborative analysis aided in their growth as a team.

The general education teacher from T2 expressed, “We’re so busy with the things we have to do and this made us sit down every week…..We saw how it helped, so maybe we’ll try to do that again next year…We both felt better after the class if we felt we were both utilized well.” He stated he could see a difference in the way he and his co-teacher were working together and hoped the two would have the opportunity to work together next year. In general, teachers found communicating with each other about their class and their students aided in their growth as a team.

The general educator from T2 expressed that watching the recording and reflecting was sometimes frustrating. He indicated that he and his co-teacher would watch the video clip and ask what would they do better the next time. They would become frustrated because the discussion would lead to “well we tried this last time, that didn’t work, we tried this time and that wasn’t any better. That was frustrating.” This data indicated that the teachers were attempting to change their practice and were probably moving towards growth through this frustrating process.

Mutual trust and respect. Another team indicated mutual trust and respect assisted their growth as a team. The special educator from T1 reflected upon her co-teacher. She specified, “This teacher really has a wonderful teaching approach…she makes it easy to understand.” She did not feel there was a lot of room to re-emphasize “because she really covers it so well. Sometimes I think if we had two people sharing the stage I’m not sure if that would help as much as it might confuse. In effort not to confuse them I have them

focus directly on what's going on." The general educator expressed positive thoughts about the special educator as well. She appreciated the collaboration between the two for grading and addressing the needs of all the students in the class. This demonstrated a mutual trust and respect between the teachers. Other special educators in this study also indicated their respect for their general education counterpart and their command of the content.

Understanding co-teaching. The teachers were asked to provide any additional comments about their co-taught classroom or the study at the conclusion of the interview. Many teachers wanted to share their thoughts. The mathematics teacher from T3 commented that he was happy to participate. He expressed that this was the first opportunity to sit down and "get some understanding of what co-teaching is." He admitted some of the material presented in the professional development at the beginning of the study was new to him. Much of this was material he "had not seen before, never learned it in a workshop…. [I] never understood the dynamics of co-teaching….what the purpose was.' He expressed that the study helped him understand what "needs to be done better for next year as far as sitting down and planning more together." He stated the study was an "eye opener for me." This data indicated at least that the general educator from this team grew, which in turn probably aided in the growth of the two as a team. With the Co-ACT scores of both the teachers in this team, T3, decreasing, the teachers were probably transitioning into growing as a team. Growth of a team is unique to each team. One team, T1, appeared to experience more growth than the others; however, other teams did increase their communication and were growing together at varying rates.

Overall the growth of teams was indicated through shared roles, communication, collaboration, understanding co-teaching, and mutual trust and respect. One team provided evidence of all five sub themes, collectively these sub themes supported the evidence that teams were growing as in their collaborative practices.

Role of special educator

Role of the special educator indicated what responsibilities and tasks the special educator assumed or participated in within the study. During two different reflection sessions the special educators (T1 and T2) discussed calculators. In one of the discussions, the special educator in T2 mentioned to her co-teacher that when he turned down the lights to show examples on the overhead, the students could not use their calculators. The calculators were powered by the light provided in the classroom.

Team 1 discussed calculators as well. In this team the special educator suggested to the mathematics teacher that the way the calculators were handed out was disrupting the flow of the classroom. The general educator agreed and said in her other classes she had a set routine where she allowed students to pick up their calculators while she was checking homework. In the co-taught classroom the special educator checked the homework and the mathematics teacher began going over the answers. The mathematics teacher would not remember to tell the students to get their calculators until they were needed. They agreed that the special educator would instruct the students to get the calculators upon entering the classroom. The only other issue left that was discussed was the special educator did not know when the calculators were needed. The general educator agreed she would try to remember to tell the special educator when to pass out the calculators.

The use of student practice also was mentioned. The special educator within T1 discussed the importance of practice in every reflection. She either commented on the use of practice or suggested the use of more practice. Another special educator from T2, suggested the class begin with one practice problem and that the two teachers circulate the room to check the answer. The special educator thought this routine would ensure students were understanding at the beginning of the class or during guided practice, as opposed to collecting work at the end of the class period and realizing a student completed all the problems incorrectly.

Some accommodations have been documented within the research literature as helpful to students with disabilities; however, many of these accommodations have proven to be successful with all students. One such accommodations is the use cooperative learning. All teams implemented cooperative learning. One team in particular, T3, allowed students to pair up to complete work in 7 out of 9 recordings. During one of T3's reflections, the general educator discussed his concern that each student was really working when assigned to a group. The team discussed the importance of each student having a role during the group work. Team 4 only mentioned the use of cooperative learning once. Even though the implementation of specific accommodations is usually seen as the role for the special education, in these teams this role was shared by both teachers.

Other accommodations that were identified within the discussions, included using visuals, reference sheets, repetition, brainstorming and oral assessments. One team, T1, discussed using the accommodations with any student who would benefit, not just the students with disabilities. For example, the class included a student who was receiving

speech services. The special educator was not familiar with her, but the general educator thought she would benefit from having the tests read aloud to her. They agreed and permitted her this accommodation. Again, this demonstrates how a role typically assumed by the special educator is shared between the co-teachers.

Overall, the role of the special educator was indicated through discussions of accommodations such as the use of calculators, cooperative groups, as well as reference sheets, repetition, and reading assessments aloud. The introduction and use of accommodations were not restricted to just the role of the special educator indicating the sharing of this role on occasion.

Relationship of teachers

Dynamics. The mathematics teacher from T4 expressed that, “Sometimes there’s just a chemistry there and the teachers get along, everything works great. He also expressed when it’s not working so well, “it could be better.” The special educator from T1 expressed the model presents problems, especially when the special educator does not have expertise in the subject area. She emphasized when the special educator did not have that expertise the students were at a disadvantage. She also expressed her situation where her background was language arts and not mathematics, which she felt placed her at a disadvantage in her co-teaching situation. She expressed the perfect situation was when the special educator has experience with the content area in which the special educator is co-teaching.

The special educator from T4 expressed that the co-teaching takes some planning. She stated co-teaching can be “great if both can get together and work on the same

page…and know what's going on with the students…if two people click it would be great and the students would pick up on that vibe." The special educator appeared to communicate the importance of both teachers working towards the same goal. She also re-emphasized the importance of chemistry of the team here.

Reflecting on practice. The general educator from T2 reflected quite a bit on this question. He mentioned it was hard at the beginning of the year because the situation was new to both teachers (i.e. the students, each other). He felt both teachers should go into the year planning to change. The mathematics teacher stated the two should have a good working relationship and have some time to plan, "if not given the chance to plan co-teaching ends up becoming just another adult in the room…not that that's a bad thing…., but that's not the point." He noted that special educators are "more capable than parent volunteers…using the teacher as crowd control is a disservice to everyone." He emphasized "co-teaching isn't something you're taught" and that the "ESE teacher has to be willing to teach the teacher."

The researcher also asked whether the reflective process has affected their co-teaching practices. Most of the teachers agreed the discussion did help. The special education teacher from T1 said the discussion "didn't really make a difference either way. Nothing really changed as far as how the class is taught." The general education teacher from T4 noted the discussion "didn't really force us to communicate about planning… about the things we do in the classroom….it didn't force us really to get into the needy issues that needed to be talked about." His co-teacher (special educator of T4) noted, she thought it helped, "You notice your mannerisms….what kinds of body language you're using….you can see how the students feed into that." One of the

mathematics teachers commented that the discussions helped by showing "what could have been done differently [by either teacher]." The mathematics teacher from T2 mentioned he saw some things and that the discussions helped.

Involvement in instruction/planning. Another question from the interview asked the teachers if the they were altering their instruction or using any learning strategies as a result of the discussion. The general educator from T3 stated, "yes", even though most of the discussions were more "hindsight." He said he would be able to use the discussions when he was teaching the same material the following year. He also stated his team was using more grouping, small groups, and more time on guided response. Another mathematics teacher, from T2, mentioned the study helped his team reflect and to decide to try different things. The mathematics teacher from T4 mentioned the discussion didn't really "force us to try more learning strategies," but he also later mentioned that his co-teacher "has come up with some things that really worked really well." He also emphasized that, "watching the tape didn't really help as much as having time to sit down and talk…..[the study] forced us to use some of our planning time to sit down and talk a little bit about the class."

The special educator from T1 expressed her frustration with her situation.

> *If I were a math teacher, it would have helped with developing more types of strategies…..students needed a slower pace…..everything is taught exactly the way it is taught in every other class….we're constantly struggling with that. I'd rather slow it down so they understand perfectly than to keep pace with everyone else [order of instruction]. That's been our struggle all year. We're not doing repetition, we're not doing practice because we want to keep the pace.*

The relationship of the teachers in some of the teams were dynamic, reflective, and purposeful related to instruction and planning. Teams appeared to realize the dynamics that existed within their relationships and how it impacted their co-teaching partnerships. The teachers also acknowledged that the aspect of reflecting on their class and their involvement in instruction, planning, and assessment (or lack thereof) impacted the co-teaching relationship as well.

Student achievement and interactions

Student achievement and interactions is defined by teachers' knowledge and engagement with student achievement as well as their interactions with students and the students' interactions with the content, the environment, as well as each other. Topics that emerged under this theme included: students with disabilities being included, communication, student interactions, student achievement, and student behavior.

Including students with disabilities. During the interview the researcher asked the teachers what their thoughts were on inclusion. All the teachers were positive, focusing on the students. The teachers thought students with learning disabilities should be included within the general education setting. General educators from T2 and T3 noted inclusion allowed all students to receive the same instruction. The general educators also emphasized the importance of students with disabilities still receiving needed accommodations and interventions. The general educator from T4 noted students with disabilities should be included when they can be, "but sometimes there's just too much for one or even two teachers to handle." The special educators agreed with the statements on inclusion as well; however, one special educator noted it was only a good idea when proportions were right. A very insightful comment since the percentage of students with

disabilities in the co-taught classes as at approximately 50% and that overall the average class performance we made up of lower level preformers, based on quarter benchmark assessment, than in a mainstreamed environment. This teacher obviously realized the challenges presented by a skewed environment that included to many low achieving students or students with disabilities than would be recommended for a more effective co-taught environment.

Communication. The special educator from T1 really liked that the study made the team discuss their students. She really enjoyed "sitting down and talking about our students and what works and who's having difficulty and how can we make it easier." She also mentioned she enjoyed talking about the lessons and lessons learned by the teachers themselves. An example she shared was when the teachers discussed how to test over the chapter. The teachers agreed that the test would cover the entire chapter as opposed to testing over sections of the chapter as the teachers had previously done during the school year. When the students did not do well on the test, the co-teachers agreed next time to test a portion of the chapter at a time and considered the experience a lesson learned. This data demonstrated again that communication played a role.

