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Teacher self -efficacy and beliefs for teaching mathematics in inclusive settings

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College of William & Mary - School of Education

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TEACHER SELF-EFFICACY AND BELIEFS
FOR TEACHING MATHEMATICS
IN INCLUSIVE SETTINGS

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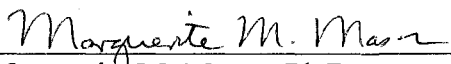
By
Pamela Wilson Aerni
December 2008

TEACHER SELF-EFFICACY AND BELIEFS
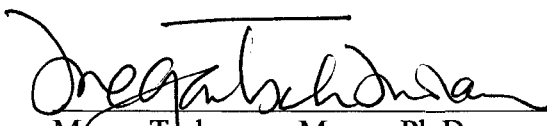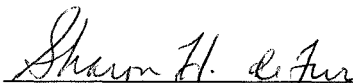# FOR TEACHING MATHEMATICS
IN INCLUSIVE SETTINGS

by

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Approved December 2008 by

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Dedication

"No matter what accomplishments you make, somebody helps you."

Althea Gibson

In memory of Clara R. Merricks and Walter "Bruce" Mason
My guardian angels

In honor of my family and their loving support
Mom and Dad
My husband, Paul
My sons, Adam and Ryan
My brother and sister-in-law, John and Sandy
My niece and nephew, Trey and Laura
Who always asked when am I getting my "doctor kit"?
Daughters of my heart, Brittany and Amber
Aunt Janie and Aunt Barbara

In appreciation to my William and Mary family
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Ali, Christie, Jenny, Jessica and Maria
Members of the Tidewater Team
And without exception,
Teachers participating in this study

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Acknowledgements

The task of the excellent teacher is to stimulate "apparently ordinary" people to unusual effort. The tough problem is not in identifying winners: it is in making winners out of ordinary people. ~K. Patricia Cross

I wish to thank my dissertation committee members, Dr. Margie Mason, Dr. Megan Tschannen-Moran, and Dr. Sharon deFur for their encouragement, support, patience, and coaching during my dissertation journey. For without them and their expertise and knowledge, this research study would not have been possible. Thank you for stimulating my creativity and intellect so that I could complete this wondrous journey.

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Abstract

The purpose of this mixed-design study was to determine if mathematics teachers experienced changes in their self-efficacy and beliefs about their ability to teach students with disabilities in an inclusive setting. The intervention for this study was a 14-month professional development program that consisted of content and methods courses taught during two-week intervals during the summer on the campus of The College of William and Mary followed by specific professional development activities provided by a team of math specialists/facilitators with expertise in mathematics curriculum, instruction, and assessment as well as special education services including inclusive education models. Teachers participating in the study completed a survey, Teaching Mathematics in Inclusive Settings, and participated in focus groups.

Findings indicated that teachers participating in both content/methods courses and school-based professional development activities significantly increased in their self-efficacy with regard to teaching mathematics to students with disabilities in inclusive settings. Components of the professional development program rated as being most valuable as well as changing teaching practices were coaching from a mathematics specialist; discussions and dialogues with a mathematics specialist, and lesson study. School-based professional development designed to support teachers as they integrate research-based instructional strategies may significantly increase their self-efficacy leading to more effective instruction for diverse student populations.

Teacher Self-efficacy in Teaching Mathematics in Inclusive Settings

CHAPTER 1

Introduction

In order to meet the mandates of the Individuals with Disabilities Education Act

(IDEA, 1997), which requires students with disabilities to have access to the general

education curriculum, educators have responded by creating a variety of inclusive or

mainstream models in an attempt to provide students with disabilities an opportunity to

participate in a general education setting. The accountability movement climaxed with the

passage of No Child Left Behind (NCLB, 2001), which mandates that students with

disabilities be included in state assessments to meet measures of adequate yearly progress

(AYP) for all student populations. These mandates led to a need for students with disabilities

to access the same standards-based curriculum as students without disabilities, since they

were now being held accountable for the same content knowledge as general education

students. Inclusion of students with disabilities in the general education classroom was seen

as a viable response to the mandates of the Individuals with Disabilities Education

Improvement Act (IDEIA, 2004) and NCLB (2001).

As a result of these legislative changes, children with disabilities are increasingly

placed along a continuum of inclusive models, which presents many challenges for schools

(Termini, 2003). As more students with disabilities are provided special education services in

inclusive settings, general education teachers need to be prepared to meet their learning

needs; however, often times the general education teacher in the inclusive classroom does not

feel prepared to meet the diverse learning needs of students present in their classrooms. The

feeling of unpreparedness may be due to a lack of knowledge about and experience with

teaching students with disabilities, particularly in the areas of behavior management and

alternate or differentiated instructional strategies (Norman, Caseau, & Stefanich, 1997). Therefore, it is essential to consider teacher perceptions of their abilities to meet the needs of learners in increasingly diverse classroom settings (Arnold, 2005).

As schools struggle to find ways to meet the mandates set forth in both NCLB (2001) and IDEIA (2004), states are implementing reform efforts to ensure schools demonstrate a positive impact on student performance and achievement for all student populations (Ahearn, 2002; Darling-Hammond, 2004; Olson, 2002). Teachers are now finding it necessary to reflect on their current teaching practices, as well as their current level of knowledge and pedagogy, in an effort to meet the learning needs of diverse student populations (Darling-Hammond & McLaughlin, 1995). Bandura (1997) surmised, "The task of creating learning environments conducive to development of cognitive competencies rests heavily on the talents and self-efficacy of the teacher" (p. 240).

Teachers' self-efficacy has a direct impact on student achievement in the classroom (Ashton & Webb, 1986; Dembo & Gibson, 1985; Gibson & Dembo, 1984; Tschannen-Moran, Hoy, & Woolfolk, 2001); however, other mitigating factors, such as professional development programs and activities, play a key role in the development of teacher self-efficacy (Lewandowski, 2005). Additionally, professional development activities influence self-efficacy when the knowledge and skills that are acquired are pertinent to the teacher's classroom situation (McLaughlin & Berman, 1977; Scribner, 1998). When professional development activities are appropriate for teachers, teachers become more motivated to design instruction, which supports high levels of student engagement (Ashton & Webb, 1986; Gibson & Dembo, 1984).

Teachers have been identified as the most important resource in the schools, yet little is done to promote the continued learning and improvement for those in the teaching profession (Darling-Hammond & McLaughlin, 1995; Hunzicker, 2004; McLaughlin, 1986). Professional development opportunities should incorporate multiple methods to present information to teachers while also providing them with avenues to practice new knowledge and skills in order to increase the probability of use and retention of new instructional techniques and practices. Research consistently supports the assumption that desired outcomes can be achieved when teachers practice new knowledge, understanding, and skills within the context of high-quality professional development opportunities (NCREL, 2006). "High-quality professional development programs have been empirically linked to the presence of constructivist theories of learning among educators and to the enactment of practices, including research, questioning, project-oriented instruction, and collaborative group structures, which are most compatible with these theories" (NCREL, 2006, pp. 7).

Statement of the Problem

As the Individuals with Disabilities Education Improvement Act (2004) and No Child Left Behind (2001) align to ensure that students with disabilities access the general education curriculum, schools are increasingly responding by delivering special education services within the context of the general education classroom. To this end, the National Council of Teachers of Mathematics (NCTM) Principles and Standards for School Mathematics (2000) address the issue of providing a high quality and equitable mathematics curriculum for all students. As inclusive practices become more prevalent in school settings, general and special education teachers express concern related to their ability to teach students with disabilities.

Current performance of students with disabilities on the Virginia Standards of Learning (SOL) assessments reflects the need to assist and support mathematics teachers in providing quality instruction for students with disabilities within the inclusive setting. To this extent, mathematics teachers need support in acquiring new professional knowledge and understanding to enhance not only their pedagogy, but their self-efficacy to affect more positive outcomes in student achievement for students with disabilities in mathematics. School leaders need to consider how to design, plan, and implement professional development programs that afford mathematics teachers the opportunity to increase their content expertise while learning how to differentiate instruction to meet the learning needs of diverse student populations present in our schools today. To achieve this end while providing quality support, there is a need to determine the impact that intensive professional development in mathematics instruction and professional collaboration have on teacher self-efficacy, and beliefs related to providing mathematics instruction to students with disabilities. To what extent does intensive professional development affect teacher self-efficacy and teacher beliefs regarding mathematics instruction for students with disabilities in inclusive settings?

<div align="center">Theoretical Framework</div>

Systems Thinking

Viewing education as the sum of the independent parts working together and individually to achieve a common, ideal societal purpose allows one to visualize the system in order to understand how it functions. From this systems perspective, administrators and instructional leaders can identify the needs of the school and create goals and objectives within action plans focused on improving the teaching and learning process. These "aligned

acts of improvement" (Senge, 1990) will allow instructional leaders to design professional

development programs that support teachers as they learn how to design and implement

instructional practices focused on increasing student access to the general education

curriculum.

As these learning organizations continually adjust to respond to multiple legislative

mandates, it is imperative that the organization's members participate in dialogues related to

effective instructional practices that meet the needs of all students. Participation in collective

dialogues allows organization members to share a vision of educational success for all

students in their school. Members of school organizations not only learn as a team, but as

individuals while working collectively to understand how their schools function (Senge,

1990). As individual teachers feel empowered through participation in these activities,

personal mastery may be reflected in increases in self-efficacy related to mathematics

instruction in inclusive settings.

Teacher Beliefs of Self-Efficacy

The way people perceive themselves can affect their behavior. Teacher beliefs "are

the best indicators of the decisions individuals make throughout their lives" (Pajares, 1992, p.

307). Self-efficacy is an integral component of how individuals conduct themselves in all

aspects of life (Arnold, 2005; Welch, 1995). It is almost impossible to explain psychological

constructs such as motivation, self-regulated learning, and performance without

understanding the role of self-efficacy beliefs (Pajares & Urdan, 2005).

Bandura (1997) defined self-efficacy as the beliefs a person holds regarding his or her

ability to learn or complete a given task. Arnold (2005) postulated that one's self-efficacy in

completing a given task is not derived simply from an individual's skill level, but may also

be connected to the discernment of the potential for the successful completion of the task at hand given the possession of a known skill set. Bandura also asserted that tasks could not be completed without a set of required skills. Consequently, if a person does not possess an adequate level of self-efficacy, a possibility exists that the task may not be attempted even though the person knows how to accomplish the task.

Changing Instructional Practices

Fullan (1993) stated that school organizations continually seek change, but are inherently averse to it. Educational organizations continuously seek ways to improve systems to increase student achievement in order to meet legislated mandates. While many educational organizations rise to the challenge of implementing effective changes to address standards-based reform criteria, the current challenge for educational leaders is how to maintain the forward momentum. School districts across the nation invest a multitude of resources into professional development with hopes to improve teacher practices which demonstrate a direct link to improved student performance and achievement.

Essentially, Fullan argued for a structured approach to systems improvement beginning with a vision of how the institution will promote human decency and fairness in a climate of high expectation. According to Fullan (2001), "moral purpose is about both ends and means" (p. 13), implying that as schools strive to improve their processes in order to achieve a value-added education benefiting both students and communities, the change agents used in this process must reflect integrity while also building trust. To come closer to this vision, people must work in a learning culture where the community is hospitable to the vision and fosters its own continuing development. Growth occurs through highly developed networks of relationships and communication – creative lateral connections with supportive

individuals and groups, intelligent accountability in vertical relationships, which enhance the capacity of those in the system. The result is "deep learning" -- deep in the sense that of what Theodore Sizer (1992) called a climate of "unanxious expectation," people ask difficult questions, think seriously, experiment, fail intelligently, and consequently develop new knowledge and understanding.

Pedagogical Content Knowledge

Traditionally, teacher preparation programs have focused on ensuring that teachers become content experts. More recently, a change in focus for teacher preparation programs has occurred to address the science of teaching or pedagogy. Shulman (1986) explored the relationship or interrelationship of the content and pedagogical knowledge of educators. Shulman proposed that both content and pedagogy should be the focus of teacher preparation and continuing professional development in order to produce effective teachers with a better understanding of the science and art of teaching. The pedagogical content knowledge (PCK) theory provides a larger perspective into the teaching and learning process related to the role of the teacher.

Pedagogical Content Knowledge Meets Special Education Knowledge

The idea that PCK may be merged with other aspects of teacher knowledge allows educators and researchers to reflect on other types of knowledge that teachers need to possess in order to affect positive student outcomes for all students in their classrooms, including students with disabilities. Special Education Pedagogical Content Knowledge (SPECK) builds on Shulman's idea of PCK, and attempts to capture some of the essential qualities of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge (Mishra & Koehler,

2006). Expanding upon this idea, general education teachers working in collaborative and/or inclusive classroom settings need to possess technical knowledge related to all aspects of special education, including legal requirements, documentation, service delivery, types and function of meetings essential to the identification and service delivery for students with disabilities. A greater awareness and understanding of the aspects of special education may assist general educators in providing access and equity to students with disabilities who are receiving services in the general education classroom.

Conceptual Framework

The conceptual framework for this study focused on the impact of intensive professional development (e.g., classroom observations; coaching; co-teaching; demonstration teaching; lesson study; on-site workshops; support from mathematics coach) on teacher self-efficacy in addition to teachers' attitudes/beliefs regarding instruction of students with disabilities and by implication improves instructional practices among middle-school mathematics teachers.
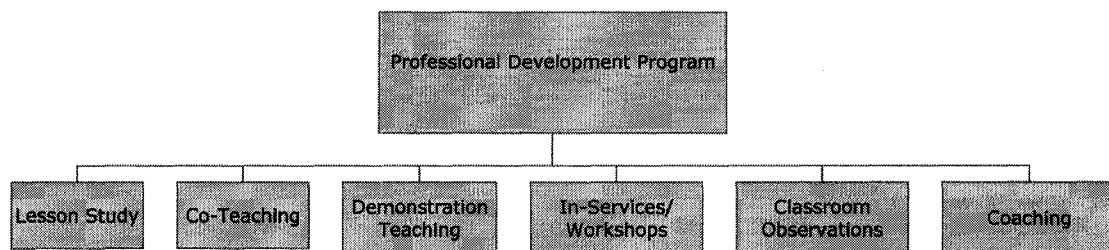
Figure 1. Professional development program components

Positive changes in the instructional practices among mathematics teachers afforded students with disabilities greater access to the standards-based curriculum as teachers understand how

to differentiate instruction through integrating appropriate accommodations and

modifications for the diverse learning needs present in an inclusion classroom.

The professional development program provided teachers with opportunities to

increase their knowledge and understanding of the teaching/learning process in three specific

areas: pedagogy, content, and inclusive education. Teachers' self-efficacy and beliefs

regarding mathematics instruction in inclusive settings demonstrated more positive changes

as a result of their participation in the professional development program where this new

knowledge and understanding is supported by a mathematics specialist/coach as teachers

begin to integrate them into their teaching practices. Essentially, mathematics teachers were

introduced to concepts and methods related to teaching mathematics which are aligned with

the National Council of Teachers of Mathematics' Principles and Standards, which promotes

equity and access to mathematics for all students.
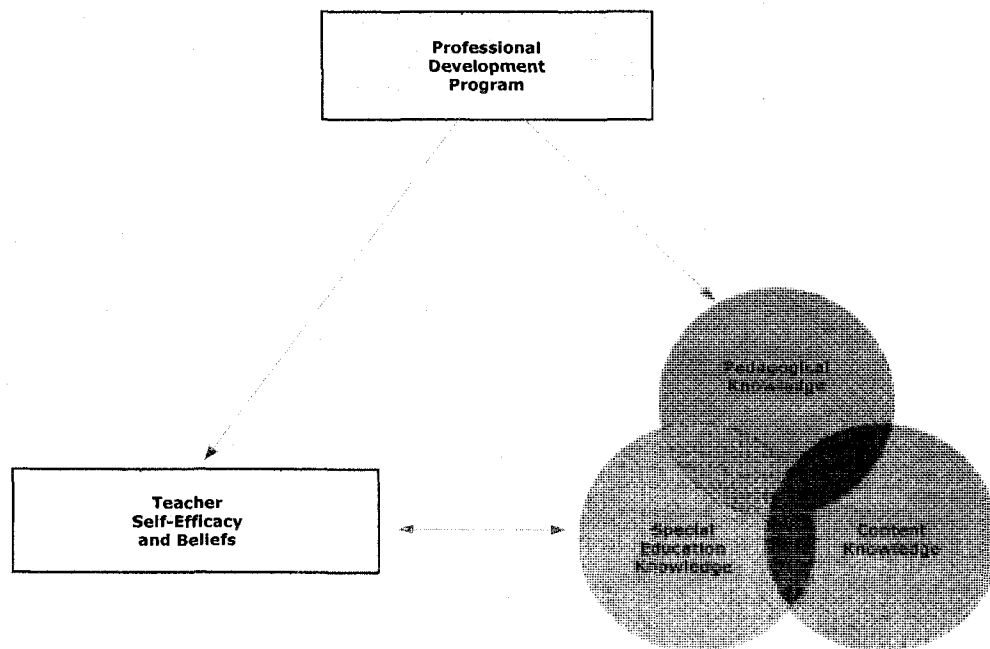
Figure 2. Conceptual framework model

Purpose of Study

During a period of educational reform focused on equipping *all* students with global

knowledge and academic skills, the need for highly-qualified mathematics teachers has

increased drastically. Equally important is how mathematics teachers perceive their ability to

teach content to students with disabilities in an inclusive environment; subsequently, schools

need to provide opportunities for mathematics teachers to not only enhance their knowledge

regarding mathematics content and pedagogy, but also about inclusive education. The

purpose of this mixed-design study was to determine the impact of an intensive professional

development program on teacher self-efficacy related to mathematics instruction for students

with disabilities in the inclusive setting. Secondly, this study proposed to assess the beliefs of

mathematics teachers regarding instruction of students with disabilities in inclusive settings.

Research Questions

This investigation proposes the following research questions:

1. To what extent is a general educator's level of self-efficacy regarding mathematics

    instruction in inclusive settings related to participation in an intensive professional

    development program? Content/methods courses? Both?

2. How is the level of participation in professional development activities related to a

    general educator's beliefs regarding mathematics instruction in inclusive settings?

3. How do teachers perceive the relative value of various elements of the professional

    development program and content/methods courses?

4. How do teachers perceive changes in their teaching practice based on participation in

    the professional development program and/or content/methods courses?

Definition of Terms

Inclusive Setting – learning environment where students with disabilities have access to

the general education curriculum while interacting with their non-disabled peers in a

general education classroom (Stainback & Stainback, 1996).

Mathematical Knowledge for Teaching – the mathematical knowledge use to carry out the

work of teaching mathematics (Hill, Rowan, & Ball, 2005).

Pedagogical Content Knowledge -- set of special attributes that allow teachers to transfer

knowledge of content to their student (Geddis, 1993).

Professional Development – the formal and informal learning activities or experiences

intended to advance teachers' professional knowledge, pedagogic skills, and

attitudes (Guskey, 1995; Smylie, 1990).

Self-Efficacy – an individual's personal judgment of his/her capabilities to organize and

carry out actions that will result in anticipated types of performances, such as

improved student achievement (Bandura, 1977; Pajares, 2002).

Special Education Pedagogy Content Knowledge – the intersection of the set of special

attributes that allow teachers to transfer knowledge of their content to their students

(Geddis, 1993) and knowledge and understanding of available services of special

education and their implementation in an inclusive setting.

Teacher's beliefs related to inclusion – "philosophies, attitudes, or expectations,

perceived to be based on truth and reality, related to inclusive instruction,

learning, disability, teacher preparation, and resources and support" (DeSimone,

2004, p. 14).

Teacher self-efficacy beliefs regarding instructing students in an inclusion classroom – a

teacher's perception of his or her ability to execute given pedagogical tasks

related to mathematics instruction in a setting that includes both general education

and special education students (Arnold, 2005).

Universal design for learning – "a blueprint for creating flexible goals, methods,

materials, and assessments that accommodates learner differences" (CAST, 2006).

Limitations of Study

Mathematics teachers participating in the study may or may not have prior experience

teaching in inclusive settings; however; all participating middle schools implement inclusion

through a variety of models. Teachers with more experience teaching in inclusive setting may

not experience the same level of change in their teaching practices during the course of the

study as a teacher who is a novice with inclusion teaching. Data collected through the

Teaching Mathematics in Inclusive Settings survey is self-reported; therefore, accuracy of

teacher responses cannot be verified. The potential also exists for measurement error related

to the survey instrument.

The instrument used in this study was piloted with a sample of middle-school

teachers who have previously completed one content/methods course. Furthermore, a

problem that has been identified with using a Likert scale instrument, such as Part II and III

of the Teaching Mathematics in Inclusive Settings survey, is the potential for response bias,

which occurs when a respondent circles the numeric level for each item without

consideration of question stems. This respondent behavior may reflect their disinterest in

participating fully in the study. Lastly, study participants are members of an intensive

professional development program; therefore, they may provide responses they believe is the

desire of the researcher as the researcher is an instructor and teacher-in-residence for the

professional development program. Some study participants possess a variety of motivations

for participating in the study, ranging from the need to become highly qualified to teach

middle school mathematics to principal recommendation on an improvement plan, which

may affect their level of openness and honesty during data collection points.

Major Assumptions

It was assumed that study participants will read and understand all questions

contained in the Teaching Middle School Mathematics in Inclusive Settings survey.

Participants in the proposed research study were required to provide a written statement

regarding their desire to participate in the intensive professional development program as part

of the application process. Another assumption of this proposed research study is that

participants, regardless of their motivations for attendance, participated fully and provided

honest feedback related to their teaching practices and beliefs related to inclusive practices

and level of self-efficacy.

