The Effects of Microteaching on Pre-Service Teachers' Knowledge and Implementation of the Concept Mastery Routine

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA
BY

Mary Ann Lindell

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

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June 2013

Acknowledgements

The term “grateful” has been foremost on my mind throughout my graduate experience at the University of Minnesota. I hesitate to write this acknowledgement page for fear of neglecting to credit all who have supported me to get to this point. Following is my humble attempt.

Thank you to Dr. Kristen McMaster, my advisor, who has provided me opportunities to stretch and re-envision myself in the work of improving outcomes for students with disabilities. Thank you for your guidance in shaping this dissertation study and your careful and tireless editing. Second, I would like to thank my co-advisor Dr. Susan Hupp. From the beginning of my work at the University, she provided rich opportunities to research, teach, and learn. I am exceedingly grateful to my remaining committee members, Dr. Susan Rose and Dr. Roger Johnson. Sue Rose is a tireless champion for teacher education and students with disabilities and I have benefited greatly from her encouragement and counsel. I would like to thank Dr. Johnson for his lifetime of work improving outcomes for students with disabilities in inclusive settings and for his insights regarding how to strengthen my study.

I would also like to thank the instructors of the courses in which I implemented my study: Jennifer Wilson, Dr. Christine Peper, and Dr. Kathy Seifert. I am grateful for their willingness to incorporate my unit into their course requirements, invite me into their course as a guest instructor, collect consent forms, and assign study identification numbers to study participants. Their assistance offered me an opportunity to implement a clean, rigorous study while offering pre-service teachers quality teacher education experiences.

I want to thank all of the volunteers who helped gather implementation data. Haven Skyy, Leah Royseth, Julia Cisteria, Christine Vang, Amy Lein, Viveca Pinto, Bonita Janda, Pyung-Gang Jung, Danielle Dupuis, Emily Monn, Susan Slater, Meredith Peterson**,** Shawna Petersen-Brown, Dana Brandes, Naomi Rahn, and Melissa Kreuser. In addition, I want to thank Breanne Byiers for managing the recording of the videos. Thank you to Haven, Melissa, and Julia for scoring the paper and pencil measures, and thank you to Julia for viewing and scoring implementation videos. Finally, I recognize Danielle Dupuis's help with statistical analysis. I appreciate your knowledge, patience, and good humor.

I want to thank my family and friends for their encouragement on this journey. In addition, my new colleagues at the Minnesota Department of Education have been supportive of my efforts to complete this work, even in the midst of work on important special education statewide policy initiatives.

I am ever grateful for my children, Taylor and Andrew, and, my husband, Tom Lindell. Taylor, thank you for your practical help copying, stuffing folders, and making tape recorders work when I was implementing this study. You were willing to help in so many ways and have encouraged me in the many stages of this process. Andrew, thank you for accepting of the demands of this work on my time and for showing me what is ultimately important. And Tom, thank you for believing it was possible for me to earn this academic achievement, even during the many times I did not believe in myself. Thank you all for taking on additional roles so that I could accomplish my goals. Thanks, family, for circling around me to move (or push) me forward. You're the best!

Abstract

The purpose of the present study was to investigate the effects of a teacher education pedagogy (microteaching) on pre-service general education teachers' knowledge and implementation of the Concept Mastery Routine (CMR), a research-based intervention, and on their teacher efficacy. In addition, this study explored the feasibility of implementing a randomized, control-group study in the context of a teacher preparation class. One hundred pre-service teachers from a teacher education course participated in the study. Participants were blocked by class and assigned randomly to a treatment (microteaching) or control condition. Knowledge of CMR and teacher efficacy were assessed at pre and posttest and fidelity of implementation of CMR was assessed at posttest only. For knowledge and efficacy measures, a repeated measures ANOVA was conducted with time (pretest and posttest) as the within-subjects effect and condition (treatment or control) as the between subjects effect. On the knowledge tests there was a significant effect of time, but the interaction between time and condition and the within subjects effect for condition were not significant. On the efficacy measure the interaction between time and condition, the between subjects effect for condition, and within subjects effect for time were not significant. The implementation measure was analyzed using an independent samples *t*-test and no significant difference between groups was found. Implications for conducting rigorous research within teacher education settings are discussed.

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Chapter I

Introduction

The Effects of Microteaching on Pre-Service Teachers' Knowledge and Implementation of the Concept Mastery Routine

Teaching students with disabilities with their typical peers has been emphasized in court cases (e.g., Mills v. Board of Education, 1972) and legislation (e.g., P.L. 94-142, 1975) since the early years of special education. Educational researchers have debated whether segregated or inclusive settings are more effective to meet the needs of students with disabilities (e.g., Dunn, 1968; Fuchs & Fuchs, 1998; Gresham, 1982; Marston, 1996; Sindelar & Deno, 1978; Stainback & Stainback, 1984). Policy makers have also entered the debate; for example, in 1986, Madeline Will, then U. S. Secretary of Education, argued for merging special and regular education to provide better options for all students. As a result of these debates and actions, great strides have been made in including students with disabilities in general education classrooms with their typical peers.

The 1997 Reauthorization of the Individuals with Disabilities Act (IDEA) shifted the emphasis from providing students with disabilities access to typical peers to providing access to the general education curriculum. In addition, the No Child Left Behind Act of 2001 (NCLB, 2002) increased school districts' accountability for student achievement, including reporting test scores for subgroups of students (e.g., English language learners, students with disabilities). Requirements for school districts to report high-stakes test scores for all students have raised expectations for students with disabilities to show progress within the general education curriculum, increased opportunities for students

with disabilities to learn the general education curriculum, and influenced classroom instruction (Ysseldyke et al., 2004). Finally, to ensure meaningful access to general education, IDEA's 2004 reauthorization and NCLB (2002) require that educators use research-based practices to support all children to meet high standards and progress within the general education curriculum.

During this time of education initiatives, the number of students with disabilities learning in general education classrooms with their peers without disabilities has continued to increase. For example, of the students receiving special education services in 1989, 31.7% were served in general education classrooms most of the time (80% of the time or more). In comparison, by 2006, 53.7% of students receiving special education services were served mostly in general education classrooms (U.S. Department of Education, 2009). In other words, from 1989 to 2006, 22% more of the students receiving special education services were being taught mostly in general education classrooms.

As students with disabilities are served in increasing numbers in general education classrooms (Fisher, Frey, & Thousand, 2003), general educators are required to teach students with a broad range of strengths and needs. Teacher roles are changing as schools implement co-teaching, team teaching, collaboration, differentiation, universal design for learning, response to intervention, and many other models (Fisher et al., 2003; Salisbury & McGregor, 2002; Stanovich & Jordan, 2002). General educators generally support inclusion (Carter & Hughes, 2006) but often lack necessary preparation, experience, skills, and dispositions to meet the needs of students with and without disabilities in inclusive classrooms (Brown, Welsh, Hil, & Cipko, 2008; VanLaarhoven, Munk, Linch, Bosma, & Rouse, 2007).

Fortunately, research-based practices do exist to improve student outcomes in inclusive general education classrooms. Some of these include cooperative learning, classwide peer tutoring, peer-assisted learning strategies, schema-based instruction, and content enhancements (see Bulgren, Deshler, Schumaker, & Lenz, 2000; Fuchs, Fuchs, & Karns, 2001; Griffin, & Jitendra, 2008; Madden, & Slavin,1983; Mastropieri, Scruggs, & Berkeley, 2007). However, teachers do not often use research-based practices in their classrooms, leading some to describe this circumstance as a gap between research and practice (Fuchs & Fuchs, 1990; Greenwood & Maheady, 2001). To reduce this research-practice gap, strong pre-service teacher preparation and inservice professional development programs are needed to help teachers develop skills and knowledge and a sense of efficacy to implement research-based practices.

The Role of Teacher Education Research

While pre-service teacher education programs may address the gap between research and practice in classrooms (Greenwood & Maheady, 2001), there is currently not a broad body of research that indicates which specific teacher education pedagogies are effective in increasing the likelihood that pre-service teachers will implement research-based practices with fidelity in their future inclusive classrooms. In fact, research on preparing teachers to teach students with disabilities in general education classes is thin, and has mostly relied on surveys and qualitative methods to describe teacher education courses or programs of study (Cochran-Smith & Ziechner, 2005; Pugach, 2005).

Yet, to provide causal evidence regarding effective teacher education pedagogy, researchers must develop thorough programs of research, using rigorous research designs

carefully tailored to specific research questions (e.g., experimental, quasi-experimental, single subject, correlational, and qualitative) (Odom et al., 2004). An established program of research is needed to further examine the effect of teacher education pedagogy on pre-service teachers' practice in practicum and student teaching sites, as well as their first years of professional teaching. These efforts should include examining the effects of teacher education pedagogy on school-age student outcomes in each of those teaching/classroom situations. Results from well-developed and thoroughly reported research studies will help teacher educators choose teacher education pedagogy that effectively supports their desired outcomes (e.g., pre-service teacher knowledge and implementation of a research-based practice).

Therefore, the advancement of a research-based approach to the field of teacher education, and specifically teacher education for inclusive classrooms, requires the two-pronged research agenda depicted in Figure 1. As indicated by the left prong, researchers must identify *conceptually sound teacher education pedagogy* to improve intended outcomes (e.g., teachers' implementation of research-based interventions) based on strong theoretical underpinnings and previous literature and research. As indicated by the right prong, researchers must implement a *rigorous program of research* that allows for causal inferences about the effectiveness of this pedagogy. Existing research in teacher education is lacking in both areas. Thus, this study addressed both factors in this two-pronged approach: by (a) examining the effects of a specific teacher education pedagogy (microteaching) on pre-service teachers' knowledge, efficacy, and implementation of a specific research-based intervention (concept mastery routine), and (b) using a powerful research design (randomized, pretest/post, treatment/control group design). Below, I

briefly describe the teacher preparation pedagogy and research-based intervention selected to be the focus of this study; the literature supporting these approaches is comprehensively reviewed in Chapter II.

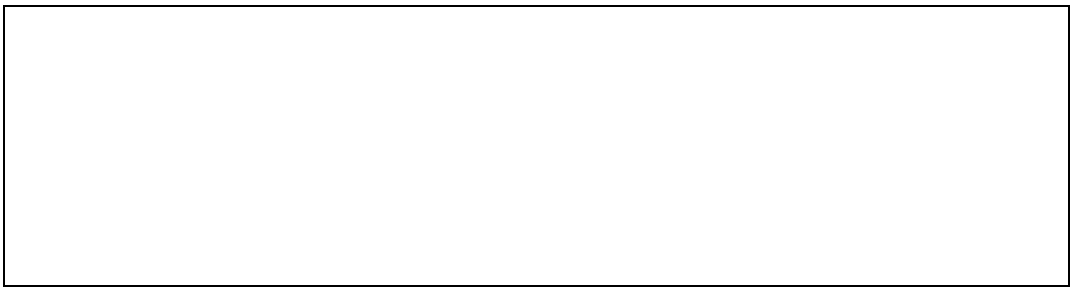

Figure 1: Two-Pronged Approach to Teacher Education Research

Pedagogy. Microteaching, first developed at Stanford University (Amobi, 2005; Shermis & Barth, 1971), is a teacher education pedagogy that holds promise to support pre-service teachers learning and implementing research-based practices. Microteaching allows pre-service teachers to isolate and practice one technique or specific skill under optimum conditions (Brent & Thomson, 1996; Cruickshank, Kennedy, Williams, Holton, & Fay, 1981; Shermis & Barth, 1971). Pre-service teachers typically teach abbreviated lessons to a small group of school-age pupils or peers and receive feedback from videotaping, peers, or an instructor (Brent & Thomson, 1996; Cruickshank et al., 1981; Shermis & Barth, 1971; Subramaniam, 2006; Wilson & I'Anson, 2006).

Microteaching is designed to reduce the complexity pre-service teachers face in practicum and student teaching settings and provides an opportunity to practice under optimal conditions (Amobi, 2005; Brent & Thomson, 1996; Shermis & Barth, 1971), thereby bridging the gap between the pre-service teachers' university and initial teaching experiences (Brent & Thomson, 1996). Practice is potentially an important component in

training teachers to implement a research-based practice with fidelity (Bulgren et al., 1988; Fisher et al., 1999). In addition, participating in a microteaching small group provides pre-service teachers an opportunity to "try on" the role of teacher and begin to see themselves as facilitating student learning. The assumption is that learning a research-based practice designed to meet the academic needs of students in inclusive classes combined with practicing, receiving feedback, observing others, and giving feedback will increase pre-service teachers' beliefs that they can facilitate student academic growth in their future classrooms, as well as their knowledge and implementation of the practice.

Microteaching was originally used to teach pre-service teachers specific skills to later implement in their field-based placements and classrooms (Brent & Thomson, 1996). As described above, this is an era of growing emphasis on scientific evidence as a basis for teaching decisions, and microteaching's flexibility allows it to be used with a variety of research-based practices. For these reasons, I chose microteaching as the teacher education pedagogy to examine in the current study.

Research-based practice. Given the current emphasis on research-based practices, it seems relevant to investigate whether microteaching can be an effective tool to support pre-service teachers to learn and implement such practices. One example of a research-based practice developed to teach students with and without disabilities in general education classrooms is the Concept Mastery Routine (CMR; Bulgren, Schumaker, & Deshler, 1988; Fisher, Deshler, Schumaker, 1999). CMR is part of the Content Enhancement Routines, a set of researched methods (e.g. advance organizers, graphic organizers, interactive devises) combined into an instructional routine that facilitates student mastery of information related to key concepts in the general education

curriculum (Deshler et al., 2001). Researchers have found that inservice teachers implemented CMR with greater fidelity after training than before training. Pre-service and inservice teachers increased their knowledge of CMR after training. Additionally, students with and without learning disabilities performed significantly better on concept acquisition tests and regularly scheduled content tests when teachers used CMR than when they did not use CMR (Bulgren et al., 1998; Fisher et al., 1999).

CMR is an ideal research-based practice to prepare teachers to use in inclusive classrooms for several reasons. First, CMR is a versatile routine that can be used to help school-age students master concepts across the curriculum. Pre-service general education teachers who enroll in special education courses typically represent a variety of teaching majors, and thus it is important that the research-based practice is relevant to a wide range of curriculum areas. Second, previous researchers have demonstrated that pre-service and inservice teachers can master CMR with minimum times for training. For example, Fisher and colleagues (1999) delivered a 2.5 hr workshop and Bulgren and colleagues (1988) delivered a 4 hr workshop. While course instructors must consider the evidence base supporting a particular teacher education practice, they also must consider the limited course time available to prepare pre-service teachers to use the practice with fidelity. Third, Fisher (1999) utilized virtual and in-person content delivery, suggesting pre-service teachers can learn CMR in a variety of ways. Finally, Bulgren et al. (1988) demonstrated school-age students had increased achievement when their teachers used CMR as compared to other teaching methods, reinforcing the value of CMR as a research-based practice. For these reasons, I chose to use CMR as the research-based practice pre-service teachers would implement in this microteaching study.

Theory of Change

The purpose of this study was to investigate the effectiveness of microteaching as a teacher education pedagogy to improve pre-service teachers' knowledge and implementation of CMR, a research-based practice, and to increase teacher efficacy. The study is guided by a theory of change, represented in Figure 2 and described below, that suggests that microteaching will increase pre-teachers' knowledge, implementation, and efficacy related to CMR, which in turn will lead to improved student outcomes.

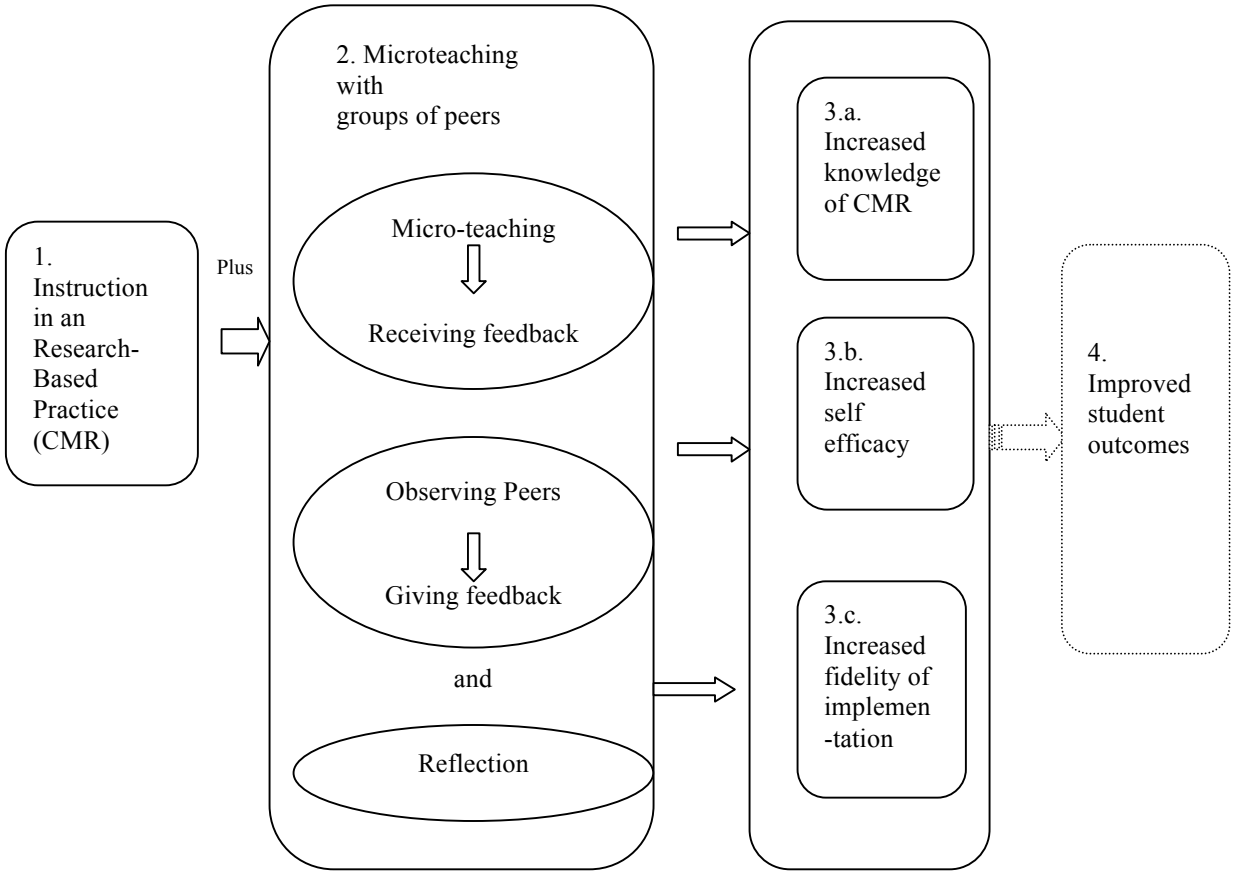

Figure 2: Theory of Change

This theory of change rests on the assumption that preparing pre-service teachers to implement research-based practice (such as CMR) (1) using conceptually-sound pedagogy (such as microteaching) (2) will lead to improved teacher knowledge (3a), efficacy 3(b), and fidelity of implementation (3c) of that research-based practice. The second assumption undergirding this study's theory of change was that microteaching CMR in a small group of peers (2) will increase pre-service teachers' knowledge of CMR (3a), increase pre-service teachers' self efficacy (3b), and increase fidelity of implementation of CMR (3c). Ultimately, improved teacher knowledge, efficacy, and implementation will lead to improved school-age student outcomes (4). This study focused on the teacher variables (knowledge, efficacy, and fidelity of implementation) as dependent variables

Teacher knowledge, implementation, and efficacy. The primary dependent variables for this study are: (a) teacher knowledge of a research-based practice (CMR); (b) fidelity of implementation of a research-based practice (CMR); and (c) teacher efficacy. These variables were chosen because of their link to student outcomes, as described below.