In light of communication most of the groups discussed content at one point or another. All the teams were from the same district, and this district has a county-wide order of instruction, so many times the content being covered across teams was similar. Often the discussion of content included a theme of how difficult the concepts being presented were for all students.

A common topic discussed by teachers included permutations. The data suggested many students, students with and without disabilities, struggled with the topic of

permutations. Other topics discussed by the teachers over the course of the study included volume, circumference, radius, diameter, probability, and combinations.

Co-teachers discussed the use of vocabulary and terminology within the content regularly. Team 1 discussed the use of the term number cube. The special educator mentioned that the students understood better when the general educator used the term die or dice, instead of number cube. Team 1 also discussed the term permutation. The special educator mentioned the term is foreign to the students. She mentioned students were more familiar with combination and even probability, but permutation was more difficult. She mentioned maybe stressing the mutation part of the term and emphasizing that mutation means change. Noting that although problems were observed, limited changes in the individualized instructional practices for students with disabilities were discussed.

Student interactions. Student interactions were often noted as well, interactions with the content, each other, and the teachers. All the groups discussed student interactions, student focus and attention at one point or another during the co-reflections. For T1, T2 and T3 these reflections were detected in every reflection. For T4 reflections on students were less frequent. Co-teachers noted whether students were paying attention and if they appeared focused on the lesson. Many times after identifying students who were or were not paying attention a discussion of the student within the class in terms of grades and assignments followed with limited discussion.

T1, T2, and T3 discussed seating arrangements. From the discussions at least three of the teams had seating charts. Team 1 discussed more than once moving students' seats around on a regular basis. Students who were not as attentive were repositioned

closer to the front of the room. Team 3 discussed separating problem students. This issue was discussed on only one occasion.

Team 1 discussed on three occasions the activity level of their students. This team commented the class appeared more active in the video than their perception. T1, T 3 and T4 commented that their classes appeared to chat more on camera than they perceived and that the class' noise levels appeared higher on the video. The video appeared to amplify these issues in the teams' discussions. T1, T3 and T4 commented on this issue only once, but overall no differentiation occurred.

Student achievement. The teachers would regularly identify any specific issues of individual students during reflections. All the teams discussed student issues during every reflection in some form. Often this discussion was of students who were struggling with the content. The co-teachers would discuss which students were not getting the concepts. The general educator from T1 expressed her concern with students who appeared to understand the content, but struggled on assessments. She noticed how students would answer questions during class discussions, but would fail the tests. One student was doing so poorly that when the general educator found out the student had not scored a level one (the lowest possible score on the state assessment) on the FCAT the co-teachers were both shocked. The co-teacher, realizing the lower level at which the student performed, decided to allow the student to have her tests read aloud. The teachers did not indicate whether this was an accommodation that was previously noted on the student's IEP. Here is a rare example of instruction changing based upon an individual student's needs.

Other student issues were discussed. Team 1 discussed one student completing that night's homework during class time. The student was not paying attention to the

lesson and was completing the homework incorrectly. Another issue discussed by the same team included a student who entered the class upset. The student was allowed to take a time out. The teachers allowed him to go and get a drink of water, calm down, and to see another person on campus (the teachers did not specify if this was another teacher, a guidance counselor or an administrator). There were a few times that the researcher observed these type of individualized behavioral or instructional needs being addressed.

Student behavior. Most of the teams discussed student behavior. These discussions included students who were not permitted to be together and students who had missed class due to suspensions. Team 3 discussed students that needed to be separated. The teachers discussed how the separation of the students was a concern that had been shared by a family member as well. This reflection between teachers demonstrated that T3 also communicated with family of the students.

Social skills were not a common topic; however, T2 did discuss social skills. The team was pleased with the way students were working with their peers. The special educator noted that students were working well together and no one was getting mad at the other during turn taking, or sharing materials.

Team 1 compared their co-taught class with the general educator's other classes. The special educator asked on two different occasions how did student interactions of this class compare to other classes. The general educator responded that the co-taught class did not ask as many questions as the other classrooms. The students in the co-taught class did not respond to posed questions either. The co-taught classroom did not appear to ask for clarification or explanation, even when the general educator could sense further explanation was needed. This observation led her to spend more time on reviewing the

homework from the previous night to increase students' questioning. Overall the discussion behavior was limited, but some evidence of modifying classroom instruction for individual behavioral needs was observed.

In summary, teams in this category felt they improved their students' achievement and level of interactions by the including students with disabilities, communicating with each other and monitoring/discussing student behavior. Teacher interactions with students were a theme seen throughout the study with teacher beliefs and dispositions being detectable through this data. Yet the individualization of instruction was not observed on a regular basis.

Qualities of a team that is moving towards true co-teaching

Even though true co-teaching was not observed in any team, T1 did demonstrate characteristics and growth that indicated the team was moving closer to that of a true co-teaching team, including demonstrating that the team moving towards truly reflecting on their practice. This team exhibited behaviors indicative of co-planning, co-instructing, as well as co-assessing-three aspects that are imperative to an effective co-teaching team.

Co-planning. The special educator from T1 offered numerous comments. She expressed that she and her co-teacher felt, "This is an area that needs this kind of research." She discussed how she and her co-teacher tried to find ideas at the beginning of the year but they could not find anything on mathematics and students with learning disabilities in the research literature. This area has been an interest for her and her co-teacher and she stated, "We didn't think twice about participating." This data indicated the team's vested interest in the research and their commitment to students and instruction before the commencing or knowledge of this study.

Team 1 provided more reflective statements than any other team and provided more back and forth conversation. The two teachers talked more about what bothered them. For example, after the teachers were surprised by how active and chatty their class appeared on video the special educator admitted that this bothered her. She preferred a calmer environment; however, she also noted that this did not bother the general educator. The general educator admitted that the activity level did not bother her. The general educator emphasized that this was her personality, and she did not want to be a drill sergeant with the students. The co-teachers agreed this was the nature of the class. On another occasion the general educator expressed her frustration of students not following directions. The general educator admitted maybe she did not communicate with them well that day, but discussed that she was frustrated nonetheless.

The general educator and the special educator also discussed their frustrations with trying to balance student understanding and the Order of Instruction. The general educator expressed her frustration with wishing she could spend more time practicing, as the special educator stressed, but also trying to keep up with the Order of Instruction mandated by the district and making sure concepts were covered before the state assessment. The general educator also was frustrated because the school schedule had gone from a block schedule to a more traditional school schedule. When the school was on a block schedule, she was able to do more activities including the use of manipulatives which she did not feel she had the time to do in a traditional 45 minute class period.

This team also used brainstorming within their discussions. For example, on one occasion the general educator was trying to figure out how to divide the curriculum for the next test. The general educator was concerned with the confidence level of the class.

The class had been doing well, but difficult material was fast approaching. The two teachers discussed how the content could be broken up to ensure success for all students.

The two co-teachers also discussed content and special education. During the first discussion, the general educator was going through the ELEC. When the conversation reached the topic of differentiated instruction, the general educator was not certain about this practice in her classroom. She expressed that she predominately used direct instruction, so she did not think she was differentiating. The special educator shared with her what differentiating instruction was and how indeed she did differentiate her instruction within the context of direct instruction. The general educator then realized that she was differentiating without even knowing it.

The two teachers discussed accommodations on a ongoing basis. The general educator wove the accommodations into her everyday instruction and these accommodations were generally offered to all students. For example, visuals were used daily within her instruction. She intentionally repeated difficult terms and concepts and would continually ask questions to gauge student understanding. She would explain concepts in different ways and allowed students to share their ideas with each other. She also provided students with guided notes.

On one occasion the general educator had a question about modifying instruction. The special educator indicated that their particular school did not modify within the co-taught classroom. She specified that accommodations were permitted and constantly woven into their lessons by both teachers. At their school, students were only permitted to receive accommodations within the general education setting. Modifications were not

permitted because the state assessment, that all students were required to take, would not be modified.

On another occasion the special educator and general educator were discussing the difficulty some students were having with radius and diameter. The special educator wanted to make a copy of the reference sheet provided by the state assessment for practice. This reference sheet also was provided during the assessment. The reference sheet was primarily blank. The special educator wanted to have the students draw reference lines on the circle to indicate the radius and diameter. The general educator was adamant about not doing so. She said this would not be permitted for the assessment. The two came to an agreement that the special educator could make a copy of the sheet for the students to use in class and as a reference for homework, but this sheet would not be used for the state assessment.

Co-instructing. The team addressed co-instruction; however, it was on more of a limited basis than that of co-planning. On one occasion the special educator and the general educator discussed the format of the class. During one reflection the special educator expressed her concern with spending the beginning of class going over every question from the previous night's homework. The general educator expressed a few reasons for this concern. First, she felt she had more time for reviewing homework in this class as opposed to her other classes because she did not have to check homework in this class since the special educator did that tasks. While the special educator checked off the homework, the general educator felt she could take that time to go over every question. The general educator expressed that in her other classes she only asked her students what questions the students had about the homework. In her other classes she always had 3 or

4 questions about the homework. In this co-taught class students did not usually respond to questions asked. The general educator was concerned if she only asked students for questions about the homework that she would not get any students to respond. In her other classes she only reviewed homework problems students had questions about; however, she was concerned in this class students would be too shy or embarrassed to admit they had questions. In order to ensure students' questions were answered she opted to review all the homework problems. The special educator noted that many of the students either did not have out their homework while this process was going on or if they had their homework, the students promptly put it away once the special educator checked off that the student's assignment. The special educator expressed her desire for the general educator to spend more time practicing and reviewing the current day's material instead.

The special educator also was very flexible. She often offered to use her planning time to pull students out of non-content area classes to provide one-on-one instruction to students who were struggling in the co-taught mathematics classroom. This team was the only one that discussed this type of model during the reflective sessions. This model could be considered alternative teaching and demonstrates the special educator's involvement in instruction in terms of reinforcement for students who were struggling with the content.

Co-assessing. The general educator asked the special educator for input on test development. The general educator was concerned with the confidence level of the students and wanted to keep the confidence level high. The general educator wanted to know whether to give the students a test over the entire chapter or part of the chapter as

had been done for most of the school year. The teachers noted that the students were doing well on the subject matter within the chapter to this point. Both teachers knew the end of the chapter would be harder for the students. The teachers agreed to test the entire chapter. In a later reflection the two agreed they should have kept with the testing on part of the chapter after the test scores were not as high as expected.