Significance of Study

Information and data collected as part of this research study may heighten the

awareness of school administrators regarding which professional practices need to be

supported in order to meet the needs of students with disabilities in the inclusive mathematics

classroom. An increased awareness of teacher needs may lead to administrators discovering

the "optimal mix" of inclusive practices, learner-centered mathematics instruction, in

addition to the enhancement of teachers' pedagogical, content, and technical knowledge

through school-based professional development opportunities to affect more positive student

outcomes (Guskey, 1995). Valuable resources, human and monetary, could be more

efficiently and effectively allocated to professional development opportunities where the

most impact for value-added education for students with disabilities is realized, so that

schools may continue to meet adequate yearly progress (AYP) requirements, especially in the

area of mathematics.

CHAPTER 2

Literature Review

Accessing the General Education Curriculum

The reauthorization of the Individuals with Disabilities Education Act in 1997 highlighted the need for students with disabilities to have access to the same content as their non-disabled peers in addition to receiving instruction in an educational environment that did not restrict their ability to learn. "One of the fundamental values built into current special education practice is the notion of equity for students with disabilities" (Rueda, Callego, & Moll, 2000, p.70). Educational reform initiatives have forced educators to re-examine the intent of IDEA directives to provide an equitable education for students with disabilities by revamping the deficit model of service delivery to a social constructivist (Trent, Artiles, & Englert, 1998) approach aimed at increasing academic success among all students with disabilities, not just students with low incidence disabilities through the integration of research-based instructional strategies. As No Child Left Behind (NCLB, 2001) and the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) aligned to improve the educational experiences for all students and in particular students with disabilities, through specific accountability measures, the focus of educators has shifted to developing systems to close the achievement gap by the 2014 NCLB mandated deadline.

As school divisions within the state of Virginia have begun to implement standards-based assessments from grades three through eight for mathematics, science, language arts, and social studies during the 2005-2006 school year as mandated by NCLB (2001), the assessment results for students with disabilities exhibits both good and bad news for school divisions within the state. Promising news exists pertaining to the assessment of students

with disabilities since 100% of the students with disabilities population participated in the

assessment procedure during the 2005-2006 school year. Nevertheless the outcomes of state

assessment reveal that only 53% of the total number of students with disabilities tested met

the proficient pass rate in mathematics. Closer examination of the pass rates at each grade-

level mathematics assessment by students with disabilities demonstrates that students with

disabilities are falling short of attaining a pass rate of 70%. There was a glimmer of hope for

the future outcomes of state assessment as students with disabilities in third grade achieved a

pass rate of 75% (VDOE, 2006). Inclusive education practices are more extensively

integrated and implemented in the lower elementary school grades (K-3) than in upper

elementary and secondary grades.

<div align="center">Legal and Policy Foundation</div>

Over the past 30 years, the concept of educational access for students with disabilities

has evolved from allowing students with disabilities access to the school building itself to

allowing students to access the same standards-based general education curriculum afforded

to students without disabilities. With the passage of the Education for All Handicapped

Children Act (EAHCA) in 1975, educational access was simply defined as the right to a Free

and Appropriate Public Education (FAPE) opening the doors of the schoolhouse to students

with disabilities. With the current reauthorization of the Individuals with Disabilities

Education Act (IDEA), schools are now focused on creating policies to enact both the intent

and spirit of the law where the ideas of social and academic inclusion in the least restrictive

environment (LRE) are the main focus of instructional pedagogy. Most recently, the

Individuals with Disabilities Education Improvement Act (IDEIA) 2004 accentuated

participation and progress in the general education curriculum by aligning IDEIA with No

Child Left Behind (NCLB, 2001), which makes schools accountable for learning that results in positive student outcomes, including students with disabilities. Therefore, educational access is currently defined as an entry point into the general education curriculum where students with disabilities are actively engaged in learning the content and skills outlined within state standards in addition to participating in state-wide accountability assessments. In order to meet the mandates of the Individuals with Disabilities Education Act (1997) requiring students with disabilities to have access to the general education curriculum, educators have responded by creating a variety of inclusive or mainstream models in an attempt to provide students with disabilities an opportunity to participate in a general education setting.

The reauthorization of the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) upholds the requirement for students with disabilities to be placed in the least restrictive environment (LRE). This mandate was first outlined in IDEA (1997) requiring students with disabilities to remain in the general education setting with the provision of educational supports. Students with disabilities were to be placed in an alternate education setting if appropriate educational supports were not feasible in the general education classroom. Inclusive practices created a need to adjust instructional methods in order to address the diverse learning needs present in the general education classroom. Instructional leaders responded to this need by incorporating differentiated instruction, which employed evidence-based practices to meet the needs of all learners present in individual classrooms. Within the same time frame, the National Council of Teachers of Mathematics (2000) issued a call for educational reform regarding the use of evidence-based practices to increase mathematical understanding and reasoning at all grade levels. Professional organizations

sought to provide support and guidance during the integration progress of evidence-based practices in math classrooms across all grade levels by providing training, professional development, as well as resource materials.

Individuals with Disabilities Education Improvement Act 2004

Nolet and McLaughlin (2005) acknowledge that "the foundation of special education rests with the guarantee that each eligible student receives a 'free and appropriate public education' or FAPE" (p. 13). With the reauthorization of the Individuals with Disabilities Education Act (IDEA) in 2004, the focus of special education shifted from the assurance of FAPE by accessing the general education curriculum to "improving the educational performance of students with disabilities and aligning special education services with the larger national school improvement efforts that include standards, assessments, and accountability" (Nolet & McLaughlin, 2005, p. 3). As the standards-based reform movement transforms general educational practices, special education has evolved as a range of services and supports is now afforded to students with disabilities allowing them to access the standards-based general curriculum, usually in an inclusive environment. Inclusive practices have been integrated within most schools as an avenue to provide students with disabilities access to the general education curriculum in the least restrictive environment as mandated by IDEIA.

IDEIA (2004) re-emphasizes the significance of least restrictive environment (LRE) in the delivery of special education services; "to the maximum extent appropriate, children with disabilities. ... are educated with children who are nondisabled; and ... special classes, separate schooling, or other removal of children with disabilities from the regular educational environment occurs only if the nature or severity of the disability is such that education in

regular classes with the use of supplementary aids and services cannot be achieved satisfactorily" [34 C.F.R.§300.114(b)(i-ii)]. Yell (1995) explained, "LRE is a principle stating that students with disabilities are to be educated in settings as close to the regular classroom as appropriate for the child" (p. 70) In order for all students with disabilities to be afforded equitable access, the standards-based general education curriculum should guide instructional practices within special education placements along the continuum of service delivery, not just in the inclusive general education classroom.

IDEIA (2004) denotes that the Individualized Education Plan (IEP) is the pathway for individual students with disabilities to access to the standards-based general education (Nolet & McLaughlin, 2005). Under the guidance of IDEA (1997), "a student's program may have been individualized, but it was based on annual goals and thus separated from the scope and sequence of a curriculum" (Nolet & McLaughlin, 2005, p. 13). Thus the IEP is a tool for implementing the standards-based general curriculum. IEPs should provide a guide for quality standards-based instruction and related services for students with disabilities receiving special education services anywhere along the service continuum, rather than goals and objectives mutually inclusive of a functional curriculum present in most self-contained and resource settings.

No Child Left Behind 2001

NCLB is a powerful national statement that the achievement gap is of national concern deserving national attention. "If nothing else, NCLB has launched an unprecedented focus on reading and math" (Guilfoyle, 2006). Many factors impact the success of students with disabilities on NCLB mandates including access to the general education curriculum as well as the ability of teachers to teach diverse student populations (Nagle, Yunker, &

Malmgren, 2006). As the 2014 deadline requiring all public school students to be able to demonstrate proficiency in reading and math as measured by states through high-stakes assessments is quickly approaching, schools are still struggling to create systems to increase academic achievement among students with disabilities in all disability categories.

No Child Left Behind Act of 2001 (NCLB) mandates that all student with the exception of students with severe cognitive disabilities master the general education curriculum. Mastery is assessed with standards-based tests to gauge levels of performance for all categories of students, including students with disabilities. Thus, it becomes essential to analyze the effectiveness of inclusive education programs from a variety of perspectives (DeSimone, 2004). Since assessments are vital instruments for measuring student performance, identifying success, and holding schools accountable to the mandates espoused by NCLB, assessments operationalized a crucial tenet of standards-based reform--that all children should learn the same high standards. The requirement to disaggregate state assessment or achievement test score data ensures that schools are educating all children to a high standard, including students with disabilities by indicating which subgroups are performing at an acceptable level. NCLB requires all students with disabilities to take grade-level assessments with the exception of students with the most severe cognitive difficulties who are allowed to take alternate assessments and still be counted for AYP purposes. Alternate assessments for students with disabilities should not exceed one percent of the student population. If even one subgroup does not meet AYP, the whole school can face penalties (ACCESS, 2006) creating a need for school divisions to ensure that students with disabilities regardless of the placement along the service delivery continuum receives the same quality instruction afforded to students without disabilities within the regular

classroom. Improving the performance of students with disabilities according to the provisions outlined within NCLB may be the most challenging barrier to reaching AYP targets (Nagle, Yunker & Malmgren, 2006; Olson, 2002).

National Council of Teachers of Mathematics 2000

The vision statement of the National Council of Teacher of Mathematics (NCTM) begins, "imagine a classroom, a school, or a school district where all students have access to high-quality, engaging mathematics instruction" (2000, p.3), consequently achievement of this ambitious vision requires a solid curriculum, highly qualified teachers, clear alignment between instruction and assessment, and a commitment to both equity and excellence. NCTM's first principle clearly states, "Excellence in mathematics education requires equity – high expectations and strong support for all students" (p. 11). Hence educational equity as defined by NCTM mandates that all students regardless of their life circumstances, including disabilities, be presented the opportunity to study and learn mathematics. "Equity requires accommodating differences to help everyone learn mathematics" (NCTM, 2000, p. 13) to ensure every student within a school building has access to an excellent and equitable mathematics curriculum which supports their learning and is responsive to their strengths, weaknesses, and individual needs.

"The challenge for teachers is to provide effective math instruction to students with disabilities so they can meet the high standards set for what all students must be able to know and do mathematically" (Warger, 2002, p. 1). Unfortunately, students with disabilities do not always participate in a mathematics classroom where the instruction is aligned with standards, thus they often experience difficulty when they are provided access as proper supports for learning may not be provided. Standards-based mathematics instruction may not

be accessible to students with disabilities along the special education service delivery

continuum even students with disabilities receiving instruction in an inclusive setting may

not have access to the general education curriculum accessed by students without disabilities.

Schools are obligated to provide a strong instructional mathematics programs for students

that not only support conceptualizing and learning mathematics, but also incorporating

research-based instructional strategies which address the individual learning styles of all

students, not just students with disabilities.

<div align="center">Defining Inclusion</div>

"Inclusion" models are now being implemented more consistently as a means for

serving students with disabilities. Difficulties arise, however, not only in providing effective

services for students with special needs, but also in how inclusion itself is defined and

implemented across contexts. Monahan, Marino, and Miller (1996), for example, assert that

"inclusion, as it has been embraced by the special education field, appears to have many

meanings" (p.302). Consistent with this perception of inclusive practice, Bergren (1997)

suggests that inclusion be considered a continuum of services that allows special education

students to receive instruction within a general education classroom. Still others describe

inclusion as collaborative service delivery whereby general and special education teachers

work side by side, as co-teachers, in general education settings (Lipsky & Gartner, 1997).

Ideally, an inclusive, collaborative service delivery model would benefit all students in the

general education classroom where the general and special educator design and implement

universally-design lessons. Lessons that provide access to content through multiple avenues

to meet the learning needs of all learners present in an inclusion classroom.

Movement toward Inclusion

The reauthorization of the Individuals with Disabilities Education Act (1997) placed a greater emphasis on students with disabilities receiving instruction in the least restrictive environment (LRE) has received mixed reviews from educators (Galis & Tanner, 1995). Discussions and dialogues regarding the benefits and consequences of inclusion for students in the general education classroom continue to be a major focus in educational reform with proponents and opponents. The delivery of special education services for students with disabilities within the general education setting continues to evolve. Based on the presupposition that students with special needs can benefit, academically and socially, from the general education environment rather than receiving special education services in an isolated setting, inclusion is the opportunity for all children to be included, accepted, and valued in age-appropriate settings with necessary supports and services. Inclusion affords an opportunity for students with disabilities to benefit both academically and socially through daily interaction with non-disabled peers in addition to a special and general education teacher.

Advocates of inclusive practices suggested that the inclusion of students with disabilities into general education classrooms is a moral imperative that does not require, and cannot wait for, empirical justification (Pryor, 2003; Stainback & Stainback, 1996; Stainback, Stainback, & Forest, 1989). The ethic of justice and care position coincided with considerable increases in inclusive placements for students with mild disabilities (Cook, Semmel, & Gerber, 1997). Proponents of inclusion indicate that students with learning disabilities can be supported in typical classroom settings for the entire school day, with

student outcomes as high, if not higher than those achieved in self-contained or pull-out class

settings (Affleck, Madge, Adams, & Lowenbraun, 1988; Bear & Proctor, 1990).

Delivery of special education services in inclusive settings benefits students with

disabilities in their academic and social development. Students with disabilities improved

their social interaction as well as academic performance in inclusive settings (Slavin 1987,

1990). General and special education teachers agreed that students with and/or without

disabilities could benefit from learning experiences within the inclusive classroom setting

(Bender, Vail, & Scott, 1995; Scruggs & Mastropieri, 1996). According to a meta-analysis

conducted by Baker, Wang, and Walberg (1995), the effects of inclusive and self-contained

practices on the academic achievement of students with disabilities demonstrated "a small-to-

moderate beneficial effect of inclusive education on the academic and social outcomes of

special needs children" (p. 34). The authors further concluded that the "concern is not

whether to provide inclusive education, but how to implement inclusive education in ways

that are both feasible and effective in ensuring school success for all children" (p. 34).

Inclusive Practices

A myriad of inclusion models were created by schools to address the mandates of

IDEA 1997 requiring access to the general education curriculum in the least restrictive

environment based on their interpretations of the legislation. Stanovich (1994) developed a

model for inclusion as there was little research available demonstrating the specific factors

which contribute to successful inclusion of students with disabilities. Stanovich's model

included predictive factors related to the effective inclusion of students with disabilities in

classrooms related to differences in teacher beliefs about their roles and responsibilities in

integration. Based on her model, effective teaching behaviors were predicted from three

variables defined as "teacher attitudes about integration", "school norm", and "perceived behavioral control". Teachers' attitudes were conceptualized as specific beliefs about a general education teacher's role in inclusive practices and the positive or negative evaluation of these practices on teacher behaviors.

Stanovich also proposed that teachers would be more likely to use effective teaching behaviors in an inclusive classroom when their respected colleagues possessed the same positive beliefs regarding the practice of inclusion in addition to their shared belief in the effectiveness of their skills and abilities to affect positive student outcomes (Giddens, 2001). Stanovich defined perceived behavioral control as the skills and abilities a teacher perceived they had to influence student learning for all student populations.

Roach (1998) adapted Stanovich's model to investigate whether the instructional interactions between teachers and their diverse group of students in inclusive classrooms can be predicted by teacher attitudes about inclusion, available school resources, school norms related to inclusion, and staff collaboration. During the course of her research study, Roach found that teacher's attitudes were predicted by teacher's self-efficacy as well as teacher perceptions of collaboration present in their classroom. Observations of teacher interactions with individual students provided valuable data regarding the quality of student-teacher interaction present in the inclusion classroom. Roach determined that teachers who were more competent and confident regarding inclusive practices required less collaborative support to implement effective instructional practices. Other findings from this research study show that teachers who are more collaborative and believe that they possess the requisite skills to positively influence student learning for all students demonstrate more positive attitudes and toward the concept of inclusion. Additionally, teachers who work in

supportive school contexts are more likely to conduct quality instructional interactions (Giddens, 2001).

Role of Special and General Educator in Inclusion

When implementing inclusive practices, consideration needs to be given to the pairing of special and general education teachers. Special education teachers are the instructional strategy experts who are able to adapt instruction to meet the individual learning needs of all students present in the inclusive setting. General education teachers are the content area experts able to align curriculum, instruction, and assessment to ensure a value-added education for students in the inclusive setting. Special education teachers are not typically as well trained in specific academic areas as regular education teachers (Galis & Tanner, 1995). Combining the expert skills of general educator in curriculum and instruction with the diagnostic and remedial capabilities of the special educator theoretically will create a classroom environment where all students can benefit from the integrated expertise. Students with disabilities receiving services in an inclusive setting earn significantly higher grades in the four main content areas (Rea, McLaughlin, &Walther-Thomas 2002).

Teacher Beliefs about Inclusive Education

Admittedly, perceptions vary among stakeholders (students, parents, administrators, special education teachers, and general education teachers) representing different views along a negative/positive spectrum. The issue in need of research is not whether inclusion works or who believes that to be true, but how and why it works within the parameters of the various service delivery models (Smith & Dlugosh, 1999). Even though general educators believe in inclusive practices to allow students with disabilities access to the general education curriculum, they also believe that the practice of inclusion is not feasible due to

factors that impact their ability to provide special education services in the general education setting.

Little research has focused directly on the perceptions of general education teachers working in inclusive settings; therefore, we know "less about their role in inclusion than we do about any of the other participants involved" (Smith & Smith, 2000, p. 162). Smith and Dlugosh also note that most research studies conducted regarding teacher perceptions of inclusion are quantitative in nature and do not address perceptions of general education teachers, those who are often primarily responsible for the implementation of inclusive services.

Brantlinger (1996), former special educator and teacher educator, categorized teachers' attitudes and beliefs toward inclusion as "inclusive beliefs" and "anti-inclusive beliefs". "Inclusive beliefs" are defined by Brantlinger as beliefs that facilitate and maximize inclusive environments, while "anti-inclusive beliefs" are described as beliefs that hinder or weaken the implementation of inclusive instructional strategies in schools (p. 19). Given the demands of recent federal mandates for *all* students to "reach high standards" and "graduate from high school," (Virginia Department of Education, 2005, p. 1), a focus on general education teachers' perceptions of inclusion is particularly timely.

Furthermore, the perceptions of general education teachers regarding inclusive education programs are needed to inform local and state policy decision-making processes (Smith & Smith, 2000). Because inclusion is not "going away," (Smith & Dlugosh, 1999, p. 2) administrators must be aware of the support structures and resources needed to implement an effective inclusion program or to improve an existing one. As the main responsibility for the implementation of inclusive practices lies with general education teachers (Smith &

Smith, 2000), how do their lived, personal experiences shape or construct their beliefs about

inclusion along a negative/positive continuum?

Effective classroom instructional strategies are at the core of getting all students to

learn, including exceptional populations; however, instructional practices are not

implemented in a vacuum (DeSimone, 2004). Research has linked teachers' instructional

practices, as well as their attitudes regarding student learning, with student achievement and

performance including the relationship with inclusive education (Garvar-Pinhas &

Schmelkin, 1989; Larrivee & Cook, 1979). Instructional practices are also connected to

beliefs about learning, disability, and perception of available resources especially time

(Scruggs & Mastropieri, 1996).

General education teacher perceptions regarding disabilities and the availability of

resources coupled with their beliefs related to teaching and learning impact their willingness

to teach in inclusive or collaborative settings. Middle school teachers had the most negative

toward the concept of mainstreaming, the forerunner of inclusion practices (Larrivee &

Cook, 1979). Many general education teachers support the idea of inclusive education for

students with disabilities; however, some of the same teachers do not believe that students

with disabilities benefit from this educational environment. Most importantly, a small

population of teachers indicated that they believed they had sufficient resources, training, and

time required to implement inclusive practices successfully in their classrooms (Scruggs &

Mastropieri, 1996). Conversely, general educators with more experience in implementing

inclusive practices for students with disabilities were more positive in their attitudes

regarding inclusion and its impact on student achievement. Negative attitudes demonstrated

by general education teachers were related to their doubt and insecurity about inclusive

education. The source of doubt and insecurity rest in the general educator's lack of understanding related to teacher roles and responsibilities in the inclusion classroom (Janney, Snell, Beers, & Raynes, 1995).

Teachers' beliefs, attitudes, and knowledge have also been found to impact decisions about inclusive instructional strategies (DeSimone, 2004). General education teachers possessing a positive view of inclusion consistently implemented inclusive practices more than general education teachers with less favorable attitudes regarding inclusive practices (Bender et al., 1995). Grade level and school environments may also effect teacher beliefs regarding inclusive practices. deBettencourt (1999) discovered that middle school general education teachers did not incorporate instructional strategies shown to support inclusive practices, which demonstrate a positive impact on student achievement among students with disabilities. Teachers expressed a need for assistance in classroom management, adapting curriculum, lesson planning, and instructional methods (Rao & Lim, 1999).

Pedagogical content knowledge comes to the forefront when teachers voice concerns related to their ability to delivery educational services for all students in inclusive classroom settings. Kochhar, West, and Taymans (2000) stated one of three major barriers to inclusion is the teacher's negative beliefs and attitudes regarding inclusion. Research conducted by Bender et al. (1995), in addition to Gibson & Dembo (1984), demonstrated that attitudes, beliefs, and knowledge related to inclusion impacted teacher decisions about which inclusive instructional strategies would provide the greatest level of access for students with disabilities to the general education curriculum

Stipek et al. (2001) developed the Beliefs about Mathematics and Teaching instrument to gather data related to this definitive question - which beliefs will make

teachers' instruction more effective? Stipek and colleagues (2001) argued that teachers should shift their beliefs to align more with NCTM standards, which advocate an "inquiry-oriented" or "constructivist" approach to mathematics instruction. His findings further suggest that teachers should adopt beliefs that inspire them to "give up some of their control over mathematical activity and allow students to initiate their own strategies to solve problem and grapple with contradictions" (p. 215).