Teacher knowledge of research-based practice. As mentioned above, educational researchers have studied a growing number of practices to improve school-age student outcomes and published their results in peer-reviewed journals. To effectively use research-based practices to support their students' improved outcomes, teachers must use professional wisdom to choose appropriate practices (Cook, Tankersley, & Harjusola-Webb, 2008), develop sufficient knowledge of the practice (Cook et al., 2008), implement the research-based practice with fidelity (Cook et al., 2008; Kretlow & Blatz,

2011), and monitor student progress (Kretlow & Blatz, 2011). Before a teacher can implement a research-based practice, he or she must have a thorough understanding of the theoretical and empirical knowledge base and comprehend how to apply that knowledge to specific instructional situations (Cochran-Smith & Lytle, 1999). Specifically, teachers must have procedural (procedures and examples) and conceptual (underlying principles) knowledge of the practice (Greenwood & Maheady, 2001) to increase the likelihood of improved student outcomes.

Fidelity of implementation of research-based practice. When teachers use research-based practices with fidelity, there is great promise to improve student outcomes. Researchers developed each of the practices listed above with specific procedures to maximize effectiveness. However, lack of implementation fidelity is likely to diminish the research-based practice's positive impact or erase it altogether (Cook et al., 2008). Implementation quantity and quality affect student outcomes (Klinger, Ahwee, Pilonieta, & Menendez, 2003; Kretlow & Blatz, 2011). Researchers have found coaching, mentoring, and implementing as a team to provide additional support to pre-service and inservice teachers and increase the likelihood that teachers will implement research-based practices with fidelity (Kretlow, Cooke, & Wood, 2012; Vaughn & Coleman, 2004).

Teacher efficacy. Alfred Bandura first introduced self-efficacy: the concept that "expectations of personal mastery affect both initiation and persistence of coping behavior" (Bandura, 1977, p. 193). Lancaster and Bain (2010) define self-efficacy as "a personal belief about one's ability to perform an action (that) is directly related to a sense of competence and confidence about performance in a given domain" (p.118). Bandura outlined four sources of efficacy expectations (1997): (1) success or mastery experiences

in overcoming obstacles; (2) social modeling by someone else; (3) social persuasion by others; and (4) reducing stress and depression. Applying Bandura's theory to "teacher efficacy," indicates a teacher's belief that the environment (e.g., family background, socio-economic status, school conditions) can be controlled and he or she possesses the necessary abilities to affect positive student outcomes (Gibson & Dembo, 1984). Educational researchers have defined, measured, and researched teacher efficacy and discovered positive correlations between teacher efficacy and student achievement. (Tschannen-Moran, Hoy, & Hoy, 1998). More recently, teacher efficacy has been linked to teacher attitudes about inclusive education, persistence when faced with obstacles, effort he or she is willing to extend, and implementation of new initiatives (Ahsan, Sharma, & Deppeler, 2012; Cantrell & Calloway, 2008; Erdem & Demirel, 2007).

Purpose and Research Questions

The purpose of this study was to examine how a teacher education pedagogy (microteaching) affects pre-service teachers' knowledge and implementation of a research-based practice (Content Mastery Routine - CMR) and teacher efficacy. In addition, this study explored the feasibility of conducting a randomized, controlled experimental study in the context of a teacher preparation class. Specifically, this study addressed three research questions: (1) What is the effect of microteaching on pre-service teachers' knowledge of CMR? (2) What is the effect of microteaching on pre-service teachers' implementation of CMR? and (3) What is the effect of microteaching on pre-teachers' teacher efficacy?

Chapter II

Literature Review

The inclusion of students with disabilities in general education classrooms is changing the instructional environment (Fisher & Frey, 2003), adding to a general increase in the diversity of general education classrooms (Salisbury & McGregor, 2002). Within this context, general and special education teachers are expected to provide instruction to a wider range of students (Stanovich & Jordan, 2002), assume new roles (Fisher & Frey, 2003), and integrate supplemental materials and services to support the success of students with and without disabilities in their classrooms (Salisbury & McGregor, 2002). General and special education teachers generally support inclusion and view it as beneficial to students with and without disabilities (Carter & Hughes, 2006, Lancaster & Bain, 2007). However, they often lack necessary preparation and experience (Brown, Welsh, Hill, & Cipko, 2008), as well as skills and dispositions (Van Laarhoven, Munk, Lynch Bosma, & Rouse, 2007), to meet the needs of students with and without disabilities in inclusive classrooms.

In step with teachers' growing need for methods and materials to address the range of needs of all students in inclusive classrooms, educational researchers are working to design and validate practices to help students with diverse academic needs learn in general education classes. Research-based practices that have been developed to improve academic outcomes for students in inclusive classrooms include cooperative learning (e.g., Madden & Slavin,1983; Slavin, Madden, & Leavey,1984), classwide peer tutoring (e.g., Greenwood & Maheady, 1995; Mastropieri & Scruggs, 2009), content enhancements (e.g., Bulgren, Schumaker, & Deshler, 1988; Fisher, Deshler, &

Schumaker, 1999), peer-assisted learning strategies (e.g., Fuchs, Fuchs, & Karns, 2001; Fuchs et al., 2012), and schema-based instruction (e.g., Griffin & Jitendra, 2008; Jitendra et al., 2007). Researchers have demonstrated the effectiveness of each of these interventions in improving the academic achievement of students with and without disabilities in inclusive classrooms.

Yet, even as research on educational practices increases and becomes more available, school-age students are often not exposed to research-based practices in their schools--a situation often described as a gap between research and practice (Greenwood & Maheady, 2001). One possible explanation for this lack of student exposure to research-based practices is the mismatch between what researchers deem research-based practices, what teacher educators present to pre-service teachers to meet the needs of students with disabilities in inclusive classrooms, and what teachers choose to implement in their practice (Cannon, 2007). While researchers have cited a number of reasons for this gap between research and practice (e.g., Fuchs & Fuchs, 1990; Greenwood & Abbott, 2001; Vaughn, Klingner, & Hughes, 2000), there is agreement that implementing research-based practices will help general and special educators meet student needs in inclusive classrooms (Greenwood & Maheady, 2001).

To help close the research-practice gap, the education community is presented with the challenge of investigating, verifying, and promoting pre-service and inservice initiatives that increase the likelihood that teachers will implement practices that lead to improved outcomes for all students (see Brownell, Sindelar, Kiely, & Danielson, 2010; Hochberg & Desimone, 2012; Maheady, Jabot, Rey, & Michielli-Pendl, 2007). Greenwood and Maheady (2001) recommended that teacher education programs prepare

teachers to implement research-based practices as a way to improve the learning of all students in inclusive classes. Indeed, pre-service teachers who develop a repertoire of skills (including skills needed to implement research-based practices) may be better prepared to teach students with and without disabilities in inclusive classes (Feiman-Nemser, 2001). One approach that is often used in pre-service teacher preparation programs is microteaching, in which candidates have the opportunity to practice and develop skills, and potentially increase the likelihood that pre-service teachers will use research-based practices in their future classrooms.

The purpose of this literature review is to examine the research on teacher education pedagogy in general, and microteaching specifically, to prepare pre-service teachers to implement research-based practices. First, I describe research addressing the preparation of pre-service teachers to meet the needs of students with and without disabilities in inclusive classrooms. Second, I summarize the professional literature on microteaching. Finally, I describe the Concept Mastery Routine (CMR) and its research base: CMR is designed to facilitate student mastery of important content concepts in general education settings, and was chosen as the research-based practice for this dissertation study.

Method

To locate articles for this review, I first searched two electronic databases: PsychInfo and Academic Search Premier. Next, I checked references in relevant articles and reviewed articles forwarded by colleagues that had not emerged in my previous searches. I used the following criteria to select articles for this review: articles had to (1) focus on a pre-service teacher education pedagogy, (2) include at least some participants

who were K-12 general education pre-service teachers, (3) be published in a peer-reviewed journal, and (4) be published after 1970, when microteaching was introduced.

To identify articles on preparing teachers to teach students with and without disabilities in inclusive classrooms, I searched the terms *inclusion, mainstreaming, diverse classrooms, teacher preparation, teacher education, pre-service teachers, teaching, inclusive practices* and *inclusion*. To identify articles on microteaching, I searched the terms *microteaching, clinical experiences, student teaching, pre-service teachers, teacher preparation, teacher education, clinical teaching,* and *precision teaching.* I included articles providing theoretical background on microteaching, descriptions of teacher education programs using microteaching, and qualitative studies, mixed method studies, and quasi-experimental and experimental studies (Odom et al., 2004) in which the use of microteaching was manipulated as the independent variable. To locate articles on the Concept Mastery Routine (CMR), I searched the terms *concept mastery routine, Kansas learning strategies*, and *concept enhancement routines*. I identified two mixed-method studies on CMR. After hearing Fisher present his findings (Fisher, Deshler, & Schumaker, 1999), I contacted him to discuss the specifics of his study, because they directly related to the current study.

Literature Synthesis

In this section I review the literature on microteaching and the CMR. Before reviewing microteaching and CMR, I discuss research in teacher education pedagogy in general and list 14 categories of teacher education pedagogy described in the professional literature. Then, I review an experiment (Maheady, Jabot, Rey, & Michielli-Pendl; 2007), a review of research that examined the effects of specific teacher education pedagogy on

pre-service teachers' knowledge and implementation of research-based practices and school-age student outcomes (Kretlow & Bartholomew, 2010), and two CMR, teacher pedagogy studies (Bulgren, Schumaker, Deshler, 1988; Fisher et al., 1999). Next, I review 10 microteaching articles: two describe teacher education programs (Brent & Thomson, 1996; Wilson & I'Anon, 2006), three are qualitative studies,(Amobi, 2005; Bell, 2007; Vare, 1996), one is a mixed methods – qualitative and quantitative study (Butler, 2001), one is a quasi-experimental study (Borg, Kallenbach, Morris, & Friebel, 1969), and three are experimental studies (Copeland, 1975; Madike, 1980; Saunders, Niflson, Gall, & Smith, 1975). Finally, I review two mixed methods, experimental - single subject studies that examined the effects of CMR on pre-service and inservice teachers knowledge and implementation of a research-based practice (Bulgren et al., 1988; Fisher et al., 1999).

Teacher Preparation Research

Historically, teacher education research has been scarce, and most of the studies have been surveys or course or program descriptions (Cochran-Smith & Zeichner, 2005; Pugach, 2005), preventing researchers and practitioners from making strong statements about what is effective. In the published literature, a variety of teacher education pedagogy has been explored, including action research (Price & Valli, 2005), case studies (Kim, Utke, & Hupp, 2005), school-university collaborations (Friedman & Wallace, 2011), field experience (Capraro, Capraro, & Helfeldt, 2010), coaching (Kretlow & Bartholomew, 2010), co-teaching (Salovity & Takalab, 2010), interviews (McDonough, Clarke, & Clarke, 2002), mentoring (Hudson, 2004), professional development schools (Taylor & Sobel, 2010), reflection (Valdez, Young, & Hicks, 2000), service learning

(Jenkins & Sheehy, 2009), using technology (Fisher et al., 1999), workshops (Bishop & Jones, 2002), and microteaching. Few studies have linked effective teacher education pedagogy to the outcome of pre-service teachers' increased knowledge and implementation of research-based practices. Fewer still link teacher education to future (K-12) student learning (Brownlee, Ross, Colon, & McCallum, 2005). Following are several studies that found that teacher education practices influenced the implementation of research-based practices by general education pre-service teachers in their inclusive practicum experiences and impacted school-age student outcomes.

Maheady, Jabot, Rey, & Michielli-Pendl (2007) described the field placement classroom practices of 422 pre-service teachers over four semesters of classes. As part of a teacher education course, pre-service teachers completed an 8-10 week field placement, visiting an assigned school twice per week. At their practicum site, pre-service teachers implemented research-based practices learned during their university class. While implementing research-based practices, pre-service teachers' fidelity of implementation was measured by their cooperating teacher or partner pre-service teacher and outcomes were measured for the school-age students in the field placement classrooms at pretest and posttest. Perceived impact of pre-service teachers' use of research-based practices in their field placement classrooms on student learning was coded as "noticeable improvement," "marginal effect," or "no effect," based on the classroom students' scores. Maheady and colleagues (2007) found pre-service teachers implemented 221 lessons (out of 225 lessons) using research-based practices (e.g., numbered heads together, graphic organizers, think-pair-share). They implemented all research-based practices with fidelity ratings consistently at or above 90%. In addition, the authors reported "noticeable

improvements" in student learning in 60% and "marginal effects" in 23% of the lessons taught by the pre-service teachers.

Maheady et al. (2007) provided detailed information regarding the teacher education department and students enrolled in the four semesters of the study. They described the course and field experience, research-based practices assignment, measurement tools, and data-collection strategies. Additionally, findings were presented in a meaningful way. Maheady and colleagues' (2007) presentation of a description of a teacher education course and associated field experience indicated that pre-service teachers have demonstrated knowledge of research-based practices and implemented them in their field-based classrooms. However, this article did not describe experimental control or lead to causal conclusions.

Kretlow and Bartholomew (2010) conducted a review of the literature on the effects of coaching on pre-service and inservice teachers' implementation of research-based practices (classwide peer tutoring, direct instruction, learning strategies, positive behavior supports). Ten studies used a single-subject design and three used experimental or quasi-experimental designs. Thirty-seven inservice teachers and 73 pre-service teachers were represented in the 13 studies for a total of 110 teachers. Forty-one of the teachers were general educators and 69 of the teachers were special educators.

Kretlow and Bartholomew (2010) found two methods of coaching represented in the 13 studies: supervisory coaching and side-by-side coaching. Supervisory coaching included the following elements: (a) multiple observations of the teacher by the coach prior to the intervention, (b) "feedback" meeting, (c) follow-up observations, and (d) at least another "feedback" meeting. Side-by-side coaching included all of the same

elements as supervisory coaching with the addition of a demonstration lesson taught by the coach in the teachers' classrooms. All 13 studies measured teaching behaviors and found that coaching interventions led to general and special educators' improved fidelity of implementation of research-based practices. In addition, five studies reported data on student outcomes (e.g., weekly spelling performance, frequency of inappropriate behaviors, rate of correct student responses). Three studies found teacher coaching led to improvements in these student outcomes. Kretlow and Bartholomew (2010) concluded that coaching was a promising pedagogy to support pre-service and inservice teacher implementation of research-based practices.

Finally, Bulgren et al. (1988) and Fisher et al. (1999) found that pre-service teachers demonstrated improved knowledge of the research-based practice, the Concept Mastery Routine (CMR) and implemented CMR with greater fidelity after training than before training. These studies are described in greater detail below in the CMR secion, but the information reported here is relevant to teacher education pedagogy research. Bulgren et al. (1988) tested the effectiveness of CMR for teaching concepts to students with and without disabilities in inclusive classes and found that teachers' average scores on the CMR Diagram Test improved from 24.3% at baseline to 93.4 % after training. Likewise, teachers' average score on the CMR Concept Teaching Routine improved from baseline (27.7%) to after training (91.4%). Bulgren et al. (1988) also found that school-age students with and without LD performed significantly better on the Concept Acquisition Tests and regularly scheduled content tests when teachers used CMR then when they did not use CMR.

Fisher et al. (1999) focused on the effects of an interactive multimedia program on teachers' understanding and implementation of CMR by randomly assigning 58 pre-service and 10 inservice teachers to a virtual workshop condition or an actual workshop condition. Fisher et al. (1999) found that pre-service and inservice teachers scored significantly higher on both the Knowledge Test and Diagram Test after both types of workshops (virtual and actual) with no significant differences between the posttest scores of the two groups. In addition, inservice teachers who participated in both types of workshops improved their implementation of CMR as measured by Implementation Checklist scores (12.45%; virtual workshop and 19.03%; actual workshop before training to 84.68%; virtual workshop and 78.25%; actual workshop after training).

In summary, Maheady et al. (2007), Kretlow and Bartholomew (2010), Bulgren et al. (1988), and Fisher et al. (1999) provided evidence that teacher education pedagogy can affect pre and inservice teachers' implementation of research-based practices and school-age student outcomes. While previous research indicates that pre-service teachers can learn to implement research-based practices, teacher education research provides limited insight into the most effective ways to teach pre-service teachers to use such practices. Thus, additional research is needed to shed light on pedagogical tools that can promote teachers' knowledge and skills related to the use of research-based practices.

Microteaching – Teacher Education Pedagogy

One approach that holds promise to support pre-service teachers learning to implement research-based practices during their teacher preparation programs is microteaching, a teacher education pedagogy developed at Stanford University (Amobi, 2005; Shermis & Barth, 1971). Microteaching allows pre-service teachers to isolate and

practice one technique or specific skill under optimum conditions (Amobi, 2005; Brent & Thomson, 1996; Shermis & Barth, 1971) and can be used to bridge pre-service teachers' university and initial teaching experiences (Brent & Thomson, 1996).

During microteaching, pre-service teachers typically teach abbreviated lessons to a small group of school-age pupils at their practicum site (see Wilson & I'Anson, 2006) or peers at their university (see Brent & Thomson, 1996; Shermis & Barth, 1971). The lesson may be videotaped, providing one type of feedback to the pre-service teacher, or he or she may receive feedback from peers or instructors (Brent & Thomson,1996; Shermis & Barth, 1971; Subramaniam, 2006). Self-reflection is an important component in microteaching models; for example, Amobi (2005) emphasized reflection as an instructional and/or an evaluation tool. Researchers have reported that microteaching is viewed positively by pre-service teachers (Amobi, 2005) and is a versatile and transportable teacher education tool (Brent & Thomson, 1996).