The two co-teachers often discussed grading. Over the course of the study the special educator began taking over the grading responsibilities within the class. In a few of the reflections the teachers discussed grades of quizzes and homework completion. On one occasion the special educator discussed how she graded students with disabilities on a different scale. For instance, the special educator discussed one student who completed 15 problems on an assignment, so she graded the assignment on a scale of 15 as opposed to assigned 20 problems. The general educator was agreeable with this accommodation and mentioned the grading was like grading on a curve and how she had used curves in the past. She discussed how she would curve grades by separating the students with disabilities from the students without disabilities and provided each group its own separate curve.

Team 1 was the only participating team who provided data to support their discussion of assessment and grading. The team participated in co-assessment on an on-going basis. This team is one that showed individualized concerns for each student by supporting the individual needs of students related to their IEP goals and objectives. This collaboration on grading attributed to their qualities of a team moving towards that of a true co-teaching pair. This team shows great promise of growing into a model team. The one issue remains is that the mathematics instruction as more direct in nature. If this

team could be further supported to move into an inquiry-based model then the flexibility in this model might allow the special educator to move forward even faster in enriching and further defining her role in the co-taught environment.

Conclusion

Data from the Co-ACT overall demonstrated that the teachers' perceptions of their co-teaching practices were mixed in their evaluation of their co-teaching implementation from the video discussion. Data from the TROS were consistent over the course of the study for all four teams. The finding implied that the special educator was not as involved in the instruction or use of strategies within the classroom as the general educator. This finding leads to further discussion of the role of the special educator in co-taught mathematics settings.

Data gathered from the ELEC were consistent for all teams throughout the study. One team, T1, did reflect for longer periods of time and addressed more issues within their discussions while the other teams were not as detailed in their discussions. The ELEC and discussions indicated that co-teachers were discussing co-planning, co-instructing, and co-assessing although limited changes were observed in co-instruction.

In summary, the data analysis yielded the following general findings. The Co-ACT revealed perception of implementation went up for two teams, mixed for one team, and went down for another. The TROS yielded interactions and discussions which were consistent across teams. These findings lead to several discussion points as well as potential generalizability and limitations.

The research study did not find true co-teaching to investigate, T1 provides further insight into this practice in middle school mathematics classrooms. The study

results are similar to that seen within the current research literature. Of the four teams studied one team demonstrated behaviors that were closer to characteristics of a true co-teaching team based on the Cook and Friend (1995) definition and characteristics of effective middle and high school teams (Dieker, 2001). The research found promising findings, but more investigation is needed.

Chapter 5 provides insight into the co-teaching relationships and how these findings reflect the current literature as well as future directions and research needed in middle school co-taught mathematics classrooms. However, if only one of the teams observed in this study is moving in the direction of developing a strong co-taught relationship, then students with disabilities will continue to fail in advanced mathematics. All teams need to look at the three components of co-teaching; co-planning, co-instructing and co-assessing and perhaps adding an additional area for reflection being that of individualization -- in behavior and instruction. When teams have all four components at the core of their co-teaching then the role of the special educator and what is "special about special education" will be embraced in middle school co-taught mathematics classrooms.

CHAPTER FIVE: DISCUSSION

Statement of the Problem

The current study explored if co-teachers were encouraged to reflect on their own teaching practices through video and whether their discussions influenced co-teaching practices.

Purpose of the Study

The purpose of this study was to contribute to the research regarding co-teaching, focusing on secondary mathematics classrooms. The study explored the co-teaching practices within middle school mathematics classrooms and the practice of review of video and discussion thereafter encourages self-reflection and co-reflection that impacts co-teaching practices.

Research Design

The study employed a mixed methods approach. Qualitative measures were collected throughout the study from evaluations, observations, and interviews of the study participants. Quantitative measures were collected through pre and post assessments (Co-ACT).

Three research questions were investigated. The first question explored teacher perception of their co-teaching practice over the study using the Co-ACT. The second questions investigated whether the role of the special educator within the co-taught mathematics classroom changed. The dependent variable of the study was co-teaching. The independent variable was video review to encourage reflection.

Instrumentation included the use of the Colorado Assessment of Co-Teaching (Co-ACT), Evaluating Learning Environments in Co-teaching Environments Checklist (ELEC), and the Teacher Roles Observation Schedule (TROS). In addition, a researcher developed demographics sheet, guiding questions for discussion, and interview questions were utilized.

Data collection took place over a nine week period. A preliminary meeting was held to orientate the participants followed by nine weeks of engaging in video recording and discussion of the co-taught mathematics classrooms. At the of the study a concluding interview was conducted. All data were gathered on an ongoing basis by the RT.

Data were analyzed on an ongoing basis. Quantitative data was entered into SPSS. Qualitative data were analyzed using the constant comparative method. Through this methods themes emerged from the discussions as well as the interviews.

Results

In summary, the data analysis yielded findings that are consistent with the research literature. First, no teams were found to be truly co-teaching as defined by Cook and Friend (1995). Of the data gathered from the participating teams, findings were mixed. The Co-ACT revealed perception of implementation was mixed. Two teams' scores increased, one team's scores decreased while a final team's scores were mixed. The TROS yielded interactions were consistent. The ELEC exposed teachers discussed co-planning, co-instruction, and co-assessment. The qualitative data indicate teachers are discussing students, content, and accommodations.

Research question one yielded a mixed answer. The video review of a co-teaching team's practice during planning time in a co-taught middle school mathematics class

enhanced the level of co-teaching implementation in relation to the Co-ACT for two teams. One team's implementation was not enhanced and the other team had mixed results. Research question two indicated using video review of a co-teaching team's practice to encourage discussion during planning time in a co-taught middle school mathematics class did not enhance the role of and the use of strategies by the special educator in the co-taught middle school mathematics class.

Analysis of the Co-ACT data was mixed. Five teachers' scores increased from the pre-assessment to the post-assessment. An interesting finding was a decrease in one team's scores. Both the general educator and the special educator in the co-teaching team scored lower on the post assessment than on the pre assessment. The researcher speculates if this was a true decline. When teachers completed the Co-ACT teachers were in a room together in close proximity and this may have influenced the scores. Also, the pre-assessment was filled out in with more of a time constraint that the post assessment. The post assessment was filled out after the teachers interviews which were conducted separately-at separate times and in separate locations. The research speculates if the teachers took more time to really evaluate and reflect on the questions during the post assessment. However, the researcher ponders if this was the case whether all teachers scores should have shown a decrease. The researcher also speculates whether this decrease in score indicates a move from an orientation phase to more of a storming phase.

As indicated in Table 7, T4S scores on the Co-ACT greatly increased on the post-assessment. This change may have been because the teacher did not answer many of the questions for the pre-assessment. She did not feel she could answer many of the questions, so she left them blank initially.

Surprisingly from the qualitative analysis one teacher, the general educator from T4, wished the study had placed more pressure on him and his co-teacher. He wanted to be forced to communicate with his co-teacher. The impression given was that the co-teachers did not work well together. The other co-teachers discussed being able to talk more with their co-teacher and felt pressure to keep up with the schedule. That did not seem to be the case for T4. The teachers did not discuss much in their conversations either. Their discussions were typically one page in length. As opposed to one team, T1, whose transcriptions were typically three to four pages in length.

Application to Practice

This study focused on teachers discussion their practice to encourage co-reflection of co-teaching. Regardless of the teacher's role, teachers should reflect upon what is happening within the classroom and as a result their responses, individually and as a team, should impact their practice. By encouraging teachers to watch their practice via video, co-teachers were shown their current practices and were given a chance to reflect on needed changes. Through these discussions the researcher hypothesized that the teachers would identify their strengths and weakness within a co-taught mathematics environment.

The participating teams were highly qualified teachers. Adminstration at the participating schools instituted these collaborations in effort to honor the spirit of NCLB requiring access to the general education curriculum and IDEA's requirement of the least restrictive environment. This commitment was shown in all participating teams. All teachers were certified in their perspective fields and students were provided a highly qualified environment by having the two teachers in their class.

Looking back at the literature discussed in chapter two, similarities were found in this study and those seen in previously reported meta-analyses. Weiss and Brigham (2000) identified as one of their conclusions that the instructional behaviors of the special educator were often subsidiary to the general educator. The special educators did not exhibit instructional behaviors other than that of supporting the general educator throughout the study. The special educators often drifted from one side of the room to the other checking student work as they moved throughout the classroom. Some special education teachers appeared more involved than others in the instruction. There also were times when the special educator was not present at all in the video clips. Indications of the special educators instructional role came from discussions and interviews, which were subjective due to their qualitative nature. This study demonstrates a need for clearer role clarification of the special educator. For example, the special educator in T1 discussed her literacy background. This expertise could have been used to aid in the mathematics classroom to help with strategies to use when reading the text. This class also used literature within the curriculum. The special educator could take a lead in this arena as well.

Murawski and Swanson (2001) pointed out the mixed findings of past co-teaching studies. This study also presents mixed results. The researcher theorized different teams were more energized about the process than others and those teams benefited more from the discussions and began to co-reflect. This subjective analysis parallels findings in other studies. The researcher believes the role of both teachers is instruction. The instruction does not have to be similar, each teacher has their expertise that should be utilized. The mathematics teacher would focus on the mathematics content, while the

special educator could focus on strategy instruction. The research believes teacher's attitudes and dispositions play into the relationship and chemistry between teachers and is beneficial in aiding in comfort levels needed to aid in effective instruction. The teachers who appeared more "comfortable" with each other appeared so due to documented higher levels of discussion and interaction between the two teachers.

Weiss (2004) commented that little research was available on what was happening instructionally in the classroom as well as with student outcomes. These types of findings were nonexistent in mathematics classrooms in the reviewed literature. This study did detail interactions of co-teachers in middle school mathematics classrooms using the TROS. The study adds to the research needed on the topic of co-teaching implementation in mathematics. For example, the role of special educator should be strategy instruction as well as interjecting as appropriate to aid in keeping student's attention and focus thereby allowing breaks in the curriculum to allow students to chunk and experience material more effectively. The general educator's role is that of the main instructor, but that of an instructor who is willing to relinquish some of the control of the classroom to aid in effective instruction of all the students. The researcher also believes teachers should feel confident stepping into each other's shoes from time to time permitting the special educator to lead a lesson on occasion and the general educator engaging in strategy instruction and use as well.

Zigmond & Magiera (2001) in a practice alert sponsored by the Divisions of Learning Disabilities and Research of the Council for Exceptional Children commented on the difficulty of researching co-teaching due to several factors which are difficult to control. One of these factors was the ability to randomly assign teachers or to use

matched samples. This was true for the current study. Teachers volunteered for the research.