Teacher Self-Efficacy

When teachers believe in their ability to meet the learning needs of their students, they design and deliver instruction which provides students access to content while enabling them to construct new knowledge and understanding. A strong link exists between teacher self-efficacy and improved student achievement (Ashton & Webb, 1986; Berman & McLaughlin, 1977; Dembo & Gibson, 1985; Hoy & Woolfolk, 1993; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Additionally, research shows a link between higher teacher self-efficacy and improved student achievement (Lewandowski, 2005; Tracz & Gibson, 1986). Bandura (1986, 1997) postulated that behavior is more effectively predicted by an individual's belief related to their capabilities rather than what they are able to accomplish. Therefore, an individual's self-belief is a driving force in his/her professional and/or academic accomplishments (Lewandowski, 2005). It is these beliefs that "determine what individuals do with the skills and knowledge that they have" (Pajares, 2002, pp.28).

When teachers teach, they interpret the outcomes of their instruction then use these interpretations to create beliefs about their ability to provide effective instruction. These beliefs regarding their instructional capabilities act in concert with beliefs about their knowledge and understanding related to pedagogy. Bandura's social cognitive theory (1986)

suggested that individuals are able to self-regulate cognitive processes and behaviors, rather than reacting to situations as they arise. This premise suggests individuals are able to exercise some control over their thoughts, feelings, actions, and motivators (Pajares, 2002). This control over cognitive processes impacts and has the potential to alter subsequent actions and behaviors of educators (Lewandowski, 2005).

Definition of Self-Efficacy

Bandura (1986) defined self-efficacy as "people's judgment of their capabilities to organize and execute courses of action required attaining designated types of performance" (p. 391). Bandura also clarified that self-efficacy "is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses" (p. 391). Perceived self-efficacy beliefs may impact a person in either a positive, empowering way, or in a negative, demoralizing way (Lewandowski, 2005). It is the individual's beliefs regarding their ability (positive or negative) to carry out the necessary actions to achieve the desired result that impacts their attainment of personal and professional goals (Bandura, 1986, 1997). One example of self-efficacy in action focuses on a student's ability to complete a complex mathematics algorithm. For a student who excels in mathematics, they will feel empowered and confident in their ability to solve the algorithm; while students who fear mathematics or feel unsure of their abilities may feel demoralized as they recognize their weaknesses related to finding a solution for the algorithm. In short, individuals who believe in their ability to perform a specific task will work harder and persist in order to successfully reach the goal than those who do not believe in their ability (Pajares & Miller, 1994).

Sources of Self-Efficacy

Bandura (1977) describes four sources of personal efficacy: performance accomplishments, vicarious experiences, verbal persuasions, and emotional arousals. Performance accomplishments demonstrate the greatest potential for raising self-efficacy beliefs as they directly involve the successful completion of individual task. Vicarious experiences impact self-efficacy when an individual observes someone else completing a task with success, believing that they too can be successful at completing the same task. While verbal persuasion allows an individual to overcome doubt when others express their beliefs in the individual's ability to achieve a goal or complete a task. Emotional arousal employs the individual's anxiety, steering the individual away from a feeling of avoidance. If the task is not successfully completed, the individual's self-efficacy will be further influenced in a negative manner (Bandura, 1977, 1986, 1997; Smylie, 1990). Self-efficacy increases with repeated successful tasks just as a decrease will occur when failure is experienced after the non-completion of several tasks (Lewandowski, 2005).

Characteristics of Self-Efficacy

Beliefs of self-efficacy differ in level, generality, and strength. The perception of a task is affected by the level of demand created by the task in order for the task to be accomplished. Generality refers to the range of activities that are included in the perception. Areas are more generalizable when activities are similar in degree, situations, and require similar capabilities from a person. Finally, strength varies with self-efficacy beliefs. Those who have weak self-efficacy beliefs will allow negative experiences to weaken their personal level of self-efficacy, which creates a tendency for persons fitting this category to stop working toward the task or goal at hand. Persons possessing a strong sense of self-efficacy

will continually strive to accomplish a task, even when obstacles are placed in the path of completion (Bandura, 1986, 1997).

Bandura's self-efficacy theory distinguishes between the constructs of outcome expectancy and efficacy expectation. Outcome expectancy is related to the degree at which a person believes that their environment can be controlled; conversely, efficacy expectation predicates the individual's undertaking of a specific action. If the individual perceives they possess the ability to successfully handle the assigned task, he/she is more likely to engage in the task. Once engaged in the task, the positive perception of self-efficacy and positive outcome expectancy will drive the individual to persist with the task until it is successfully completed leading to the affirmation of the person's positive self-efficacy. The conviction that the person is personally capable of successfully executing actions that will result in the desired outcome defines efficacy expectation (Bandura, 1986; Gibson & Dembo, 1984). Should an individual with weak self-perception attempt a task, he/she is more likely to surrender in the presence of obstacles or difficulties resulting in a lower self-efficacy (Bandura, 1986; Gibson & Dembo, 1984; Smylie, 1990).

The locus of control focuses on causal beliefs of actions and outcomes and whether the outcomes and actions are controlled internally or externally. Individuals possessing an external locus of control will conclude that external factors of which they had no control, such as luck, contributed to the specific outcomes rather than the input of their knowledge and skills (Bandura, 1997; Lewandowski, 2005). In fact, a strong internal locus of control will not guarantee a strong self-efficacy for an individual, as Bandura and Smylie discovered individuals who believe they are inept with regards to performing specific tasks may possess an ineffective locus of control in addition to a weak self-efficacy.

Most importantly, it should be noted that differences are present between the constructs of "self-efficacy" and "self-concept" although the terms appear interchangeably within some professional literature and research articles. Bandura (1997) points out the specific distinction between the two constructs by emphasizing that "self-efficacy" is specifically related to personal judgments regarding one's ability while "self-concept" is based on an individual's feelings of self-worth. Pajares (2002) further defines "self-concept" as an individual's feelings of self-worth as related to the values held in high regard by society. One major difference between the concepts of self-efficacy and self-concept in that "no fixed relationship" exist between the integration of cognitive, social and behavioral skills. An individual's belief about their perceived ability (self-efficacy) to perform a task extends beyond just their basic knowledge (Lewandowski, 2005).

One important difference between self-efficacy and self-concept is that the construct of self-efficacy is not static. The beliefs may be altered as a result of contextual factors, such as a teacher may believe they are highly qualified to teach mathematics until they teach a highly gifted group of students, who challenge their level of mathematics knowledge and subsequently, their ability to provide instruction to a high-ability group of students. Conversely, a teacher may believe they are not highly qualified to teach mathematics to students in an inclusive setting; however, experience a level of success with differentiation of the curriculum and instruction. Those who believe in their capability to be successful make greater and lengthier attempts to achieve the desired outcome (Lewandowski, 2005).

Teacher Self-Efficacy and Education

Teachers' belief that they possess the ability to influence student learning and achievement for all students, including students with disabilities is referred to as teacher self-

efficacy (Bandura, 1977, 1997; Guskey, 1987; Hoy, 2000; McLaughlin & Marsh, 1978).

McLaughlin and Marsh found teacher self-efficacy positively impacted the achievement of a

goal, adjustment in a teacher's instructional practices, and continued employment of methods

and materials introduced during the scope of their research project. Teachers who

demonstrate a strong instructional commitment to student learning have a greater impact on

student achievement (Brookeover et al., 1978). Teachers, who possess high expectations for

student performance in addition to strong feelings of responsibility related to student

achievement, produced higher gains in student performance and achievement (Brophy &

Evertson, 1977; Dembo & Gibson, 1985; Gibson & Dembo, 1984). Professional

development activities impact teachers' sense of efficacy; therefore, an indirect link is

formed with student performance and achievement (McLaughlin & Berman, 1977; Scribner,

1998).

Dembo and Gibson's (1985) study related to teacher self-efficacy discovered the

presence of two distinct dimensions within the construct, which they labeled as general

teaching efficacy and personal teaching efficacy. Personal teaching efficacy (PTE) refers to

the teacher's own personal beliefs related to their skill and capacity to improve student

learning. General teaching efficacy (GTE) is defined as beliefs that external factors beyond

the teacher's control, such as socioeconomic status, home environment, and parental

involvement, limit the teacher's ability to bring about change or stimulate improvement. This

relationship was represented by the response stem, "when it really comes right down to it, a

teacher really can't do much because most of a student's motivation and performance

depends on his or her home environment" (p. 572). The intersection between PTE and GTE

demonstrates that teachers may interpret student capabilities as something that is in or out of

their control. When teachers possess strong PTE and are able to critically examine their GTE, they may be able to determine how best to address the diverse learning needs present in their classrooms.

Teacher Self-Efficacy and Math Education

Mathematics teacher beliefs regarding their level of content and pedagogical expertise are directly related to the quality and effectiveness of mathematics instruction provided to students in their classrooms. Existing literature on teachers' beliefs about the subject of mathematics and mathematics instruction has focused on three issues: the relationship between teachers' beliefs and knowledge; the influence of teachers' beliefs on instruction; and the role that teacher education programs play in both altering teachers' beliefs and fostering an awareness of the importance beliefs play in instruction (DeSimone, 2004). Research focusing on the relationship between mathematics teachers' knowledge and beliefs has proposed that both constructs have different definitions, motivations, and correlations with instruction (Borko, Eisenhart, Brown, Underhill, Jones, & Agard, 1992; Nespor, 1987; Pajares, 1992).

Teachers of mathematics not only need to possess high self-efficacy related to their pedagogical content beliefs, but also in their instructional practices in order to affect positive student outcomes. Interestingly, mathematics teachers' pedagogical content beliefs and knowledge has been found to be interrelated with a teacher's instructional practice, as well as students' understanding of mathematics (Peterson, Fennema, Carpenter, & Loef, 1989). A strong connection was established between a teacher's level of mathematical knowledge and beliefs about teaching mathematics (Borko et al., 1992). Correlations between teachers'

beliefs and instruction have been evidenced in other research studies (Mewborn, 2002; Stipek et al., 2001; Thompson, 1992).

Teachers with high self-efficacy in content, pedagogy, and instruction may not provide standards-based instruction using research-based methodologies. Upper elementary teachers who possessed more traditional beliefs related to content and pedagogy appeared to rely more heavily on traditional methodologies that focus on student performance and correct responses rather than student conceptualization of presented mathematical content in order to construct new knowledge and understanding (Stipek et al., 2001). In their case studies of elementary and middle school mathematics teachers, similar conclusions regarding the positive impact of beliefs on mathematics instruction were evidenced (Mewborn, 2002; Wilson & Goldenberg, 1998). DeSimone (2004) suggested that additional research is needed to "collect actual implementation data through observation to develop an understanding of teachers' actions toward included students in middle school and discovering ways in which students can be more effectively included" (p. 67).

Teacher Self-Efficacy and Inclusion

The interrelationship of teacher self-efficacy and teacher beliefs related to inclusive education impacts the quality and effectiveness of instructional delivery to all students. Many teachers lack confidence in their abilities to teach students with special needs in their inclusive classrooms (Bender et al., 1995; Buell et al., 1999; Jordan & Stanovich, 2004; Poulou, 2005; Woolfolk & Hoy, 1990). Factors influencing the level of teacher self-efficacy include previous training and experience, perceived support from the school environment, and the type and severity of disability of students receiving inclusive special education services in their classrooms. Specifically, teachers reported lack of

confidence in their abilities to meet the requirements and goals set forth by the students' Individual Education Plan (IEP) (Avramidis et al., 2000). Teacher self-efficacy was reportedly higher among teachers who taught in supportive school environments where colleagues and administrators encouraged them (Brownell & Pajares, 1996).

General educators faced with preparing lessons for a diverse student population may be overwhelmed with the technical details related to modifications and accommodations needed for students with disabilities to have access to the general education curriculum. A teacher's level of self-efficacy related to technical knowledge regarding special education is impacted by their perceptions and experiences with certain categories of disabilities. Teachers tend to report having more positive attitudes about teaching students with physical disabilities rather than those with emotional or behavioral disabilities (Soodak, Podell, & Lehman, 1998). Williams and Algozzine (1979) posit that this is a result of teachers' perceptions that students with milder disabilities require fewer adaptations and modifications for the general education curriculum and environment than students diagnosed with more severe disabilities. Thus they will be able to deliver instructional services in an inclusive setting more easily for students with milder disabilities. Research related to teachers' attitudes about teaching included children with learning disabilities are more readily available than research pertaining to teacher attitudes about teaching students with other categorical disabilities in inclusive settings (Gresham & Elliott, 1989; Taylor, Asher, & Williams, 1987; Vaughn, Elbaum, & Schumm, 1996; Weiner & Tardif, 2004).

One of the most reliable predictors of student outcomes and teacher practices is the teacher's own self efficacy (Jordan & Stanovich, 2004; Poulou, 2005; Woolfolk &

Hoy, 1990). Teachers with higher self-efficacy who expect positive student outcomes may be more willing to include children with disabilities in their classes because they believe that they have the ability and the skills to teach students of diverse populations (Podell & Soodak, 1993). Conversely, Sachs (1988) found that teachers with lower expectations of student potential may put less effort into adapting the environment because they do not believe that they can effect change in the learning outcomes of their students.

Research has shown a connection between a teacher's self-efficacy and their ability to select instructional strategies that meet the needs of students with disabilities in their classrooms (Bender et al., 1995; Rimm-Kaufman & Sawyer, 2004). In fact, teachers who possess a higher self-efficacy about teaching students with disabilities tend to report the use of effective inclusion strategies, such as individualizing instruction, peer tutoring, and differentiation of instruction, more consistently than teachers who have lower efficacy beliefs (Bender et al., 1995; Jordan & Stanovich, 2004; Rimm-Kaufman & Sawyer, 2004). Vaughn, Elbaum, and Schumm (1996) suggested that teachers with little or no experience with successfully planning interventions for students with disabilities may not be able to adapt the environment successfully to meet the learning needs of students with disabilities. Podell and Soodak (1993) found that teachers with a lower level of self-efficacy are more likely to recommend that students with disabilities to receive special education services in a self-contained setting rather than the general education classroom.

Pedagogical Content Knowledge

Pedagogical Content Knowledge (PCK) is viewed as a set of special attributes that allow teachers to transfer knowledge of content to their student (Geddis, 1993). These special attributes include the "most useful forms of representation of these ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations – in a word, the ways of representing and formulating the subject that make it comprehensible to others" (Shulman, 1987, p. 9). Shulman further posited that those special attributes a teacher possesses helps them guide a student to understand content in a personally meaningful way.

PCK includes understanding what makes learning of specific topics easy or difficult for students with diverse learning styles and needs as well as the conceptions and preconceptions that students of different ages and backgrounds bring with them when learning concept and/or content. "If those preconceptions are misconceptions, which they so often are, teachers need knowledge of the strategies most likely to be fruitful in reorganizing the understanding of learners, because those learners are unlikely to appear before them as blank slates" (Shulman, 1986, p. 9-10). The construct of PCK includes teachers understanding how specific topics, ideas, or problems are organized and adapted for presentation to the diverse interests and abilities of student present in the classroom. Shulman (1987) emphasized the need for teachers to possess the capacity to transform content knowledge into powerful pedagogical forms yet differentiated to the abilities and backgrounds present among students in their classrooms.

Pedagogical Content Knowledge Meets Mathematical Knowledge for Teaching

Teachers of mathematics not only need strong pedagogical content knowledge; they need to possess a strong conceptual understanding of the language of mathematics. In mathematics instruction, awareness of individual student's cognitive capabilities is needed to

facilitate assessing their knowledge and understanding related to presented mathematics content. In order for teachers to interpret children's mathematical thinking, they should possess strong content knowledge. A teacher with well-developed pedagogical content knowledge has the ability to foster deep understanding among students while also averting misunderstanding (Ball & Bass, 2000).

Facilitation and support of student mathematical learning among diverse student populations may be enhanced when a mathematics teachers possesses both mathematics content knowledge and pedagogical content knowledge. Mathematics pedagogical content knowledge consists of "profound understanding of fundamental mathematics (PUFM)" (Ma, 1999, p. 118). The three elements of mathematical content knowledge include: deep understanding of mathematics, ability to conceptualize content, and the ability to correctly apply mathematical knowledge (Bransford, Brown, & Cocking, 2000, p.16; Kahan et al., 2003). This definition of mathematical content knowledge highlights both procedural and conceptual aspects of content knowledge, which demonstrates a teacher's need to be proficient in both aspects.

The idea of mathematics content knowledge has been further extended by Deborah Ball and colleagues called "mathematical knowledge for teaching (MKT)" (Hill et al., 2005, p. 373). The characteristics of mathematical knowledge for teaching include: mathematical knowledge; unpacking and decompressing mathematical ideas; sequencing ideas; choosing and using representations and examples; explaining and guiding explanation; using mathematical language and notation; analyzing errors; interpreting and evaluating alternative solutions and thinking; analyzing mathematical treatments in textbooks; making

mathematical practices explicit; and attending to issues of equity. MKT may be separated into two domains: subject matter knowledge and pedagogical content knowledge.

One crucial aspect of MKT discovered by Ball and Sleep (2007) is that insufficient opportunities are present that improve a teacher's ability to develop mathematical knowledge for teaching. Current professional development activities and/or programs designed to support teacher learning related to mathematics education are not specifically aimed at developing the capacity to know and use mathematics when teaching. Many teachers learn MKT from their classroom or professional development experiences, while other teachers may not be afforded the same opportunities. The missing key in professional development programs or courses for mathematics teachers is the lack of materials for teaching mathematics in a more constructivist manner where the central tasks of teaching mathematics are taught and supported. Helping teachers acquire a richer more flexible MKT and PCK remains a critical aspect of mathematics professional development (Grossman, 1992; Shulman, 1986; Wagner, 2003).

Special Education Pedagogical Content Knowledge

When the idea of technical knowledge related to the field of special education is merged with the construct of PCK, then the larger picture of the knowledge and skill sets needed by general education teachers assigned to work in inclusive settings is displayed for critical, yet reflective thought. Administrators, professional development providers, researchers, and professors need to consider how the interrelationships between these elements impact teacher self-efficacy related to teaching students with disabilities in inclusive classrooms. Not only do teachers need strong PCK to address the learning needs of students with disabilities in their inclusive classrooms, teachers need to understand how

special education functions in relation to the teaching and learning process, especially in inclusive settings. The intersection of content knowledge, pedagogical knowledge, and special education knowledge represents a general educator and/or special educator who possess a strong understanding about how to design and implement a universally-designed lesson. Universally-designed lessons allow students with disabilities access to the content-based general education curriculum through differentiation of instructional activities that meet the individual learning needs of students.

<center>Defining Professional Development</center>

The era of educational reform and accountability has stimulated changes in how educators are supported in the continuation of their professional learning. Sparks and Hirsch (1997) described the paradigm shift occurring in the field of professional development: "Soon to be gone forever, we hope, are the days when educators (usually teachers) sit relatively passively while an "expert" exposes them to new ideas or "trains" them in new practices, and the success of the effort is judged by a "happiness quotient" that measures participants' satisfaction with the experience and their off-the-cuff assessment regarding its usefulness" (p. 1). Currently, professional development program models incorporate several theories and methodologies, including adult learning theories (Speck, 1996), change theory (Fullan, 1991, 1992; Fullan & Miles, 1992), constructivism (Darling-Hammond & McLaughlin, 1995; Lieberman, 1995), systems thinking (Senge, 1990), and results-driven education to address the intricacies of the teaching and learning process.

Teaching is a complex and ever-changing endeavor (Fullan, 1995). Based on this observation, professional development programs need to focus on ways to assist teachers in continually improving the teaching and learning process. The core of professional

development is learning to make a difference by learning how to bring about continuous improvement for teachers and student outcomes (Goodlad, 1990). Professional development should be connected to "real-time" learning with a theoretical basis and coherent focus while supporting specific innovations which are integrated with the daily teaching experiences (Fullan, 1995). "The first basic point, then, is that professional development must be reconceptualized as continuous learning, highly integrated with the moral task of making a difference in the lives of diverse students under conditions of somewhat chaotic complexity" (Fullan, 1995, p. 257)

Teaching and Professional Development

Changes in instructional practices do not occur as a direct result of participation in professional development activities (Hunzicker, 2004). Goodlad (1990) outlined four moral purposes for teaching, including facilitating critical enculturation, providing access to knowledge, building an effective teacher-student connection, and practicing good stewardship. "The moral purpose of the teacher is the building block of change. But it cannot be done alone, or without the skills and actions that would be needed to make a difference" (Fullan, 1995, p. 255). The need for continuous learning for teachers meant that new ways of incorporating and supporting professional development were needed to ensure that changes to the teaching and learning process had a positive impact on student outcomes.

As the focus and purpose of professional development are shifting, teachers are also beginning to see new ways of supporting their learning regarding pedagogy, content, and technical knowledge. Nias, Southworth, and Campbell (1992) stated "teachers who wanted to improve their practice were characterized by four attitudes: they accepted that it was possible to improve, were ready to be self-critical, to recognize better practice than their own within

the school or elsewhere, and they were willing to learn what had to be learned in order to be able to do what needed or had to be done" (p. 72). Teachers are beginning to understand that their professional learning does not have to occur within the confines of a workshop, in-service, or lecture hall, but should occur within the context of their classrooms and school. An additional advantage to contextual professional development programs is that individual teachers realize that they are not alone in their need to learn when they observe learning occurring among their colleagues (Fullan, 1995). Observations related to peer learning support the idea that learning is a means of increasing one's ability as a teacher rather than emphasizing inadequacies of individuals.