Researchers have described the use of microteaching for a variety of purposes in the professional literature. For example, researchers have used analysis of microteaching sessions as part of the data collected (dependent variable) to test research questions (see Feryok, 2009; Oh, 2010: Pringle, Dawson, & Adams, 2003; Sadker & Sadker, 1977). For the purposes of this literature review, I was particularly interested in research where microteaching was investigated as a teacher education pedagogy, and as such, was the primary independent variable manipulated in the study. Articles focusing on microteaching as teacher education pedagogy included: (1) descriptions of teacher education programs, (2) qualitative studies, (3) mixed methods studies, (4) quasi-experimental studies and (5) experimental studies.

Descriptions of teacher education programs. Authors' descriptions of college and university departments of education using microteaching are included in the literature. For example, Shermis and Barth (1971) described how senior-level pre-service teachers used microteaching (with groups of peers and video feedback) to improve their teaching precision. They reported that microteaching allowed pre-service teachers to isolate and practice one teaching technique, leading to greater precision in teaching.

Brent and Thomson (1996) described how microteaching was used flexibly in their teacher education department to bridge the gap between abstract teacher education instructional strategies (e.g., lectures, cases studies, discussions) and concrete strategies (e.g., student teaching, field experiences); microteaching bridged the university classroom and the pre-service teachers' first teaching experience. They noted that professors used microteaching early in the teacher education program to encourage reflection and self-evaluation, rehearse a specific teaching strategy, and introduce an assessment instrument. In addition, Brent and Thomson (1996) noted that students reported that viewing videotapes of their teaching and conferencing with their instructors was the most effective component of the microteaching assignment. The authors reported that approximately 75 students participated in microteaching each semester.

Wilson and I'Anson (2006) described a microteaching experience where pre-service teachers worked in pairs, alternating teaching and videoing roles with small groups of six to eight school-age students brought to the university. The pre-service teachers discussed the videotaped lesson with their university supervisor and school-based practitioner, integrating a process of reflection and engaging with multiple perspectives. Through a small scale survey of previous students now teaching in schools

(n = 6), Wilson and I'Anson found that former students valued the limited complexity of the microteaching experience, which allowed them to concentrate on specific aspects of teaching before entering the more complex classroom environment.

Despite the lack of empirical evidence regarding the effectiveness of microteaching, these published descriptions of how microteaching has been used in teacher education programs, together with the theoretical basis, can help advance thinking about important microteaching elements and how microteaching can be studied in the future.

Qualitative studies. Qualitative research offers a systematic approach of understanding the essential qualities of a phenomenon (Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005). The literature search yielded three qualitative case studies describing microteaching (Amobi, 2005; Bell, 2007; Vare, 1996). Vare (1996) conducted a case study in a semester-long, junior-level undergraduate course for pre-service teachers that took place in a microteaching laboratory. Twenty-five participants taught and retaught three sets of lessons and participated in pre- and post-lesson conferences with instructors. Researchers collected observation data, interview data with instructors in the microteaching laboratory, pre-service teacher microteaching lesson artifacts, and course documents. Data were analyzed using grounded theory, allowing ideas and themes to emerge. Vare (1996) found that two instructors with distinct styles taught in the microteaching laboratory: *Mr. Effective*, who represented the ideal type of applied science, and *Ms. Effective Teacher*, who represented the ideal type of reflective practice (p, 211). Vare (1996) reported that the "applied science" side of the laboratory emphasized observation, normative standards, solo teaching performances, and privately

given feedback. The "reflective practitioner" side of the microteaching lab emphasized parental connection, personalized, practice-based knowledge, supported performances, and public feedback. Vare (1996) concluded that pre-service teachers who completed their microteaching experiences with *Mr. Effective* on the "applied science" side of the laboratory viewed the microteaching as a simulation or practice of selected teaching skills. Pre-service teachers who completed their microteaching experiences with *Ms. Effective Teacher* on the reflective practice side of the laboratory, viewed microteaching as "real teaching" and pre-service teachers deviated from explicit scripts to follow students' leads. Vare (1996) called for further dialogue between the applied scientists and reflective practitioners in teacher education.

Vare (1996) included many elements of credible qualitative research (Brantlinger et al., 2005). She described her theoretical framework for the study and used a variety of data sources. However, Vare (1996) failed to establish the trustworthiness of her data analysis procedures by not providing sufficient details. Overall, Vare's case study (1996) outlining how microteaching may be used and describing the experiences of pre-service teachers in microteaching situations is worthy of attention.

Bell (2007) examined 22 microteaching videos (i.e. pre-service teachers microteaching with their peers) and pre-service teacher questionnaires using an interactional, sociolinguistic framework to begin to understand the meanings of the interactions portrayed in the videos. Using discourse analysis, she found that pre-service teachers characterized microteaching in multiple, overlapping ways: teaching, a course requirement, or performance. Bell (2007) found that pre-service teachers were most likely framing microteaching as performance and least likely as "real teaching."

Bell (2007) included several elements that enhance the credibility of this qualitative study (Brantlinger et al., 2005). She incorporated well-developed theoretical arguments as a foundation for the analysis and provided descriptive examples supporting study findings. In addition, Bell (2007) included descriptions and sufficient quotes supporting her conclusions. However, the article lacked a full description of how the videos and questionnaires were analyzed. Bell's (2007) findings of the microteaching experiences of pre-service teachers can be accepted as reliable.

Amobi (2005) explored the themes of reflectivity in 31 pre-service teachers' sequencing of their teaching actions before and after microteaching and their patterns of confronting reflectivity as they responded to peer evaluations of their microteaching. Amobi (2005) examined reconstructive reflectivity, or how participants would enact alternative actions after viewing their videos and hearing peer feedback. Amobi (2005) used a content analysis method to analyze participant reflections and a conceptual framework developed by the author. Amobi (2005) offered three conclusions: (1) microteaching is viewed as a meaningful experience by pre-service teachers, (2) there is no guarantee that pre-service teachers will allow their teaching to be critiqued even in what is meant to be a pressure-free, microteaching environment, and (3) if pre-service teachers do allow their teaching to be scrutinized in a microteaching situation, the experience may help the pre-service teacher self correct elements in their developing teacher repertoire.

Amobi (2005) included many credibility measures for qualitative research (Brantlinger et al., 2005). He cited references to the conceptual framework for analysis which provided a rationale for what was included in the report. Additionally, the author

described how data were analyzed and coded, provided tables of relevant themes and connected these findings with related research. Several elements of credible qualitative research studies were missing from this study. The researchers' personal perspectives were not described and there was little evidence of a convergence of evidence from multiple data sources, evaluators, theories, or methods. Given the relative strength of this study, Amobi's (2005) conclusions regarding the microteaching experience can be accepted.

Moving forward from these qualitative studies, researchers can assume that the experience of pre-service teachers during microteaching is varied and dependent on internal factors (personal perspectives; Amobi, 2005) and external variables (instructors' guidelines; Vare, 1996). A more thorough understanding of what is happening during microteaching episodes will allow researchers to design and establish the effectiveness of teacher education pedagogy.

Mixed methods – qualitative and quantitative designs. Butler (2001) studied the effects of two microteaching experiences on pre-service teachers' understanding of important concepts related to effective teaching. Fifteen participants completed two measures at pre and posttest: (1) concept maps on the topic of teacher effectiveness, and (2) the Survey of Teaching Effectiveness (STE) - an observation, time sampling procedure. After instruction in concept mapping and completing the pre-test map on effective teaching, pre-service teacher participants completed two microteaching sessions: one with their peers, and one with school-age students. Pre-service teachers viewed a video of their teaching, wrote a self-evaluation, created a second concept map on "effective teaching," and participated in a personal interview with the researcher.

Butler (2001) found no significant change in concept map scores from pre to posttest. Also, the author found no significant correlation between pre-service teacher map scores and STE scores. Butler (2001) concluded that qualitative analysis suggested microteaching affected pre-service teachers thinking regarding the challenges of teachings and their skill development.

Other than reporting subjects' responses, however, Butler did not report in detail a qualitative data analysis process that led to these conclusions. In addition, *t*-tests and correlations were referenced, but no statistics were given, nor were effective sizes reported. For these reasons, the findings of this study do not lend themselves to causal conclusions.

Quasi-experimental studies. Borg et al. (1969) used a quasi-experimental research design to study the effects of microteaching formats on 11 observed pre-service teacher behaviors (e.g., using redirecting questions, pausing, asking questions requiring longer student answers). Over 60 participants completed pre- and post-treatment video tapes and participated in mini lessons of watching videos on identified discussion strategies, microteaching with a small group of school-age students, observing a video of their lesson, and re-planning for the next microteaching session. Borg and colleagues (1969) concluded that pre-service teachers who completed the entire microteaching mini-course did not make significantly greater gains in identified teacher behaviors than pre-service teachers in the groups without microteaching or video feedback.

The authors' (Borg et al, 1969) assignment of participants to treatment and comparison groups was difficult to understand. For instance, pre-service teachers from several colleges or universities participated in the study and Borg and colleagues (1969)

describe a complicated process of assigning them to treatment and comparison groups. In addition, the study lacks most of the quality indicators described by Gersten et al. (2005) for quasi-experimental research. Most notably, the total number of participants is unclear, and the conditions were not described with replicable precision. Information on the video observation tool is not included and multiple measures are lacking. Given these study limitations, any conclusions regarding causality cannot be regarded as trustworthy.

Experimental studies. Saunders et al. (1975) compared the effects of four teacher education pedagogies on pre-service teachers' use of questioning strategies. Forty-six different pre-service teachers were assigned randomly to a microteaching or comparison group for each of three terms in an academic year and performed a pre and posttest video microteaching lesson with junior high school students. All groups of pre-service teachers studied the same content focused on questioning techniques but the teacher education pedagogy varied: the treatment group was microteaching with school-age students; and the three control groups were observation, microteaching with peers, and lecture-discussion. Pre and posttest videos were scored for frequency of redirection and type of questions asked (e.g., probing, knowledge, comprehension). Saunders and colleagues (1975) did not find a significant difference between the redirecting behavior or question types on posttest means of the groups. However, both microteaching groups did make significant gains from pretest to posttest scores, whereas participants in the lecture-discussion or observation groups did not make significant gains.

Saunders and colleagues (1975) included a number of quality indicators for experimental studies (Gersten et al., 2005). Saunders et al. (1975) randomly assigned participants within each class, increasing the likelihood of comparable groups. They

described each condition, measures were administered at appropriate times, and they used appropriate data analysis. However, Saunders and colleagues (1975) did not use multiple measures, provided no fidelity of implementation information, and did not calculate effect sizes. Even with these limitations and the small sample size (n = 46), this randomized study points to the promise of microteaching as an effective teacher education pedagogy for increasing specific, research-based, teacher behaviors.

Copeland (1975) studied whether microteaching affected specific teaching skills of 32 pre-service teachers in the teaching laboratory and in the classroom during student teaching. Subjects were randomly assigned to treatment or control groups and subjects in the treatment (microteaching) group participated in a 5-week microteaching course. All participants were recorded in the laboratory teaching a lesson, as well as recorded three times teaching in their field placements. Recordings were coded for the target skill of "asking higher order questions" and "asking probing questions" (p. 290). Results indicated significant differences between the groups during the laboratory recordings, favoring the microteaching group. However, no significant difference was found between the pre-service students in the microteaching and control groups during the field-test recordings.

Copeland (1975) included the quality indicators (Gersten et al., 2005) of random assignment to help ensure relevant characteristics were equivalent across conditions, measured outcomes at appropriate times, and used data analysis techniques appropriate to answer his research questions. However, several quality indicators for experimental research were missing (Gersten et al., 2005). Little information was given regarding the intervention and no information was given about the interventionists or the control

condition. Fidelity of implementation information was not included, multiple measures were not included, and no effect sizes were included. Considering the quality indicators missing from Copeland's (1975) study, results should be interpreted with caution.

Madike (1980) examined whether school-age students' mathematics achievement would be affected by the type of preparation pre-service teachers received prior to their practicum: microteaching, observation, or no practicum preparation. Madike (1980) randomly selected 36 pre-service teachers and 576 school-age students in Nigeria for participation in this study. Pre-service teachers in the microteaching group participated in a 5-week unit focused on nine teaching skills (e.g., lesson closure, reinforcement). Pre-service teachers in the observation group consciously modeled experienced high school teachers. Madike (1980) measured student mathematics achievement and the frequency of student participation behaviors during mathematics lessons. Madike (1980) reported a significant main effect for students' mathematics achievement scores and teacher preparation strategy. In addition, he found a significant difference between microteaching and observation strategies, but no significant difference between observation and no preparation. Madike (1980) also found a significant teacher-preparation effect for student participation behaviors. When comparing teachers trained with microteaching and observation strategies, he found a significant affect favoring the microteaching condition. There was no significant effect when comparing the observation group with the no preparation group. Madike (1980) concluded that microteaching can be used to help pre-service teachers translate their learning into improved student participation in classroom activities and academic achievement.

Madike (1980) included several quality indicators for experimental research (Gersten et al., 2005). Madike (1980) included sufficient rationale for why participants across conditions were equivalent, measured outcomes at the appropriate time, and analyzed data appropriately to answer his questions. However, some quality indicators for experimental studies were missing. He did not provide information about the interventionists for either the microteaching or the observation groups, explain the intervention or control conditions well enough to allow for replication, use multiple measures, or report effect sizes. Given these study limitations, Madike's (1980) conclusions, while encouraging, should be revisited using more thorough study reporting.

These three experimental studies established microteaching's effects on pre-teacher behaviors and improved school-age student outcomes. Saunders et al. (1975) and Copeland (1975) found pre-service teachers in microteaching groups implemented more targeted teaching behaviors in videos; however, the difference was not sustained by the pre-service teachers during their practicum settings in Copeland's (1975) study. Madike (1980) found, not only did pre-service teachers who had participated in the microteaching condition implement more of the targeted teacher behaviors, school-age students in their classes improved their classroom participation and achieved higher academic outcomes.

Summary of microteaching research. In summary, microteaching has been used and written about in the professional literature for over forty years. Descriptive studies and qualitative research provide a context to better understand findings from the available quasi-experiment and experiments on microteaching's effect on pre-service teachers' knowledge and implementation of research-based practices. Descriptive studies examined the various ways teacher educators have used microteaching to support pre-service

teacher development. Vare's case study (1996) provided insight into the varying viewpoints of pre-service teachers in microteaching labs – whether microteaching is viewed as simulation or real teaching may impact what Amobi (2005) found as pre-service teachers willingness (or unwillingness) to allow their early teaching attempts to be scrutinized by others.

Much of the experimental and quasi-experimental work on microteaching's effect on pre-service teachers' knowledge and implementation of research-based practices was completed in the 1970's and 1980's – an era of effective teaching techniques and clinical teaching. The studies reviewed here reflect the research standards of the time (e.g., lack of reporting of effect sizes). They also show that pre-service teachers who participated in microteaching pedagogy may (1) use more target skills than pre-service teachers participating in lecture-discussion or observation classes (Saunders et al., 1975), (2) exhibit target skills in microteaching settings but not in their practicum classrooms (Copeland, 1975), and (3) promote higher academic achievement in their practicum classrooms (Madike, 1980). Given the requirement in both IDEA's 2004 reauthorization and 2011 NCLB legislation that educators use research-based practices to teach all students, it seems appropriate to revisit microteaching and focus on its effectiveness to increase pre-service teachers' knowledge and implementation of a research-based practice.

Research-Based Practice for Inclusive Classrooms: Concept Mastery Routine

The literature describes how teacher educators have implemented microteaching to address a variety of goals with pre-service teachers (e.g., reflection, precision). Given the current emphasis on research-based practices in education and the inclusion of

students with varying abilities and disabilities in general education classes, it seems relevant to study microteaching's effectiveness on pre-service teachers' learning and implementing of a research-based practice designed to meet the needs of all students in inclusive classes. The Concept Mastery Routine (CMR) is an example of a research-based practice developed to help pre-service and inservice teachers teach students of various abilities in their classes. Previous studies indicated that inservice teachers implement CMR with greater fidelity after training than before training and that pre-service and inservice teachers alike increase their knowledge of CMR after training (Bulgren et al., 1988; Fisher et al., 1999). Because of CMR's focus on improving school-age students' academic outcomes in inclusive settings and previous success in training teachers to implement CMR, it appears to be an appropriate practice to use in conjunction with mictroteaching to discover if microteaching is an effective pedagogy to help pre-service teachers learn and implement a research-based practice.

CMR is one of the Content Enhancement Routines (CERs), a set of practices to help teachers organize and present content information (Bulgren, Deshler, & Lenz, 2007; Deshler, 2001). The CERs were developed and researched at the University of Kansas Center for Research on Learning (KU-CRL) to provide students with learning disabilities (LD) and at-risk students better access to the general education curriculum in inclusive classrooms (Bulgren, 2006). Researchers found that following training, teachers implemented CERs with fidelity; and students with and without disabilities in CER classrooms scored significantly higher than did students in classes with traditional instruction on regularly scheduled exams (Bulgren, Deshler, Schumaker, & Lenz, 2000; Bulgren et al., 1988; Schumaker, Fisher, & Walsh, 2010).

With input from teachers, researchers at KU-CRL developed CERs to benefit all students in inclusive classrooms. Teachers reported that student success in general education classes depended on mastery and manipulation of content knowledge (Bulgren, 2006), and they were unwilling to implement interventions that benefited only a small number of students in their classes (Deshler et al., 2001). Therefore, the CERs were developed with several principles to support every student's content learning in inclusive classes (Bulgren, 2006). For example, in the CERs, the integrity of critical course content is maintained, and the teacher mediates instruction by building on the students' previous knowledge, identifying, linking, and organizing essential content. Finally, learning is delivered in partnership with students, enriching learning for all students (Bulgren, 2006; Bulgren et al., 2000).

The CERs include three major types of routines: organizing routines, understanding routines, and recall routines. The Concept Mastery Routine (CMR) is part of the understanding strand of CERs, designed to guide teachers to routinely help students understand concepts by relating them to previous knowledge (Deshler et al., 2001). Teachers "specify what concept is going to be learned, access the knowledge students possess related to the new concept, explicitly depict the information …in a graphic organizer, connect student knowledge with the new concept, and summarize what has been learned in a brief written statement" (Deshler et al., 2001, p. 98).

CMR combines previously researched methods (e.g., advance organizers, graphic organizers, interactive devices) into an instructional routine that facilitates student mastery of information related to key concepts in the general education curriculum (Bulgren, Schumaker, & Deshler, 2003; Fisher et al., 1999). Before presenting a concept

to students, teachers prepare a concept diagram outlining the key concept, the broader concept encompassing the key concept, key terms, characteristics that are always, sometimes, and never present, examples and nonexamples, and a complete definition. Using this prepared concept diagram as a guide and the CMR instructional routine, the teacher leads the class to co-construct a diagram with student input. The CMR instructional routine includes a three-phase sequence: cue, do, review. During the "cue" phase, the teacher names the concept diagram, explains how it will help, and explains student expectations. During the "do" phase, teachers and students co-construct the concept diagram using seven linking steps. Finally, in the "review" phase, teachers ask questions to check for understanding of the concept and use of the concept diagram.