Scruggs and colleagues (2007) found co-teaching was perceived as beneficial by teachers. During the interviews in this study, every teacher agreed that co-teaching was beneficial for all students; however, the mathematics teachers were more apt to list qualifiers for the inclusion (i.e. “when they can be included,” “sometimes it is too much for even two teachers”). Scruggs and colleagues (2007) also mentioned that a number of conditions were needed for the service delivery’s success, including sufficient planning time and compatibility of co-teaching. The teachers also commented on this during their interviews. The teachers agreed that planning time made the difference, but this valuable time was hard to come by. The teachers also mentioned how having chemistry or having shared philosophies with a colleague can make a difference. Another finding from Scruggs and colleagues was the dominance of one lead, one support structure of co-teaching. This held true for the study. No other structure was observed during the study. Just as true co-teaching was not observed in the research by Scruggs and colleagues (2007), same held true for this study. Even though teachers were working together in the same classroom, the true co-teaching definition as defined by Cook and Friend (1995) was not observed. To move teachers to this level the field of mathematics and special education should become more acquainted and involved with each other. Mathematics teachers should be introduced to special education and special educators in the teacher preparation programs. The mathematics teacher ultimately will work with a special educator in their career, exposing preservice teachers to this relationship should aid in easing this relationship when it occurs in the classroom. Special educators must become

less apprehensive about content. Special educators do not need to become content specialists; however, special education teachers must feel confident enough in their mathematics content knowledge to answer questions posed by students and lead a class discussion on concepts without trepidation.

Question one asked: Does using video to encourage discussion of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of implementation as measured by the Co-ACT, a self-report perception tool? The data from the study yielded mixed results. The teachers solely used one lead and one support during throughout the study. This is indicative of research in the field as mentioned above. The importance of co-teaching in middle school mathematics is indicated in the research. In light of the challenges faced by all students, not to mention students with learning disabilities, mathematics presents particular challenges. Secondary students with LD have challenges in acquiring mathematics concepts; however, these challenges can be over come through effective instruction (Maccini & Gagnon, 2000; Miles & Forcht, 1995). In order to do this both preservice mathematics and special education teachers must be exposed to these strategies that aid in successful mathematical concept attainment and understanding. The field must continue to investigate special education and mathematics and aggressively disseminate successful strategies to pre-service and in-service teachers alike.

Question two asked: Does using video to discuss a co-teaching team’s practice during planning time in a middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class? The data from this study indicates, no, the classroom role of the special educator was not enhanced. The

teams did not demonstrate the use of reflection on action (Schön, 1983), for the most part. One team appeared more reflective than the others. Teachers did watch the video snippets from their own class, evaluating their own co-teaching practices. Teachers commented on these discussions with each other and recorded these discussions for researcher analysis. This discussion was also recorded using the ELEC. Discussion from the study did indicate professional growth for some of the teachers. Similar to Manouchehri (2001) findings, the teachers were engaged in collaborative investigation of their co-teaching practices. Teachers did discuss making changes in their instruction, if not currently, then in the following school year when that particular topic instructed.

Upon observation in this study, the special educator was not more involved in the instruction and strategy use within the classroom. This aspect has been expressed as a concern, especially when asked the question, "What is 'special' about special education?" The intensity of instruction and individualization of instruction are considered the foundation of special education (Dunn, 1996; Fuchs & Fuchs, 1995; Mastropieri, et. Al, 2005). Even though quality mathematics instruction was observed in the co-taught classroom, the intensity and individualization described above was not observed in the current study. The field of special education needs to embrace a stronger role in mathematics. Again, special educators do not need to become mathematicians; however, teachers cannot be afraid to contribute to the class discussion or answer student questions. Special educators cannot continue to refer all the mathematics questions to the mathematics teacher; otherwise the special educator will continue to be perceived as more of an assistant than an instructional equal. This finding means special and general educators need to learn more about mathematics strategies, learning the language of both

fields, and having the confidence to make equal contributions in the mathematics classroom.

A pressing concern from this current study is the absence of true co-teaching. When administrators see examples of co-teaching such as observed in this study and seen in the existing research literature they may rightfully question why should the resources of a special educator be directed in such a manner when that of a paraprofessional could suffice. When the special educator's skills and abilities are not used to the fullest extent, there is not a reason to use resources in such a manner. However, with strong preparation of both teachers to work together there are classrooms in which students with disabilities are thriving. These settings are not lopsided in the number of students who are low achievers but are heterogeneous in nature as are the teachers in their approach. Both respecting the strengths each teacher brings to the environment and ensuring the individual needs of students with disabilities are met. Simply stated special educators must step up and teach in all environments, not necessarily the content, but ensuring students with disabilities are receiving the individualized and intense instruction mandated by their Individualized Education Program which is the cornerstone of special education. Administrators should be able to observe, comprehend, and value the contribution of the special educator in a co-taught setting and not have to ponder for a second whether a paraprofessional should be taking the place of the special educator.

No team in this study at this point truly exemplified all aspects of co-teaching; co-planning, co-instructing and co-assessing. All of the teams made efforts and demonstrated interest in doing so; however, co-teaching as defined by Cook and Friend (1995) was not observed. In light of that one team was more reflective and was showing

evidence of growth as a team to become more of a true co-taught pair in middle school mathematics. This team shared grading. Both teachers knew the achievement levels of all students within the co-taught class. The teachers discussed students outside the area of achievement including student behavior, attention, and focus within the class leading to greater equality and yet differentiation in the roles of each teacher in the classroom. The team discussed the content and the curriculum. The teachers communicated at length about their class and discussed students, content, and logistics (i.e tests, chapters, procedures for the class)-precisely what is described in the literature as the components of effective development in a co-taught relationship.

Implications

The data provides insight into what is currently the status in middle school co-taught mathematics classrooms. One teacher indicated she and her co-teacher intentionally did not change much of what they were doing because they wanted the researchers "to see what is real." None of the teams demonstrated true co-teaching as defined by Cook and Friend (1995), but one team definitely showed a stronger differentiation of roles and practices. The special educators on all teams appeared to take more of a subordinate role. This lack of presence of the special educator was seen in the video clips used for coding using the TROS as well as in the discussion sessions and the interviews. Never once did the special educator lead instruction in the co-taught classroom including providing students with individualized instruction or reminders of learning strategies. Special educators, if seen in the specified video clips, were floating or on the perimeter of the classroom. This finding is similar to the current research literature on co-teaching. Hence, the question still remains as to the role of the special educator in

co-taught middle school mathematics classrooms. The researcher also ponders if the true definition is being expressed and demonstrated to teachers in their preservice and inservice preparation and if the field of special education is adequately preparing special educators to be an equal or deliver instruction in middle school mathematics classrooms. If so, then maybe the next step is to find successful co-taught teams in middle mathematics that articulates both strong inquiry-based mathematics instruction and a role of the special educator enhancing instruction while individualizing as needed for students with disabilities. Studying successful teams could help in revising or reaffirming the Cook and Friend definition and further informing the field of unique aspects of practices in specific content areas.

The mathematics teachers within the study were highly qualified teachers. One of the special educators even touted the expertise of her general education counterpart. The researcher does not doubt quality mathematics instruction was delivered; however, practices emphasized within the field were not observed. First, NCTM has begun emphasizing the Focal Points and the importance of focusing on fewer concepts, but providing more in-depth experiences with these concepts. The teachers in this study were teaching in a school district with an Order of Instruction which did not reflect these new ideas in the field. Adhering to these revised focal points could have allowed for the general educators to spend more time on practice and review and a clearer role for the special educator to teach these concepts in depth to the students with disabilities.

Another aspect of effective mathematical instruction that was not observed is the use of inquiry within the mathematics classroom (Manouchehri, 2004). Researchers in the field of mathematics emphasize the importance of developing a community of

learners and using the language of mathematics to aid in the development of a strong mathematical foundation. Inquiry based classroom encourages students to discuss mathematics and talk through mathematics problems aiding in a comprehension and understanding of the mathematics concepts. Using inquiry aids in increasing interactions with the mathematics classroom and permits more hands-on, minds-on manipulation of the content, which is being encouraged by both fields. Co-teaching is a prefect framework to aid in inquiry based learning in the mathematics classroom. With two teachers in the room, there is increased possibility of interactions, more opportunities for hands-on, minds-on classroom in which all students can benefit. This researcher would suggest mathematics teachers listen to the call from their field (Manouchehri, 2004) and institute more inquiry-based learning. Mathematics teachers can learn how to use inquiry and how to utilize their special education counterpart to the fullest extent within this framework. Special educators can prepare for this role by learning the language of mathematics and becoming confident in their skills and abilities within an inquiry-based classroom.

Teachers did appear to have increased communication during the study. One general educator indicated during his interview that the process made communicating with his co-teacher easier. Discussions demonstrated teachers discussing content-related topics as well as students. Logistics were also discussed within conversations. One team even discussed more personal items such as things that bothered them within the co-taught class. As seen in the co-teaching literature, relationships did appear to play a part in the co-teaching pairs.

The study results indicated special educators were not involved in the instruction of the co-taught classroom. Video clips did not demonstrate special educators providing instruction of the content or learning strategies. Special educators even mentioned they were somewhat apprehensive about getting involved in the instruction. One special educator (T1S) admitted during her interview that mathematics is not her expertise. Another special educator was in her first year of teaching (T4S). Teachers may have felt intimidated or apprehensive about jumping into the instruction. One general educator (T2G) mentioned during his interview that he and his co-teacher were beginning to discuss what more she could do in the classroom that would be helpful to the students. Another special educator (T4S) indicated in her interview she wanted to be more involved in the instruction, but this desire did not appear have been communicated to her co-teacher.

The results also revealed teachers were not using mathematics specific learning strategies. Teachers mentioned using accommodations such as practice and review. Two teachers mentioned using guided response and another teacher used guided notes. However, the only mathematics specific accommodation mentioned was the use of calculators and no one mentioned any mathematical learning strategies. This lack of strategy instruction may be due to the limited research on students with Learning Disabilities (LD) and mathematics.

Overall the most common item not observed within the co-taught team recordings and discussions was the important issue of grading and assessment. The ELEC required teachers to reflect on grading and assessment each discussion session. Only one team really discussed protocol or procedures for grading. This team decided to involve the

special educator in grading for the entire class. This shared grading was only seen in the one team, T1. The topic of grading is another theme that should be discussed within professional development of co-taught teams. The concept of grading and assessment are important issues as evidence by NCLB and IDEA and the mandate of state assessments ensuring gains of all students.