New Focus and Purpose for Professional Development

According to Sparks and Hirsch (1997), professional development for educators not only must affect the knowledge, attitudes, and practices of individual teachers and support staff, but it must also change the cultures of the schools. Fullan (1993) added that organic professional development is primarily about "reculturing" the school, not "restructuring". Fullan (1991) supported this premise with regard to organizational change – "the greatest problem faced by school districts and schools is not resistance to innovation, but the fragmentation, overload, and incoherence resulting from the uncritical acceptance of too many different innovations" (p. 197). Fullan's idea that organizational elements dynamically interact is supported by Senge's (1990) systems theory, which is described as "a system for seeing wholes". A systems framework allows one to see the interrelationships rather than individual components where one can identify "patterns of change rather than static 'snapshots'" (p. 69). Within a systems theory framework, professional development should be cyclical in nature rather than linear so that changes in one component of the teaching and

learning process are examined and evaluated based on their impact to other areas of the process as well as other areas of the school.

Professional development is now viewed as an avenue for changing components of a system so that the system performs at an optimal level where effective teaching and learning is occurring so that positive student outcomes result. In order for this change to occur in the teaching and learning process, Lieberman (1995) believes that "teachers must have opportunities to discuss, think about, try out, and hone new practices" (p. 592). Aligned with Lieberman's suggestion for the focus of professional development is the theory of constructivism where the learner is the center of the teaching and learning. Darling-Hammond and McLaughlin (1995) support constructivism and lifelong learning as the crux of professional development as a way "to see complex subject matter from the perspectives of diverse students" (p. 597).

A constructivist approach to professional development allows teachers to "reflect critically on their practice and to fashion new knowledge and beliefs about content, pedagogy, and learners" (Darling-Hammond & McLaughlin, 1995, p. 597). Diaz-Maggioli (2005) suggested there are four distinct types of awareness needs that teachers can address through professional development: technical awareness, personal awareness, problematic awareness, or critical awareness. Professional development should and will be judged by whether it alters instructional behavior in a manner that demonstrates a positive impact on the teaching and learning process. With a new focus and purpose for professional development, the stumbling bocks that impede effective professional development will be greatly diminished. The stumbling blocks include a deficit model approach, lack of ownership, technocratic nature, lack of awareness of contextual factors, lack of variety in delivery

models, and inaccessibility of professional development opportunities (Diaz-Maggioli, 2005)

The main stumbling blocks that will be eliminated by the new paradigm of professional

development are little or no support for transferring new learning and content into classroom

practice, lack of understanding related to adult learning and learning styles among educators,

and systematic evaluation of professional development programs. Peery (2004) stated, "The

best way to improve education for our nation's youth is simpler than most people think. We

must improve the ongoing education of the adults who facilitate student learning" (p. 1).

Components of Professional Development

Four variables including content, process, strategies and structures, and context

impact the quality and nature of professional development. Guskey (1995) stated that "we

know far more about professional development processes that fail than we do about those

that succeed" (p. 118). Therefore, it is essential for professional development programs to

incorporate theories, methodologies, and practices that support teachers as they examine their

teaching practices to discover ways to improve and/or enhance the teaching and learning

process. Professional development programs should include the following processes in order

to address the needs of the system: recognize change as both an individual and organizational

process; think big, but start small; work in teams to maintain support; include procedures for

feedback on results; provide continued follow-up, support, and pressure; and integrate

programs. Beginning with small steps incorporating collegial systems among teachers to

provide feedback and support may encourage both teachers and administrators to recognize

systems change that produces positive student outcomes.

While professional development programs begin to incorporate strategies, methodologies,

and processes to address pedagogical, content, and technical issues and concerns from a

constructivist systems approach, educators and administrators need to look for programs with the following characteristics: collaborative decision-making, growth-driven approach, collective construction of programs, inquiry-based ideas, tailor-made techniques, varied and timely delivery methods, adequate support systems, context-specific programs, proactive assessment, and adult-centered instruction (Diaz-Maggioli, 2005, p.6). A well-rounded professional development program that focuses on the individual needs of teachers should provide on-going supports as teachers learn to implement and integrate research-based instructional strategies to improve student outcomes for all student populations. Professional development programs should combine technical skills, reflective practice, inquiry, and collaboration may result in true lifelong learning (Fullan, 1989).

School leaders control many of the most essential conditions and supports needed for professional development. The quality of school leadership impacts the conditions that "enable teachers' learning and professional growth" (Lieberman, 1995, p. 75). In order to support teachers' professional development, instructional leaders should be aware that a slow pace for teacher learning is needed in order to achieve deep, lasting change (Fullan, 1989) "Improved, focused teaching emerges slowly, with flexible leadership, and increased student learning is the ultimate and most precious benefit" (Peery, 2004, p. 9). Instructional leaders need to create "enabling" professional development programs, which integrate learning into ongoing practices while encouraging collegiality so that teachers feel safe to critically examine their teaching practices.

"Optimal Mix" for Inclusive Mathematics Education

The struggle for instructional leaders is to find the right mix of ingredients to create a teaching/learning environment where all students have access to the general education

curriculum. An "optimal mix" is essential as there is no one right answer or solution to many

of the concerns and issues present in diverse educational environments related to the complex

process known as teaching and learning (Guskey, 1995). The uniqueness of the context of

individual school environments is a critical factor in education (Fullan, 1985; Huberman &

Miles, 1984). An "optimal mix" suggests finding the mixture of professional development

processes and practices that will work best with the dynamic contexts of individual school

environments in order to improve the teaching/learning process to affect positive student

outcomes. "It is apparent that teacher learning is critical in helping instruction move beyond

mechanistic implementation to maximize student learning" (Loucks-Horsley & Matsumoto,

1999. p. 2).

In order to ensure mathematics teachers meet the "highly qualified" criteria as

outlined by NCLB (2001), professional development activities and programs need to use the

technical pedagogical content knowledge framework to identify the areas teachers need

training and support. It is essential for mathematics teachers to possess a high level of self-

efficacy related to teaching the content matter in addition the instructional practices and

strategies that meet the learning needs of diverse student populations. More importantly,

mathematics teachers assigned to inclusive classroom settings need strong self-efficacy

related to the technical aspects of the delivery of special education services.

Professional development programs need to assess where teachers are in their

individual knowledge and understanding of content and pedagogy, in addition to technical

special education information so that activities are designed and implemented to allow

teachers to experience success as they begin to make changes to affect more positive student

outcomes for all students in their classrooms, including students with disabilities. When

teachers believe they possess the knowledge and skills to provide educational services to all student populations, the teaching and learning process in inclusive mathematics classrooms may reach a level needed for all students to experience success on state assessments.

The "teachers as learners" theory (Lieberman, 1995) suggested creating on-going enabling professional development environments where teachers think, question, and reflect on their new knowledge and understanding regarding student-centered mathematics instruction that incorporates differentiated processes and products to support student learning among diverse student populations. Principles of learning hold true for teachers just as they do for all learners. When teachers experience success designing and implementing universally-designed lessons, their self-efficacy related to inclusive math instruction may increase. Supportive professional development activities, such as lesson study, co-teaching, and coaching, provide teachers with the opportunities to explore the possibilities through dialogue and discussions with their colleagues and peers. Common understanding among colleagues and peers related to PCK and technical aspects of special education delivery ensures a more consistent delivery of research-based instructional practices that meet the learning needs of students so that they experience success as they work towards mastery of the content of the mathematics curriculum. The "optimal mix" needed for inclusive math education integrates the following processes in order to produce more positive student outcomes in mathematics: continuous teacher-centered professional development; student-centered instruction; differentiation of instruction for teachers and students; access to the general mathematics curriculum for all students; on-going administrative support of professional development; and collaborative school culture and climate.

Summary

In order to affect more positive outcomes for students with disabilities in inclusive settings, instructional leaders need to examine the systems present in their schools that promote collegiality, enabling professional development focused on technical pedagogical content knowledge, and high teacher self-efficacy. General education teachers deserve to participate in enabling professional development activities that positively impact their self-efficacy related to mathematics instruction, especially in inclusive settings. By focusing on content, methods, and technical knowledge, instructional leaders need to design and implement professional development programs incorporating lesson study, mathematics coaching, courses, observations, and co-teaching. When teachers possess higher self-efficacy related to their technical pedagogical content knowledge related to inclusive mathematics instruction, students with disabilities will not only have access to the general education curriculum, but will receive instruction designed to meet their learning needs.

CHAPTER 3

METHODOLOGY

Introduction

Chapter Three details the proposed study's research design, sample specifics, selection of instruments, data collection methods, as well as data analysis. In the research design subsection, the specifics of the study type are described in detail. The sample subsection describes the sample and the selection process for members of the control group. In the instrumentation subsection, selection criteria for each instrument as well as scoring processes are discussed to demonstrate validity and reliability of the two selected instruments. The next subsection outlines the selected methodology for data collection at each point in the proposed study. Finally, the data analysis subsection includes descriptions of the statistical tests used to address each of the study's hypotheses.

Questions

1. To what extent is a general educator's level of self-efficacy regarding mathematics instruction in inclusive settings related to participation in an intensive professional development program? Content/methods courses? Both?

2. How does the level of participation in professional development activities related to a general educator's beliefs regarding mathematics instruction in inclusive settings?

3. How do teachers perceive the relative value of various elements of the professional development program and content/methods courses?

4. How do teachers perceive changes in their teaching practice based on participation in the professional development program and/or content/methods courses?

Research Design

The purpose of this mixed-design study was to determine if teachers of mathematics experienced changes in their self-efficacy and beliefs regarding their ability to teach mathematics to students with disabilities in an inclusive setting after participating in a 14-month professional development program. The 14-month professional development program consisted of content and methods courses taught during two-week intervals during the summer on the campus of The College of William and Mary followed by specific professional development activities provided by a team of math specialists/facilitators with expertise in mathematics curriculum, instruction, and assessment as well as special education services including inclusive education models. The study was designed to assess teacher self-efficacy and beliefs related to teaching mathematics in inclusive settings using quantitative methods (Teacher Self-Efficacy Survey, Teaching Mathematics in Inclusive Settings Survey, and Individual Professional Development Evaluation Survey), as well as qualitative methods (focus groups) to allow for the triangulation of data to support the generalizability and reliability of the study findings.

The study was an additive intervention approach to professional development, which incorporated graduate-level content/methods courses and on-site professional development activities for members of the study group as well as members of the control group. Three tiers of participation for selected participants involved the following interventions: 1) graduate level content courses only; 2) professional development activities only; and 3) participation in both graduate level content courses and professional development activities. Members of the study group were considered Tier III participants while members of the control group are considered Tier II participants. Tier I participants were members of the first

and second cohorts that are not eligible for participation in professional development

activities.
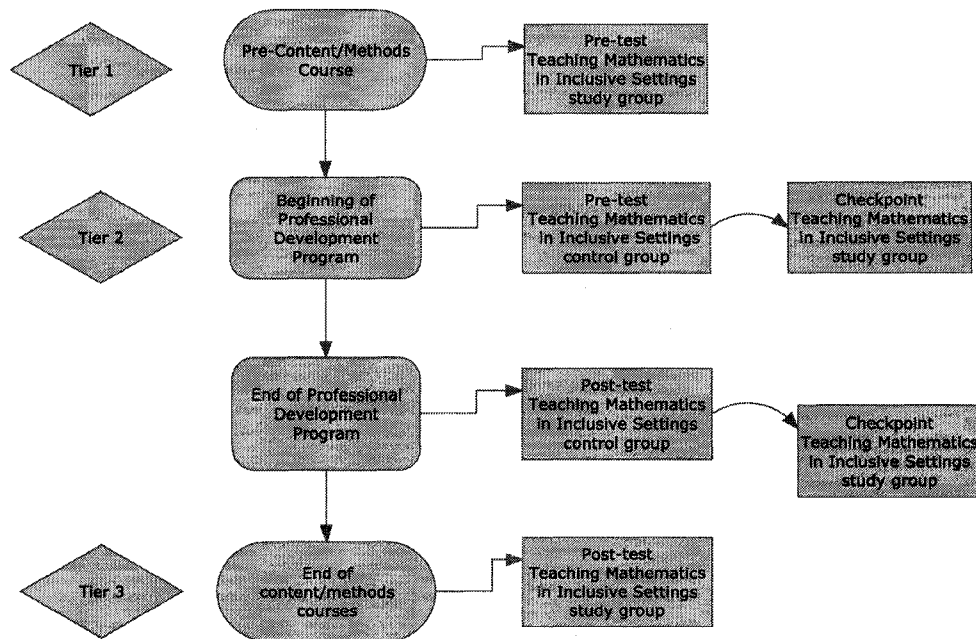
Figure 3. Data collection by tier of participation

The Tidewater Team grant provided the services of a mathematics

specialist/facilitator to each of the school divisions with at least two mathematics teachers

participating in the content/methods courses. The mathematics specialists/facilitators

provided support to all the mathematics teachers in the middle schools in each of the school

divisions. The aim of the support provided by the mathematics specialists/facilitators was to

provide a high level of professional development centered on the goals of the individual

schools and administrators. Professional development activities provided to mathematics

teachers included lesson study cycles, co-teaching, coaching, modeling, in-services,

classroom observations, and support for inclusion.

Prior to the initial professional development activity in each identified school, the

project director and mathematics specialist/facilitator met with the administrative team for

each school division to share the aims and goals of the professional development program as well as to gather information related to current professional development activities already planned for each of the identified middle schools. Administrative teams at each identified middle school collaborated with the mathematics specialist/facilitator to design and implement professional development activities to meet the specific need of their mathematics instructional teams.

Data collection for this study began on June 18, 2007, with the collection of extant data by the grant project director and was completed on August 15, 2008, at the end of the final content/methods course for the current cohort of participants. Data, including demographic data, was collected using two survey instruments, the short form of the Teachers' Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001), and Survey on Teaching Mathematics to Students with Learning Disabilities in Middle School (DeSimone, 2004). Data analysis includes descriptive statistics, repeated-measures MANOVAs, Pearson r correlations, and factor analyses. It was predicted that teachers will report increases in their self-efficacy and beliefs related their ability to provide effective mathematics instruction to students with disabilities after completing the professional development program supported by the Tidewater Team for Improving Middle School Mathematics II grant through the school-based efforts of a mathematics specialist.

Sample

The sample for the study was comprised of a convenience sample of mathematics teachers employed by the twenty-four school divisions participating in the Tidewater Team to Improve Middle School Math Instruction II grant. The grant was received from the Virginia Department of Education using U. S. Department of Education funds through the

Math and Science Partnership to Drs. Margie Mason and George Rueblin of the College of William and Mary. None of the middle schools in school divisions choosing to participate in the grant project reached the seventy percent pass rate on the sixth or seventh grade Virginia Standards of Learning mathematics assessment. Participant sample for each tier of participation was as follows: Tier I included 14 teachers who participated in courses alone, Tier II included 66 teachers who participated in the school-based professional development activities exclusively, and Tier III included 35 teachers who participated in all five content/methods courses as well as school-based professional development activities. Teachers participating in this study represented fourteen school divisions (rural, urban, and suburban) in the state of Virginia. The sample for both Tiers I and III was limited to the number of participants registered for the content/methods courses.

<center>Instruments</center>

Teacher Self-Efficacy Survey

Most research conducted regarding teacher self-efficacy was conducted with the use of self-report surveys, which were correlational in nature (Henson, 2001; Linnenbrink & Pintrich, 2002). Self-efficacy is most suitably measured within the context of specific behaviors (Henson, 2001; Pajares, 1996) as Bandura (1997) explains, "self-efficacy is the belief in one's capabilities to organize and execute the course of action required to manage prospective situations" (p. 2). "Assessment of efficacy without reasonable context specificity may actually be assessment of a different construct altogether, perhaps of more general personality traits" (Henson, 2001, p.13). Coladarci and Fink (1995) found that a lack of discriminant validity for measures of teacher self-efficacy demonstrates measurement of

general personality traits. Pajares (1996) addressed this potential flaw in measuring teacher

self-efficacy:

> Judgments of competence need not be so microscopically operationalized that their
>
> assessment loses all sense of practical utility. Domain specificity should not be
>
> misconstrued as extreme situational specificity, and there is no need to reduce
>
> efficacy assessments to atomistic proportions (p. 13).

This caveat was echoed by Tschannen-Moran, Woolfolk Hoy, and Hoy (1998) as they

suggested that the development of measures not be so specific that they lose their predictive

power and only address very particular skills or contexts.

The current debate involving the measure of teacher self-efficacy demonstrates a need

to balance both specificity and generalization without compromising construct validity of

current measurement scales (Coladarci & Fink, 1995; Guskey & Passaro, 1995; Henson,

2001). In order to capture teacher self-efficacy beliefs, the instrument selected for the

proposed study is the Teachers' Sense of Efficacy Scale (TSES) developed by Tschannen-

Moran and Woolfolk Hoy (2001). The model for TSES describes major aspects of teacher

self-efficacy through a cyclical feedback loop for efficacy judgments demonstrating a more

balanced picture of teacher self-efficacy without over generalization or deep levels of

specificity. Due to this strength of instrument design, the short form of the TSES is selected

for the proposed study, as the study participants are mathematics teachers with experience

rather than pre-service teachers.

The TSES (Tschannen-Moran & Woolfolk Hoy, 2001) is a commonly used

instrument for measuring teacher self-efficacy beliefs (Appendix A). The short form of the

TSES consists of twelve questions focusing on three domains: self-efficacy in student

engagement, self-efficacy in instructional strategies, and self-efficacy in classroom management. Each item of the survey instrument reflects pedagogical activities which regularly occur in an inclusive classroom. The construct of self-efficacy in student engagement is measured with questions, such as "to what extent can you motivate students who show low interest". Secondly, self-efficacy in instructional strategies is gauged using questions like "to what extent can you craft good questions for your students". Finally, the construct of self-efficacy in classroom management is assessed with the question, "to what extent can you control disruptive behavior". Question content meets the needed degree of specificity when conducting self-efficacy research, but is not so specific that responses cannot be generalized. This point is vital, as judgments of efficacy are deemed most accurate at reasonable levels of specificity (Bandura, 1997; Henson, 2001; Pajares, 1996).

The twelve questions allow the respondent to select the level of his or her belief along a nine-point Likert scale. Question stems begin with the words, "How much can you do?" or "To what extent can you ..." followed by a specific pedagogical activity. Following Bandura's (1997) nine-point response scale, the odd numbers are labeled as follows: one is "Nothing", three is "Very Little", five is "Some Influence", seven is "Quite A Bit", and nine is "A Great Deal". Each point on the scale expresses how much or how well the respondent felt he or she could do regarding the specific task or activity (Tschannen-Moran & Woolfolk Hoy, 2001). Respondents may also select points represented by even numbers (two, four, six, and eight) to depict a level of belief between the expressed levels assigned to each odd number.

The short form of the TSES is scored in a manner that provides an overall self-efficacy score for each respondent as well as an individual score on three subscales among

samples of practicing teachers. The overall self-efficacy score is computed by summing the numeric value for the recorded responses for each of the twelve items on the self-report instrument. The maximum number of points achievable on the instrument is 108, which represents the highest level of self-efficacy a respondent can possess. The minimum number of points achievable on the TSES instrument is 12, which represents the lowest level of efficacy a respondent can possess.

The TSES instrument has three moderately correlated factors as reported by Tschannen-Moran and Woolfolk Hoy (2001), which are 1) self-efficacy in student engagement; 2) self-efficacy in instructional practice; and 3) self-efficacy in classroom management. The authors recommend conducting a factor analysis to discover how participants of a study respond to the instrument's items. In order to determine the subscale scores, the authors calculated unweighted means of the items that loaded on each factor and provided, with the scale, the groupings of items that loaded on each factor (Tschannen-Moran & Woolfolk Hoy, 2001).

Although a long form for the TSES was also available, the short form was selected as the instrument was one section of four for the entire TMIS survey. The 12-item short form provides a reliable measure of efficacy while decreasing the total number of survey items that study participants will complete at each data collection point. The total number of items is a concern, as study participants will be completing two separate instruments to assess their efficacy beliefs in addition to their beliefs regarding mathematics instruction for students with disabilities in an inclusive setting.

Validity and reliability. The TSES was formerly known as the Ohio State Teacher Efficacy Scale (OSTES), which underwent three individual studies incorporating a diverse

sample population of teachers across age, years of experience, and levels taught

demographics. Each study represents a stage in the refinement and further development of

the TSES. After the initial study of the OSTES was conducted, the number of instrument

items was reduced from 52 to 32 after a factor analysis demonstrated a loading of 0.60

criterion for each of the selected items (Tschannen-Moran & Woolfolk Hoy, 2001). A second

study using the 32-item efficacy instrument resulted in further refinement of the survey

instrument reducing the number of items from 32 to 18. A scree test suggested two or three

factors were measured by the instrument – efficacy of student engagement, efficacy of

instructional strategies, and efficacy of classroom management – with calculated reliabilities

of 0.82, 0.81, and 0.72 respectively. A second-order factor analysis of combined data was

also performed resulting in a reliability score of 0.95 in addition to moderate positive

correlations of the three subscales (Tschannen-Moran & Woolfolk Hoy, 2001).

During the second study, Tschannen-Moran and Woolfolk Hoy (2001) examined the

construct validity of the OSTES by assessing its correlation with other existing measures

especially the RAND study and the Gibson and Dembo (1984) Teacher Efficacy Scale. Total

scores on the OSTES were positively correlated to both the RAND items (p < 0.01) and the

Gibson and Dembo tool (p < 0.01). A discriminant validity measure of this refined

instrument yielded good results with the included factors conceptually depicting teachers'

pedagogical tasks and activities (Tschannen-Moran & Woolfolk Hoy, 2001).

A third study using the OSTES instrument was conducted on a larger scale using 410

participants with diverse demographics across age, experience, and grade levels taught

dimensions. An additional six items were added to increase the number of management items

in the scale resulting once again in favorable reliabilities of 0.91, 0.90, and 0.87 for

instructional strategies, classroom management, and student engagement respectively. Intercorrelations for each of the three dimensions were 0.60 for instructional strategies, 0.70 for classroom management, and finally 0.58 for student engagement (Tschannen-Moran & Woolfolk Hoy, 2001). The short form was developed when Tschannen-Moran and Woolfolk Hoy (2001) selected the four highest loading items on each scale to create a 12-item efficacy instrument. Intercorrelations between the long and short forms for the total scale and three subscales were high ranging form 0.95 to 0.98. Further factorial analyses reveal favorable results for construct validity as positive relationships to the RAND, as well as the Gibson and Dembo teacher efficacy instruments.