Researchers have conducted two experimental studies exploring the effectiveness of the CMR, mentioned earlier in this chapter. In the first of these two studies, Bulgren et al. (1988) used a multiple-baseline across teachers design and a multiple-baseline across groups of students design to examine the effectiveness of CMR for teaching concepts to secondary students with and without disabilities in inclusive classes. Seven regular education teachers completed the study and 32 students with LD were enrolled in the 23 classes taught by the seven teacher participants. A subset of the 443 students who were not LD (NLD) in the teacher participants' classes was selected randomly to be experimental comparison students. LD students were matched with NLD students from the pool of students enrolled in the same course, and further matched by gender, age, and grade. Participating teachers attended a 4 hr workshop including description and demonstration of the CMR steps, and teacher practice of the steps with individual feedback. After training, teacher participants organized lessons by preparing a Concept

Diagram prior to class and implementing the Concept Routine during instruction. As the study progressed, teachers were asked to incorporate a "Concept Review" using the Concept Diagram during their typical review session before the unit test.

Bulgren and colleagues (1988) found that, following training, teachers completed Concept Diagrams accurately; their scores on the Concept Diagram Test improved from 24.3% at baseline to 93.4 % after training. Likewise, teachers' average score on implementing the Concept Teaching Routine improved from 27.7% at baseline to 91.4% after training. In three cases, this improvement occurred after a researcher consulted with the teacher about missing implementation elements.

Bulgren et al.(1988) also found that students with and without LD performed significantly better on the Concept Acquisition Tests and regularly-scheduled content tests when teachers used the CMR then when they did not use the CMR. The researchers conducted *t*-test analyses on matched LD and NLD students' scores. Both LD students and NLD students achieved significantly better on Concept Acquisition Tests during the concept training and review condition than during baseline (LDs: $d = 1.50$; NLDs*:* $d = 2.99$), in the concept training condition than during baseline (LDs: $d = 1.11$; NLDs: $d = 0.99$), and in the concept training and review condition than the concept training condition (LDs*:* $d = 0.73$; NLDs: $d = 2.56$). On regularly scheduled unit tests, students with and without disabilities scored significantly higher during the concept training and review condition than baseline (LDs: $d = 1.73$; NLDs*:* $d = 1.56$), and significantly higher during the concept training condition than baseline (LDs: $d = 1.45$; NLDs*:* $d = 1.25$). Bulgren et al. (1988) noted, however, that even after concept training, one quarter of students with LD were not scoring above 60% on regularly scheduled class tests.

Bulgren et al. (1988) included several quality indicators for single-subject research (Horner et al., 2005) in their study. The dependent variables were operationally and quantifiably described, measurement was valid and precise and repeated over time, and reliability data were reported. The independent variable was described precisely, manipulated by the researcher, and implementation fidelity was measured. A baseline condition was described and experimental effect was demonstrated. Social validity was established as the dependent variable (teacher knowledge and implementation, student outcomes) was socially important and cost effective, and implementation of the independent variable (CMR training) was also practical. Bulgren and colleagues (1988) did not provide an adequate description of participants and settings; they failed to provide enough detail of their participant selection process to allow for replication.

Fisher et al. (1999) used experimental group and single-subject designs to examine the effects of an actual or virtual CMR workshop on pre-service and inservice teachers' knowledge of CMR and inservice teachers' implementation of CMR. Fisher et al. (1999) randomly assigned 58 pre-service and 10 inservice teacher volunteers to either a virtual workshop condition or an actual workshop condition. At the beginning and end of each workshop, participants completed the Knowledge and Diagram Tests. In addition, before and after training in the CMR, inservice teachers in both conditions were observed in their classrooms presenting lessons in which they indicated a concept would be presented. These lessons were scored using the Implementation Checklist. Participants assigned to the virtual workshop condition attended training in a university computer lab. A virtual workshop session leader loaded the virtual workshop, provided a 5 min demonstration, and provided technical support. Participants were allowed 2 hr 30 min to

complete the workshop, followed by 30 min to complete the Knowledge Test and 10 min to complete the Diagram Test. Participants in the actual workshop condition attended the actual workshop where the session leader presented the CMR using visuals and videos, as well as answered any questions. Similar to the virtual workshop condition, 4 hrs were scheduled during the actual workshop condition to complete the pretests, the actual workshop, and the posttests.

A pre-posttest control-group design was used to compare participant scores on the Knowledge and Diagram Tests. Fisher et al. (1999) found that pre-service and inservice teachers improved their understanding of the CMR as evidenced by an increase in their Knowledge and Diagram Test scores after training. Specifically, Fischer et al. (1999) found that pre-service teachers who participated in the virtual workshop scored significantly higher on both the Knowledge Posttest (d = 5.80) and Diagram Posttest (d = 14.11) than on the pretests. Likewise, pre-service teachers who participated in the actual workshop scored significantly higher on the Knowledge Posttest (d = 6.43) and Diagram Posttest (d = 14.63) than on the pretests. There was no statistically significant difference between pre-service teacher posttest scores in the virtual and actual workshop conditions on the Knowledge Test or the Diagram Test. In a similar way, Fisher and colleagues (1999) found that inservice teachers in the virtual workshop condition scored significantly higher on the Knowledge Test ($z = 2.19$, $p < 0.04$) and on the Diagram Test ($z = 1.80$, $p < 0.04$) after training than at pretest. Inservice teachers in the actual workshop condition also scored significantly higher on the Knowledge Test ($z = 2.21$, $p < 0.04$) and on the Diagram Test ($z = 1.80$, $p < 0.04$) at posttest than at pretest. There was

no statistically significant difference between inservice teacher posttest scores in the virtual and actual workshop conditions on the Knowledge Test or the Diagram Test.

Fisher et al. (1999) examined the inservice teachers' Implementation Checklist scores using a multiple-baseline across-teachers design, replicated twice. They found that inservice teachers who participated in both types of workshops improved their implementation of the CMR as measured by Implementation Checklist scores from baseline (virtual: $M = 12.45\%$; actual: $M = 19.03\%$) to after training (virtual: $M = 84.68\%$; actual: $M = 78.25\%$).

Fisher et al. (1999) included some of the quality indicators for group experimental and quasi-experimental research (Gersten et al., 2005). Participants were assigned randomly to virtual and actual workshop conditions and pretest scores were compared to ensure the groups were comparable. The two conditions were clearly described but no fidelity of implementation data were provided. Outcomes were measured at appropriate times, and knowledge and implementation measures were used. The data were analyzed correctly to answer the researchers' questions and matched the unit of analysis. Effect sizes were not given. Fisher and colleagues (1999) also used several quality indicators (Horner et al., 2005) in the multiple-baseline across teachers portion of this study. They described the teacher participants, and provided information on how the dependent variable would be measured and the reliability of the measurement tool. The conditions (actual and virtual workshops) were described well, and information was provided regarding establishing baseline conditions. The effects were documented across eight teachers in five different schools. Fisher et al. (1999) did not provide information on how they solicited volunteers for the study. Given the quality of the design and

implementation of this study (Fisher et al., 1999), the conclusions can be deemed trustworthy.

Both of these studies on CMR (Bulgren et al., 1988; Fisher et al., 1999) found that pre-service and inservice teachers improved their knowledge of the CMR from pretest to posttest. In addition, all inservice teacher participants improved their Implementation Checklist scores from pre- to posttest. Finally, Bulgren and colleagues (1988) found that students with and without learning disabilities scored significantly better on Concept Acquisition Tests and unit tests during conditions when CMR was used.

One key difference between these CMR studies has implications for the current study: Bulgren et al. (1988) included practice in the training she offered teachers while Fisher et al. (1999) did not. All of the teachers in the Bulgren et al. study (1988) achieved mastery (85%) during post training implementation of the CMR on the implementation checklist. However, two of the eight teachers in Fisher's et al. study (1999) never reached mastery (80%) in implementing the CMR. It is unknown whether practice opportunities or lack of practice opportunities significantly influenced the implementation outcomes in these studies. The current study explored the importance of practice, as part of the microteaching model, in pre-service teachers' learning and implementation of CMR, a research-based practice.

Summary

Research indicates that implementing research-based instructional practices with fidelity impacts positive student outcomes in inclusive classrooms. Yet, a gap exists between research and practice, in part because pre-service teachers are often not adequately prepared to implement research-based practices (Greenwood & Maheady,

2001). Teacher preparation programs can provide an avenue to increase pre-service teachers' knowledge and implementation of research-based practices and may also impact future school-age student outcomes. Rigorous research leading to causal claims regarding teacher preparation pedagogy, pre-service teacher knowledge, fidelity of implementation, sense of efficacy and school-age student outcomes is scarce. Using varying levels of methodological rigor, microteaching has been studied in the past as a teacher education pedagogy to increase pre-service teacher knowledge and implementation of specific skills with mixed results.

The purpose of the current study was to examine how teacher education pedagogy (microteaching) affects pre-service teachers' knowledge and implementation of a research-based practice (Content Mastery Routine) and teacher efficacy. In addition, this study explored the feasibility of implementing a randomized, control-group study in the context of teacher preparation classes. Better understanding of how to conduct rigorous research in teacher education programs that affects pre-service teacher outcomes may lead future researchers to examine the effects of teacher education pedagogies to improve school-age student outcomes as pre-service teachers move into their teaching careers.

Chapter III

Method

The purpose of this study was to examine how a teacher education pedagogy (microteaching) affects pre-service teachers' knowledge and implementation of a research-based practice (The Content Mastery Routine - CMR) and teacher efficacy. In addition, this study explored the feasibility of implementing a randomized, control-group study in the context of a teacher preparation class. Specifically, this study addressed three research questions: (1) What is the effect of microteaching on pre-service teachers' knowledge of CMR? (2) What is the effect of microteaching on pre-service teachers' implementation of CMR? and (3) What is the effect of microteaching on pre-teachers' teacher efficacy?

Participants and Setting

Participants were pre-service teachers seeking general education licensure in a variety of content areas (e.g., math, science, language arts, social studies, business, or history). They were recruited from one of four sections of teacher education classes focused on teaching diverse students in general education classes. All classes met during a summer session at a large Midwestern university.

Before the first day of CMR instruction, I met with each class and described the study, detailed the opportunity to participate and read and discussed the study consent form. I answered questions and invited pre-service teachers to participate in the study and sign the consent form. I told the pre-service teachers enrolled in each class that all study activities, with the exception of the video implementation using the Implementation

Checklist, were part of the course requirements. If they consented to participate in the study, they were primarily consenting for their data to be used in the study. The course instructors collected the forms on that day and following class periods prior to the first day of CMR instruction. A total of 102 participants out of 135 pre-service teachers attending the four classes consented to participate in the study, providing an overall consent rate of 75.56%.

After pre-service teachers consented to being in the study, the course instructors assigned each participant a study ID number. Participants were blocked by class and assigned randomly to a treatment or control condition using the Microsoft Excel Rand function. Within the treatment and control conditions, participants were further assigned randomly to small groups for the small-group processing portion of the study. Also during this process, participants in the intervention condition were assigned randomly to be the first, second, or third microteacher in their small group.

At pretest, 99 participants completed the Knowledge and Diagram Tests and 100 participants completed the Efficacy scale. At posttest, 100 participants completed all three paper and pencil measures. Of the final sample of 93 completed implementation videos, 47 participants were in the experimental condition (microteaching) and 46 participants were in the control condition.

Demographic information was collected at the time of the video sessions, so demographic information was only recorded for those participants who completed videos and agreed to provide the information. One participant who agreed to be videoed did not provide demographic information. Table 1 provides demographic information for the 92 participants who agreed to provide this data for the study. Chi-square analysis conducted

to examine the relation between treatment (microteaching) or control group placement and the demographic factors age, gender, years of postsecondary education, ethnicity, and major field of study revealed statistically non-significant findings: age (X^2 (3) = 2.39, p = .50); gender (X^2 (3) = 0.41, p = .81); education (X^2 (3) = 1.39, p = .71); ethnicity (X^2 (6) = 3.11, p = .80); and major (X^2 (11) = 4.50, p = .95).

Table 1. *Demographic Characteristics of Participants by Condition*

Variable	Control		Treatment (Microteaching)	
	n = 46		*n* = 46	
	n	(%)	*n*	(%)
Age in years				
20-24	25	54.3	20	43.5
25-29	9	19.6	15	32.6
30-40	10	21.7	10	21.7
40 +	2	4.4	1	2.1
Gender				
Male	20	44.4	17	37.8
Female	25	55.6	28	62.2
Years postsec. education				
1-4	10	21.7	12	26.7
5-7	32	69.6	30	66.7
7 +	4	8.7	3	6.7
Ethnicity				
Asian	2	4.4	2	4.4
Hispanic	1	2.2	0	0
American Indian	0	0	0	0
Black	1	2.2	1	2.2
Native Hawaiian / Pacific Islander	0	0	0	0
White	39	86.7	42	91.3
Biracial	1	2.2	0	0
Other	1	2.2	1	2.2
Major field of study				
Lang. arts	5	11.1	7	15.2
Soc. studies	8	17.8	4	8.7
Art	4	8.9	5	10.9
Music	0	0	1	2.1
Foreign lang.	2	4.4	1	2.1
Science	8	17.8	9	19.6
ESL	5	11.1	4	8.7
Business	1	2.2	1	2.1
Elem. Ed.	1	2.2	2	4.4
Agriculture	0	0	1	2.1
Math	11	24.5	11	23.4

Measures

All participants completed pre and posttest measures outlined in Table 2.

Table 2. *Data Collection Schedule*

Pre-test	Posttest
CMR Knowledge Test	CMR Knowledge Test
Diagram Test	Diagram Test
Teacher Efficacy Scale	Teacher Efficacy Scale
	CMR Implementation Checklist
	CMR Satisfaction Questionnaire

CMR Knowledge Test. A 5-item Knowledge Test and evaluation guidelines developed for previous research (Fisher et al., 1999) were used to assess participants' knowledge of the critical features of CMR at pretest and posttest. This group-administered measure required participants to write responses to questions, which were scored based on specific evaluation guidelines. For example, Item 1: *Briefly describe the purpose of the Concept Mastery Routine* was scored for a total of up to 3 possible points (0, 1, 2, or 3 points). A response was awarded 1 point if the response included the words *teach*, *master*, or *understand;* 1 point if the response included the words *concepts*, or *big ideas*; and 1 point if the response included the words *diverse*, *academically diverse*, or *heterogeneous learners*. After a point value was assigned to each answer, the points were totaled. A total of 32 points was possible on the 5 items. Refer to Appendix A for an example of the CMR Knowledge Test, Evaluation Guidelines, and Coding Sheet. On the Knowledge Test, Fisher et al. (1999) reported an interscorer reliability of 96.75%. Reliability data from the current study was $K = .884$ ($p < .001$) on 20% of items scored and a Cronbach's alpha internal consistency reliability of .80.

Diagram Test. At pretest and posttest, participants completed a Diagram Test used in previous research (Fisher et al., 1999) to assess their knowledge of the type of information that should be included in each section of the CMR diagram. During this group-administered, paper-and-pencil test, participants were given a blank CMR diagram and directed to complete the Concept Diagram for the targeted concept, "automobile" within a 10-min time limit. The Diagram Test was scored using evaluation guidelines, awarding points for each diagram section (Fisher et al., 1999). For example, a participant could earn 5 points for correctly writing the *concept name*, 5 points for writing the *overall concept*, and up to 5 points for *noting the key words*. Points awarded for each diagram section were totaled; a total of 110 points was possible. Refer to Appendix B for an example of the Diagram Test and Coding Sheet. Similar to the Knowledge Test, the Diagram Test was developed for the Fisher et al. (1996) study with interscorer reliability of 97.87%. Overall inter-rater reliability on 24% of items scored was $K = .798$ ($p < .001$) for this study, while also achieving a Cronbach's alpha internal consistency reliability of .78.

Teacher Efficacy Scale. At pretest and posttest, participants completed a 16-item Teacher Efficacy Scale, scoring each item on a scale of one to six (strongly disagree to strongly agree) (see Gibson & Dembo, 1984). Teacher efficacy measures participants' general beliefs that the environment can be structured so that students can learn and their beliefs in their own abilities to effect positive student change. This group-administered, paper-and-pencil measure included items intended to measure participants' "personal teaching efficacy" (e.g., item 14: *When the grades of my students improve, it will usually be because I found better ways of teaching the student*) and "teaching efficacy" (e.g.,

item 2: *The hours in my class will have little influence on my students compared to the influence of their home environments*). Item responses were totaled for the Teacher Efficacy Scale score. Gibson and Dembo reported a Cronbach's alpha internal consistency reliability of .79; while the current study achieved a Cronbach's alpha reliability of .77. See Appendix C for a copy of the Teacher Efficacy Scale.

Implementation Checklist. The Implementation Checklist was used at posttest to assess participants' fidelity of implementation of CMR on video recorded lessons (Fisher et al., 1999). The checklist was divided into sections aligned with CMR Linking Steps and Cue-Do-Review sequence and points were awarded for each CMR essential element. A total of 17 teacher behaviors were assessed. Ten of those behaviors were awarded 0 or 1 point (e.g., *specifies the students' role in the process*); six of the behaviors were awarded 0, 1, 2, or 3 points (e.g., *each appropriate characteristic written on the board labeled as always present*); and one behavior was awarded 0, 1, 2, 3, 4, or 5 points (*note key words*). Points awarded for each behavior were totaled; 33 points were possible. Fisher and colleagues (1999) reached inter-observer agreement of 90%. Overall inter-rater reliability on 20% of items scored was $K = .972$ ($p < .001$) for this study and Cronbach's alpha internal consistency reliability was .58. See Appendix D for an example of the Implementation Checklist.

CMR Satisfaction Questionaire. A four-item measure, adapted from Bulgren, Schumacher, & Deshler (1988) was administered to assess participants' satisfaction with the CMR. Questions included likeliness to use the CMR or recommend it to others. Refer to Appendix E for a sample of the CMR Satisfaction Questionnaire.

Dependent Variables

The dependent variables for this study were: (a) total number of items scored correctly on the CMR Knowledge Test; (b) total number of items correctly included on the Diagram Test; (c) total Teacher Efficacy Scale score; (d) total number of CMR elements included in the implementation video as measured by the Implementation Checklist total score; and (e) satisfaction with the CMR as indicated by analysis of responses to each item on the Satisfaction Questionnaire.

Independent Variable

The independent variable for this study was the type of small-group processing the participants received (i.e. whether participants performed microteaching or discussion). Following large-group discussion, all students divided into small groups. Participants in the control condition discussed application questions related to CMR. Participants in the treatment condition used microteaching with feedback on their use of CMR. A description of the two-day, CMR instructional sequence repeated in each of the classes is provided in Table 3.