Education in general must be prepared to promote successful co-teaching in all content with specific focus by the field of special education in an area where our success has been limited, mathematics (Maccini & Hughes, 2000). Communication between the fields must be stressed, reflection promoted, instruction reevaluated, and growth encouraged and celebrated. Once teams are on the right track, importance lies in allowing the teams to continue to grow by allowing these pairs of teachers to work together year after year, highlighting their success and permitting the teams the needed resources to grow (such as time).

Limitations

In qualitative research, the researcher is perceived as the instrument of the study (Rossman & Rallis, 2003). The researcher followed the established purpose of the study and stayed true to the purpose of the research study while staying objective. Inter-rater reliability aided in the coding of video and audio recording and ensuring compliance to the study procedures.

A major limitation for the study was the lack of co-teaching. Co-teaching as defined by Cook and Friend (1995) was not observed. This is a limitation as the study focused on co-teaching. The data that was gathered pertained to teachers who were teaching heterogeneous group of students together in a single space; however, the

proportions of students were a little imbalanced and the special educator did not deliver substantive instruction.

On the topic of instruction, mathematics was considered a limitation as well. All participants instructed using direct instruction. Occasionally, teachers used cooperative groups and technology in the form of laptops. Instruction did not include emphasized practices such as the use of manipulatives (Gagnon & Maccini, 2001; Maccini & Gagnon, 2000) or inquiry learning (Manouchehri, 2004). The encouragement of the communication and understanding the language of mathematics (Ball, 1997) was not stressed either. These practices are being pushed by NCTM as well as other researchers within the mathematics education field due to their effectiveness with all students and the ability to differentiate instruction with these strategies.

One limitation is the generalizability of the results. Results may not be generalizable to settings with different constitutions from that of this research study.

The instrument, ELEC, used to evaluate the quality of co-teaching by the participants is a relatively new tool. The tool has been found reliable and valid by outside sources. Other teachers and school districts also have used the tool. This tool is a one-page document, which did not yield many details. The researcher provided guided questions in addition to this tool to ensure more dialogue between the two teachers (see Appendix B for guided questions).

As with any study teacher effects are a limitation. Since participants were selected on a voluntary basis, the researcher did not control for teacher experience or demographics. Unfortunately, these aspects were considered, but were not regulated. Interesting to note though, is that the teams were diverse across gender and ethnicities.

Teachers participating in the study varied in their teaching experience and life experience. These differences impacted the findings.

Mortality was an issue for the study. The study recruited more teachers than needed to prevent mortality, but still only four teams completed the study. Finally, construct effects is also a limitation because what teachers label as “co-teaching” varies widely.

The number of participants was a limitation for this study. The research was conducted using four co-teaching teams. The researcher would have preferred to have more participants, but the researcher was only able to successfully recruit four teams. Teams also participated on a voluntary basis. This voluntary nature may speak to the type of people participating in the study. Participating teachers wanted to participate and may have been more inclined to seek out enrichment and professional development. These teachers and teams may not be representative of all middle school mathematics co-taught teams.

Future Study

The work from this study is a springboard for many possibilities for future research. One possibility of future research could focus more on professional development for general and special educators in terms of co-teaching. General educators may benefit from preparation on the role of each teacher. All the general educators expressed at some point their inexperience with co-teaching. It would be helpful to give the general educators more information on the nature of co-teaching and what co-teaching looks like, focusing on the purposes and intentions of the service delivery model.

Special educators may benefit from more hands on type experiences in preserive and inservice mathematics preparation. Special educators in this study did not appear confident enough in their skills and abilities to share the stage with theie general education counterpart in middle school mathematics classrooms. Having the chance to get into the classroom instruction by conducting opening exercises or reviewing with students could be beneficial. Special educators could also be encouraged to interject strategy instruction and take the lead in the literacy of mathematics or other areas of strength. Yet if preparation provides limited discussion and preparation for the role of the special educator in advanced mathematics then students with disabilities will continue to fail to have access to advanced level content in this area (Maccini & Hughes, 2000).

Both teachers could benefit from combined professional development, especially focused on mathematics-specific learning strategies. Teachers used accommodations, but not any mathematics-specific learning strategies. This finding is not surprising and is aligned with the research literature on the topic (Mastropieri, et. Al.,2005). Only one research study was found which focused specifically on co-taught secondary mathematics classes (Magiera et al., 2005). This study however did not really focus on providing mathematic-specific learning strategies. Ultimately it would be useful to produce teachers who can increase student learning in mathematics.

Reevaluating the definition

Studies should evaluate what successful teams look like, especially in the field of mathematics. Studies should determine whether the definition presented by Cook and Friend (1995) still holds true or if the field should look at revising the current accepted definition of the practice. If the current definition is kept, focus should be shifted to

encouraging and ensuring adherence to the definition. The current study, as well as other studies in the research literature, have found it challenging to find true co-teaching practices especially as we move up grade levels (Scruggs, et. Al.). This concern needs further investigation. Team 1 in the current study should be studied further to determine their growth in co-teaching or lack thereof, considering this team demonstrated the most growth within this study. This team had open lines of communication and shared responsibilities and roles. Another option for future study is to find teams that have exemplified excellence in student achievement and success for co-teaching practices.

Evaluating Mathematics Instruction

Future studies should also focus on the mathematics side of the study. Finding an evaluation tool to evaluate mathematics instruction, especially in terms of inquiry instruction could be beneficial. In addition, developing a tool to evaluate effective co-taught mathematics classrooms that are inquiry-based could be beneficial to both fields.

Diversity within Co-teaching

As mentioned earlier, each participating team included a Caucasian participant and a diverse counterpart. Three of the four teams also consisted of a male-female team. Further researcher into what role diversity could have played in the team dynamics could yield interesting results. The possibilities of research in this area are numerous including whether diversity played a role in the interactions of the co-teachers with each other as well as with their students. Further research could determine whether the dynamics of the co-teaching team had any affect on the classroom environment.

Demographics provided on the student within the participating classrooms were cause for concern as well, especially when compared to their mainstream counterparts.

The co-taught classrooms used do not abide by the research suggested proportions for co-taught classrooms. The mainstream classrooms also contained only a few students with disabilities, one or two on average. Co-taught classrooms should adhere to natural proportions and should never exceed 50% of the class make up. By ignoring natural proportions and including high number of students with disabilities in addition to students considered at-risk or demonstrating specific needs, co-teaching cannot occur. These results demonstrate to administration that creating dumping grounds is not effective and in fact may be detrimental to some students.

Conclusion

In conclusion, teacher preparation must prepare all teachers for co-teaching, not just special educators. Only two of the participating special educators had any coursework on co-teaching. One received co-teaching preparation in her undergraduate work, the other in her graduate work. None of the general educators received co-teaching training in their preparation programs.

For teachers who are not being prepared, schools and districts must be prepared to provide professional development on co-teaching and mathematic specific learning strategies. Schools and districts should be cautioned about the proportion of students with disabilities and low achieving students placed within the co-taught classrooms. The dumping grounds that may be created are unfair settings for the students as well as the teachers and can have a negative effect on student achievement.

Reflecting on the spirit of IDEA and NCLB and their relationship to students with disabilities these laws were not meant to have this population exceed their general education peers, but to at least level the playing field to access and opportunity to achieve

state standards. While in this study two teams appeared to benefit from collaboration and their work did level the playing field for their students with disabilities, the need for extensive research in secondary mathematics classrooms continues to exist.

APPENDIX A:

DEMOGRAPHICS SHEET

Demographics

Name: _____

Co-teacher name: _____

Code: _____

Directions: Before completing the assessment, please provide background information by circling or listing the appropriate answer.

1. Ethnicity
    a. African-American
    b. Asian
    c. Caucasian
    d. Hispanic/Latino
    e. Native American
    f. Other: _____
2. Circle the grade level of the co-taught class that you teach.
    a. Sixth b. Seventh c. Eighth
3. Circle the position in which you are currently employed.
    a. Special Educator b. General Educator-Mathematics Educator
4. What teaching certification(s) do you hold?

_____

5. Circle the highest level of education you have achieved.

a. Bachelor's b. Masters' c. Masters'+ d. Doctorate

6. Write the number of:

   a. Total years of teaching experience _____ years

   b. Total years of co-teaching experience _____ years

   c. Years taught with this co-teacher _____ years

7. What types of co-teaching training have you received? Please circle all that apply.

   a. Undergraduate coursework

   b. Graduate coursework

   c. Student teaching internship

   d. District workshops/in-services

   e. Building-level workshops/in-services

   f. Other: _____

APPENDIX B:

GUIDED QUESTIONS

Guided Questions

1. What do you think went well in the lesson?
2. What do you think needed more attention?
3. Did all students appear engaged in the lesson? Why or why not?
4. Do you feel you were engaging in the lesson as well as attending to the students? Why or why not?
5. What learning strategies were utilized?
6. What math concepts were difficult to instruct? How could this be remedied utilizing both teachers?
7. What would you change for next time?

APPENDIX C:

INTERVIEW QUESTIONS

Interview Questions

1. What are your thoughts on inclusion?
2. What are your thoughts on co-teaching?
3. Do you think this reflective process has helped in the implementation of co-teaching practices in your class? If so, How? If not, what more could be done to aid in the implementation of your co-teaching practices?
4. Do you think you are getting more involved in the instruction of content or use of learning strategies? If so, how? If not, why not?
5. What was the most difficult about the process of using video to co-reflect?
6. What was the least difficult?
7. What did you like the most about the process?
8. What did you like the least?
9. What was the most helpful?
10. What was the least helpful?
11. Is there anything else you would like to share with me about the co-taught class and this study?