Although the name of the OSTES instrument has changed to the TSES, the survey items on both the long and short form remained the same. Even though studies conducted by Tschannen-Moran and Woolfolk Hoy (2001) demonstrated validity and reliability for the two versions of the TSES, it has been suggested that further empirical study is necessary to ascertain strength of validity and reliability under other study conditions (Henson, 2001). The TSES instrument's short form demonstrates acceptable levels related to validity and reliability for the purposes of the proposed study, which are to measure general education teacher efficacy related to teaching students with disabilities in inclusive mathematics classrooms. According to Tschannen-Moran and Woolfolk Hoy (2001), the TSES assesses effectiveness and creativity related to student thinking as well as developing alternate assessments and differentiating instruction for students who struggle to learn.

The content of the question stems included in the short form of the TSES "shows them to be indicative of those practices deemed most effective in classrooms housing a wide array of student needs and levels, which is generally the case in the inclusion classroom"

(Arnold, 2005). The teaching methodologies represented in the short form have demonstrated promise as good teaching practices for teaching diverse student populations (Marzano, 1999). Conducting a pilot test with members of the first cohort of the Tidewater Team for Improving Middle School Math Instruction in May 2007 tested alignment between the purpose of the study and the selected instrument. Data collected during the pilot study demonstrated acceptable levels of reliability of instrument measurement. Feedback from the study participants in the pilot study included a suggestion to change the initial portion of each question stem that reads "How much can you do ...". After much consideration and discussion with a panel of experts, the short form of the TSES will be used as originally designed by Tschannen-Moran and Woolfolk Hoy as the instrument demonstrated good validity and reliability during the pilot study conducted by the researcher in May 2007 in addition to historical evidence of validity and reliability.

Teaching Mathematics in Inclusive Settings

DeSimone and Parmar (2006) constructed the survey to assess mathematics teachers' beliefs related to inclusive education after an extensive review of available literature on teacher beliefs related to inclusion and mathematics instruction. The characteristics of students with learning disabilities were compiled from major textbooks while the compilation of mathematics topics came from the New York State curriculum guidelines for grades seven and eight, which were found to similar across states. DeSimone and Parmar wanted to study the connections between teacher beliefs related to inclusive mathematics education, administrative supports, and experience teaching students with disabilities in inclusive mathematics classrooms.

The second phase of the proposed study involved measuring teacher beliefs related to teaching mathematics in inclusive settings. An instrument adapted by DeSimone (2004) was used to measure teacher beliefs related to teaching mathematics to students in inclusive settings entitled, Survey on Teaching Mathematics to Students with Learning Disabilities in Middle School. Designed as a three-part questionnaire, Part I collects descriptive data regarding the respondents and their schools, including the level of administrative support, Part II uses a five-point Likert scale to measure the respondent's beliefs related to inclusive mathematics education, students with disabilities, and teacher preparation for inclusive education. According to DeSimone and Parmar (2006), question stems for Parts I and II are adapted from existing research on teachers' beliefs about inclusion (Chow & Winzer, 1992; Coates, 1989; Larrivee & Cook, 1979; McLeskey et al., 2001). Finally, Part III of the questionnaire addresses the respondent's level of comfort in their abilities to adapt their instruction of mathematics based on the characteristics of students with learning disabilities in addition to adapting their instruction of mathematics based on specific topics for students with learning disabilities.

The second instrument, Survey on Teaching Mathematics to Students with Learning Disabilities in Middle School, may be reviewed in Appendix B. This instrument consists of three individual sections where the third section collects data related to demographic information on each study participant. The first section of this instrument contains fourteen questions focusing on teacher beliefs related to inclusive mathematics classes, students with disabilities, and preparation for inclusion. To assess teacher beliefs related to inclusive practices, questions included in the survey range from "students with disabilities should be afforded every opportunity to learn mathematics with general education students" to "for the

most part, middle schools are effectively implementing inclusive programs". Each of the 14

questions in Part I of the survey instrument incorporate a six-point Likert scale (1 = strongly

disagree; 2 = moderately disagree; 3 = disagree slightly more than agree; 4 = agree slightly

more than disagree; 5 = moderately agree; 6 = strongly agree). The second section of the

instrument consists of two dimensions regarding the respondents' level of comfort in their

ability to adapt mathematics instruction either by characteristics of disability or by

mathematical topic, such as "how comfortable do you feel in your ability to adapt your

instruction in the following topics for students with disabilities". Each of the eleven questions

related to characteristics of disability are rated along a four-point Likert scale (1 = not

comfortable; 2 = somewhat comfortable; 3 = quite comfortable; 4 = very comfortable). The

same four-point Likert scale is applicable for the seventeen questions related to adapting

mathematics instruction by topic for students with disabilities.

Validity and reliability. The second instrument selected to measure teacher beliefs

related to mathematics instruction for students with learning disabilities, Survey on Teaching

Mathematics to Students with Learning Disabilities in Middle School, demonstrates both

validity and reliability. DeSimone and Parmar (2006) used a panel of experts comprised of

three researchers with experience in teaching mathematics to students with and without

learning disabilities to review the questionnaire as part of a validity test, which resulted in

some wording changes. The second portion of the validity test for the survey instrument was

a pilot test where 27 middle-school mathematics teachers completed the survey instrument.

Reliability tests were also conducted using data collected during the pilot study resulting in

the following coefficients: general beliefs (Cronbach's α = .75), instructional adaptations for

characteristics of students with learning disabilities (Cronbach's α = .92), and instructional

adaptations for students with learning disabilities based on topics of mathematics

(Cronbach's α = .90), which DeSimone and Parmar (2006) deemed as acceptable for their

research objectives.

Pilot study. The pilot study conducted by the researcher in May 2007, with a sample

of 17 participants produced similar reliability scores. One adaptation to the original

instrument created by DeSimone (2004) was to change question stems from "students with

learning disabilities" to "students with disabilities". This change was deemed necessary as

schools are changing inclusive practices so that inclusive settings are not just the placement

for special education services for students with learning disabilities. The instruments did not

demonstrate any changes in reliability scores due to the change in question stem wording as

demonstrated in the results of the pilot study. Another adaptation made for the Survey on

Teaching Mathematics to Students with Learning Disabilities in Middle Schools was to

shorten the name of the instrument to Teaching Mathematics in Inclusive Settings, so that it

was more reflective of the intent and purpose of the instrument.

Individual Professional Development Evaluation Survey

The Tidewater Team for Improving Middle School Math II staff designed and

implemented a professional development program to support mathematics teachers'

pedagogical, content, and technical (special education) knowledge during the 2007-2008

school year. The Individual Professional Development Evaluation Survey was designed to

assess teacher beliefs related to the helpfulness and impacts of the components of the

Tidewater Team professional development program. The instrument allows teachers to rate

the level of helpfulness of each component of the professional development program as well

as how each component impacted changes in their teaching practices. This instrument was

field tested to determine its validity and reliability to measure teachers' beliefs about the helpfulness of each component of the professional development program, including the content/methods courses in addition to how each component of the professional development program impacted their teaching practices. Human Subjects approval was received for the field study to begin March 31, 2008; therefore, a time for teacher review and comment was scheduled for April 7, 2008 with a group of mathematics teachers participating in a content-methods course sponsored by a collaborating university.

The survey was comprised of 10 questions related to how helpful teachers found each component of the professional development program as well as ten questions to rate how each component impacted their current teaching practices. The question stem for this section of the survey is "rate each of the following professional development activities and courses based on their value". Teachers respond to the first ten question stems using a four-point Likert scale (1 = not at all; 2 = somewhat; 3 = helpful; 4 = very helpful) to assess how helpful each component of the program was to developing their knowledge and understanding related to mathematics content, pedagogy, and special education.

The second section of this instrument included ten questions related to the level of impact each component of the professional development program had on individual teacher practices. The question stem for this section of the survey is "to what extent did these professional development activities and courses impact your teaching practices". Teachers respond to these question stems using a four-point Likert scale (1 = no change; 2 = little change; 3 = moderate change; 4 = a great deal) to assess how much they believe their teaching practices have changed based on their participation in each component of the professional development program.

Data Collection

The Tidewater Team for Improving Middle School Mathematics Instruction II grant identified 34 school divisions where scores on the Virginia Standards of Learning assessments for sixth and seventh grade were below the mark for accreditation. The initial data collection point for the proposed study was June 2007 when the first content/methods course began for the second cohort of the Tidewater Team for Improving Middle School Mathematics Instruction. This data, collected by the program director, was made available for the study, once permission was granted by the Human Subjects Committee at the College of William and Mary. Members of the teacher group who only participated in the professional development program also completed the two survey instruments, Teachers' Sense of Efficacy Scale and Teaching Mathematics in Inclusive Settings, prior to their participation in the first phase of the professional development program.

Once approval was received from the Human Subject Review Committee at the College of William and Mary, focus groups were scheduled with the mathematics teachers in each of the school divisions supported by a mathematics specialist/facilitator. Qualitative data collection for examining teacher self-efficacy and beliefs focusing on teaching mathematics in inclusive settings as they relate changing in teaching practices was conducted so that teacher confidentiality was maintained at all times. The focus groups were conducted by the researcher according to grade level to keep the number of participants to a small number to ensure each participant had an opportunity to share their thoughts, feelings, and reflections about the process including course and professional development program participation. The researcher used a digital voice recorder to ensure that all data was captured for analysis for each focus group session.

The phenomenological strategy utilized to generate data required that we obtain information from participants based on the meanings each make of their experiences with teaching mathematics in inclusive settings, as well as participation in a professional development program. In order to obtain such information, five focus groups were conducted during May and June 2008. Focus groups were selected from five different schools divisions who participated in all phases of the professional development program. Specifically, the researcher conducted focus groups with participants of Tiers I and III using the focus group protocol found in Appendix E. The focus group protocol was intended to elicit the lived experiences of our participants during the professional development program as well as the content-methods courses. The researcher used the guide to insure that gathered information is based on the broad categories and topics but also so that other topics may pursued should they be presented by individual participants. Use of the focus group protocol allowed for some structure, but also resulted in conversation that was directed by the participants. Additionally, the protocol provided each participant with the opportunity to allow their own perspectives to "unfold" (Rossman & Rallis, 2003, p. 181). Each informant was asked to participate in one focus group session lasting between 45 minutes and one hour. Specific categories and topics discussed are delineated in the focus group protocol.

Each teacher who only participated in the school-based professional development activities completed both of the survey instruments again in May 2008 during a school-based professional development meeting. Teachers who took courses at the College of William and Mary completed both of the survey instruments during the final day of the content course cycle in August 2008. The survey instruments, Teachers' Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001) and Teaching Mathematics in Inclusive Settings

(Aerni, 2007; DeSimone & Parmar, 2006) were administered by the four mathematics specialists/facilitators. Training was provided for the mathematics specialists/facilitators regarding survey instrument administration procedures to ensure consistent data collection among all teachers participating at any level of the program.

In order to maintain confidentiality of each participant's responses during each data collection point, codes were assigned to each survey instrument aligned with participant sign-in sheets for the first content/methods course and professional development activity at each participating middle school. The project director maintained the sign-in sheets in confidential files. Completed survey instruments were maintained in a file box in a secure location in the locked office of the mathematics specialists/facilitators unless being used for analysis of data.

Factor Analysis

In order to reduce the number of individual data points for the selected statistical analyses, factor analyses were conducted for each section of the Teaching Mathematics in Inclusive Settings survey instrument. Principal axis factoring analysis was performed for each survey section with varimax rotation. A rotated factor matrix was generated to show factors with eigenvalues greater than one. Scree plots were also generated to visualize where the factors leveled off for each survey section. Four individual factor analyses were conducted to discover factors to simplify the chosen quantitative analyses. Finally, a factor analysis was also conducted for all questions except the demographic questions on the TMIS survey instrument to show alignment of factors generated by both an overall and individual factor analyses. The factor analyzes provided an avenue to determine factor scores, which were then used to calculate change scores and to determine the significance of changes in efficacy and beliefs.

Data Analysis

Data collected through the three separate survey instruments, Teachers' Sense of

Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001), Teaching Mathematics in

Inclusive Settings (Aerni, 2007; DeSimone, 2004), and the Individual Professional

Development Evaluation survey (Aerni, 2008) in the post-test format were analyzed using a

variety of statistical tests to understand the relationships between efficacy and beliefs about

inclusive education and a professional development program. The professional development

program provided on-going, school-based support while addressing issues of pedagogy,

content, and special education knowledge and understanding in mathematics classrooms.

Demographic data collected through the Teaching Mathematics in Inclusive Setting

instrument was analyzed by employing frequency counts to determine the number of

participants in each of the demographic categories as well as the amount of experience

teaching mathematics in inclusive settings.

Statistical tests selected to analyze the collected data are factor analyses, frequency

counts, paired samples t-tests, and repeated-measures MANOVAs. Data analysis for the four

research questions was conducted using the data sources outlined as follows:

Table 1

Research Questions

Question	Data Sources	Analysis
To what extent is participation in professional development activities and/or content-methods courses related to a general educator's level of self-efficacy related to mathematics instruction in inclusive settings?	Teachers Self-Efficacy Survey questions 1-12; Teaching Mathematics in Inclusive Settings questions 27-54; focus group question protocol	Factor Analysis Repeated-measures MANOVA Paired Samples t-test Axial Coding and Emergent Themes
Does participation in professional development activities and/or content-methods courses impact teacher beliefs related to inclusive mathematics education?	Teaching Mathematics in Inclusive Settings questions 13-26; focus group question protocol	Factor Analysis Repeated-measures MANOVA Paired Samples t-test Axial Coding and Emergent Themes
How do teachers rate the relative value of various elements of professional development including content-methods courses?	Individual Professional Development Evaluation survey questions 1-10; focus group question protocol	Descriptive Statistics Frequency Counts Axial Coding and Emergent Themes
How do teachers rate changes in their teaching practice after participating in professional development activities and/or content-methods courses?	Individual Professional Development Evaluation survey questions 11-20; focus group question protocol	Descriptive Statistics Frequency Counts Axial Coding and Emergent Themes

Data collected through the Teachers' Sense of Efficacy Scale (Tschannen-Moran &

Woolfolk Hoy, 2001) was analyzed using repeated-measures MANOVA to determine if

significant change was present for each self-efficacy factor: self-efficacy in classroom

management; self-efficacy in instructional practices (pedagogical content knowledge). As part of the repeated-measures MANOVA, an analysis was also performed to show significant changes within subjects.

Part III of the Teaching Mathematics in Inclusive Settings instrument that collected data related to teacher's perceived value of professional development activities and the impact of the activities on their instructional practices were analyzed using frequency counts to determine where participants' responses fell across the six-point Likert scale (1 = strongly disagree; 2 = moderately disagree; 3 = disagree slightly more than agree; 4 = agree slightly more than disagree; 5 = moderately agree; 6 = strongly agree).

Qualitative Data Analysis

Initial analysis of focus group data was inductive in nature, as the first step in analysis is often open coding, when segmentation and labeling of generated data occur (Patton, 2002). Specifically, the researcher will perform analysis of expressed ideas and identify indigenous patterns, themes and categories as they are articulated by selected participants. The identification of indigenous categories, those "categories and terms used by the informants themselves" is consistent with the constructivist paradigm in that the researcher is entirely open to the perspectives of selected participants as the researcher is most interested in discovering the teachers' experiences from their own words and world views (Patton, 2002, p. 455). The selected unit of analysis (Patton, 2002), that is, the specific lines of text or discrete ideas, expressed by each participant is identified because the researcher intended to identify themes as they emerge from the data collected based on similarities and differences among perspectives. Finally, inductive analysis allows the researcher to modify and recode data as new data are generated from the focus groups conducted by the researcher to support

extent data collected through focus groups conducted by the program evaluator in August

2007 and again in February 2008.

Utilizing the phenomenological strategy as the foundation, the researcher employed a

variety of methods throughout the study to identify salient themes, patterns, and categories in

the generated data. Methods included were concept mapping, collaborative discussion with

program evaluator, and identifying recurring words. The final data analysis included

identified themes, as well as direct quotations from participants that reflect their lived

experiences and perspectives with regard to their self-efficacy and beliefs in teaching

mathematics in inclusive settings.

In order to provide high-quality and credible findings, participants member checked

responses given during the focus groups by asking for clarification, summaries of responses

will be provided to participants for correction and approval following focus group

transcription, and drafts were submitted of completed study results to each participant for

final approval (which is known as a "grand member check"). Peer debriefing, as defined by

Schwandt (2001), consists of researchers continually and consistently sharing ideas and

discussing field experiences in an effort to synthesize data rather than considering interviews,

texts, observations and artifacts in isolation. The researcher, program director, and program

evaluator engaged in this type of peer debriefing and the researcher documented such

activities and subsequent reflections in a reflexive journal.

Trustworthiness and Authenticity

Judgment related to whether or not qualitative research is quality research relates

directly to a particular study's trustworthiness and authenticity. As each concept is critical

both from a research perspective and as each relates to participants' experiences in the

research process, they are defined in detail below within the context of the proposed study. As defined by Rossman and Rallis (2003), trustworthiness in qualitative research refers to standards associated with acceptable and competent practice and ethical conduct on the part of the researcher with regard to context-specific sensitivity to the politics of the topic and the setting. Trustworthiness is further described along the four dimensions of credibility, transferability, dependability, and confirmability, each of which must be met in order for a study's findings to be deemed trustworthy.

Credibility refers most directly to how well study findings match participants' perceptions. In order to insure credibility of findings for this proposed study, researchers will engage in several activities associated with increased credibility. Member checking, as described in the data analysis section, will be conducted to elicit the most accurate and complete statements possible. Triangulation--the use of multiple types of data from multiple participants--will also be employed as researchers conduct focus groups and participants complete survey instruments. In addition to these two important strategies, the researcher will also maintain a reflexive journal in which researcher's significant actions, findings, wonderings, and reflections are recorded. Through the journal and peer debriefing process, the researcher intends to ensure the truth value of the study's findings.

Transferability, a second component of trustworthiness, refers to the extent that a study's findings may be applied in other contexts or with other informants. The researcher's responsibility to maximize transferability is to provide thick, rich descriptions of each participant's perspectives. This will be accomplished by purposeful sampling of focus group participants in order to have a diverse representation of levels of teacher self-efficacy and beliefs related to teaching mathematics in inclusive settings based on data collected and

analyzed from the pre-test survey extent data. Additionally, data triangulation and

maintaining a reflexive journal to provide a mechanism for insuring transferability in so

much as the researcher can consistently search for ways to provide the most meaningful

descriptions possible.

Dependability relates most to the consistency of the study's findings. Specifically,

dependability is concerned with whether or not any variance in results, where the study

repeated, can be tracked. Reflexive journaling attempts to document any and all elements that

impact the study's findings. The journals will provide this level of detail so that future studies

may benefit from the evidence of this process, connections, and subsequent findings.

Confirmability, the fourth and final component of trustworthiness, refers to the extent to

which the study's findings report the informants' perspectives. Most importantly,

confirmability relates to the notion that results from the study are based on generated data,

not the researcher's beliefs and expectations. Again, the journal provides a vehicle for

documenting the research process and the connections made between participants' individual

and collective perspectives and experiences related to participation in the professional

development program and how it relates to changes in their self-efficacy and beliefs

regarding teaching mathematics in inclusive settings. Additionally, member checking and

reflective "researcher as instrument" statements aid in insuring the study results'

confirmability.

As described by Dimock (2001), trustworthiness alone is not sufficient for judging

the quality of qualitative work. Authenticity--that is, the directed concern for participants and

the meaning they make of the research is equally important. Authenticity is considered along

five dimensions: fairness, ontological authenticity, educative authenticity, catalytic

authenticity, and tactical authenticity. Fairness relates to the fair and equal treatment of participants and the accuracy with which their experiences and perceptions are reflected in the study's findings. Member-checking, reflexive journals, informed consent and peer debriefing are each mechanisms by which fairness will be maintained and documented in this study.

Ontological authenticity is achieved when informants experience personal growth (Dimock, 2001) and although the researcher does not have direct control over this aspect of authenticity, the researcher hopes to develop this growth in the participants through the focus group process. Asking follow-up questions, clarifying, and asking for member checks will provide opportunities for ontological authenticity to be developed. Similarly, the researcher hopes that by consistently engaging and dialoguing with study and control participants, the researcher will help them to experience educative authenticity. Specifically, the researcher hopes to increase participants' understanding of other perspectives and experiences related to teacher self-efficacy and beliefs related to teaching mathematics in inclusive settings by providing each focus group participant with a copy of the final study findings.

Tactical authenticity and catalytic authenticity are closely tied and refer respectively to the actions participants take as a result of participating in the study and how empowered they may be to make changes that lead to improvement. The researcher hopes to help focus group participants achieve this by first, engaging participants in the focus of the study and second, sharing the final report with each participant.

Summary

Understanding the relationships and interconnections between teacher self-efficacy and beliefs and special education pedagogical technical knowledge is essential for

instructional leaders and professional development planners. The design and implementation of school-based professional development activities focused on improving student outcomes for diverse student populations is essential. These specially-designed opportunities need to focus on teacher learning related to mathematics content, pedagogical practices, and the delivery of special education services. School-based professional development opportunities allow teachers to develop collegial and collaborative relationships with their peers. Within these safe environments, teachers are able to critically examine inclusive mathematics instructional practices, including differentiation of instruction and access to the general education curriculum. As teachers are afforded the opportunity to grow within the comfort of their school environment, teacher self-efficacy related to inclusive mathematics education may increase affecting more positive student outcomes for all students, especially students with disabilities. As teacher self-efficacy increases related to an individual's ability to effectively meet the learning needs of students with disabilities, their beliefs about inclusive practices may become more positive.