Table 3. *Concept Mastery Routine (CMR) Instructional Sequence*

	Day 1	Day 2
Activity/ Topics	Pretesting Powerpoint Lecture • Diverse Classrooms • Evidence-Based Practices • Content Enhancement Routines • Concept Mastery Routine • Concepts • Components of the Concept Mastery Routine o Concept Diagram o Linking Steps (with video clips) o Cue-Do-Review Sequence (with video clips)	Review CMR components Discuss Implementation Checklist View video of CMR implementation while filling out Checklist Small group processing of CMR • Control condition – discussing application questions related to CMR • Treatment condition – microteaching of CMR with feedback • Group processing Individual reflection

Day 1. I began class by reintroducing myself: my background, and my interest in improving inclusive outcomes for students with and without disabilities. The instructor of each class and I distributed the pretests and gave the pre-service teachers time to work. Following the pretest, I began the lecture and discussion portion of the class by reviewing the exceptionalities covered in the course and highlighting increasing classroom diversity. I (a) introduced the idea that using research-based practices is one way teachers can attempt to meet the varied needs of students in their classrooms, (b) discussed some of the strategies they have discussed in class, and (c) introduced the content enhancement routines as techniques that have been developed to meet the needs of students with differing abilities and backgrounds in general education classes.

Next I described the specific goals of CMR, the definition of a concept, and the importance of concepts in content learning, allowing the pre-service teachers opportunities to generate and share examples of important concepts from their content

areas. CMR stresses that school-age students understand concepts when they know the characteristics that are always present in examples of the concept, characteristics that are sometimes present, and characteristics that are never present. In addition, CMR requires students to sort potential examples into examples and non-examples based on the always, sometimes and never characteristics.

Next, I taught the pre-service teachers the three components of CMR: the concept diagram, the linking steps, and the cue-do-review sequence. I distributed a completed diagram ("Civil War") and discussed each diagram part, including the name of each section and type of information included in each. I highlighted the graphic organization of the diagram as a tool to support student concept learning and the links between the sections. I summarized that the concept diagram is created by the teacher before class and used as a reference as the teacher and class co-create a diagram during class.

Next, I showed the class an overview of the seven linking steps, pointing out that the first letters of each step form the mnemonic CONCEPT, and that they are listed on the concept diagram. I highlighted the critical information of each step and provided a video clip of a teacher implementing that step. After each video, we briefly discussed how the teacher implemented the step and other implementation options before moving on to the next linking step and repeating the process. All of the video clips for this lesson were part of a high school lesson on religions of the Middle East. Following the discussion and video clips of all seven linking steps, I opened up the discussion to general questions about implementing CMR using the linking steps. I emphasized that none of the CMR models I would show them would be totally satisfying with regard to content. That is, they may not agree with each characteristic or example included in an example

diagram or teaching sequence that I show them. However, when they are teaching, they will have resources, standards, and their expert content knowledge to guide them in creating an accurate concept diagram with their students.

The final component of CMR is the cue-do-review sequence. I provided an overview of this general instructional process and proceeded in a similar way as the linking steps. I explained a step (e.g., cue), showed a short implementation video (the same social studies lesson on Middle East religions) and summarized the cue-do-review sequence at the end. To close out the first day of CMR instruction, I reviewed the purpose and components of CMR and previewed the following day's activities.

Note: One of the classes did not finish the cue-do-review instruction during Day 1. They had more discussion surrounding the concepts presented, and were the largest class with more questions. For this class, I completed the remaining content for Day 1 at the beginning of Day 2 before continuing with Day 2 content.

Day 2. I began the second day of instruction with a review of techniques that the pre-service teachers had discussed in their coursework to teach classes of diverse learners, the purpose of CMR, and CMR's three components. Next, the course instructors and I distributed the Implementation Checklist and I discussed each item as it relates to CMR's cue-do-review sequence and linking steps. Together, the class and I watched a video of me implementing CMR with the concept "fractions" with two role-playing volunteers. The class followed the Implementation Checklist, scoring my implementation of CMR. Periodically, a pre-service teacher would ask a question or I would point out something in the video that we would discuss. Following the video, there was a short, all-class discussion.

With the class together, I gave directions regarding their small-group activities, which focused on applying CMR to the concept, "cooperation". Group members in both conditions were instructed to consider CMR within the context of a professional development initiative at "their" school with the directive to use CMR in an upcoming unit on conflict resolution, specifically to teach the concept "cooperation." The pre-service teachers were instructed to find their assigned groups, go to their assigned rooms, read and follow the entire small-group protocol, check off the boxes/steps on the protocol as they completed them, and complete the group processing questions with members from another group. I informed them that the instructor and I would "float" between the two rooms to answer any procedural questions.

Study participants were assigned randomly to their groups within conditions (see above) and course instructors assigned nonparticipants to groups. Pre-service teachers (both participants and nonparticipants) in the microteaching group went to another room and those in the control room (both participants and nonparticipants) stayed in the regularly assigned room. Each small group received a folder with the materials they needed to complete the group activities including: material on "cooperation," the concept to be studied (e.g., "cooperation" concept diagrams, "cooperation" packet), and a small group protocol checklist. Each group of participants also had a labeled audiotape and tape recorder and was instructed to record their entire small-group interaction.

Control group activities. When developing the protocol for the control group activities, I surveyed the teacher education instructors at this university. I incorporated activities that the instructors reported they typically have small groups of pre-service teachers perform to process new information. I asked the course instructors to review the

draft small group protocols and provide feedback; afterwards, I integrated their responses as appropriate.

Pre-service teachers in control groups began their discussion by sharing their feelings about CMR's potential to help a class of diverse students learn content information. Next, they reviewed the content materials on "cooperation" and discussed which aspects may be challenging for their students. After examining the "cooperation" concept diagram and reviewing their notes, group members answered questions regarding how they might use CMR in the unit (e.g., to introduce the unit or provide review), potential benefits to their students of using CMR, and possible difficulties for students. Group members next read a text of a teacher using CMR as a review in a "food chain" unit with some additional activities and discussed how the teacher used CMR, how it might be effective or ineffective for the "cooperation" unit, and how they could use CMR in similar ways to teach the concept "cooperation."

Treatment group activities. Pre-service teachers in the microteaching treatment group found 11" x 17" blank concept diagrams taped to the walls when they entered the room for their small group processing. Their first tasks were to read the content material on "cooperation," review the "cooperation" concept diagram, and review the microteaching order listed on their protocol sheet. Next, each group member (in the order provided) implemented part of the cue-do-review sequence using the "cooperation" concept diagram as a guide. Group members used the Implementation Checklist to monitor the microteacher's implementation and gave feedback at the conclusion of each microteacher's turn (7-10 min) based on the Implementation Checklist. The next microteacher began implementing the CMR at the point where the previous

microteacher's implementation had been interrupted. Group members took turns microteaching and giving feedback in this way until all group members had at least one turn microteaching.

Group processing. With 10 min of small group time remaining, groups in both the control and treatment conditions were instructed to advance to the group processing questions on their protocol forms. With members of another group, they discussed specific group activities or group member actions that helped them learn the CMR. Highlights of these discussions were recorded on the protocol sheet.

Individual reflection. At the conclusion of Day 2, all of the pre-service teachers returned to the main classroom for instructions on completing their reflection assignment. In their reflections, pre-service teachers described how they would use the CMR in their licensed teaching area(s), potential benefits and difficulties to their students in using the CMR, and an overall explanation regarding the importance of using research-based practices such as the CMR. Course instructors collected and recorded these reflections for course credit.

Procedures

Data collection procedures. Pre-test and posttest paper-pencil measures (CMR Knowledge Test, Diagram Test, and Teacher Efficacy Scale) were group measures given during class time. The posttest CMR Knowledge Test and Diagram Test were incorporated into the final course exam, as CMR was embedded into the content of the course.

Video recording procedures. Participants were video recorded while implementing CMR to measure their fidelity of implementation on one of the last days of

the course. Volunteers role-played middle and high school students during the fidelity of implementation video recordings; as study participants implemented the CMR, volunteers responded to the instruction as typical school-age students.

Of the 99 participants who completed the pre- and posttest paper-and-pencil measures, five did not complete the video recording posttest; of these, one did not attend the video recording session for an unspecified reason; two chose not to complete the video portion, citing stress regarding the video recording component; and two were absent the day of the recording. Ninety-four implementation videos were completed, but the audio quality on one video was too poor to score. Therefore, there were 93 quality videos to score for implementation fidelity.

Recruiting video recording volunteers. I recruited volunteers from two primary avenues: emails to graduate students in the Department of Educational Psychology and an advertisement in the Psychology Department newsletter. Seven undergraduate Psychology majors, one Masters' student in Educational Psychology, eight Doctoral students in Educational Psychology, and one research project coordinator volunteered.

Training video recording volunteers. I trained volunteers during group sessions or individually. During training, volunteers learned the study purpose, background of microteaching and CMR, study design, and their role during the fidelity of implementation video recording. Volunteers viewed a video of me implementing CMR with the concept "fractions," while filling in a blank concept diagram and discussed their role as being similar to the two volunteers in my video. We discussed the concept "cooperation," which the study participants would be implementing for their video recording and the procedures for the video recording sessions. We discussed the

importance of being consistent in their responses from the first participant's lesson to the fourth or fifth participant's lesson and the importance of their role as a reflection of the instruction. Because CMR is an interactive routine, it was important that the study participants had someone to interact with as they implemented, but the interactions had to be as consistent as possible from one participant to the next.

I emailed the volunteers the PowerPoint slides of the training presentation, the instructions for video recording and the completed "cooperation" concept diagram for their review before the video recording day. The volunteers reviewed the completed "cooperation" diagram, but were instructed to not provide responses exactly as given. Refer to Appendix E for an example of the training PowerPoint slides and materials.

Video recording. Video recording occurred near the end of the course during regularly scheduled class time in a suite designed for recording counselor training. The counseling lab has six rooms with video and audio recording equipment that open off a central meeting room. Volunteers were assigned randomly in pairs to each room and one volunteer in each pair served as timekeeper. Each recording room held two chairs for the volunteers and an 11" x 17" blank concept diagram was attached to the opposite wall. The study participant filled in the blank diagram as he or she implemented the CMR lesson on the concept, "cooperation." Following all the video recording for each class, the files on the hard drive were burned to DVDs for future viewing and scoring.

Study participants were scheduled to leave their class in random order in 15-min intervals to report to the counseling lab for fidelity of implementation video recording. When they reached the lab, they completed a demographic form and waited in the central meeting area where snacks and beverages were available. I kept the conversation to

topics of summer activities, classes they were taking, and so on, rather than discussing the CMR or microteaching. The participant entered a recording room as one became available where the volunteers greeted the participant and helped him/her orient to the room. Next, a volunteer reminded the participant to finish his or her lesson in 20 min and indicated that a signal would be given at the 18-min time mark. When the participant was ready to begin, one of the volunteers turned the camera on in the room. A volunteer ensured that each participant stated his or her study ID number before beginning the lesson. At the end of the lesson, a volunteer turned off the camera and reminded the participant to label the concept diagram with his or her study ID number. The volunteers thanked the participant for being part of the study and removed the completed concept diagram from the wall before the next participant entered the room. Volunteer instructions were printed for each volunteer and reviewed at the beginning of each class. The researcher and volunteers were blind to which condition the participants had been assigned.

Scoring procedures. Measures were scored by the researcher and a team of undergraduate Psychology students who had volunteered for the videotaping. Therefore, the scorers received previous volunteer training and were familiar with microteaching, the study's design, and CMR. Because the course instructors had assigned the study ID numbers, no identifying information should have been included on the measures submitted for scoring. If a participant had inadvertently written additional information, it was redacted. The scorers and the researcher were blind to which condition the participants had been assigned.

Scoring procedures for paper-pencil measures. I met with the Diagram Test scorers and introduced the Diagram Test (pre and post), evaluation guidelines, and coding sheet. Together we examined scored examples, then scored and discussed common examples, coming to agreement on any unclear responses. While still onsite, each volunteer independently scored 10 Diagram Tests. Inter-rater reliability for the scorers during training ranged from $K = 0.851$ to 0.966 ($p < .001$). We reconciled disagreements and each volunteer scorer independently scored part of the remaining Diagram pre and posttests offsite. Inter-reliability across scorers was $K = 0.798$ ($p < .001$) on 24% of items scored.

To achieve reliability in scoring the Knowledge Test, I initiated similar steps with two of the three volunteers who had scored the Diagram Tests. I introduced the Knowledge Test and coding sheet and the volunteers and I examined a sample test I created, applying the coding sheet. While still onsite, each scorer independently coded the same set of participant tests (n=17), marking any questions to discuss after scoring. Next, each scorer took a set of pre and post Knowledge Tests ($n = 17$), scored, and returned them. We reconciled disagreements and each volunteer scorer independently scored part of the remaining Knowledge pre and posttests offsite. Inter-reliability across scorers was $K = 0.884$ ($p < 0.001$) on 20% of items scored.

Scoring procedures for implementation videos. One undergraduate Psychology student and the researcher viewed the videos and used the Implementation Checklist to score participants' fidelity of implementation of CMR. This volunteer was familiar with the study from scoring the Diagram and Knowledge Tests, as well as from volunteering in the video implementation sessions. I began by introducing the Implementation

Checklist. Next, we viewed the implementation video I had created, applying the Implementation Checklist and discussing scoring protocol. We scored participant videos ($n = 9$), discussing responses and coming to agreement; and then scored nine more videos independently. Interrater reliability for training on the Implementation Checklist was $K = 0.99$ ($p < 0.001$). We reconciled disagreements and scored implementation videos independently offsite. Overall interrater reliability on 20% of items scored was $K = 0.972$ ($p < 0.001$).

While scoring the fidelity of implementation videos, I questioned whether the Implementation Checklist adequately discriminated between teachers implementing the CMR with varying degrees of fidelity. Thus, I created a Quality Ratings for Implementation Videos Scale to offer a broad score of how well the pre-service teacher implemented important CMR components to promote student understanding and student-teacher interaction. I scored 32 videos (over 33% of the total scorable implementation videos) using this Ratings Scale, in addition to the Implementation Checklist score. Given the resources available to me, double-scoring of over one-third of the videos seemed a reasonable option to explore the use of a newly-developed qualitative measure. Refer to Appendix G for an example of the Quality Ratings for Implementation Videos scale.

Treatment Fidelity

Each small group completed a Small Group Protocol Form to assess treatment fidelity. The Small Group Protocol Form consisted of detailed directions for the groups to follow and checkboxes to indicate their completion of each step. Refer to Appendix H for a sample Small Group Protocol Forms. Students assigned to treatment and control groups met in separate rooms during the small-group portion of instruction to help ensure that

control groups did not adopt microteaching elements and treatment groups did not adopt control group, application question elements. Examination of the Small Group Protocol Forms indicated that small groups assigned to the treatment condition completed a greater percentage of protocol steps (84.78%) than small groups assigned to the control condition (71.53%).

Research Design

A randomized, pretest-posttest, treatment and control-group design was used to investigate the effectiveness of microteaching on knowledge of CMR, knowledge of the concept diagram, and teacher efficacy. A post-test only, treatment and control group design was used to investigate the effectiveness of microteaching on pre-service teachers implementation of CMR and satisfaction with CMR. Pre-service teachers were blocked by class and assigned randomly to treatment (microteaching) or control (business as usual) conditions. A power analysis using the G*power program was conducted. It indicated that a sample size of 125 participants was necessary to achieve adequate power (1- *β error probability*= 0.80) to detect an effect size of $d = 0.5$.

Data Analysis

The Knowledge Test, Diagram Test, and Teacher Efficacy Scale were analyzed using a between subjects repeated measures analysis of variance (ANOVA) where time (pretest and posttest) was treated as a within subject effect and condition (treatment or comparison) was the between subject effect. Effect sizes were calculated using Eta squared (η^2; Cohen, 1992). I used a two-samples *t*-test to examine if there was a significant difference between the average scores of participants in the control and microteaching groups on the Implementation Checklist, given only at posttest. Quality

Ratings for the Implementation Videos Scale and the Satisfaction Questionnaire were both analyzed using a Chi Square analysis. An item-by-item analysis was also reported on the Satisfaction Questionnaire. Effect size calculations were interpreted using Cohen's guidelines: (a) .02 as a small effect size, (b) .13 to .25 as a medium effect size, (c) .26 and larger is considered a large effect size (Cohen, 1988).

Chapter IV

Results

The purpose of this study was to examine the effects of microteaching on pre-service general education teachers' knowledge and implementation of CMR, a research-based intervention to support content learning in inclusive settings, and on their teacher efficacy. Specific research questions were: (1) What is the effect of microteaching on teachers' knowledge of CMR? (2) What is the effect of microteaching on pre-service teachers' implementation of CMR? and (3) What is the effect of microteaching on pre-teachers' teacher efficacy? The study used an experimental design in which individuals were assigned randomly within each of four classes to an experimental (microteaching) or control group. A pre- and posttest design for the knowledge and efficacy measures and posttest-only design for the implementation measure were employed.

In this chapter, data analyses are presented, including an examination of the underlying assumptions of analysis of variance (ANOVA) and *t*-tests. Descriptive statistics are presented for each measure, followed by findings from each statistical test. The Knowledge Test, Diagram Test, and Teacher Efficacy Scale repeated measures ANOVA results are presented first, followed by the Implementation Checklist *t*-tests results, and then Quality Ratings for Implementation Videos Scale and Satisfaction Questionnaire chi-square results. Finally, an item-by-item analysis is provided for the Satisfaction Questionnaire.

Analysis of Assumptions

The assumption of normality was tested by examining the skewness and kurtosis of each dependent variable. Skewness should be within -2 and +2 range and kurtosis

within the -3 and +3 range when data are normally distributed (Field, 2005). Values for the dependent measures are generally within acceptable limits with the exception of large kurtosis values for the Efficacy Scale at pretest and posttest and the Implementation Checklist for both microteaching and control groups. These kurtosis values indicate that participants' scores are concentrated and peaked around a central value on those measures. In addition, Implementation Checklist scores are positively skewed for the microteaching group (Tables 4, 5, 6, and 7).

A test of the homogeneity of regression was conducted for each of the three dependent variables analyzed with an analysis of variance (ANOVA): Knowledge Test, Diagram Test, and Efficacy Scale. The homogeneity of regression test assesses the interaction between the covariate (the pretest) and the independent variable (control or microteaching condition) in the prediction of the dependent variable (the posttest). A significant interaction between the pretest and condition indicates differences in how posttest scores vary as a function of the pretest. On the Knowledge Test, the interaction was not statistically significant, $t(98) = -0.21$, $p = .832$. On the Diagram Test, results indicated a statistically significant interaction, $t(98) = -2.68$, $p = .009$. On the Efficacy Scale, results also indicate a significant interaction, $t(99) = -2.92$, $p = .004$. Based on these findings, I proceeded to conduct a scatterplot analysis of the correlation between pretest and posttest scores, by condition on the Diagram Test (Figure XX) and the Efficacy Scale (Figure ZZ).