APPENDIX D:

VIDEO RECORDING PROTOCOL

Protocol for video recording:

1. Set up video camera
    a. Ensure a new tape is in the recorder
    b. Ensure correct code is written on tape (including date)
    c. Ensure camera is fully charged/plugged into a power source
2. check camera angle
    a. Check teachers are in the area being recorded
    b. Ensure students not permitted on film are not in the camera shot
    c. Ensure tripod is in a safe place
    d. Ensure tripod is stable
3. Turn on camera
    a. Ensure red light is on and camera is recording
4. Proceed with class as usual
5. Turn off camera at the conclusion of class
6. Take down camera equipment now or at your convenience

APPENDIX E:

VIDEO DISCUSSION TO ENCOURAGE REFLECTION PROTOCOL

Protocol for video watching

1. Ensure connection from video camera to television
2. Ensure camera is charged or plugged in
3. Ensure you have your recording device
4. Ensure correct code is written on tape (including date)
5. Ensure recording device is on
6. Make sure you have co-teaching evaluation (ELEC)
7. Decide what part you want to watch (as indicated by weekly prompt)
8. Watch five minutes
9. Feel free to discuss clip before, during, and after
10. Feel free to fill out the ELEC during the clip, before or after
11. At the conclusion of the discussion turn off recording device

APPENDIX F:

PROTOCOL FOR USING THE TROS

Protocol for using TROS

1. Read over the Teacher Roles Observation Schedule Technical Manual.
2. Obtain TROS instrument for observation.
3. Label instrument with team's code (see code on tape).
4. Randomly selected 10 times to observe for 30 seconds each.
5. Watch a 30 second clip.
6. Record observations from 30 second clip.
7. Repeat steps 5 and 6, nine more times.
8. Double check each column is filled in accurately.
9. Count number of times for each row in each heading.
10. Double check each row has a calculation.

APPENDIX G:

PROTOCOL FOR INTERRATER RELIABILITY FOR THE TROS

Interrater Protocol

1. Interrater was provided training on the TROS using the above protocol with an unrelated clip.
2. Interrater and researcher completed one TROS together discussing the protocol and TROS throughout to establish agreement and consistency.
3. Interrater and researcher completed a TROS separately watching the same clips without discussion.
4. Interrater and researcher compared observations, ensuring an agreement of 80% or higher of the instrument.
5. Interrater observed 25% of the recorded co-taught classes throughout the data collection to ensure reliability of the results (2-3 classes per week, based on 10 classes recorded per week).

APPENDIX H:

EVALUATING LEARNING ENVIRONMENTS IN CO-TEACHING CHECKLIST

Evaluating Learning Environment for Co-Teaching

General Ed Teacher:	Special Ed Teacher:	Grade/Subject:	School:	Date:
Attended Classrooms for Excellence ☐ Yes ☐ No	Attended Classrooms for Excellence ☐ Yes ☐ No			

Observation Time: Begin_____ End _____	# General Ed Students	# Special Ed Students

				Scale		
				Effective	Evident	Not Observed
Co-Planning	A	Lesson Plans	Lesson plans should demonstrate that both teachers have had input and will be actively engaged with all students.			
	B	Adapted Materials	Materials ready prior to lesson; may include books on tape, adapted assignments, highlighters, etc.			
Co-Instruction	C	Professionals	Two or more professionals working together in same physical space; parity between special educator and general educator			
	D	Classroom Environment	Evidence of data collection that could include behaviors, homework, tardiness, social skills, classwork, participation			
	E	Differentiated Instruction	Lessons provided differentiated instructional strategies in content, process, and/or product to a variety of individual learners			
	F	Grouping	Grouping based on interest, task, or ability			
	G	Student Work	Student work reflects what was taught; specifically what was emphasized			
	H	Materials	Evidence of manipulatives, teacher tools, technology for learning			
Co-Assessing	I	Assessing	Evidence that assessments vary in type and format; used to monitor progress, plan and implement differentiated instruction			
	J	Alternate Assignments	Copies of modified tests, examples of modifications and accommodations, IEP requirements present			
	K	Description of how students are individually graded (process v. product; weighted)	Rubric, criteria for grade, variety of grading options evident			

Comments: _____

Date_____ ☐ Discussion with Teacher ☐ Attempted to See Teacher

Date_____ ☐ Discussion with Principal ☐ Attempted to See Principal

Observer Signature: _____

Adapted/Dr. Wendy Murawski, Dr. Lisa Deiker, and Dr. Barbara Stanford, 2006
Revised October 2006

APPENDIX I:

DETAILED TROS OBSERVATIONS FROM STUDY

TROS T1

	Week									
	1	2	3	4	5	6	7	8	9	Total
Interactions										
Interaction										
No interaction		1		2			1	1	1	6
Interaction with other adults								1		1
Interaction with student/instructional	6	9	10	8	7	9	8	6	7	70
Interaction with student/managerial	4	2			4	2	3	3	3	21
Interaction with student/personal			1							1
Interaction with student/unknown			2							2
Interaction with student/unknown					2					2
Setting										
Teacher's desk	0	2	1				1	9		13
Student's desk	1			2	3		1			7
Small group	1		1							2
Whole class	8	9	9	8	9	10	9	9	8	79
Traveling	2	2	2	2	6	1	2	2	2	21

Other										
Purpose of interaction										
Focus on task's content	6	7	8	8	4	9	8	5	7	62
Focus on task's product	5	1	8	2	3	4	4	1	4	32
Focus on task's process	2	5	8	8	3	4	6	5	5	46
Communicate the task's procedures/directions	2	5	9		3		4			23
Determine the difficulty of the task								1		1
Restructure specific learning task										
Redirect student's thinking		1	3	1		3	2	1		11
Check student's work	1		1	2	1	3	5	9		22
Respond to student signal	3	2	7	4	2	6	7	8	4	43
Show interest in student work	1		1	3	2	5	8	8	3	31
Encourage students to succeed		1	1	3		4	6	1		16
Praise student performance				1		4	2			7
Correct student behavior		1								1

Nature of interaction										
Questioning	3	2	5	3		6	6	8	5	38
Explaining	9	3	8	8	7	10	8	5	7	65
Commenting	8	5	7	3	5	7	8	8	7	58
Listening	4	2	6	3		4	7	9	4	39
Cueing or prompting	1	3	5	3	1	4	6	4	3	30
Demonstrating		6	6	6	5	6	2		6	37
Modeling		6	6	6	5	6	2		6	37
Total Interactions	67	83	112	88	73	107	116	104	82	824

TROS T2

	Week									
	1	2	3	4	5	6	7	8	9	Total
Interactions										
Interaction										
No interaction					1	1	2		7	11
Interaction with other adults					2					2
Interaction with student/instructional	9	7	10	9	10	9	6	6	1	58
Interaction with student/managerial	1	4	2		2	5	2		3	19
Interaction with student/personal		1			4		1			6
Interaction with student/unknown				2			1	4	1	8
Setting										
Teacher's desk		1							4	5
Student's desk	7	4	7	3	7		2	4	1	35
Small group	1	2			8		1	4		16
Whole class	7	5	10	9	2	6	7	6	2	50
Traveling	9	4	3	2	3	3	2	3	2	31
Other		5								5

Purpose of interaction										
Focus on task's content	6	4	9	9	1	9	6	6		50
Focus on task's product			7	3	1			4		15
Focus on task's process		4	6	1	2	1	6	4		24
Communicate the task's procedures/directions	3	2	7		1	1	1		1	16
Determine the difficulty of the task										
Restructure specific learning task										
Redirect student's thinking				5		1	1			7
Check student's work	3			3					1	7
Respond to student signal	7	5	9	6		5	7	4		43
Show interest in student work	7		6	5	1		1	2		22
Encourage students to succeed			7	2				1		10
Praise student performance	2									2
Correct student behavior		1					1			2

Nature of interaction										
Questioning	5	5	5	7		5	5	5		37
Explaining	9	6	10	9	2	8	8	6	1	59
Commenting	8	7	6	7	9	5		3		45
Listening	9	7	8	7	5	6	7	9		58
Cueing or prompting	6	2			3	1		5	1	18
Demonstrating	4	4								8
Modeling										
Total Interactions	10 3	80	112	89	64	66	67	76	25	682

	Week									
	1	2	3	4	5	6	7	8	9	Total
Interactions										
Interaction										
No interaction		2	1	1		3	3	1	1	12
Interaction with other adults		1								1
Interaction with student/instructional	10	3	6	6	9	5	7	7	7	60
Interaction with student/managerial		4	3	4	4	3	1		3	22
Interaction with student/personal		1	2							3
Interaction with student/unknown						1		2		3
Setting										
Teacher's desk		6								6
Student's desk		2	1			1		1		5
Small group										
Whole class	6	2	7	6	9	4	7	8	7	56
Traveling	5	2	3	2	7	4	3	3	3	32
Other		3				1				4

Purpose of interaction										
Focus on task's content	10	3	4	4	7	5	7	6	5	51
Focus on task's product	10	3	6	4	3		3	5	3	37
Focus on task's process	10	3	4	3	1	4	2	6	3	36
Communicate the task's procedures/directions	5	3		5	2	1	1		2	19
Determine the difficulty of the task						1				
Restructure specific learning task										
Redirect student's thinking						2	1	1		4
Check student's work		5			3	2	4	3	2	19
Respond to student signal	3	5	4	5	8	4	5	6	5	45
Show interest in student work	3	5	1		7	3	6	3	3	31
Encourage students to succeed	4		1		4	2	4	1	2	18
Praise student performance	1									1
Correct student behavior										

Nature of interaction										
Questioning	9	1	5	4	10	4	3	4	5	45
Explaining	10	3	6	7	6	5	7	6	6	56
Commenting	6	7	8	8	9	5	5	5	7	60
Listening	8	2	4	5	9	3	5	4	4	44
Cueing or prompting	7	3	2	1	2	3	4	3	2	27
Demonstrating	2					4	5	4	3	18
Modeling						3	5	5	3	16
Total Interactions	109	69	68	66	100	73	88	84	76	721

TROS T4

	Week									
	1	2	3	4	5	6	7	8	9	Total
Interactions										
Interaction										
No interaction	1	1			1	1			1	5
Interaction with other adults		1	1		2		1	1	1	7
Interaction with student/instructional	5	3	7	10	6	5	4	3	5	48
Interaction with student/managerial	5		4		3	2	7	3	2	26
Interaction with student/personal			1							1
Interaction with student/unknown		8		1			8	3	5	25
Setting										
Teacher's desk										
Student's desk	2	8	6		9	4	8	7	8	52
Small group			1		6			3		10
Whole class	9	4	7	10	1	7	8	3	7	56
Traveling	7	5	8	8	8	8	7	8	7	66
Other										

Purpose of interaction										
Focus on task's content	3		4	9	3		4		3	26
Focus on task's product	2	2	1	1	3	4	3	1	2	19
Focus on task's process			4	8	3	2	3	2	2	24
Communicate the task's procedures/directions	4	2	3	5	2	2	3	2	2	25
Determine the difficulty of the task										
Restructure specific learning task										
Redirect student's thinking	1	1		4					1	7
Check student's work		6	1	2	4	4	2	1	2	22
Respond to student signal	5	2	6	8	2	3	7	5	3	41
Show interest in student work	3	6	2	8	4	4	3	5	4	39
Encourage students to succeed			2							2
Praise student performance			1							1
Correct student behavior	1						4			5

Nature of interaction										
Questioning	2		4	7	3	2	3	3	2	26
Explaining	7	3	2	9	3	2	4	3	2	35
Commenting	4	1	10	4	3	5	8	4	1	40
Listening	5		5	8	3	6	8	5	3	43
Cueing or prompting	5		3		2	6		2		18
Demonstrating	2			1		2		1	1	7
Modeling	2					2		1	1	6
Total Interactions	75	53	83	103	71	73	92	76	77	703

APPENDIX J:

DEFINITIONS OF TERMS FROM THE TROS

Definitions from TROS

Interaction: type and purpose of any exchange a teacher may have with students/other adults. Five types of interactions are specified for this instrument:

1. No interaction: teacher who is working alone or not interacting with others
2. Interaction with other adults: exchange the teacher has with another adult
3. Interaction with student(s)/Instructional: teacher-student exchange that has an instructional purpose.
4. Interaction with student(s)/Managerial: teacher-student exchange that has a managerial purpose.
5. Interaction with teacher for personal purpose: teacher-student exchange on a personal matter.