Chapter 4
RESULTS

Introduction

The purpose of this mixed-methodology research study was to explore the

relationship between participation in an intensive professional development program and

teacher self-efficacy and beliefs about teaching mathematics in inclusive settings. The

professional development program was composed of two components: content/methods

courses taught by mathematicians and a mathematics educator in a university setting and

school-based professional development provided by a mathematics specialist trained by

university professors. The study was designed to include three tiers of participation for

teachers: 1) content/methods courses; 2) school-based professional development; and 3) a

combination of content/methods courses and school-based professional development (See

Appendix D).

A total of 115 teachers completed the Teaching Mathematics in Inclusive Settings

survey instrument at four different points in the study (see Table 2).

Table 2

Data collection schedule

Time of Data Collection	Tier I	Tier II	Tier III
Prior to content/methods courses	X		X
Prior to Professional Development Activities		X	X
Conclusion of Professional Development Activities		X	X
Conclusion of series of content/methods courses	X		X

Tier I participants who completed a survey prior to the beginning of coursework, but did not

complete the last content/methods course were not included in the study thereby reducing the

sample size for Tier I from 21 participants to 14 participants. Tier II participants who

completed a survey instrument prior to the beginning of the professional development

activities, but did not complete the survey instrument at the end of the professional

development program were not included in the study thereby reducing the sample size for tier

II participants from 74 participants to 66 participants. The sample for tier III participants was

reduced by one participant who was unable to participate in the last content/methods course

thus reducing the pool of participants by 16 teachers.

Focus group sessions were also conducted at specific points during the course of the

study. The first focus group session was conducted at the end of the first summer after Tier I

and Tier III participants had completed the first three content/methods courses. A second

focus group session was conducted in February, 2008, for Tiers I and III participants during a

course related professional development activity. Focus group sessions were conducted at

selected school sites for Tier II teacher participants. A convenience sample that included 27

sixth and seventh grade mathematics teachers was selected from three schools participating

in the professional development program. The focus groups were conducted by the grant

project's program evaluator and as well as the researcher using a specific protocol (See

Appendix E).

<center>Demographic Data for Teacher Participants</center>

A total of 115 participants from all three tiers of participation completed the Teaching

Mathematics in Inclusive Setting survey instrument at two time periods: before their first

experience with either content/methods courses or professional development and again at the

end of the program based on their level of involvement in the professional development

program. Tier III participants (n = 35) also completed the TMIS survey at the pretest and

post-test interval for Tier II participants (n = 66) in order to ensure fidelity in data collection.

The demographic data collected through the TMIS survey was analyzed by SPSS to show

how many participants fell into each characteristic category as a total population and by tier

(see Table 3).

Table 3

Demographic Characteristics of Survey Respondents

Characteristics	Total Sample		Tier I		Tier II		Tier III	
	N	%	N	%	N	%	N	%
Gender								
Male	19	16.5	3	21.4	9	13.6	7	20
Female	96	83.5	11	78.6	57	86.4	28	80
Educational Level								
Completed bachelor's degree	32	27.8	5	35.7	21	31.8	6	17.1
Pursuing master's degree	40	34.8	5	35.7	19	28.8	16	45.7
Completed master's degree	38	33.0	3	21.4	22	33.3	13	37.1
Pursuing professional diploma	2	1.7	0	0	2	3	0	0
Completed professional diploma	1	.9	0	0	1	1.5	0	0
Pursuing doctoral degree	2	1.7	1	7.1	1	1.5	0	0
Completed doctoral degree	0	0	0	0	0	0	0	0
Years of teaching experience								
1-2 years	21	18.3	4	28.6	11	16.7	6	17.1

3-8 years	25	21.7	3	21.4	15	22.7	7	20
9-14 years	29	25.2	2	14.3	16	24.2	11	31.4
15 + years	40	34.8	5	35.7	24	36.4	11	31.4
Years of experience teaching inclusion								
None	11	9.6	1	7.1	7	10.6	3	8.6
1-2 years	43	37.4	9	64.3	25	37.9	9	25.7
3-5 years	26	22.6	2	14.3	11	16.7	13	37.1
6-10 years	18	15.7	1	7.1	11	16.7	6	17.1
10 + years	17	14.8	1	7.1	12	18.2	4	11.4

Teacher participants described their school setting as urban (n = 50, 43.5%), suburban (n = 34, 29.6%), or rural (n = 31, 27%). All participants taught in public schools with a majority of the schools being middle schools. The focus of the professional development program was to improve middle school mathematics. Teachers enrolled in the content/methods courses were not exclusively middle school teachers as five high school teachers and six elementary school teachers completed the course cycle. Participating teachers taught in schools which ranged from very small (1-200 students, n = 1) to very large (1100+ students, n = 7). The largest group of teachers (n = 56, 48.7%) taught in schools serving 801-1100 students while the remaining teachers were in schools serving 501-800 students (n = 35, 30.4%) and 201-500 students (n = 16, 13.9%) respectively.

Teachers also shared demographic information regarding their professional experiences related to inclusion. The data was analyzed by total sample and by tier (see Table 4).

Table 4

Professional Characteristics of Survey Respondents

Professional Characteristics	Total Sample		Tier I		Tier II		Tier III	
	N	%	N	%	N	%	N	%
Average number of students in inclusion classes								
Less than 15	23	20	3	21.4	16	24.2	4	11.4
15-20 students	30	26.1	4	28.6	13	19.7	13	37.1
21-25 students	41	35.7	4	28.6	24	36.4	13	37.1
26-30 students	18	15.7	2	14.3	12	18.2	4	11.4
31-35 students	3	2.6	1	7.1	1	1.5	1	2.9
Number of workshops related to inclusive education								
0-2 workshops	52	45.2	8	57.1	32	48.5	12	34.3
3-4 workshops	28	24.3	3	21.4	18	27.3	7	20
5-6 workshops	18	15.7	2	14.3	7	10.6	9	25.7
7-9 workshops	7	6.1	0	0	4	6.1	3	8.6
10 + workshops	10	8.7	1	7.1	5	7.6	4	11.4

Teachers who completed the TMIS survey instrument possess a variety of

certifications for teaching. Certifications for teaching among the study participants are as

follows: elementary education (n = 53, 46%), secondary education (n = 30, 26%), special

education (n = 1, 1%), middle school education (n = 28, 25%), and provisional (n = 3, 3%).

Also noteworthy, is the low number of teachers reporting that they hold a provisional

certification for teaching mathematics in the middle school setting. Of the 53 study

participants who reported that they held an elementary certification, 42 of the participants

reported that their certification is preschool to sixth grade, which only allows them to teach at

the middle school level for grade six.

<div align="center">Factor Analyses</div>

In order to analyze the data collected using the Teaching Mathematics in Inclusive

Settings (TMIS) survey, factor analyses were conducted for each section of the instrument in

addition to an overall analysis of the entire instrument. This step allowed the 84 individual

questions to be reduced into 11 distinct factors that will allow for more efficient analysis of

the collected data. The first part of the survey adapted from Tschannen-Moran, Woolfolk

Hoy, and Woolfolk Hoy (1998) self-efficacy instrument contained twelve questions related to

teacher self-efficacy related to teaching mathematics. The second section (questions 13 – 26)

of the TMIS survey instrument consisted of questions about teacher beliefs about teaching

mathematics in inclusive settings. The third section of the survey instrument consisted of

questions related to how comfortable teachers felt in adapting instruction for students

presenting specific characteristics. Lastly, the fourth section consisted of questions related to

how comfortable teachers feel in adapting instruction for students with disabilities based on

mathematics content. The last three sections of the TMIS survey were adapted from another

research study related to middle school mathematics teachers' beliefs and knowledge about

inclusion for students with learning disabilities (DeSimone, 2004).

Teacher self-efficacy subscale. A factor analysis was conducted for the first part of

the TMIS (Teaching Mathematics in Inclusive Settings) survey (questions 1 – 12) to

determine what underlying structures might exist for items within this section of the

instrument. Principal axis factoring analysis was performed with varimax rotation. The

rotated factor matrix showed two factors with eigenvalues greater than one. The scree plot

demonstrated that eigenvalues level off after two factors.

Principal axis factoring demonstrated that the first factor had an eigenvalue of 6.20

and accounted for 51.65% of the total variance. The factor loadings ranged from .757 to .529

Questions from the first part of the TMIS survey focus on self-efficacy related to classroom

management. The second factor showed an eigenvalue of 1.66 and accounted for 13.79% of

the total variance. The factor loadings ranged from .929 to .622. These items consisted of

questions related to self-efficacy for mathematics pedagogical (instructional) knowledge. The

two factors combined account for 65.44% of the total variance (see Table 5).

Table 5

Factors for teacher self-efficacy

	Efficacy in student engagement	Efficacy in instructional strategies	Efficacy in classroom management
Tschannen-Moran & Woolfolk Hoy	2, 4, 7, 11	5, 9, 10, 12	1, 3, 6, 8
Factor Analysis		4, 5, 9, 10, 11, 12	1, 2, 3, 6, 7, 8

The results of the factor analyses were surprising as the section of the survey adapted

from Tschannen-Moran and Woolfolk Hoy's (2001) Teachers' Sense of Teacher Efficacy

Scale (TSES) only demonstrated two distinct factors – efficacy in classroom management

and efficacy in pedagogical knowledge. Tschannen-Moran and Woolfolk Hoy's factor

analyses showed the scale was comprised of three sub-scores: efficacy in student

engagement, efficacy in instructional strategies, and efficacy in classroom management (See

Table 6).

Table 6

Factor analysis results for TSES

	Question	Prior Subscale	Current Subscale
1.	To what extent can you control disruptive behavior in the mathematics classroom?	Classroom management	Classroom management
2.	To what extent can you motivate students who show low interest in mathematics?	Student engagement	Classroom management
3.	To what extent can you calm a student who is disruptive or noisy in the mathematics classroom?	Classroom management	Classroom management
4.	To what extent can you help your students value learning mathematics?	Student engagement	Instructional strategies
5.	To what extent can you craft good questions for your students related to mathematics?	Instructional strategies	Instructional strategies
6.	To what extent can you get children to follow classroom rules?	Classroom management	Classroom management
7.	To what extent can you get students to believe they can do well in mathematics?	Student engagement	Classroom management
8.	How well can you establish a classroom management system with each group of students?	Classroom management	Classroom management
9.	To what extent can you use a variety of assessment strategies in mathematics?	Instructional strategies	Instructional strategies
10	To what extent can you provide an alternative explanation or example when students are confused?	Instructional strategies	Instructional strategies
11.	How well can you assist families in helping their children do well in mathematics?	Student engagement	Instructional strategies
12.	How well can you implement alternative teaching strategies for mathematics in your classroom?	Instructional strategies	Instructional strategies

Efficacy in instructional strategies is aligned with teacher's mathematics pedagogical knowledge as teachers demonstrate their understanding of which instructional strategies are best for meeting the learning needs of students with disabilities. The resulting factors allowed further analyses to be conducted to determine where and if significant relationships or changes in efficacy occurred for participants based on their level of participation in the professional development program.

Teacher beliefs subscale. A second factor analysis was conducted for the section of the TMIS survey related to beliefs for teaching mathematics in inclusive settings to reduce the number of data points for easier analysis of collected data. Principal axis factoring analysis was performed with varimax rotation. The rotated factor matrix showed five factors with an eigenvalue greater than one. The scree plot demonstrated that eigenvalues level off after five factors. The 14 questions that compose the beliefs section divided into five individual factors about beliefs in teaching in inclusive settings.

The second section of the TMIS survey instrument that measured teacher beliefs about teaching mathematics in inclusive settings demonstrated five individual factors were present as a result of the factor analysis. The first factor focused on the characteristics of teacher preparation programs (e.g., Teacher education programs offer specific information about the characteristics and needs of students with disabilities in mathematics learning). Principal axis factoring demonstrated that the first factor showed an eigenvalue of 3.27 and accounted for 23.40% of the total variance. The second factor describes the role of the general education teacher in the inclusive mathematics classroom (e.g., In inclusive mathematics classrooms, general education teachers often are the primary one responsible for modifying instruction for students with disabilities). The second factor showed an eigenvalue

of 2.24 and accounted for 15.98% of the total variance. Additionally, the third factor is related to instructional logistics in the inclusive mathematics classroom (e.g., general education teachers are given sufficient time to prepare to teach mathematics with special education teachers). The third factor showed an eigenvalue of 1.64 and accounted for 11.74% of the total variance. The fourth factor generated by the factor analysis is how general educators believe students with disabilities should have access to the general education curriculum (e.g., Students with disabilities should be afforded every opportunity to learn mathematics with general education students). A fourth factor showed an eigenvalue of 1.49 and accounted for 10.63% of the total variance. Finally, the fifth factor generated by the factor analysis is contextual issues related to providing mathematics instruction for students with disabilities in the general education classroom (e.g., Students with disabilities cause the most behavioral problems in the inclusive settings during mathematics instruction). Finally, a fifth factor showed an eigenvalue of 1.17 an accounted for 8.38% of the total variance (See Table 7). The factor analysis allowed further analyses to be conducted based on these specific factor scores to determine along which of the five factors significant change(s) may have occurred in teacher beliefs about teaching mathematics in inclusive settings.

Table 7

Factors for teacher beliefs

Teacher Beliefs	Questions	Factor Loads	Eigenvalues	% of Variance Explained
Characteristics of teacher preparation programs	24, 25, 26	.924 to .878	3.27	23.40 %
Role of special educator	20, 21, 22, 23	.762 to .460	2.24	15.98 %
Instructional logistics	17, 18	.931 to .823	1.64	11.74 %
Level of student access to general education curriculum	1, 3, 14, 15	.758 to .393	1.49	10.63 %
Contextual issues related to inclusive mathematics education	16, 19	.521 to .430	1.17	8.38 %

Teacher self-efficacy in adapting instruction subscale. A third factor analysis was conducted for the third section (questions 27 – 37) of the TMIS survey instrument related to self-efficacy in adapting mathematics instruction for students with disabilities receiving services in an inclusive setting. Principal axis factoring was performed with varimax rotation. The rotated factor matrix showed the presence of two factors that had an eigenvalue greater than one. The scree plot demonstrated that eigenvalues leveled off after two factors. The first factor had an eigenvalue of 6.11 and accounted for 55.54% of the total variance (See Table 8).

Table 8

Factors for self-efficacy in adapting instruction

Adapting instruction based on learning characteristics	Questions	Factor Loads	Eigenvalues	% of Variance Explained
Math skills	27, 28, 29, 30, 31, 32, 33	.760 to .543	6.11	55.54 %
Math communication	34, 35, 36, 37	.840 to .526	1.27	11.57 %

Questions related to the first factor focus on learning characteristics specifically related to

mathematics skills (e.g., How comfortable do you feel in your ability to adapt your

instruction for students with disabilities who have the following learning characteristics?

Difficulty reading math facts?). The second factor showed an eigenvalue of 1.27 and

accounted for 11.57% of the total variance. Questions related to the second factor focus on

learning characteristics specifically related a students ability to learn mathematics (e.g., How

comfortable do you feel in your ability to adapt your instruction for students with disabilities

who have the following learning characteristics? Difficulty with written communication in

mathematics?). The two factors combine to represent 67.11% of the total variance.

Teacher self-efficacy in adapting mathematics content subscale. For the fourth

section (questions 38 – 54) of the TMIS survey is related to teacher self-efficacy for adapting

mathematics content for students with disabilities receiving services in an inclusive setting.

Principal axis factoring was performed with varimax rotation. The rotated factor matrix

showed the presence of two factors that had an eigenvalue greater than one. The scree plot

demonstrated that the eigenvalues leveled off after two factors. The first factor showed an

eigenvalue of 9.41 and accounted for 55.34% of the variance while the second factor showed

an eigenvalue of 1.59 an accounted for 9.3% of the variance (see Table 9).

Table 9

Factors for self-efficacy in adapting instruction

Adapting instruction based on mathematics topics	Questions	Factor Loads	Eigenvalues	% of Variance Explained
Mathematics topics	38, 39, 40, 41, 42, 44, 45, 46, 47, 48, 51, 52, 53, 54	.826 to .543	9.41	55.34 %
Use of mathematics tools	43, 49, 50	.778 to .608	1.59	9.3 %

Questions for the first factor in section four are related to specific mathematics topics (e.g.,

How comfortable do you feel in your ability to adapt your instruction in the following topics

for students with disabilities? Performing arithmetic operations on decimals and fractions?).

Questions related to factor two are related to the use of mathematical tools, such as

calculators (e.g., How comfortable do you feel in your ability to adapt your instruction in the

following topics for students with disabilities? Using computer spreadsheets?). Both factors

account for a total of 64.64% of the variance present among questions in section four of the

survey instrument. Further statistical analysis was conducted using factor scores based on the

results of the factor analyses.

Teaching Mathematics in Inclusive Settings Survey. In order to test the fidelity of the

factors that were found by conducting factor analyses on each individual section of the TMIS

survey, a factor analysis was conducted on the entire survey instrument. This factor analysis

revealed 13 individual factors for the survey instrument. A total of 11 factors resulted from

individual factor analyses conducted on each section of the survey instrument (see Table 10).

Table 10

Comparison of factors in individual and overall analyses

	Individual Factor Analysis	Overall Factor Analysis
Factor 1	2, 4, 5, 7, 9, 10, 11, 12	29, 32, 33, 34, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 51, 52, 53
Factor 2	1, 3, 6, 8	2, 4, 5, 7, 9, 10, 11, 12
Factor 3	24, 25, 26	1, 3, 6, 8
Factor 4	20, 21, 22, 23	24, 25, 26
Factor 5	17, 18	49, 50, 54
Factor 6	13, 14, 15	30, 31
Factor 7	16, 19	17, 18
Factor 8	27, 28, 29, 30, 31, 32, 33	20, 21, 22, 23
Factor 9	34, 35, 36, 37	27, 28
Factor 10	38, 39, 40, 41, 42, 44, 45, 46, 47, 48, 51, 52, 53	35, 36
Factor 11	43, 49, 50	14, 15
Factor 12		13
Factor 13		16, 19

There are no major surprises in the overall factor analysis conducted for the entire

survey instrument. It is interesting that 19 items from the last section of the survey about the

comfort level of teachers in adapting instruction for students with disabilities factored

together and into the first factor. There are six identical factors from the individual and overall factor analyses. The factor related to the level of access that students with disabilities should have to the general education mathematics curriculum factored into two different factors in the overall analysis. The introductory question for teacher beliefs, "students with disabilities should be afforded every opportunity to learn mathematics with general education students", did not align with the follow-up questions about student outcomes related to access to the general education mathematics curriculum. The questions related to using calculators and computer spreadsheets factored with the probe about using different representations to describe a functional relationship, which at first examination appeared strange; however, functions of a line are often demonstrated using graphing calculators.

In the overall factor analysis, the survey section containing questions related to a teacher's comfort in adapting instruction for students with disabilities based on their learning characteristics factored into three distinct factors and one factor that contains questions from the section about a teacher's comfort in adapting instruction for students with disabilities based on mathematics topics. The three distinct factors are related to attention span, difficulty with recognizing and using symbols, and written/oral communication. The most surprising find in the overall factor analysis was the questions contained in the first factor were a combination of items from the two sections on teacher self-efficacy in adapting instruction. Five questions related to adapting instruction by learning characteristics and fourteen questions related to adapting instruction by mathematics topics loading into the first factor.

Teaching Mathematics in Inclusive Setting Results

In order to find answers to the four research questions posed in this study, the data collected through the completion of the Teaching Mathematics in Inclusive Settings (TMIS)

survey instrument both quantitative and qualitative data was analyzed. The quantitative data collected through the survey was entered into SPSS and the factor scores computed for the eleven factors generated by the factor analyses conducted for each section of the survey. Once the factor scores were computed, repeated-measures MANOVA were conducted for each section of the survey instrument. The variables selected for the repeated-measures MANOVA were tier of participation and change scores on the TMIS instrument. These results are shared and explained as they relate to each of the four research questions posed by this study. Follow-up paired samples t-tests were conducted to compute the significance of change scores within subjects. The data was split based on tier and the pretest score was paired with the post-test score to find if the change was significant. Participants also shared demographic information on the survey which was analyzed using descriptive statistics.

Additionally, this study utilized focus group data as a primary source of information by which self-efficacy and beliefs related to teaching mathematics in inclusive settings were explored. Initial analysis of focus group data was inductive in nature; open coding consisted of chunking and labeling focus group data (Patton, 2002). Specifically, an analysis was performed on the focus group participants' expressed ideas in order to identify indigenous patterns, themes and categories. This process allowed the researcher to identify themes as they emerged from the data based on similarities and differences among and between multiple participants' expressed perspectives.

Analysis of focus group data collected at four different times provided insight and understanding related to the individual teacher experiences participating in all three levels of the professional development program. As the focus group data were analyzed over time, consistent themes emerged from axial codes developed from the thoughts, ideas, reflections,

and experiences shared by study participants. These emergent themes were then aligned with

the research questions to share teacher participant views related to self-efficacy, beliefs about

inclusive education, and their participation in the professional development program.

Question One

To what extent is a general educator's level of self-efficacy regarding mathematics

instruction in inclusive settings related to participation in an intensive professional

development program? Content/methods courses? Both?

In order to discover if any significant changes occurred in teacher self-efficacy among

the three tiers of participants in the professional development program from pretest to post-

test time frames, both a repeated-measures MANOVA were conducted. A comparison was

made related to time (change scores from individual pretests and post-tests) and tier of

participation (content only, professional development only, content and professional

development combined) for all 115 participants in the professional development program.