Because the assumption of the homogeneity of regression was not met, I included the interaction term in the model to account for the significant interaction between the pretest and condition.

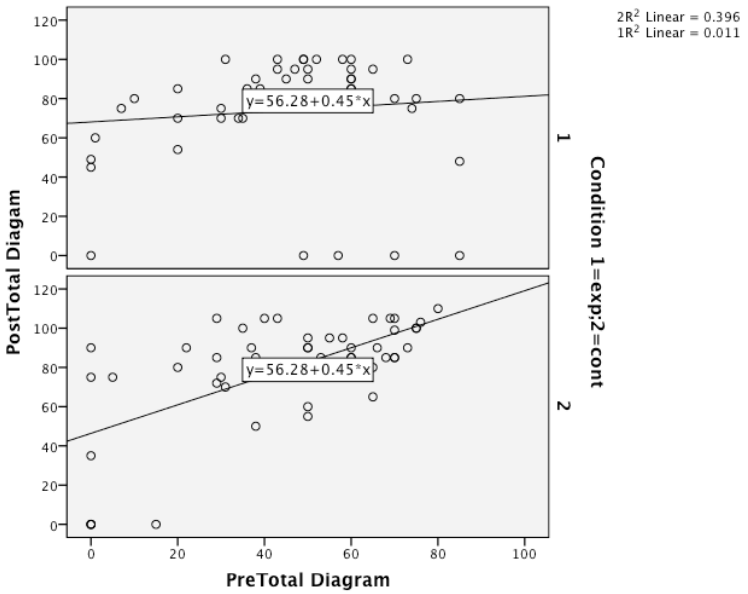

Figure 3: Scatterplot of Pretest and Posttest Diagram Test Totals by Condition with regression line

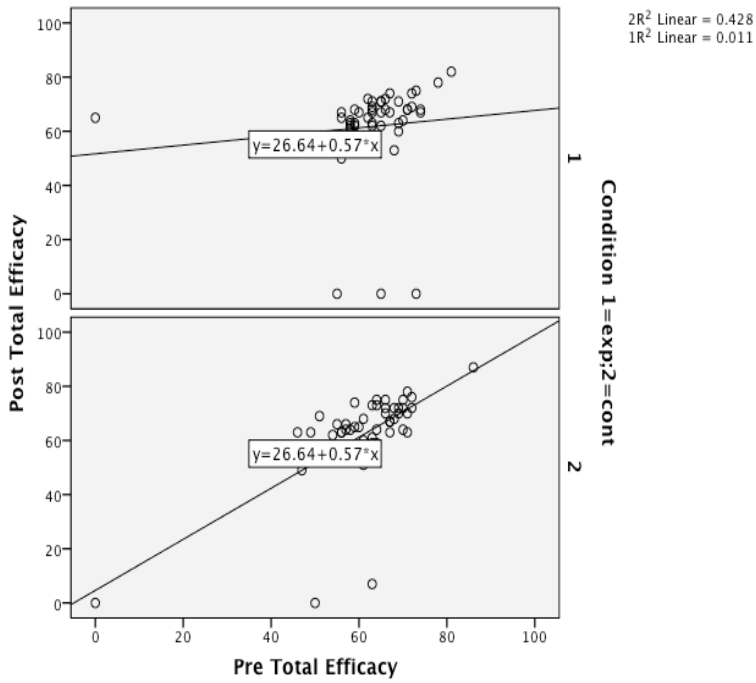

Figure 4: Scatterplot of Pretest and Posttest Efficacy Scale Totals by Condition with Regression Line

The assumptions of normality and equality of variance of the Fidelity Checklist scores were tested before the Fidelity Checklist data were analyzed using an independent-samples *t*-test. Stem and leaf plots, boxplots, and histograms indicated the distribution was not skewed in any major way, with the exception of several zero scores. Furthermore, Levine's test was non-significant for the Fidelity Checklist ($t(98) = 0.77$, $p = .446$) indicating that the two conditions had equal variances.

Inferential Analysis

I analyzed the Knowledge Test, Diagram Test, and Efficacy Scale using a repeated- measures ANOVA. I used an independent samples *t*-test to analyze the Fidelity Checklist and a chi-square analysis to examine results from the Quality Ratings for Implementation Videos Scale and the Satisfaction Questionnaire. Finally, I performed an item-by-item analysis of the Satisfaction Questionnaire.

Knowledge Test. Descriptive data analysis of participants' overall performance across conditions and time was first calculated. Table 4 summarizes the descriptive statistics for the Knowledge Test for the control and microteaching group from pretest to posttest.

A repeated measures ANOVA, where time (pretest and posttest) was treated as the within-subjects factor and condition (microteaching vs comparison) was the between subjects effect, was conducted to examine the significance of the obtained difference in Knowledge Test scores. The interaction between time and the condition variable was tested and found to be nonsignificant, $F(1, 97) = 0.745$, $p = .39$, $\eta^2 = 0.01$. In addition, the between subjects effect for condition was not significant, $F(1, 97) = 0.745$, $p = .39$, $\eta^2 = 0.01$. The within subjects effect for time was significant, $F(1, 97) = 475.780$, $p < .001$, η^2

= 0.83. These results indicated time explained 83% of the variance in Knowledge Test scores.

Table 4. *Descriptive Statistics (Means and* SD*s) and Skewness and Kurtosis for the Knowledge Test across Conditions*

Condition	*n*	*M*	*SD*	Skewness	Kurtosis
Control					
Pretest	50	1.50	1.67	0.74	0.18
Posttest	50	14.66	6.15	-0.84	0.29
Microteaching					
Pretest	50	1.38	1.84	1.21	-0.76
Posttest	49	15.90	6.16	-0.58	0.64
Total					
Pretest	100	1.44	1.75	0.99	-.028
Posttest	99	15.27	6.15	-0.69	0.42

Diagram Test. Descriptive data analysis of participants' overall performance across conditions and time was first calculated. Table 5 summarizes the descriptive statistics for the Diagram Test for the control and microteaching group from pretest to posttest.

A repeated measures ANOVA, where time (pretest and posttest) was treated as the within-subjects factor and condition (microteaching vs comparison) was the between subjects effect, was conducted to examine the significance of the obtained difference in Diagram Test scores. The interaction between time and the condition variable was tested

and found to be nonsignificant, $F(1, 97) = 0.990$, $p = .32$, $\eta^2 = 0.01$. In addition, the between subjects effect for condition was not significant, $F(1, 97) = 0.244$, $p = .62$, $\eta^2 = 0.003$. The within subjects effect for time was significant, $F(1, 97) = 111.369$, $p < .001$, $\eta^2 = 0.53$. These results indicated time explained 53% of the variance in Diagram Test scores.

Table 5. *Descriptive Statistics (Means and* SD*s) and Skewness and Kurtosis for the Diagram Test across Conditions*

Condition	*n*	*M*	*SD*	Skewness	Kurtosis
Control					
Pretest	50	45.08	24.23	-0.60	-0.73
Posttest	50	79.18	27.99	-1.86	3.09
Microteaching					
Pretest	49	45.88	22.77	-0.45	-0.31
Posttest	50	74.12	28.57	-1.73	2.26
Total					
Pretest	99	45.47	23.40	-0.53	-0.56
Posttest	100	76.65	28.26	-1.75	2.42

Efficacy Scale. Descriptive data analysis of participants' overall performance across conditions and time was first calculated. Table 6 summarizes the descriptive statistics for the Efficacy Scale for the control and microteaching group from pretest to posttest.

Table 6. *Descriptive Statistics (Means and* SD*s) and Skewness and Kurtosis for the Efficacy Scale across Conditions*

Condition	*n*	*M*	*SD*	Skewness	Kurtosis
Control					
Pretest	50	61.14	11.79	-2.83	14.33
Posttest	50	62.32	17.00	-2.68	7.91
Microteaching					
Pretest	50	63.22	11.06	-3.76	21.80
Posttest	50	61.82	16.94	-2.30	9.20
Total					
Pretest	100	62.18	11.42	-3.19	16.39
Posttest	100	62.07	16.89	-2.80	8.07

A repeated measures ANOVA, where time (pretest and posttest) was treated as the within-subjects factor and condition (microteaching vs comparison) was the between subjects effect, was conducted to examine the significance of the obtained difference in Efficacy Scale scores. The interaction between time and the condition variable was tested and found to be nonsignificant, $F(1, 98) = 0.621$, $p = .43$, $\eta^2 = 0.006$. In addition, the between subjects effect for condition was not significant, $F(1, 98) = 0.110$, $p = .74$, $\eta^2 = 0.001$. The within subjects effect for time was not significant, $F(1, 98) = 0.005$, $p < .947$, $\eta^2 = 0.000$.

Implementation Checklist. Descriptive data analysis of participants' overall performance across conditions was first calculated. Table 7 summarizes the descriptive statistics for the Implementation Checklist for the control and microteaching groups.

Table 7. *Descriptive Statistics (Means and* SD*s) and Skewness and Kurtosis for the Implementation Checklist across Conditions*

Condition	*n*	*M*	(*SD*)	Skewness	Kurtosis
Control	50	22.04	7.17	-2.33	5.30
Microteaching	50	23.16	7.46	5.50	5.50
Total	100	22.60	7.299	-2.317	4.970

An independent samples *t*-test was conducted to determine if there was a significant difference between the average scores of participants in the control and microteaching groups on the Implementation Checklist. Results of the *t*-test indicate there was not a significant difference in the scores for the microteaching and the control conditions ($t(98) = 0.77$, $p = .45$, $d = .15$).

Quality Ratings for Implementation Videos Scale. A chi-square test of independence was performed to examine the relation between the Quality Ratings for Implementation Videos Scale and microteaching or control group placement for 32 participants of the total sample. An analysis of a subset of items related to promoting student understanding and group placement revealed significant results, $X^2(3) = 9.64$, $p = .02$. A visual inspection of the results revealed no clear directional pattern; therefore, it is unclear whether the results favor the microteaching or control group. An analysis of

items related to student/teacher interaction revealed nonsignificant results, $X^2(3) = 1.76$, $p = .63$. The relation between the total score (student understanding and student/teacher interaction items) and group placement (microteaching or control) was not found to be statistically significant, $X^2(6) = 2.27$, $p = .81$.

Satisfaction Questionnaire. The Satisfaction Questionnaire was given to a subset of participants ($n = 44$). Chi-square analysis conducted to examine the relation between microteaching or control group placement and each of the four Satisfaction Questionnaire items revealed statistically non-significant findings: Question 1 (X^2 (4) = 4.25, $p = .37$); Question 2 (X^2 (3) = 4.22, $p = .24$); Question 3 (X^2 (4) = 6.10, $p = .19$); Question 4 (X^2 (4) = 6.30, $p = .18$). Participants rated responses on a five-point scale (1 indicating *strongly disagree* and 5 indicating *strongly agree*), with a majority of responses ranging from 3 (*neither agree or disagree)* to 4 (*agree*). Half of the participants (n = 22) indicated agreement (scored number 4) with Item 1: *CMR is flexible to adapt to regular classroom routines*; and 28 participants agreed (scored number 4) for Item 2: *CMR is easy to use*. Responses were more variable for Item 3: *I will likely use CMR in a future classroom situation*; six participants scored this item 1 (*strongly disagree*), nine scored it 2 (*disagree),* ten scored it 3 (*neither agree or disagree*), eighteen scored it 4 (*agree*), and one scored it 5 (*strongly agree*). Twenty-one participants scored 3 (*neither agree or disagree*) on Item 4: *I will likely recommend CMR.*

Chapter V

Discussion

This study addressed the need for teacher education researchers to develop rigorous programs of research leading to evidence of effectiveness of teacher education pedagogy. Researchers must identify conceptually-sound teacher education pedagogy and use precise research methodologies that allow for causal inferences. Existing teacher education research lacks this type of research; therefore making causal inferences related to teacher education pedagogy is difficult. Specifically, teacher educators lack research evidence regarding which teacher education pedagogies support desired outcomes (e.g., implementation of research-based practices).

Microteaching, a teacher education pedagogy designed to bridge university coursework and initial classroom teaching, was the teacher education pedagogy examined in this study. During microteaching, pre-service teachers teach shortened lessons, often focusing on single lesson components, under simplified conditions (e.g., small groups of students or peers) (Amobi, 2005; Brent & Thomson, 1996; Wilson & I'Anson, 2006). Despite some 40 years of attention in the professional literature, little is known about microteaching's effectiveness in increasing pre-service teacher's knowledge and implementation of a research-based practice or on teacher efficacy.

The Content Mastery Routine (CMR) is a research-based practice implemented by classroom teachers to meet the needs of school-age students with and without disabilities in general education classrooms (Deshler et al., 2001; Fisher, Deshler, & Schumaker, 1999). General education pre-service teachers in this study learned CMR as part of a teacher education course focused on teaching in inclusive classrooms.

The purpose of this study was to examine the effects of microteaching in the context of a pre-service teacher education course. In addition, this study explored the feasibility of conducting a randomized, controlled experimental study in the context of a teacher preparation class. Specific research questions were: (1) What is the effect of microteaching on pre-service teachers' knowledge of CMR? (2) What is the effect of microteaching on pre-service teachers' implementation of CMR? and (3) What is the effect of microteaching on pre-teachers' teacher efficacy? In this chapter, I discuss results for knowledge, implementation, teacher efficacy, and satisfaction measures. Next, I discuss the feasibility of research in teacher education, and then I discuss study limitations. Finally, I discuss implications for future research and practice.

Knowledge of a Research-Based Practice

Participants' knowledge of CMR was assessed using the Knowledge Test and the Diagram Test at pretest and posttest. Results indicated that the within subjects factor of time (pretest to posttest) was significant on both the Knowledge Test and Diagram Test. Time explained 83% of the variance in Knowledge Test scores and 53% of the variance in Diagram Test Scores. These results indicated that participants, who were essentially new to CMR before instruction, made gains in learning the required material. The greater percentage of variance attributed to time on the Knowledge Test in comparison to the Diagram Test may be explained by the structure of the tests. The Knowledge Test required knowledge of CMR-specific information to answer open-ended questions correctly (e.g., "Briefly describe each phase of the Can-Do-Review sequence"). The Diagram Test required participants to fill in a diagram focused on a topic (e.g.,

automobile), allowing participants with little or no knowledge of CMR to perform some pretest items correctly.

Results indicated no significant difference between microteaching and control groups on the Knowledge Test or the Diagram Test. These results, along with the previously explained growth in Knowledge and Diagram Test scores, may be explained by the rich pedagogy all participants experienced learning CMR, including lecture, demonstration, large-group discussion, video, and small-group discussion. In addition, the control group small-group protocol included probing application questions reflecting "business as usual" practice of the teacher education faculty, and use of application questions that have been found to facilitate application of knowledge in teacher education (Kim, Utke, & Hupp, 2005). In other words, the control group had more opportunities to discuss the diagrams in their small groups than did the microteaching groups, which focused on implementing the CMR steps.

Study results indicated participants in both conditions demonstrated significantly more knowledge of CMR after instruction than before instruction. There likely is a combination of reasons for this finding. First, the CMR was required course content (for participants and nonparticipants) and included on the course exam, encouraging all students to learn the material. Second, all pre-service teachers in the course experienced a rich variety of teacher education pedagogy including lecture with visuals, video examples of CMR implementations, large-group discussion, completing the Implementation Checklist while viewing a CMR video implementation, and individual written reflection. Third, the control group small groups implemented quality application pedagogy, providing a rigorous test of microteaching's effectiveness when compared with "business

as usual" small-group pedagogy. It is also important to consider that additional factors, such as maturation or learning from other courses participants enrolled in concurrently, may have contributed to the demonstrated growth in CMR knowledge. However, based on these results, teacher educators should choose classroom practices with a research base such as CMR to teach their pre-service teachers using the emerging body of knowledge related to effective teacher education pedagogy.

Fidelity of Implementation

Analysis of the Implementation Checklist results revealed no significant difference between participants in the microteaching and control conditions. These results countered Brent and Thomson's (1996) description of how microteaching was being used in their teacher education department to bridge the gap between lecture/discussion (abstract teacher education strategies) to field experience (concrete teacher education strategies).

The current lack of significant results may be because the Implementation Checklist did not adequately discriminate between good and poor quality implementation videos. For example, an important component of CMR is to support student understanding and facilitate students' hierarchical thinking about concepts (Bulgren, 2006). CMR Step 5 (Explore Examples) is designed to give students an opportunity to carefully consider whether a "new example" is actually an example or a non-example (Bulgren et al., 2003). The level of conceptual thinking depends on the presentation and complexity of the "new example" under consideration. However, the Implementation Checklist provides opportunity only to score how many "new examples" the teacher in the video provided, with no avenue to rate whether a "new example" helps clarify the

concept. In addition, in this process of sorting "new examples," there is no place on the Implementation Checklist to score the use of think-aloud, metacognitive strategies, which are part of the teaching of CMR. The Implementation Checklist also did not allow for recording varying degrees of teacher interaction with students when building the concept diagram, another key element of CMR. During some implementation videos, participants solicited no input from students.

After recognizing these shortcomings in the Implementation Checklist, I created and piloted the Quality Ratings for Implementation Videos Scale. Chi square results were significant related to supporting student understanding and group (microteaching or control). Descriptive statistics indicated a higher mean average for the control group than the microteaching group (control, $M = 2.44$, $SD = 1.03$; microteaching, $M = 2.20$, $SD = 1.01$) although the pattern of chi square results did not reveal whether the microteaching or control group was favored. In addition, results were non-significant related to student/teacher interaction and group, as well as total score and group. The Quality Ratings for Implementation Videos Scale began to address limitations in the Implementation Checklist.