Setting: the location or setting in which the students are situated. Six types of settings are specified for this instrument:

1. Teacher's desk: teacher who is working at their desk or working space.
2. Student's desk: teacher who is working at a student's desk or working space.
3. Small group: teacher who is working at a setting where two or more students (and not the entire class) are working together.
4. Whole class: teacher who is working with the whole class of students at the same time.
5. Traveling: teacher who is working with several students at several student work areas.
6. Other: settings that cannot be recorded under the previous categories.

Purpose of Interaction: the intent of the teacher's exchange with the students. Twenty-one purposes are specified for this instrument:

1. Responding to student's signal: any verbal or non-verbal response by the teacher to a student's signal for assistance.
2. Discussing student's work-plans/progress: any interaction where the teacher assists the student with work plans or progress towards completing the plans.
3. Determining the difficulty of the task: any statement or question a teacher makes in order to determine the source of difficulty in a student's task.
4. Communicating task procedures: any statement or demonstration by the teacher to help students structure learning tasks.
5. Communicating task's criteria for success: any statement or demonstration by the teacher to help students structure learning tasks.
6. Focusing on the task's content: teacher's assisting students with the content of a specific prescriptive or non-prescriptive task
7. Restructuring specific learning tasks: teacher prescribing different materials or tasks for students or altering the length of assignments to help students master a curricular objective
8. Helping students complete work on time: teachers helping students figure out how much time they need to complete a task or assisting students win the planning process of determining how they will finish their work on time.
9. Checking student's work: teacher checking student's work in the student's presence and providing feedback to the student concerning his/her performance.

10. Encouraging self-management: any interaction between the teacher and student where the teacher positively reinforces a self-management skill.
11. Encouraging students to help each other: teachers encouraging students to assist other students with their work.
12. Encouraging students to succeed: any teacher initiated words or behaviors that communicate to the students that they are expected to succeed.
13. Encouraging extended student responses: any teacher initiated questioning techniques that encourage students to verbalize a response in more than just one or a few words.
14. Showing personal regard for student: any response that indicates the teacher's concern for students.
15. Making contact with students in exploratory activities: any response that indicates the teacher is aware of/interested in what students are doing in non-prescriptive exploratory areas.
16. Showing interest in student work: any response that indicates the teacher is interested in what the students are doing in prescriptive or non-prescriptive areas.
17. Praising student behavior: teachers commenting, approving, or praising students regarding their classroom behavior.
18. Praising student performance: teacher commending, approving, or praising students regarding their academic performance.
19. Correcting student behavior: teacher disapproving, scolding, reprimanding, or criticizing students regarding their classroom behavior.

20. Correcting student performance: teachers disapproving, scolding, reprimanding, or criticizing students regarding their academic performance.
21. Other: any category not listed above

Nature of Interaction: how the teacher interacts with the student. Seven different natures of interaction are specified in the instrument.

1. Questioning: any questioning technique used by the teacher.
2. Explaining: any information given by the teacher concerning a prescriptive or exploratory task.
3. Cueing or prompting: any hints or clues given by the teacher to assist the student towards understanding or completing a task.
4. Demonstrating: any manipulative explanations which facilitate showing the student how a similar task is to be performed.
5. Modeling: any active demonstration by the teacher which replicates the students' prescribed tasks.
6. Commenting: teacher is not interacting as in 1-5 above, but making statements (comments) to the students or another adult.
7. Listening: teacher is not interacting verbally at all but is listening to a student(s) or another adult.

Adapted from Waxman, Want, Lindvall, & Anderson, 1988

APPENDIX K:

FIDELITY CHECKLIST AND PROFESSIONAL DEVELOPMENT

Professional Development Fidelity Checklist

- ☐ What is co-teaching?:
  - ☐ Definition
  - ☐ Co-planning
  - ☐ Co-instructing
  - ☐ Co-assessing
- ☐ Components of successful co-teaching
- ☐ Co-teaching relationship
- ☐ Co-teaching structures:
  - ☐ One Lead, One Support
  - ☐ Station Teaching
  - ☐ Parallel Teaching
  - ☐

Alternative Teaching

☐ Team Teaching

☐ Co-planning

☐ Strategies to use in the co-taught classroom

☐ Evaluation

Making Co-teaching Work!

Kimberly E Bryant Davis, B.A., M.Ed.
Doctoral Candidate
University of Central Florida
kebdavis@mail.ucf.edu

What is Co-Teaching?

- Special Educator
- General Educator
- Collaboration
- Inclusion
- Success for all students
- Natural proportions

Co-teaching aspects

- Co-planning
- Co-instructing
- Co-assessing

Successful Co-Teaching Components

- Administrative support
- Co-plan
- Shared or complimentary philosophies/dispositions
- Agreed upon evaluation and assessment procedures
- Shared, equal roles
- All students belong

(Dieker, 2001)

Successful Co-Teaching Components

- Continuum of services
- Active learning
- Parents informed
- Cooperative learning
- Clear, high academic and behavioral expectations set
- Accommodations/modifications are provided

(Dieker, 2001)

Co-Teachers must . . .

- Get to know each other
- Develop trust
- Share roles
- Come to consensus

Co-teaching relationship

- The co-teaching relationship progresses through phases
  - orientation, planning (i.e. technical aspects), and evaluation
    - (Gately & Frank J. Gately, 2001)
  - Storming, norming, performing

Other items to think about . . .

- The students must see both teachers as equals, not one teacher's classroom
- Be on time
- Share the class
- Not yours and mine

Storming, Norming, Performing

- Storming
  - Getting to know each other
- Norming
  - Getting comfortable
- Performing
  Working effectively together

Types of Co-teaching

- One Lead, One Support
- Station Teaching
- Parallel Teaching
- Alternative Teaching
- Team Teaching

- Friend and Cook, 1995

One Lead, One Support

- Lead Teacher
- Support Teacher
- Little if any co-planning required

Station Teaching

- Content is divided
- Shared but separate responsibilities
- Little to some co-planning required

Parallel Teaching

- Same content, delivered by separate teachers
- Class divided into heterogeneous halves for instruction
- Co-planning required

Alternative Teaching

- One large group, one small group
- Small group used for pre-teaching, reinforcement, re-teaching, or enrichment
- Co-planning required

Team Teaching

- Shared instruction
- Teachers are interchangeable
- Mutual trust and commitment
- Co-planning a must

Preparing for co-teaching

- Scheduling, schedule SWD first, schedule in co-planning times in the beginning
- Schedule classrooms using natural proportions
- Prepare teachers, students, and parents in advance
- Co-teachers paired up and allowed time to learn about and plan for co-teaching

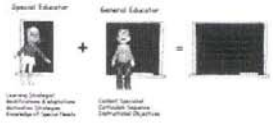
Co-planning

- Can you teach if you don't know the plan?
- Where do we find the time?
- Essential to successful co-teaching

Roles

Specifically what are our roles?

Co-Teach: The Concept



(Hines, 2006)

Strategist & Content Expert

Strategist Brings Evidence Based Best Practice:	Content Expert Brings:
SQ3R	Content Lesson
Survey	
Question	
Read	
Respond	
Review	

(Hines, 2006)

Traditional Lesson with Strategy

- Sp.Ed: Today we're going to be learning about linear equations. Open your text to pg. 110. Take 2 minutes to **Survey** our topic by skimming and scanning pages 110-115. We read pages 110-114 earlier this week so it should look familiar!
- Notice the pictures and subheadings (set timer for 2 minutes). You may discuss with a neighbor as you explore. While you read, write at least two **questions** about linear equations you think will be answered in today's reading or in the new content presentation Ms. K is about to provide.
- Gen. Ed: Presents content mini lesson.
- Now let's **read** pages 114-115 again and try the problems on 115.
- Sp. Ed: Lead reading **response**: Take 2 minutes to share your question and notes with a partner.
- Gen. Ed: **Review**

(Hines, 2006)

WHILE You, I WILL

Instructional Tasks	Managerial Tasks

(Have teachers brainstorm first, and then pull some straight from TROS…to get the idea across That there are things we can both be doing ALL (fill the boxes!)

(Hines, 2006)

Independent Practice:

Remedial/Enrichment Station Teaching

(Independent Practice Time)

(Hines, 2006)

Need a Plan?

Try This Foolproof Traditional Format Formula:

5 min Anticipatory Set/Link	Sp.Ed
15 min New content	Gen Ed
10 min Guided Practice	Sp Ed
20 min Independent Practice	both-stations
5 min Closure/Feedback	either

(Hines, 2006)

Strategies

- Cooperative Learning
- Peer tutoring
- Graphic organizers
- UDL
- Fist to Five
- Create an inclusive climate
- Brain Breaks

Brain Break!

- Allows students to summarize, synthesize or be surprised/provoked into thinking further about an idea
- Brain research indicates an adolescents attention span is 8-10 minutes
- Helps students focus longer
- Helps chuck knowledge

Fist to Five

- Used to gauge understanding
- 0 = "I don't get it!"
- 5= "I got it!"

Hines, 2008

Who does what?

- Grading daily assignments?
- Where are grades kept? One grade book? Two?
- Behavior and Classroom Management?
- Meeting IEP goals and objectives?

Don't forget to evaluate!

- Co-teachers should take time to evaluate the co-teaching arrangement on an ongoing basis

Thank You!