Sections one, three, and four of the TMIS survey are related to teacher self-efficacy

related to teaching mathematics in inclusive settings in addition to adapting instruction to the

characteristics of disabilities and the adaptation of mathematics topics for mathematics

instruction in inclusive settings. The factor analyses for these two sections of the TMIS

survey showed the presence of six factors: teacher self-efficacy in classroom management,

teacher self-efficacy in pedagogical knowledge, and teacher self-efficacy in adapting

instruction for students with disabilities, specifically in these areas: mathematics skills,

ability to learn mathematics, mathematics topics, and use of mathematical tools. Finally,

qualitative data was analyzed to explore the depth of change in self-efficacy among general

education mathematics teachers teaching in inclusive settings.

Descriptive statistics

As part of the repeated-measures MANOVA, an analysis of the descriptive statistics for the means of the individual factor scores was generated along with the standard deviations for each. The data was generated by the level at which each teacher participated in the professional development program. The descriptive statistics based on participants' factor scores for the tier of participation and time of assessment for the first twelve questions of the TMIS survey instrument are presented in Table 11 as well as the findings of significance for the paired samples t-tests. The findings of the paired samples t-tests for the self-efficacy factors for classroom management and instructional strategies showed significance in only one tier and one factor. Teachers in Tier 3 showed significant changes in their self-efficacy related to instructional strategies.

Table 11

Mean scores for teacher self-efficacy related to teaching mathematics

Factor	N	Tier	Statistic	Pretest	Post-test	T-score Significance
Self-efficacy for classroom management	14	Content only	Mean	6.94	7.14	.45
			SD	1.23	.86	
	66	PD only	Mean	6.54	6.74	.18
			SD	1.19	1.22	
	35	Combined	Mean	7.13	7.50	.06
			SD	1.06	.83	
	115	Total	Mean	6.77	7.02	
			SD	1.18	1.12	
Self-efficacy for	14	Content	Mean	7.49	7.27	.31

instructional strategies		only				
			SD	1.04	1.32	
	66	PD only	Mean	6.73	6.81	.55
			SD	1.13	1.29	
	35	Combined	Mean	7.16	7.57	.02*
			SD	.98	1.20	
	115	Total	Mean	6.95	7.09	
			SD	1.10	1.20	

Note. Possible answers range from 1-9

Note. *p < .05

The same descriptive analysis was conducted on factor scores for sections three and four of the survey. These factor scores were related to adapting instruction for students with disabilities based on their learning characteristics as well as mathematics topics. The descriptive statistics based on these factor scores for the tier of participation and time of assessment for part three of the TMIS survey instrument are presented in Table 12 as well as the results of the paired samples t-tests. Teachers participating in Tier 3 experienced significant changes in their self-efficacy related to adapting their instruction in the inclusive mathematics classroom based on the learning characteristics of students with disabilities. The two factors related to adaptations for learning characteristics include: math skills and ability to learning mathematics. Tier 3 teachers also experienced significant changes in their self-efficacy in adapting instruction for students with disabilities based on mathematics topics and tools.

Table 12

Mean scores for adapting instruction for students with disabilities

Factor	N	Tier	Statistic	Pretest	Post-Test	Significance
Learning characteristics related to math skills	14	Content only	Mean	3.06	3.09	.86
			SD	.68	.73	
	66	PD only	Mean	2.71	2.75	.56
			SD	.58	.63	
	35	Combined	Mean	2.84	3.09	.02*
			SD	.63	.52	
	115	Total	Mean	2.79	2.90	
			SD	.61	.63	
Learning characteristics ability to learn math	14	Content only	Mean	2.91	3.20	.15
			SD	.69	.48	
	66	PD only	Mean	2.64	2.73	.28
			SD	.61	.64	
	35	Combined	Mean	2.75	3.00	.02*
			SD	.62	.57	
	115	Total	Mean	2.71	2.88	
			SD	.62	.62	
Adaptation for math topics	14	Content only	Mean	2.91	3.14	.35
			SD	.78	.61	
	66	PD only	Mean	2.73	2.84	.72
			SD	.59	.64	

	35	Combined	Mean	2.86	3.24	.001*
			SD	.62	.61	
Adaptations for math tools	14	Content only	Mean	2.57	2.94	.16
			SD	.79	.69	
	66	PD only	Mean	2.31	2.51	.07
			SD	.75	.76	
	35	Combined	Mean	2.47	2.89	.001*
			SD	.63	.58	
	115	Total	Mean	2.39	2.68	
			SD	.72	.72	

Note. Possible answers ranged from 1-4

Note. *p < .05

Repeated-measures MANOVA

A repeated-measures MANOVA was conducted using the pretest and post-test factor scores produced by the factor analysis for the first, third, and fourth sections of the TMIS survey and . For the first section with twelve questions related to teacher self-efficacy about teaching mathematics in inclusive setting, the Box's test of equality of covariance is non-significant (F (20, 5.68) = 1.04; p < .05); therefore, the assumptions of the multivariate model have not been violated. The null hypothesis fails to be rejected as the covariance matrices are equal across design cells. Mauchly's test of sphericity also shows that sphericity has not been violated; therefore, meeting the assumptions of a univariate model. The results of these tests demonstrate that the factor scores meet the rigor of a repeated-measures MANOVA test.

The multivariate tests indicated the variable of tier is significant (Wilk's Lambda = .010; F = 3.38, df = 4, 222, p < .05) between subjects while the variable of change scores is

not significant (Wilk's Lambda = .119; F = 2.17, df = 2, 111, p < .05) within subjects. The

interaction of the variable tier and change scores is also not significant (Wilk's Lambda =

.244; F = 1.37, df = 4, 222, p < .05) within subjects for subscale scores of the first part of the

TMIS survey instrument related to teacher self-efficacy in teaching mathematics.

Tests of between-subjects effects show the tier variable to be significant for each of

the two factors of the first part of the TMIS survey instrument. The first factor of the general

teacher self-efficacy scale for teaching mathematics related to classroom management issues

was found to be significant (F = 5.71, df = 2, p < .05). The second factor of the general

teacher self-efficacy scale for teaching mathematics related to issues of mathematics content

and pedagogy was found to be significant (F = 5.01, df = 2, p < .05). A Games-Howell post

hoc analysis showed significance between tier two participants and tier three participants on

both factor one [classroom management] (p = .001) and factor two [mathematics content and

pedagogy] (p = .004).

Change scores were found to be non-significant for self-efficacy factors. An

examination of the mean scores showed that teachers who only participated in

content/methods courses decreased in their means scores from the pretest to the post-test

measures. The decrease in their self-efficacy score related to instructional strategies may be

attributed to a realization that their teaching practices at the beginning of the content courses

were not research-based and/or student-centered. The teachers may have also recognized that

they are still working to integrate instructional strategies that meet the learning needs of all

students. Teachers participating in Tiers II and III showed increases in their self-efficacy

related to instructional strategies. This may be explained by the school-based support from a

mathematics specialist in learning how to integrate research-based instructional strategies,

including the strategies demonstrated during the content/methods courses.

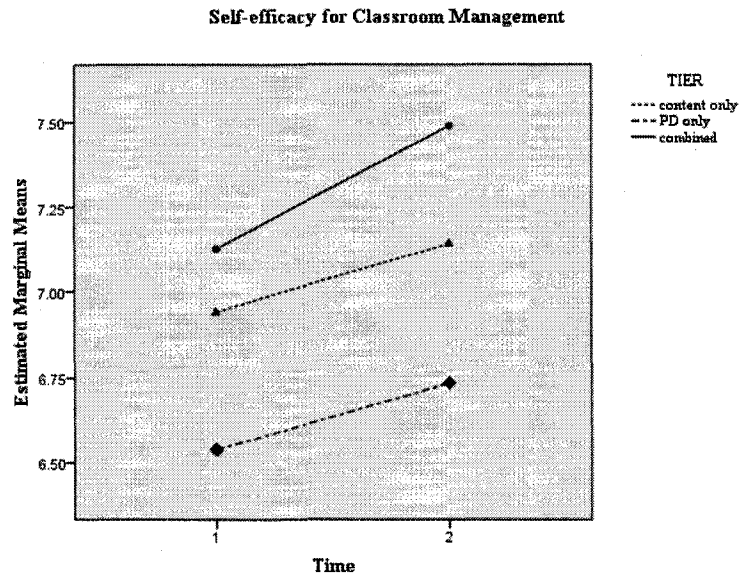**Self-efficacy for Classroom Management**

Figure 4. Comparison of pretest and post-test scores for classroom management

Self-efficacy for Instructional Strategies
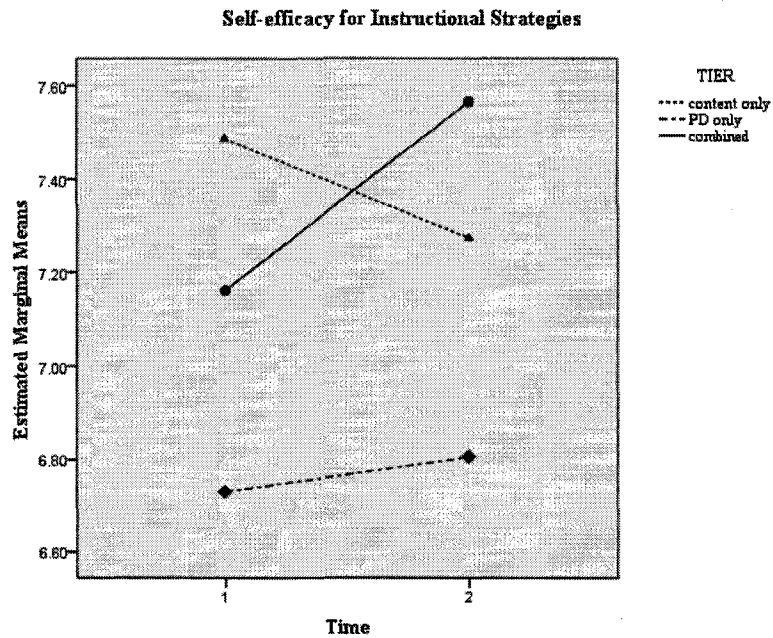
Figure 5. Comparison of pretest and post-test scores for instructional strategies

For sections three and four, Box's test of equality of covariance is non-significant (F (72, 4.74) = 1.27; p < .05); therefore, the assumptions of the multivariate model have not been violated. The null hypothesis fails to be rejected as the covariance matrices are equal across design cells. Mauchly's test of sphericity also shows that sphericity has not been violated; therefore, meeting the assumptions of a univariate model. The multivariate tests indicated the variable of tier is not significant (Wilk's Lambda = .887; F = 1.69, df = 8, 218, p < .05) between subjects while the variable involving change scores is significant (Wilk's Lambda = .837; F = 5.29, df = 4, 109, p < .05) within subjects. This finding showed that tier membership was not significant related to teacher self-efficacy related to adapting instruction for students with disabilities based on their learning characteristics in addition to teacher self-efficacy related to adapting instruction for students with disabilities based on mathematics topics. However, changes in scores on the TMIS instrument were found to be significant in the level of teacher self-efficacy for adapting instruction for students with disabilities. The interaction of the variable tier and change scores was not significant (Wilk's Lambda = .941; F = .844, df = 8, 218, p < .05) within subjects based on factor scores for part three of the TMIS survey instrument related to teacher self efficacy in adapting instruction based on mathematics content as well as characteristics of disabilities.

Tests of within-subjects effects showed significance for the second factor (ability for learning mathematics) for adapting mathematics instruction for students with disabilities as well as for both factors (general mathematics topics and use of mathematical tools) for adapting instruction for students with disabilities based on mathematical topics. The second factor of adapting instruction based on characteristics showed strong significance (F = 7.82, df = 1, p = .006). The first factor (mathematics topics) related to adapting instruction for

mathematical content showed strong significance ($F = 12.87$, $df = 1$, $p = .000$) while the

second factor (mathematical tools) also demonstrated strong significance ($F = 20.42$, $df = 1$,

$p = .000$). A Games-Howell post hoc analysis showed significance between tier one and tier

two participants on factor two related adapting instruction based on their learning

characteristics for students with disabilities related to their ability to learn mathematics ($p =$

.047). Also, significant was level of participation for the first factor related to adapting

mathematics instruction for students with disabilities based on mathematics topics ($p = .028$)

for Tiers II and III.
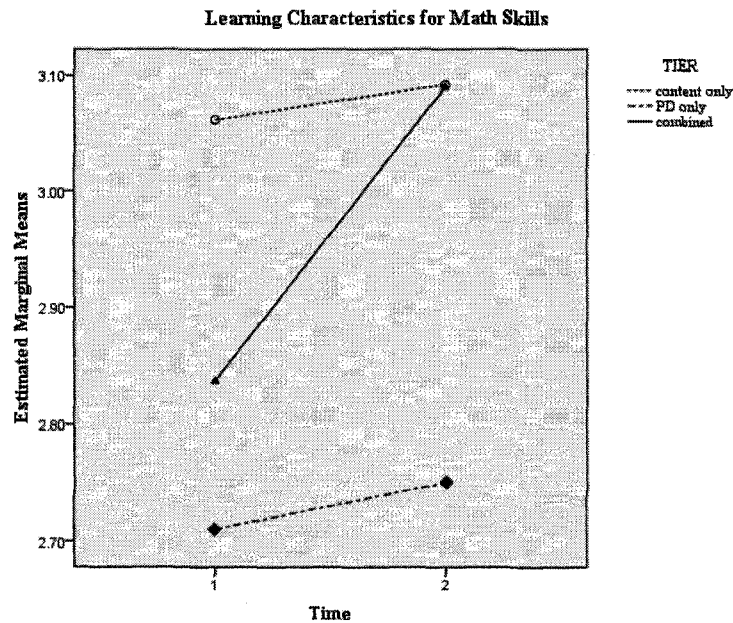
Figure 6. Comparison of pretest and post-test scores for adapting instruction for math skills
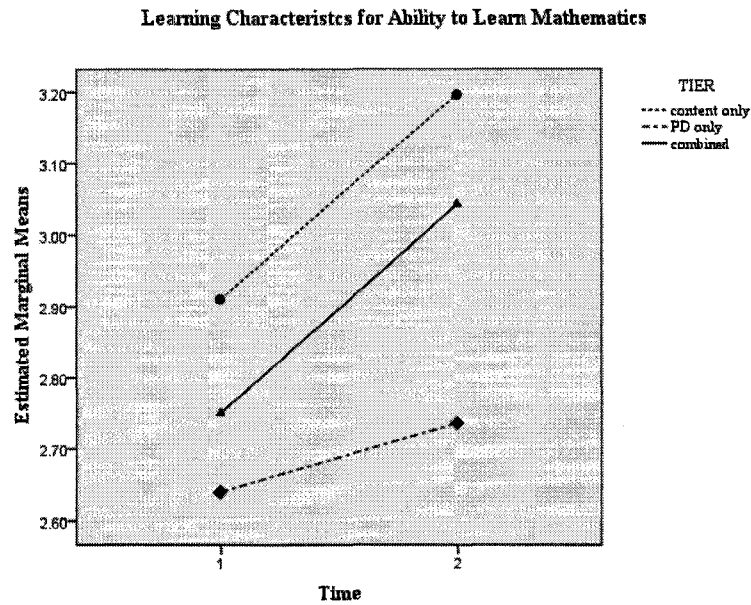
Figure 7. Comparison of pretest and post-test scores adapting instruction for ability to learn
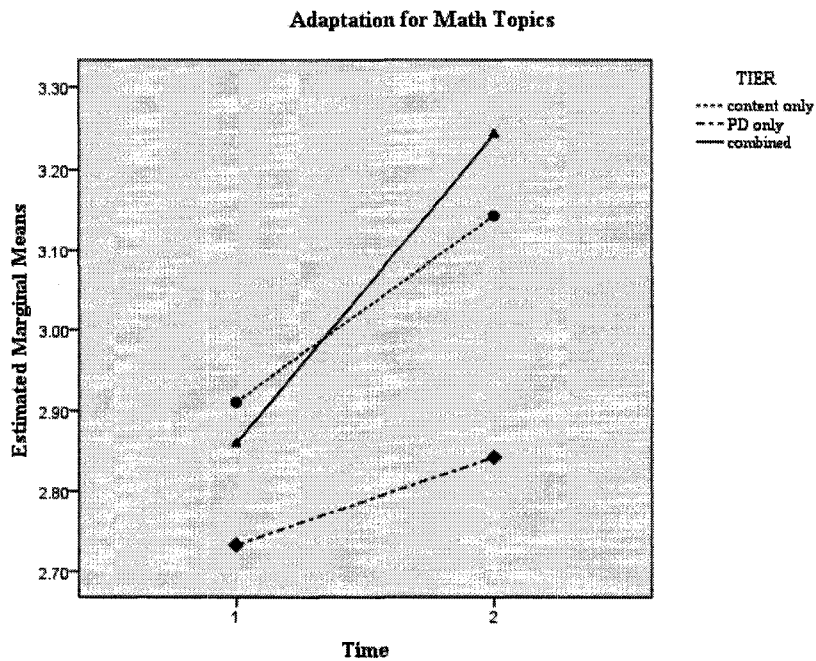
math

Figure 8. Comparison of pretest and post-test scores for adapting instruction based on math

topics

Adaptation for Mathematical Tools
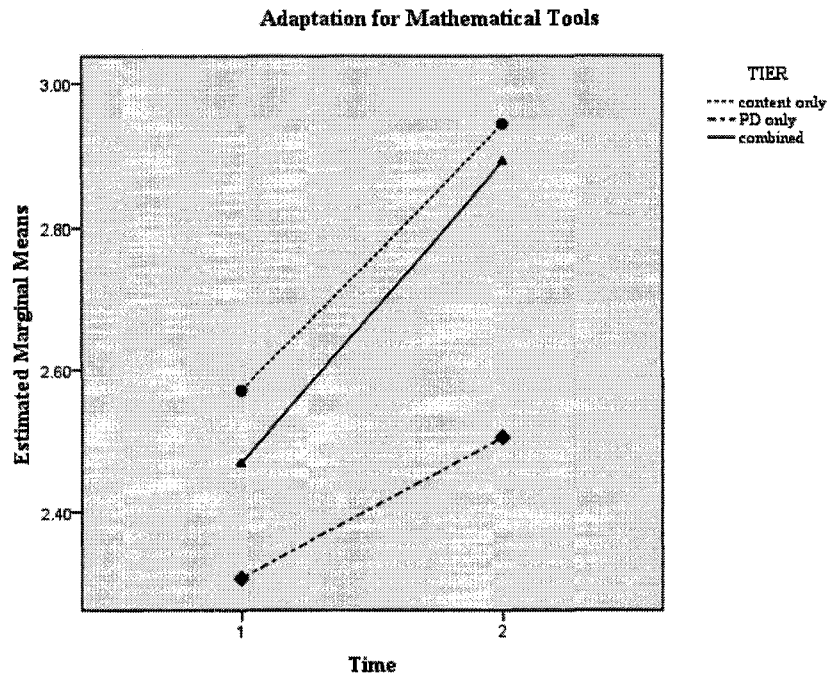
Figure 9. Comparison of pretest and post-test scores for adapting instruction for math tools

Focus Group Findings

Teachers participating in Tier I shared how the content/methods courses provided them with the knowledge and skills to design and implement mathematics lessons that focused on developing students' conceptual understanding of content. Key themes that emerged from the focus group data related to the question of changes in self-efficacy in teaching mathematics in inclusive setting were differentiation of instruction and student-centered planning.

Differentiation of instruction. One focus of both the content courses and school-based professional development was to support teachers as they learned how to integrate research-based instructional strategies that allowed students greater access to the content. When teachers understand how to effectively differentiate instruction, students with diverse

learning needs may be able to better understand the content information being presented. One

teacher [T1_A] shared:

> ...*changing how I teach concepts may reach most students, but not all of them.*
> *I am still learning how to align strategies and content to impact student outcomes.*

Another teacher [T1_P] shared how she is able to differentiate content through multiple

instructional strategies aimed to address multiple learning styles present in her inclusive

mathematics classroom:

> *I am still learning how to integrate the teaching methods I have learned from the*
> *courses for all my classes so that students will have a better understanding of the*
> *content presented during a lesson. I am finding that my inclusion students are*
> *doing better when I use the strategies demonstrated in the courses.*

Teachers participating in Tier III shared similar experiences and reflections to the

Tier I participants. During the focus group sessions, multiple Tier III teachers shared that

they were now participating in collaborative grade-level departmental planning, which they

have found to be very beneficial in learning which instructional strategies align best with

mathematics concepts. An essential element present during this collaborative planning was

collective problem-solving that allowed teachers with more experience in inclusive settings

to share their experiences and ideas with teachers, who were less experienced in teaching

mathematics in inclusive settings.

> One teacher [TIII_J] shared the following experience:

> *As a result of working with more experienced teachers [with inclusion], I have*
> *gained a better understanding of how to select strategies that will help my students*
> *with disabilities be successful. I am able to differentiate the lesson so that all students*
> *can better understand the concept presented during the lesson.*

Another factor that appeared to affect a teacher's self-efficacy related to their ability to adapt

instruction to mathematics content was seeing how to differentiate instruction:

> *Before I started taking the courses, I wasn't sure what to do for those students*

placed in my inclusion class. I did what I thought I was supposed to do, but the special educator was only available for consults. After seeing our instructors teaching us so that we were learning, it was easier for me to know what I needed to do for my students. [TI_K]

Student-centered instruction. Participants in Tier II also shared similar experiences shared by Tiers I and III participants. Teachers shared reflections regarding changes in their teaching practices, such as changing from traditional lecture-style practices to more constructivist practices that were student centered. The changes in teaching practices appeared to be a result of changes in their self-efficacy related to teaching mathematics in any setting, but especially an inclusive setting. A teacher [TII_C] shared the following experience:

> *Before the math specialist came to work with us, I dreaded my inclusion period. I didn't know what to do with my inclusion kids. I relied on the special education teacher to help them and I concentrated on the other students. She [the math specialist] came in one day and did a demonstration lesson on proportions for my inclusion class. She used colored paper to create a foldable and had the students develop a definition of proportion and give examples. At the end of class, all the students got the exit questions right. It then dawned on me that I only need to change how I teach to make sure all my students get it, not what I teach. They don't need me to water it down, just explain it a couple of different ways and let them tell me what they know.*

Summary

Based on the findings of the statistical analyses, it appears that Tier III teachers experienced significant changes in their self-efficacy in instructional strategies (pedagogical knowledge). Additionally, Tier 2 teachers experienced significant changes in their self-efficacy in adapting instruction for students with disabilities based on their learning characteristics as well as mathematics topics. Teachers in Tier I and Tier II did not experience significant changes in their self-efficacy on any of the 6 factors related to the measures of the TMIS instrument.