Even considering the limitations of the Implementation Checklist and Quality Ratings for Implementation Videos Scale discussed above, the question remains, why were there no significant differences between the microteaching and control groups in fidelity of implementation. When only those participants in the microteaching group had "taught" a concept using the CMR, why did they not include more CMR elements (as scored by these two tools) than those participants in the control group who had discussed application questions? There are several possible answers. First, the microteaching

session was relatively short. The small-group sessions lasted a total of approximately 90 min and each participant in the microteaching group microtaught for only 7 – 10 min. Thus, perhaps there was insufficient opportunity to practice and receive feedback to achieve levels of proficiency that would then be reflected in stronger fidelity ratings. Second, participants in the microteaching group did not view the microteaching session as a place for real teaching (Vare, 1994) and therefore were unable to fully take advantage of the opportunity to shape their teaching behavior. Third, participants in the microteaching condition did not view their microteaching session as stress free, were essentially unavailable for peer feedback, and unable to self-correct as a result of the feedback (Amobi, 2005). If this was the case, it could be supposed that pre-service teachers in the microteaching group would not achieve higher levels of implementation fidelity as a result of the microteaching session. Fourth, feedback was only offered from peers. Participants in the microteaching condition offered and received feedback in their peer groups, but did not receive feedback from a more experienced teacher (e.g., the instructor), nor were they able to view a video of their teaching and receive feedback. Amobi (2005) found that viewing video of their microtaught lessons can impact pre-service teachers' practice. Fifth, there was only one microteaching session. If pre-service teachers have opportunities throughout their teacher preparation programs to microteach a variety of content in various contexts (e.g., video, peers, school-age students), the effects may accumulate. Sixth, all of the participants learned from the CMR instructional unit, as evidenced by the significant results in pre to posttest scores on the Knowledge and Diagram Tests. The microteaching and control group small group sessions were only a small part of the entire unit and it is reasonable to suppose that as participants

participated in the required class activities, they learned the required content, including how to implement CMR.

Teacher Efficacy

Results on the Efficacy Scale indicated a non-significant difference between microteaching and control groups. This result appears inconsistent with Bandura's theory of four sources of efficacy expectations: (1) mastery experiences, (2) social modeling, (3) social persuasion, and (4) reducing stress (Bandura, 1997). Microteaching can be viewed as an opportunity for pre-service teachers to engage in mastery experiences, observe social modeling and experience social persuasion, all surrounding the implementation of a research-based practice. Yet, in this study, there was no significant difference between the groups on the Efficacy Scale. Perhaps part of the reason for this finding is in the nature of the application questions included in the control group protocol. For example, participants in the control group were asked to discuss "aspects of the Concept Diagram that (would) cause your students the most trouble," and "how might you use the CMR during the conflict resolution unit to help students understand the concept of cooperation." By applying, through discussion, CMR to the students and classrooms the pre-service teachers plan to teach, it is possible they began to bridge the gap between the lecture, large-group discussion, and videos of CMR to how they could and will use CMR in their future classrooms. Participants in the microteaching groups did not have that opportunity. These discussions in the control condition may have contributed to control groups participants' sense that they can overcome obstacles they may encounter teaching inclusive classes by implementing research-based practices, while microteaching may

have supported experimental group participants' sense of being able to implement a research-based practice.

Also, for the sample as a whole there was not a significant difference between pretest and posttest scores on the Efficacy Scale. The total length of time from pretest to posttest (five or seven calendar days, depending on class assignment) may have been too short for a significant change to occur on the Efficacy Scale. Other researchers have found longer interventions have affected pre-service teacher efficacy. For example, Kopcha and Alger (2011) found pre-service teachers participating in a year-long eSupervision practicum performed significantly higher on efficacy measures than those in traditional practica. Likewise, Cone (2009) found that a fifteen-week community-based service-learning course positively impacted some aspects of pre-service teacher self-efficacy and Lancaster and Bain (2007) found that a thirteen-week inclusive education course increased self-efficacy irrespective of treatment group. In the current study, length of the intervention might have accounted for the lack of significant results for the total sample from pretest to posttest.

Finally, the current study confirms Lancaster and Bain's (2007, 2010) conclusions that including an applied experience in a teacher education class on inclusion may not increase pre-service teachers' teacher efficacy. Since teacher efficacy has been found to be related to teacher practice, student motivation to learn (Thoonen, Sleegers, Peetsma, & Oort, 2011) and student achievement (Tchannen-Moran, Hoy, & Hoy, 1998), more study is needed regarding what teacher education components most likely affect it.

Satisfaction with CMR

Satisfaction with CMR was measured using the Satisfaction Questionnaire. Results indicated no significance difference in the satisfaction of pre-service teachers who participated in microteaching or control small groups. While participants' responses point to a belief that CMR is flexible and easy to use, responses varied from strongly disagree to strongly agree on likelihood of using CMR in the future.

This CMR unit was embedded in a course focused on the diversity of learners in K - 12 classrooms and participant responses may have indicated a growing awareness of the need for instructional strategies that will help them support students of various abilities in their future classrooms. Because of this course instruction, the pre-service teachers in this study may have recognized CMR's usefulness as an instructional tool across content areas. However, it is possible that the time allotted for pre-service teachers to learn, practice, and plan with CMR was not sufficient to allow them to feel competent to implement well, therefore leading to the variability in the responses regarding future use.

Feasibility of Research in Teacher Education

The current study demonstrated the feasibility of conducting a well-designed, rigorous experiment in a teacher education program, including many of the quality indicators for group experiments (Gersten et al., 2005), without compromising the goals and objectives of the teacher preparation course. For example, I assigned participants randomly within classes to microteaching or control groups. I also assigned participants randomly to their small groups within microteaching and control conditions. I used multiple measures and measured pretest and posttest scores at appropriate times without

interfering with course progress. I embedded the Diagram and Knowledge Posttest items into the final exam, highlighting CMR's importance as a research-based practice for inclusive classrooms and strengthening the place of CMR in the course curriculum. Data analysis (ANOVA's, *t*-tests, chi-squared) was relatively simple because of the "cleanness" of the research design and effect sizes were easily calculated. These elements of strong research design were combined with a strong teacher education course design – neither was compromised because an experiment was conducted in these classes.

Teacher education faculty can be encouraged by the feasibility of conducting such methodologically sound research in the context of teacher education courses. Certainly, there is an abundance of opportunities within education programs and faculty should consider conducting and publishing similar studies, which would eventually further our understanding of the most effective practices to support desired teacher education outcomes. With more research evidence available, teacher educators will be able to choose appropriate pedagogy to advance pre-service teacher learning, leading to improved pre-service and inservice teacher practice and school-age student outcomes.

Limitations

There are several limitations to the current study. First, there was a limited number of participants. An initial G*power program analysis indicated that a sample size of 125 participants was necessary to achieve adequate power (1- *β error probability*= 0.80) to detect an effect size of $d = 0.5$. The sample size of 100 reduced the power of the experiment to reject the hypothesis that there was no difference between the scores of participants in the microteaching and control groups. Second, because fidelity of implementation was a dependent variable of primary interest, the fact that the

Implementation Checklist did not seem to discriminate between quality and less quality implementation videos was a limitation. Piloting this instrument would have revealed some of these shortcomings and likely led to revisions prior to midway through scoring implementation videos. Third, questions remain about whether the microteaching intervention was rigorous enough (90 min total) to affect the dependent variables. Characteristics of microteaching that could be manipulated related to dose are length and number of sessions.

Implications for Future Research and Practice

Educational researchers and teacher educators need to conduct further research to explain the effects of microteaching on pre-service teachers' knowledge, practice, and teacher efficacy. First, further research needs to be conducted on whether repeated or extended microteaching experience increases pre-service teachers' implementation of research-based practices. To accomplish this, teacher educators must thoughtfully develop coursework using what is known about best practice for adult learners (see Bransford, 2000) while establishing rigorous research designs within the teacher education program. Second, the present study highlights the need for researchers to develop, pilot, and standardize an implementation measurement tool that will reliably discriminate between quality and inferior implementation of research-based practices. Third, researchers need to collect data on key variables (e.g., knowledge, implementation, teacher efficacy) at data points beyond the teacher preparation class. For example, it would be useful to know about the practice of practicum teachers, student teachers, and first-year teachers relative to their experiences with microteaching. The current experiment outlines the feasibility of conducting experiments in the context of a teacher

preparation program and strengthens the argument that a carefully developed program of research can address whether microteaching adds significant value to a multi-component teacher preparation program.

Conclusion

Research allowing for the possibility of causal conclusions is needed in the field of teacher education to inform practitioners regarding effective pedagogy. This study examined how a teacher education pedagogy (microteaching) affects pre-service teachers' knowledge and implementation of a research-based practice (CMR) designed for inclusive classrooms and teacher efficacy. In addition, this study modeled how to conduct a rigorous, randomized, treatment and control group experiment in a teacher education setting. This study generated questions regarding microteaching dose and elements required to impact pre-service teachers knowledge and implementation of research-based practices and teacher efficacy within the context of a multi-component, large and small group delivered teacher education course. In addition, it focused attention on the need for teacher educators (researchers and practitioners) to join together to apply precise and thorough research methods to address questions concerning which teacher education pedagogy supports pre-service teacher outcomes.

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Appendix A
CMR Knowledge Test, Evaluation Guidelines, and Coding Sheet

Knowledge Pretest / Posttest

The Concept Mastery Routine

Directions: Respond to each of the statements below. Please note, only the content of your response will be scored (not spelling, grammar, punctuation, etc.).

1. Briefly describe the purpose of the Concept Mastery Routine.

2. Briefly describe each phase of the Cue-Do-Review Sequence.

3. List and explain the Linking Steps of the Concept Mastery Routine.

4. List the three ways characteristics of a concept are classified in the Concept Mastery Routine.

5. List the elements present in a good definition for a concept.

Evaluation Guidelines for the Knowledge Test

6. Briefly describe the purpose of the Concept Mastery Routine. (3 points possible)

   1 point – teach / master / understand
   1 point – concepts / big ideas
   1 point – diverse / academically diverse / heterogeneous learners

7. Briefly describe each phase of the Cue-Do-Review Sequence. (9 points possible)

   A. Cue:
      1 point – explain that a Concept Diagram or the Concept Mastery Routine is going to be used
      1 point – explain how the diagram or routine will help students learn
      1 point – explain how students are to participate while the routine is used

   B. Do:
      1 point – follow the Linking Steps
      1 point – complete Concept Diagram
      1 point – interact with student

   C. Review:
      1 point – ask students questions
      1 point – procedural and factual questions
      1 point – check / confirm / determine student understanding

8. List and explain the Linking Steps of the Concept Mastery Routine. (14 points possible)

   a. Step 1
      1 point – convey Targeted Concept Name
      1 point – name the concept to be learned

   b. Step 2
      1 point – offer Overall Concept Name
      1 point – name a larger / broader concept which subsumes targeted concept

   c. Step 3
      1 point – note Key Words
      1 point – brainstorm / elicit words related to targeted concept

   d. Step 4
      1 point – classify Characteristics
      1 point – identify always, sometimes, and never characteristics

e. Step 5

1 point – explore Examples
1 point – identify examples and nonexamples

f. Step 6
1 point – practice with examples
1 point – practice with a new example / nonexample

g. Step 7
1 point – tie Down a Definition
1 point – define the concept

9. List the three ways characteristics of a concept are classified in the Concept Mastery Routine. (3 points possible)

1 point – always characteristics
1 point – sometimes characteristics
1 point – never characteristics

10. List the elements present in a good definition for a concept.

1 point – contain the targeted concept name
1 point – contain the overall concept name
1 point – contain the always characteristics

Knowledge Test Coding Sheet – PRETEST

Test ID # _____ Scorer's Initials _____ Date _____

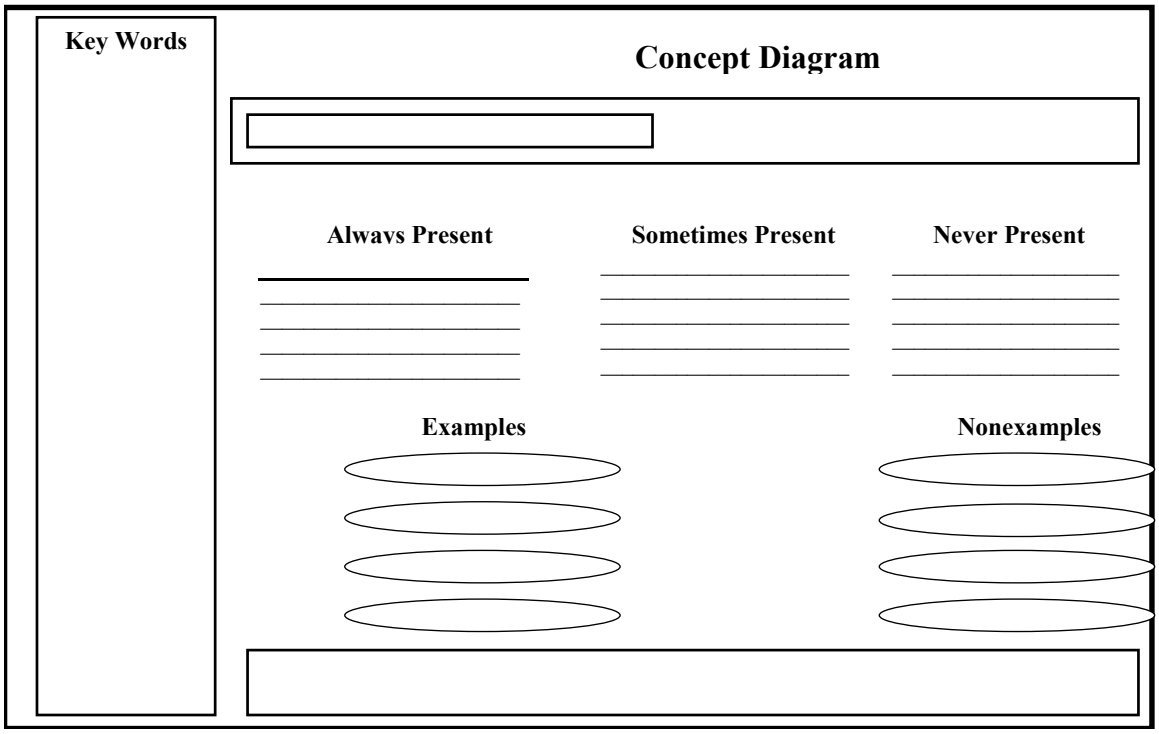
	Item	Points		*Item # (data entry)*
1. Purpose	Teach/master/understand	0 1		*1*
	Concepts/big ideas	0 1		*2*
	Diverse/ academically diverse/ heterogeneous learners	0 1		*3*
2. Cue-Do-Review Sequence	Cue: Explain concept diagram or routine will be used	0 1		*4*
	Explain how the diagram or routine will help students learn	0 1		*5*
	Explain how students are to participate while the routine is used	0 1		*6*
	Do: Follow the linking steps	0 1		*7*
	Complete the concept diagram	0 1		*8*
	Interact with student	0 1		*9*
	Review: Ask students questions	0 1		*10*
	Procedural and factual questions	0 1		*11*
	Check/confirm/determine student understanding	0 1		*12*
3. Linking Steps	Step 1: Convey Targeted Concept name	0 1		*13*
	Name the concept to be learned	0 1		*14*
	Step 2: Offer overall concept name	0 1		*15*
	Name a larger/broader concept which subsumes targeted concept	0 1		*16*
	Step 3: Note key words	0 1		*17*
	Brainstorm/elicit words related to targeted concept	0 1		*18*
	Step 4: Classify characteristics	0 1		*19*
	Identify always, sometimes, and never characteristics	0 1		*20*
	Step 5: Explore examples	0 1		*21*
	Identify examples and nonexamples	0 1		*22*
	Step 6: Practice with examples	0 1		*23*
	Practice with a new example/nonexample	0 1		*24*
	Step 7: Tie down a definition	0 1		*25*
	Define the concept	0 1		*26*
4. Cha ract	Always characteristics	0 1		*27*
	Sometimes Characteristics	0 1		*28*

	Never Characteristics	0 1		*29*
5. Definition	Contain the targeted concept name	0 1		*30*
	Contain the overall concept name	0 1		*31*
	Contain the always characteristics	0 1		*32*
Total		**/32**		

Appendix B
Diagram Test, Evaluation Guidelines, Coding Sheet

Diagram Pretest - The Concept Mastery Routine

Directions: Complete the Concept Diagram for the targeted concept, "automobile". Please note, only the content of your responses will be scored (not spelling, grammar, punctuation, etc.).



Evaluation Guidelines for the Diagram Test

110 points possible

1. Evaluate Targeted Concept Name. (5 points possible)

   5 points – written in rectangle is a relevant word or phrase naming the targeted concept (i.e. automobile).
   0 points – written in rectangle 1 is not a meaningful word or phrase naming the targeted concept (i.e. automobile).

2. Evaluate Overall Concept Name. (5 points possible)

   5 points – written in rectangle 2 is a relevant word or phrase naming an overall concept for automobile (e.g., modes of transportation, inventions, motorized vehicles).
   0 points – written in rectangle 2 is not a relevant word or phrase naming an overall concept for automobile (e.g., motorcycles).

3. Note Key Words. (5 points possible)
   Key words are words or phrases associated with the targeted concept name and can be characteristics, examples, nonexamples or other related concepts.

   1 point for each word or phrase associated with automobile written in rectangle 3 of the concept diagram (e.g. Model T, engine, Boeing 747 (nonexample)).
   0 points for each non-meaningful word or phrase written in rectangle 3 of the concept diagram (e.g., diagnostic questions).

4. Evaluate Always Characteristics. (15 points possible)

   5 points (up to a total of 15 points) for each of the first three always characteristics written on the solid lines of the concept diagram (e.g., have a motor, have tires).
   0 points for each inappropriate always characteristics (e.g., have 4 doors, are green).

5. Evaluate Sometimes Characteristics. (15 points possible)

   5 points (up to a total of 15 points) for each of the first three sometimes characteristics written on the wavy lines of the concept diagram (e.g., have a hatchback, have air conditioning).
   0 points for each inappropriate sometimes characteristics (e.g., have motors).

6. Evaluate Never Characteristics. (15 points possible)

5 points (up to a total of 15 points) for each of the first three never characteristics written on the broken lines of the concept diagram (e.g., have wings, have only 2 wheels).
0 points for each inappropriate never characteristics.

7. Evaluate Examples. (Up to 15 points)

   Examples are instances that posses all of the Always Characteristics and none of the Never Characteristics.

   5 points (up to a total of 15 points) for each of the first three examples written in the solid ovals if each possesses all of the Always and none of the Never Characteristics (e.g., truck, Nash Rambler).
   0 points for each example which is an invalid illustration of the concept because it lacks one of the always present or possesses one of the never present characteristics (e.g., horse).

8. Evaluate Nonexamples. (Up to 15 points)
   Nonexamples are instances that possess one or more of the Never Characteristics or lack one or more of the Always Characteristics.

   5 points (up to a total of 15 points) for each of the first three nonexamples written in the broken ovals if each lacks one or more Always Characteristics or possesses one or more Never Characteristics (e.g., bicycles, Sherman Tank).
   0 points for a nonexample which does not lack one or more of the Always or Never Characteristics (e.g., Model T Ford, ’57 Chevy).

9. Examine New Examples. (Maximum of 5 points)

   5 points – an example or nonexample of the Targeted Concept is written in the testing ground (e.g., lawn tractor, Jeep CJ-6).
   0 points – a nonmeaningful example or nonexample for the Targeted Concept is written in the testing ground.