Kimberly E Bryant Davis

Exceptional Education
4000 Central Florida Blvd
Orlando, Florida 32816-1250
407-823-2568
kebdavis@mail.ucf.edu

APPENDIX L:

IRB LETTER AND CONSENT FORMS

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Notice of Expedited Initial Review and Approval

From : **UCF Institutional Review Board**
FWA00000351, Exp. 5/07/10, IRB00001138

To : **Lisa Dieker**

Date : **November 28, 2007**

IRB Number: **SBE-07-05298**

Study Title: **Does using video reflection of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of co-teaching implementation in relation to personal prerequisites, professional relationship, and classroom dynamics?**

Dear Researcher:

Your research protocol noted above was approved by **expedited** review by the UCF IRB Chair on 11/28/2007. **The expiration date is 11/27/2008.** Your study was determined to be minimal risk for human subjects and expeditable per federal regulations, 45 CFR 46.110. The category for which this study qualifies as expeditable research is as follows:

6. Collection of data from voice, video, digital, or image recordings made for research purposes.

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

The IRB has approved a **consent procedure which requires participants to sign consent forms.** Use of the approved, stamped consent document(s) is required. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Subjects or their representatives must receive a copy of the consent form(s).

All data, which may include signed consent form documents, must be retained in a locked file cabinet for a minimum of three years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained on a password-protected computer if electronic information is used. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

To continue this research beyond the expiration date, a Continuing Review Form must be submitted 2 – 4 weeks prior to the expiration date. Advise the IRB if you receive a subpoena for the release of this information, or if a breach of confidentiality occurs. Also report any unanticipated problems or serious adverse events (within 5 working days). Do not make changes to the protocol methodology or consent form before obtaining IRB approval. Changes can be submitted for IRB review using the Addendum/Modification Request Form. An Addendum/Modification Request Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at http://iris.research.ucf.edu .

Failure to provide a continuing review report could lead to study suspension, a loss of funding and/or publication possibilities, or reporting of noncompliance to sponsors or funding agencies. The IRB maintains the authority under 45 CFR 46.110(e) to observe or have a third party observe the consent process and the research.

On behalf of Tracy Dietz, Ph.D., UCF IRB Chair, this letter is signed by:

Signature applied by Janice Turchin on 11/28/2007 03:46:39 PM EST

Janice M Turchin

IRB Coordinator

Wednesday, January 23, 2008

Dear Participant:

My name is Kimberly E Bryant Davis and I am a doctoral student in Exceptional Education at the University of Central Florida. I am conducting a study this fall, which is my doctoral dissertation. The study is of co-teaching in middle school mathematics classrooms. My research questions are:

1. Does using video reflection of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of co-teaching implementation in relation to personal prerequisites, professional relationship, and classroom dynamics?
2. Does using video reflection of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class?

You are being invited because you have been identified as a member of a co-teaching pair in a middle school mathematics classroom in Orange County Public Schools. Please be aware that you are not required to participate in this study and you may discontinue your participation at any time without penalty. YOU MUST BE AT LEAST 18 YEARS OF AGE TO PARTICIPATE.

Once you consent to participation you will be randomly assigned to either the control or experimental group. All teachers will be asked to complete a pre and post assessment of their co-teaching implementation. All co-teaching teams will be required to video tape one co-taught class period per week. Co-teaching teams participating in the control group will be required to submit these tapes without viewing them each week.

Co-teaching teams participating in the experimental group will be required to watch five minutes of their video tape and reflect on this segment using an evaluation provided by the research team in addition to guiding questions. This reflection will be audio taped. The video tape, audio tape, reflection, and notes will be submitted to the research team each week.

Co-teachers participating in the control group will be paid $100 for full participation. Co-teachers in the experimental group will be paid $140 for full participation.

This study does entail the use of video recording of teaching/co-teaching practices. I will have primary access to the tape, which I will personally transcribe and code, removing any identifiers during transcription/coding. Analysis of results will be shared with classmates and in possible future publications and presentations. There is a possibility that you may be recognized by your image; in response, no names will be associated with the video images. However, the future use of the video footage I obtain could be used in

teacher preparation or trainings for pre-service or in-service educators on the perceptions and best practices of inclusion and co-teaching.

YOU MAY CHOOSE TO PARTICIPATE IN THE STUDY AND BE VIDEO TAPED WITHOUT RELEASING YOUR RIGHTS FOR MY FUTURE USE. IF YOU CHOOSE THIS OPTION, ANY FOOTAGE FROM THIS STUDY CONTAINING YOUR CHILD WILL BE TRANSCRIBED/CODED IMMEDIATELY AND THEN DESTROYED TO PROTECT YOUR CONFIDENTIALITY.

Possible benefits to you may include increasing your knowledge base on the role of special educators in the middle school mathematics classroom. Hopefully, through this process you and your co-teacher will learn about each other as well as your co-teaching partnership thorough this process. You and your co-teacher may learn more about each other's disciplines and how to blend your two philosophies and styles to effectively instruct a diverse group of learners. There are no anticipated risks; however, compensation will be provided to those who participate in the study. Payment will be provided after the completion of the video recordings and collection of data. If you are unable to complete the study a partial payment will be paid for your participation. This amount will equal the amount of participation in the study. Therefore, if you withdraw five weeks into the study (half way through the study), you will be paid half the specified amount. You are free to withdraw your consent to participate and may discontinue your participation in the study at any time. If you have any questions about this research project, please contact me, Kimberly Davis at 407-823-2598 or kebdavis@mail.ucf.edu or my faculty advisor, Dr. Lisa Dieker at: 407-823-3885 or ldieker@mail.ucf.edu . Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board. Questions or concerns about research participants' rights may be directed to the UCF IRB office, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246, or by campus mail 32816-0150. The hours of operation are 8:00 am until 5:00 pm, Monday through Friday except on University of Central Florida official holidays. The telephone numbers are (407) 882-2276 and (407) 823-2901.

If you decide to participate in this research study, please sign and return this copy of the consent form. A second copy is provided for your records.

Sincerely, _____ Kimberly E Bryant Davis, doctoral candidate and principal investigator

_____ I have read the procedure described above. I have read the "Informed Consent to Participate" and agree to allow the researchers to use the information I provide for related presentations and publications.

_____ I voluntarily agree to participate in and be videotaped for the study

_____ I voluntarily give my rights to the video images to the researcher for use in future publications and training video. I understand that my name will not be associated with the images.

_____ (signature) _____
(date)

_____ (printed name) _____
(date)

Wednesday, January 23, 2008

Dear Parent:

My name is Kimberly E Bryant Davis and I am a doctoral student in Exceptional Education at the University of Central Florida. I am conducting a study this fall, which is my doctoral dissertation. The study is of co-teaching in middle school mathematics classrooms. My research questions are:

3. Does using video reflection of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the level of co-teaching implementation in relation to personal prerequisites, professional relationship, and classroom dynamics?
4. Does using video reflection of a co-teaching team's practice during planning time in a co-taught middle school mathematics class enhance the role of and the use of strategies by the special educator in the mathematics class?

Your child is being invited because he/she is enrolled in a co-taught middle school mathematics class in Orange County Public Schools. Apart of this study I will be videotaping teachers co-teaching together. As a result of videotaping the teachers, your child may be captured on video. Please note the videotaping will focus primarily on the teachers. This video will be viewed by researchers for analysis. Your child's name will not be used in analysis and the only risk for breach of confidentiality is if a member of the research team recognized your child within the video of the classroom. Again, this video footage will focus primarily on the teachers. Students who may be captured will generally have their backs to the camera. If you choose not to have your child videotaped, your child will be out of the camera's focus and will not be captured on film.

The major focus of this study is to gauge the effectiveness of co-teaching. One measure we are using to assess the effectiveness of co-teaching is by analyzing FCAT and mathematics benchmark scores of students. We would like to include your students' scores in this analysis. Please note your child's information will be submitted anonymously and confidentially. Students' scores will be submitted by your child's teacher solely through student numbers. These numbers will then be recoded to ensure confidentiality and anonymity of your child. No names will be shared with the researcher by the teacher. You can choose not to have your child's scores released.

This study does entail the use of video recording of teaching/co-teaching practices. I will have primary access to the tape, which I will personally transcribe and code, removing any identifiers during transcription/coding. Analysis of results will be shared with classmates and in possible future publications and presentations. There is a possibility that your child maybe recognized by his/her image; in response, no names will be associated with the video images. However, the future use of the video footage I obtain could be used in teacher preparation or trainings for pre-service or in-service educators on the perceptions and best practices of inclusion and co-teaching.

YOU MAY CHOOSE TO HAVE YOUR CHILD PARTICIPATE IN THE STUDY AND BE VIDEO TAPED WITHOUT RELEASING YOUR RIGHTS FOR MY FUTURE USE. IF YOU CHOOSE THIS OPTION, ANY FOOTAGE FROM THIS STUDY CONTAINING YOUR CHILD WILL BE TRANSCRIBED/CODED IMMEDIATELY AND THEN DESTROYED TO PROTECT YOUR CHILD'S CONFIDENTIALITY.

Please be aware that you or your child is not required to participate in this study and you may discontinue your participation at any time without penalty. There are no anticipated risks, compensation or other direct benefits to you as a participant in this study. You are free to withdraw your consent to participate and may discontinue your participation in the study at any time. If you have any questions about this research project, please contact me, Kimberly Davis at 407-823-2598 or kebdavis@mail.ucf.edu or my faculty advisor, Dr. Lisa Dieker at: 407-823-3885 or ldieker@mail.ucf.edu .

Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board. Questions or concerns about research participants'' rights may be directed to the UCF IRB office, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246, or by campus mail 32816-0150. The hours of operation are 8:00 am until 5:00 pm, Monday through Friday except on University of Central Florida official holidays. The telephone numbers are (407) 882-2776 and (407) 823-2901.

Please sign and return this copy of the consent form. A second copy is provided for your records.

Sincerely, _____ Kimberly E Bryant Davis, doctoral candidate and co-principal investigator

_____ I have read the procedure described above. I have read the "Informed Consent to Participate" and **I do agree** to allow the researchers to **videotape** my child.

_____ I have read the procedure described above. I have read the "Informed Consent to Participate" and **I do agree** to allow my child's **FCAT and benchmark scores** to be released using their student number **only**.

_____ I have read the procedure described above. I have read the "Informed Consent to Participate" and **I do not agree** to allow the researchers to **videotape** my child.

_____ I have read the procedure described above. I have read the "Informed Consent to Participate" and **I do not agree** to allow my child's **FCAT and benchmark scores** to be released using their student number **only**.

_____ I voluntarily give my rights to the video images to the researcher for use in future publications, presentations, and trainings. I understand that my child's name will not be associated with the images.

_____ (signature) _____
(date)

_____ (printed name) _____
(date)

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