10. Examine Definition. (Maximum of 15 points)

    5 points – includes the Targeted Concept name (e.g., automobile).
    5 points – includes the Overall Concept name (e.g., mode of transportation).
    5 points – includes all of the Always Characteristics (e.g., has a motor, has tires, carries passengers).

Diagram Test Coding Sheet

Test # _____ Scorer Initials _____

Pretest/Posttest (highlight one) Date _____

_

Linking Step	Circle Points Earned
1. **C**oncept Name	*0* *5*
2. **O**verall Concept	*0* *5*
3. **N**ote Key Words	*0* *1* *2* *3* *4* *5*
4. (Always) **C**haracteristics	*0* *5* *10* *15*
5. (Sometimes) **C**haracteristics	*0* *5* *10* *15*
6. (Never) **C**haracteristics	*0* *5* *10* *15*
7. **E**xamples	*0* *5* *10* *15*
8. (Non)**E**xamples	*0* *5* *10* *15*
9. **P**ractice New Example	*0* *5*
10. **T**ie Down the Definition Target Concept Name Overall Concept Name Always Characteristics	 *0* *5* *0* *5* *0* *5*
TOTAL: /110	

Appendix C
Teacher Efficacy Scale

Teacher Efficacy Scale

Please indicate the degree to which you agree or disagree with each statement below by circling the appropriate numeral to the right of each statement.

	Strongly disagree	Moderately disagree	Disagree slightly more than agree	Agree slightly more than disagree	Moderately agree	Strongly agree
1. When a student does better than usual, many times it will be because I exerted a little extra effort.	1	2	3	4	5	6
2. The hours in my class will have little influence on my students compared to the influence of their home environment.	1	2	3	4	5	6
3. If a student masters a new concept quickly, this might be because I knew the necessary steps in teaching that concept.	1	2	3	4	5	6
4. The amount that a student can learn is primarily related to family background.	1	2	3	4	5	6
5. If a student in my class becomes disruptive and noisy, I feel assured that I will know some techniques to redirect him quickly.	1	2	3	4	5	6
6. If students aren't disciplined at home, they aren't likely to accept any discipline.	1	2	3	4	5	6
7. If one of my students could not do a class assignment, I will be able to accurately assess whether the assignment was at the correct level of difficulty.	1	2	3	4	5	6
8. The influences of a student's home experiences can be overcome by good teaching.	1	2	3	4	5	6
9. If parents would do more with their children, I could do more.	1	2	3	4	5	6
10. Even a teacher with good teaching abilities may not reach many students.	1	2	3	4	5	6
11. When the grades of my students improve, it will usually be because I found more effective teaching approaches.	1	2	3	4	5	6
12. When a student is having difficulty with an assignment, I will usually be able to adjust it to his/her level.	1	2	3	4	5	6
13. If a student did not remember information I gave in a previous lesson, I will know how to increase his/her retention in the next lesson.	1	2	3	4	5	6
14. When a student gets a better grade than he usually gets, it will usually be because I found better ways of teaching that student.	1	2	3	4	5	6
15. When I really try, I will be able to get through to most difficult students.	1	2	3	4	5	6
16. A teacher is very limited in what he/she can achieve because a student's home environment is a large influence on his/her achievement.	1	2	3	4	5	6

Adapted from Gibson & Dembo, 1984

Appendix D
Implementation Checklist

Concept Mastery Routine Implementation Checklist

Rater _____ Date_____ Lesson duration (time) _____

	CMR Teaching Behavior	(circle one)
Cue		
1.	Provide an advance organizer • Names concept mastery routine or concept diagram	0 1
	• Explains how the process will improve student learning of a concept	0 1
	• Specifies the students' roles in the process	0 1
Do		
2.	Convey the targeted concept name • Concept is appropriate and specifies a commonly accepted generic term for a class or category into which events, ideas, or objects can be grouped. Written on the board for students to see.	0 1
3.	Offer the overall concept name • Specifies a category or class into which the targeted concept name and similar concepts can be grouped. Written on the board.	0 1
4.	Note key words • Characteristics, examples, nonexamples, related concepts associated with target concept, written on the board (1 point each)	0 1 2 3 4 5
5.	Classify the always, sometimes, and never characteristics • Each appropriate characteristic written on the board labeled as <u>always</u> present (1 point each, up to 3 points)	0 1 2 3
	• Each appropriate characteristic written on the board labeled as <u>sometimes</u> present (1 point each, up to 3 points)	0 1 2 3
	• Each appropriate characteristic written on the board labeled as <u>never</u> present (1 point each, up to 3 points)	0 1 2 3
6.	Explore examples and nonexamples • Each example with all of the always characteristics, none of the never characteristics, and is written on the board (1 point each, up to 3 points)	0 1 2 3
	• Each nonexample lacks one or more always characteristic, or possesses one or more never characteristic, and is written on the board (1 point each, up to 3 points)	0 1 2 3
7.	Practice with a new example • Provides example or nonexample of targeted concept, time to determine which of the two it is, and writes the examples or nonexamples on the board	0 1
	• Links always or never characteristics to an example or nonexample	0 1

8.	Tie down the definition – writes a complete sentence with: • Name of target concept	0 1
	• Name of the overall concepts	0 1
	• All of the always characteristics	0 1
Review		
9.	Check student understanding • Questions students about what was learned or how it was learned (1 point for each question up to 3 points)	0 1 2 3
	FOI Score: _____/33 = _____%	

Appendix E
Satisfaction Questionnaire

CMR Satisfaction Questionnaire

Please indicate the degree to which you agree or disagree with each statement below by circling the appropriate numeral to the right of each statement.

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1. CMR is flexible to adapt to regular classroom routines.	1	2	3	4	5
2. CMR is easy to use.	1	2	3	4	5
3. I will likely use CMR in a future classroom situation.	1	2	3	4	5
4. I will likely recommend CMR to others.	1	2	3	4	5

Adapted from Bulgren, Schumaker, & Deshler, 1988.

Appendix F
Volunteer Training Materials

Volunteer Training: The Effects of Microteaching on Pre-Service Teacher Knowledge and Implementation of the Concept Mastery Routine

Mary Lindell
University of Minnesota

CEHD | College of Education + Human Development
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Today's Agenda

- Introductions
- Describe study
- Describe video recording procedures
- View sample video recording

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Mary Lindell

- PhD candidate at University of Minnesota
- Interest areas - Teacher Education, Improving Inclusive Outcomes for all Students
- Previous Experience -
  - Over 20 years teaching in K-12 classrooms in rural, urban, suburban settings.
  - Experience teaching graduate and undergraduate pre-service teachers at Bethel, U of M, and George Washington University.
  - Research on schema-based math instruction - RAPPS project - at University of Minnesota
- Education
  - Undergraduate - MN State - Moorhead
  - Graduate - George Washington University, Washington, DC

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Study Purpose

- I plan to investigate the effectiveness of ***microteaching as teacher education pedagogy*** to improve pre-service teachers' ***knowledge and implementation of the evidence-based practice (EBP)*** the Concept Mastery Routine (CMR) and to ***increase teacher efficacy***.

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Microteaching

- Developed at Stanford University (Arnobi, 2005; Sherrois & Barth, 1971).
- Allows pre-service teachers to isolate and practice one technique or specific skill under optimum conditions (Arnobi; Brent & Thomson, 1998; Cruickshank, Kennedy, Williams, Holton, & Fay, 1981; Sherrois & Barth)
- Teach abbreviated lessons to a small group of school-age pupils at their practicum site or peers at their university (Brent & Thomson; Cruickshank et al., 1981; Sherrois & Barth. Wilson & T'Anson, 2006).
- Feedback from video recording, peers, or instructor (Brent & Thomson; Sherrois & Barth; Subramaniam, 2006).
- Reflection - instructional or evaluative

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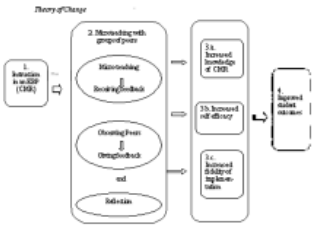
Concept Mastery Routine (CMR)

(Bulgren, Schumaker, & Deshler, 2003; Fisher et al., 1999)

- CMR combines previously researched methods (e.g., advance organizers, graphic organizers, interactive devices) into an instructional routine that facilitates student mastery of information related to key concepts in the general education curriculum
- Inservice teachers implement CMR with greater fidelity after training than before training and pre-service and inservice teachers increase their knowledge of CMR after training.
- Students with and without LD performed significantly better on concept acquisition tests and regularly scheduled content tests when teachers used CMR then when they did not use CMR.

Theory of Change



Study Design

- Randomized, pretest/posttest, treatment and control group design
- Sample - pre-service general education teachers, seeking initial licensure, enrolled in special education survey class.
- Sample size of 100 or more.
- Setting - large and small group activities will take place during regularly scheduled class times.

Independent and Dependent Variable

- Independent variable - type of small-group processing
- Dependent variable - preservice teacher knowledge of CMR, fidelity of implementation of CMR, and teacher efficacy.

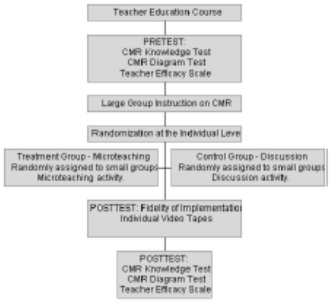
Measures

Pretest/Posttest Measures

- CMR Knowledge Test - 7-item measure and evaluation guidelines assessing critical features of CMR (Fisher, 1999).
- CMR Diagram Test - Evaluation of concept diagram created by preservice teacher (Fisher, 1999).
- Teacher Efficacy Scale - 16-item scale measuring general beliefs that the environment can be structured so that students can learn and their own abilities can affect student outcomes (Gibson & Dembo, 1984).

Posttest Only

- Implementation Checklist - Used to assess participants CMR implementation fidelity (Fisher, 1999).



Data Analysis

- For the CMR knowledge tests and teacher efficacy scale, an analysis of covariance (ANCOVA) will be used to compare the intervention and control groups on posttest variables, controlling for pretest scores, previous experiences, etc.
- A *t-test* (between two independent group means) will be used to analyze posttest fidelity of implementation scores.

During Fidelity of Implementation Videoing

- Participants will come to the video rooms one at a time.
- You will not know which are in the treatment group or control group.
- Turn the camera on in the room.
- Make sure participants read script and state their study ID# before beginning the lesson.

More Instructions for Videoing

- Respond to the particpant/instruction as a typical middle or high school student.
- Try to keep your responses consistent with each lesson/participant.
- Turn off camera at end of lesson.
- Have participant label concept diagram with their study ID#.

Questions and Suggestions

Volunteer Instructions During Video Recording

Thank You!

See you August 9

Volunteer Instructions During Video Recording

- Participants will come to the video rooms one at a time.
- You will not know which are in the treatment group or control group.
- Greet each participant at the beginning of the session.
- Help participant set up chart and orient to the room.
- Remind participant to finish their lesson in 20 minutes or less (one of the volunteers will let the participant know when he/she has 2 minutes remaining).
- When the participant is ready to begin the lesson, turn the camera on in the room.
- Make sure participants read script and state their study ID# before beginning the lesson.
- Respond to the participant/instruction as a typical middle or high school student.
- Try to keep your responses consistent with each lesson/participant.
- Turn off camera at end of lesson.
- Have participant label concept diagram with their study ID#.
- Thank the participant (please give no other feedback regarding his/her lesson).
- Take down and put away completed chart before next participant enters the room.

Volunteer Research Assistants Needed

Requirements:

- **Interest in supporting research in teacher education.**
- **Attend 1 training meeting: June 21 at 9 am in ESB room 10 OR July 27 at 11:30 in ESB room 325.**
- **Attend up to 4 (it's ok if you can only attend 1), 2-hour graduate level class sessions where you role play a typical middle or high schooler in an academic class situation. Class times are:**
  - **July 6 and August 9, 10:15-12:10 and 3:15-5:10**
- **A brief (less than 30 minute) debrief after each class session.**

Benefits:

- **FOOD! Breakfast for the June 21 training, lunch for the July 27 training, snacks during the debriefing sessions.**
- **Contributing to teacher education research.**
- **Introduction to a research-based practice for inclusive classrooms.**

Interested:

- **Contact Mary Lindell: brod0188@umn.edu, 952-412-4290.**

Note: You are not being recruited to participate in a study, but to help implement the study.

Appendix G
Quality Ratings for Implementation Videos Scale

ID# _____

Quality Ratings for Implementation Videos

PROMOTING STUDENT UNDERSTANDING

_____

score

On a scale of 1 – 4 (1=low, 4=high), how well did the "teacher" promote "student" understanding? Consider the following suggestions.

During the Convey the targeted concept name and Offer the overall concept name steps, did he/she demonstrate:

- Info does not stand alone – but forms networks or hierarchies with other information;
- Overall concept and target concept are related.

During the Classify the always, sometimes and never characteristics step, do you think:

- Students would be able to explain 3 types of characteristics?

During the Explore examples and nonexamples and Practice with a new example steps did the he/she lead students to:

- ANALYZE
- Be ACTIVE
- Judge against characteristics

Were students confident why they are classified as an example or nonexample?

STUDENT/TEACHER INTERACTION

_____

score

On a scale of 1 – 4 (1=low, 4=high), how well did the "teacher" facilitate meaningful "teacher-student" interaction to build "student" understanding of the target concept? Consider the following:

During the Note key words step, did he/she solicit words and phrases from students in brainstorming manner? Did he/she encourage students to give more ideas?

During each remaining step, did he/she ask students for feedback while clearly leading the discussion?

Appendix H
Small Group Protocol Forms

Directions: Read and follow the small-group protocol as if you will be using the CMR to teach "cooperation".

Small Group Protocol –Group A (Microteaching)

Congratulations! You have completed your in-class professional development introducing the Content Mastery Routine (CMR). Now, you will have time to practice implementing the CMR.

Your school is committed to teaching students with varying abilities and disabilities in general education classes to the greatest extent possible. Your school has adopted Concept Enhancement Routines (CERs) as one way to support the inclusion of learners of all abilities in general education classes. Your most recent professional development introduced the Concept Mastery Routine (CMR) and each teaching team is being encouraged by the school's professional development committee and administration to use the CMR in an approaching unit. Your team is considering how to implement the CMR in the upcoming unit on conflict resolution, especially as a tool to help students understand the concept of cooperation, which students have struggled with in the past.

You should find the following materials to help you prepare to teach the concept of cooperation using the CMR:

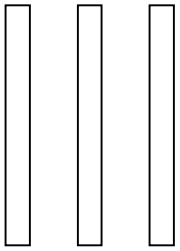
- Content materials about cooperation
- Completed concept diagram on cooperation
- Implementation checklists
- Poster-size concept diagrams and pens/markers

What you should do (Check off the steps as you complete them):

Yes	No	
☐	☐	Read/review and discuss with your small group the content materials regarding cooperation.
☐	☐	Review the completed Concept Diagram on cooperation.
☐	☐	Review microteaching order:

	Study ID Number
1st Microteacher	
2nd Microteacher	
3rd Microteacher	

Microteaching – Each group member will take a turn microteaching a portion of the CMR while other group members act as the "class". (Check off each step for each microteacher as you complete them.)



Role of microteacher:

☐ ☐ ☐ Teach the concept of cooperation using the Cue-Do-Review process

☐ ☐ ☐ Use the blank, poster-size concept diagrams and markers to diagram the concept "cooperation" with the "class"

☐ ☐ ☐ Role of the "class"

☐ ☐ ☐ Participate in the lesson as a student – answer and ask questions, etc.

☐ ☐ ☐ Complete implementation checklist recording teaching behaviors you observe the microteacher doing

Feedback

☐ ☐ ☐ At the conclusion of each microteacher's turn, "class" members will give the microteacher verbal feedback (e.g., you named the concept mastery diagram, you wrote appropriate *Always* characteristics on the board) from the implementation checklist.

☐ ☐ ☐ "Class" members will provide the completed checklist to the microteacher.

- Roles will rotate until every member of your group has had an opportunity to be the microteacher.
- When everyone has finished microteaching and receiving feedback, complete a written reflection as directed in the reflection guide.

Group Processing:

Yes No

☐ ☐ Discuss the following questions with members from the group sitting closest to you:

- What specifically happened in your group that helped you learn about the CMR?
- What did someone in your group do that helped you learn the CMR (specifically)?

☐ ☐ Write down 3 highlights of your discussion.

1.

2.

3.

Directions: Read and follow the small-group protocol as if you will be applying the CMR to the concept of "cooperation" in your class.

Small Group Protocol – Group B (Control)

Welcome to your (choose one) grade-level team meeting at your elementary school / interdisciplinary team meeting at your middle school / subject-level meeting at your middle/high school. On the agenda today is planning for the upcoming unit on conflict resolution.

Your school is committed to teaching students with varying abilities and disabilities in general education classes to the greatest extent possible. Your school has adopted Concept Enhancement Routines (CERs) as one way to support the inclusion of learners of all abilities in general education classes. Your most recent professional development introduced the Concept Mastery Routine (CMR) and each team is being encouraged by the school's professional development committee and administration to use the CMR in an upcoming unit. Your team is considering how to implement the CMR in the conflict resolution unit, especially as a tool to help students understand the concept of cooperation, which students have struggled with in the past.

You should find the following materials to help you apply the CMR to the concept of "cooperation" during your team discussion:

- Content materials about cooperation (1 per group)
- Completed concept diagram on cooperation (1 per person)
- "Food Chains" script

What you should do (Check off the steps as you complete them):

Yes No

☐ ☐ Discuss your feelings about CMR with your team.
Do you feel CMR has potential to help a class of diverse students learn content information?

☐ ☐ Read/review the content materials regarding cooperation and discuss with your team members.
At your grade level, what aspects of the concept of cooperation will cause your students the most trouble?

☐ ☐ Review the completed concept diagram on cooperation and your CMR notes.
- What aspects of the Concept Diagram will cause your students the most trouble?
- What benefits can you imagine for your students using the Concept Diagram?
- How might you use the CMR during the conflict resolution unit to help students understand the concept of cooperation?
  - To introduce cooperation? As a review? In the middle of the activities? Other aspects of instruction? Describe.

☐ ☐ Read the text of a teacher using the CMR to describe the "food chain" concept. This is an example of how the CMR has been used as a part of a review lesson for students who have studied some aspects of the concept.
- Discuss how this teacher implemented elements of CMR that you would choose to use in your CMR for cooperation.
- Describe elements you think would not be effective for your CMR for cooperation. Why do you highlight these things as effective or ineffective?
- Using this example script of a teacher using the CMR, discuss how you would use the CMR to help students learn the concept of cooperation.

Group Processing:

☐ ☐ Discuss the following questions with members from the group sitting closest to you:
- What specifically happened in your group that helped you learn about the CMR?
- What did someone in your group do that helped you learn the CMR (specifically)?

☐ ☐ Write down 3 highlights of your discussion.

1.

2.

3.