The repeated-measures MANOVA analysis found that tier of participation was significant as well as change scores within subjects. It appears that the level of intervention in which teachers participated may have affected their level of self-efficacy related to the 6 factors measured by the TMIS instrument. While the changes in pretest and post-test scores were significant based on the repeated-measures MANOVA, the paired samples t-test did not show significance in the change scores for Tier I and II teachers. The qualitative data analysis showed that teachers participating in all three levels of the professional development program felt they had experienced positive changes in their self-efficacy related to teaching mathematics in inclusive settings. The lived experiences that teachers shared during the focus groups provided great insight into how the components of the professional development programs were beneficial in developing their PCK and their understanding of the delivery of special education services. It appears that their new knowledge and understanding aided in the increases in self-efficacy. Finally, it appears that participating in a combination of content/methods courses and school-based professional development program activities may increase a teacher's self-efficacy for teaching mathematics in inclusive settings.

<div align="center">Question Two</div>

How does the level of participation in professional development activities related to a general educator's beliefs regarding mathematics instruction in inclusive settings?

In order to discover if any significant changes in teacher beliefs among the three tiers of participants from pre-test to post-test timeframes occurred, quantitative and qualitative analyses were performed on the factor scores for the teacher beliefs section of the TMIS survey. The second section of the TMIS survey related to teacher beliefs about inclusive

education contains 14 questions which factored into five different categories. The factor

scores were used in paired samples t-tests as well as a repeated-measures MANOVA.

Descriptive statistics. Descriptive statistics were generated from section two of the

TMIS survey related to teacher beliefs about teaching mathematics in inclusive settings. The

mean scores were calculated from the factor scores during the repeated-measures MANOVA

process. The descriptive statistics based on participants factor scores for the level of

participation and pretest and post-test time frames for part two of the TMIS survey

instrument are presented in Table 13. Also included in Table 10 are the results of the paired

samples t-tests conducted on each of the five factors for the beliefs section. The findings of

the paired samples t-tests showed that few significant changes occurred in the beliefs about

inclusive education among the teacher participants. Tier I and Tier III teachers demonstrated

significant changes in their beliefs about their role in an inclusive setting. Tier I teachers also

showed significant changes in their beliefs related to time issues in providing instruction in

inclusive settings.

Table 13

Mean scores for teacher beliefs

Factor	N	Tier	Statistic	Pretest	Post-test	Significance
Teacher Preparation Programs	14	Content only	Mean	4.10	3.67	.28
			SD	1.30	1.28	
	66	PD only	Mean	3.54	3.41	.44
			SD	1.24	1.10	
	35	Combined	Mean	3.91	3.82	.61
			SD	1.45	1.38	

	115	Total	Mean	3.72	3.57	
			SD	1.32	1.22	
Role of General Educator	14	Content only	Mean	4.82	3.89	.02*
			SD	1.03	1.52	
	66	PD only	Mean	4.03	4.09	.73
			SD	1.36	1.33	
	35	Combined	Mean	4.10	3.51	.03*
			SD	1.49	1.67	
	115	Total	Mean	4.15	3.89	
			SD	1.38	1.48	
Instructional Logistics	14	Content only	Mean	2.88	3.11	.37
			SD	.92	.66	
	66	PD only	Mean	3.33	3.37	.76
			SD	.98	1.02	
	35	Combined	Mean	3.21	3.39	.31
			SD	.98	.78	
	115	Total	Mean	3.24	3.34	
			SD	.98	.91	
Level of Access to General Education Curriculum	14	Content only	Mean	4.74	4.45	.15
			SD	.73	.77	
	66	PD only	Mean	4.36	4.40	.81
			SD	.80	1.14	
	35	Combined	Mean	4.81	5.04	.10

			SD	.95	.63
	115	Total	Mean	4.55	4.60
			SD	.86	1.01
Time Issues for Inclusive Education	14	Content only	Mean	3.61	2.86	.02*
			SD	.96	.97
	66	PD only	Mean	3.23	3.39	.28
			SD	1.08	1.02
	35	Combined	Mean	3.10	2.96	.48
			SD	.99	.98
	115	Total	Mean	3.24	3.19
			SD	1.04	1.02

Note: Possible answers range from 1-6

Note. *p < .05

Repeated-measures MANOVA

A repeated-measures MANOVA was conducted with the factor scores for this section of the survey. A comparison was made related to time (pretest and post-test) and tier of participation (content only, professional development only, content and professional development combined) for all 115 participants. The repeated-measures MANOVA analysis was conducted using five individual factor scores for each participant based on the factor analysis for part two of the TMIS survey instrument.

For this section of the survey about teacher beliefs related to teaching mathematics in inclusive settings, Box's test of equality of covariance is non-significant (F (110, 4.64) =

1.21; p < .05); therefore, the assumptions of the multivariate model have not been violated. The null hypothesis fails to be rejected as the covariance matrices are equal across design cells. Mauchly's test of sphericity also shows that sphericity has not been violated; therefore, meeting the assumptions of a univariate model. The multivariate tests indicated the variable of tier is significant (Wilk's Lambda = .829; F = 2.13, df = 10, 216, p < .05) between subjects while the variable of time is also significant (Wilk's Lambda = .856; F = 3.63, df = 5, 108, p < .05) within subjects. The interaction of the variable tier and time is not significant (Wilk's Lambda = .855; F = 1.76, df = 10, 216, p < .05) within subjects based on factor scores for part two of the TMIS survey instrument related to teacher beliefs in teaching mathematics to students with disabilities in inclusive settings.

Tests of between-subjects effects showed that the tier variable to only be significant for the fourth identified factor (level of access provided to students with disabilities to the general mathematics curriculum) for part two of the TMIS survey instrument (F = 6.09, df = 2, p < .05). A Games-Howell post hoc analysis showed significance between Tier II and Tier III participants on factor four related to level of access provided to students with disabilities to the general mathematics curriculum (p = .002).
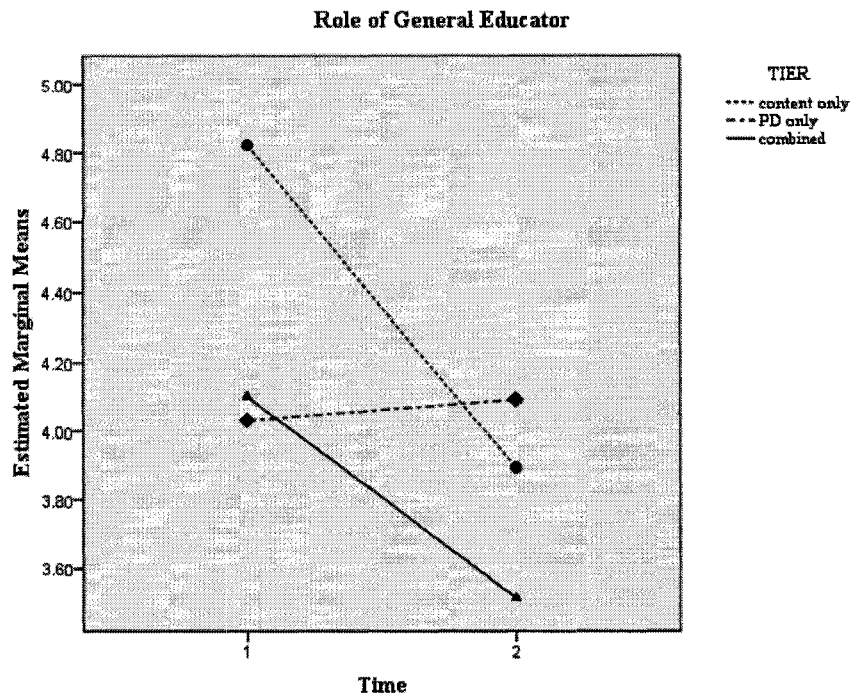
Figure 10. Comparison of pretest and post-test scores for beliefs about role of general educator
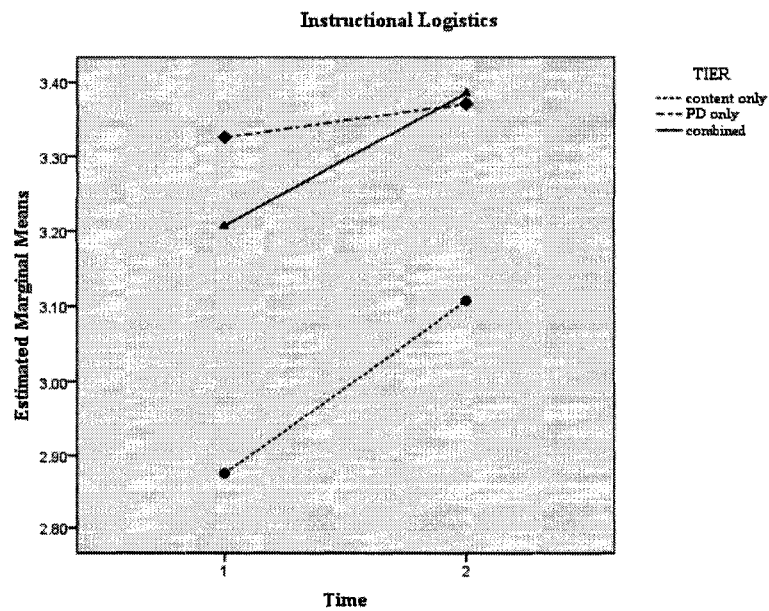
Figure 11. Comparison of pretest and post-test scores for beliefs about instructional logistics

Level of Access to General Education Curriculum
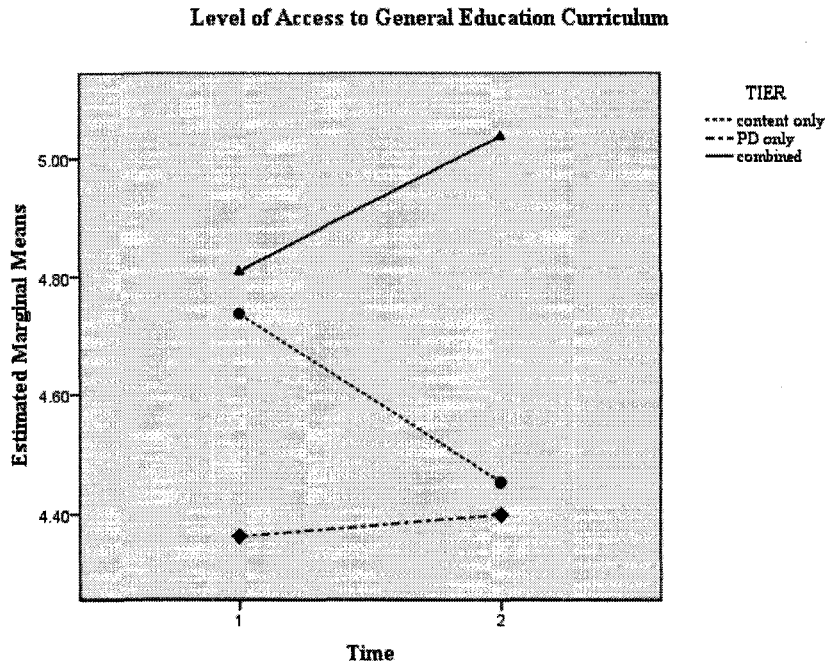
Figure 12. Comparison of pretest and post-test scores for beliefs about level of access

Time Issues Related to Inclusive Education
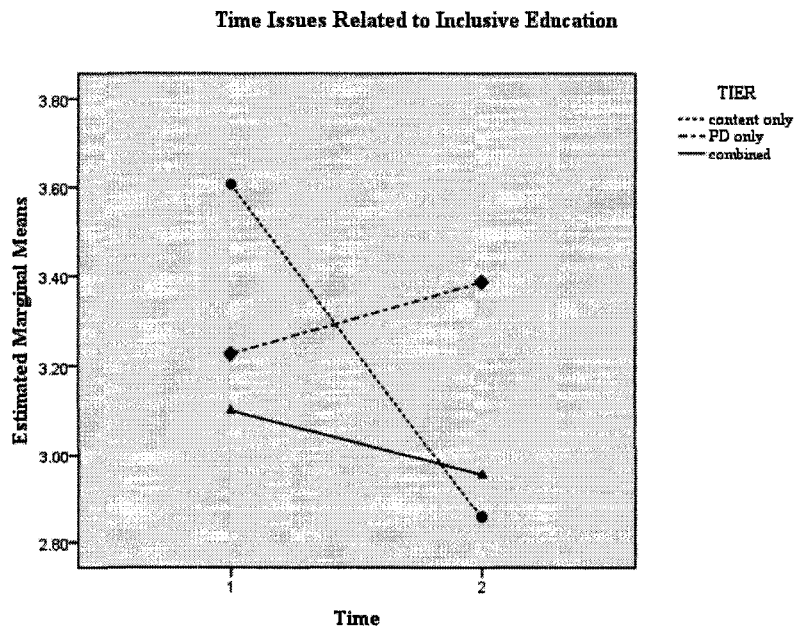
Figure 13. Comparison of pretest and post-test scores for beliefs about time issues

Focus Group Findings

Tier III in addition to tier I study participants shared their thoughts, ideas, experiences, and reflections with the researcher during focus group sessions related to their ability to create an environment conducive to the teaching and learning process for all students, especially students with disabilities. During the focus groups for tiers I and III participants, discussions and dialogues with teachers covered aspects of individuals' beliefs about inclusive education. Teachers openly shared their issues and concerns related to the implementation of inclusion models in their schools. Specific experiences were shared to describe how teachers have changed in the philosophy and beliefs about teaching students with disabilities in inclusive setting. The themes that emerged from the focus group data related teacher beliefs about teaching mathematics in inclusive settings were: philosophical changes, addressing multiple learning styles, and contextual issues.

Philosophical changes. One teacher [TIII_E] shared how her general experience in the content/methods courses has changed her perception about providing mathematics instruction to a diverse group of learners.

> *These courses – the way that I look at it are about change – to prevent what has happened to us to happen to our students so that when they get here they have the theory and the reasoning and ideas.*

Another teacher [TI_C] shared how her experiences in the content/methods courses had demonstrated another way of providing mathematics instruction that greatly differed from the type of mathematics instruction that she received as a student. Then, she shared how the change in instructional philosophy has changed her instructional perspective for meeting the learning needs of all students in her classroom.

The biggest thing about taking this class is that I am sitting there hearing these concepts as I am going "oh" – none of my teachers ever taught me that. We are changing things so that the kids in math classes that don't get it – can get it.

This same thematic thought is shared by another teacher [TI_E] with her realization of how her philosophy about mathematics instruction is changing.

I knew about different learning styles and stuff like that, but this opens me up to that person next to me that does not think the way that I do. I see now how my students feel because I am not speaking English to them. When I struggle with content, my peers can explain it to me in a way that is different from the instructors.

The teacher continued to share how course experiences had provided her an opportunity to see how teachers could address multiple learning needs through multiple, but integrated instructional strategies. Another teacher [TIII_F] joined in the conversation to state …

I was surprised that there was such an eclectic group of people. It was seeing the perspectives of everybody that helped me personally – especially the special education piece.

Still another teacher [TIII_A] shared a similar experience regarding meeting multiple learning styles …

One thing that I liked is they addressed all the different learning styles. They didn't give assignments after introducing the material. In class we typically worked things out as a whole class. What we do each day has connections somewhere else to other activities. One day we were introduced to a manipulatives and then a few days later we used them to solve a problem of the day or we read about other applications for them. It is really nice to have all those connections in the one subject area.

Teachers in all three tiers of participation shared multiple examples of how their experiences during the course of the professional development program presented them with opportunities to learn more about differentiation of instruction and meeting the learning needs of all students, including students with disabilities. Most importantly, teachers shared how they were able to recognize the roadblocks present in their schools that prevent them from implementing their newly acquired technical pedagogical content knowledge.

Contextual roadblocks. Teachers participating in all three tiers shared how they encounter roadblocks in their individual school buildings that prevent them from fully implementing the methodologies that they learned either during the content/methods courses or professional development activities. One teacher [TIII_E] stated,

> *We try [to integrate new methodologies] but there are so many restrictions – sometimes they [administrators] walk in even though the students are on task—they think that is not related to the SOLs.*

Another teacher [TIII_G] followed the same thought,

> *because it is too noisy to them [administrators] then they pass judgment, so then you try not to do them [new instructional strategies] – you know what I mean.*

Another teacher [TI_D] summarized this issues involved in this specific roadblock,

> *it is all based on administration – it's all based on who the administrator is.*

Even though the teachers leave the content/methods courses with enthusiasm for integrating their newly acquired technical pedagogical content knowledge, the administrative staff's philosophy regarding teaching and learning is often perceived as an impediment.

Another contextual roadblock is the availability of mathematics resources. Teachers shared how resources such as manipulatives may not be available. Another roadblock is finding that manipulatives are stored away in another teacher's room or community storage, but they were not informed that the resources were available. Many teachers from all three tiers shared that it is often difficult to integrate resources into their own practice when their colleagues do not agree with the methodology. One teacher [TIII_D] shared:

> *I know that I have had to hunt for the materials when new teachers start because the math leader teachers do not use them in modeling instruction. They are not really good about telling new teachers about the availability of resources.*

While a teacher [TI_E] stated:

My biggest concern is about materials and resources. We are going to go back to school with these great ideas and need for materials and the administrators are going to say – sorry no money. Then we are right back to where we were last year.

One teacher [TII_J] shared a major roadblock in improving mathematics instruction, especially in an inclusive setting.

I run into people who do not know math – trying to run math. They run math classes the way that they learned math without accepting other methods and that doesn't make a good structure for teaching. It is hard then if you aspire and your administration or fellow teachers who say stop it.

The general educator is often viewed as the content expert while the special education teacher is often viewed as the instructional strategies expert. What happens in this collaborative teaching environment when neither teacher is viewed as a content and/or pedagogical expert? How can we overcome this contextual roadblock?

Summary

The statistical analyses show that the level of participation in the professional development intervention was significant between subjects. Additionally, time was significant within subjects suggested that individual change scores from pretest to post-test reflect how teachers' beliefs about inclusion are changing. Paired samples t-tests showed that not all change scores were significant. Tier I and III teachers experienced significant changes in their beliefs about access to the general education curriculum. These changes showed that the teachers believe that students with disabilities are best taught in inclusive settings, which may lead to increased student success. Additionally, this finding is also supported by qualitative data in that Tier I and III teachers shared that their developing PCK allows them to design more effective instruction for all students, which leads to greater access to the mathematics content.

Another significant change score was found among Tier I teachers in their beliefs about the time issues related to inclusive practices. Teacher beliefs about students with disabilities requiring more time than their non-disabled peers showed positive changes. Another positive change for Tier I teachers was their beliefs about the amount of time needed to prepare foe instruction in inclusive classrooms. This finding was also supported by the analysis of the focus group data as Tier I teachers shared how their new knowledge and understanding about multiple learning styles has assisted them in designing instruction to the learning needs of diverse student populations.

Even though some factors of the teacher beliefs scale did not show significant changes during the course of this study, it was not expected as beliefs are a very stable construct requiring sustained interventions over an extended period of time to affect small changes. The qualitative findings point out the contextual roadblocks, such as differing philosophies with administration that may prevent teachers from integrating their developing PCK into their classroom instruction. When teachers are supported in their integration of new special education pedagogical content knowledge, their self-efficacy may increase leading to changes in beliefs. Often times, contextual factors may not allow teachers to integrate instructional practices presented during professional development programs.

Professional Development Program

One of the interventions for this study was a professional development program, which included content/methods courses and school-based activities. Content/methods courses included Patterns, Functions, and Algebra; Number and Number Sense; Geometry and Measurement; Probability and Statistics; and Rational Numbers. School-based professional development activities where provided by mathematics specialists from the

Tidewater Team for Improving Middle School Mathematics to participating middle schools based on the individual needs of each school and their teachers. The components of the professional development program were the Math Day conference in addition to the following activities that were supported by a mathematics specialist from the College of William and Mary: peer coaching, co-teaching, demonstration teaching, lesson study, coaching from specialist, discussions and dialogues with specialist, and classroom observations conducted by specialist (See Appendix D). Teachers who only participated in the content/methods courses were also required to participate in the Math Day conference as part of course requirements. Teachers that only participated in professional development activities were required to join lesson study, but other components were not mandatory. Teachers belonging to the group that took courses and participated in professional development activities were also required to participate in the Math Day conference and lesson study, but the remaining components were not mandatory. The last two questions posed by this study are directly related to teacher perceptions about the professional development program.

<div align="center">Question Three</div>

How do teachers perceive the relative value of various elements of the professional development program and content/methods courses?

Teachers rated their perceived value of specific professional development activities that were part of the Tidewater Team for Improving Middle School Mathematics grant project. Members of Tiers I, II, and III completed this section of the survey during the final data collection period for each group. Members of Tier I only participated in the content courses and the Math Day conference, which was a course requirement. The frequency

counts for each of the participants' responses indicate that a majority of participants at all three tiers found the professional development activities either valuable or very valuable if they participated in the specified activities (see Table 14).

Table 14

Perceived value of professional development
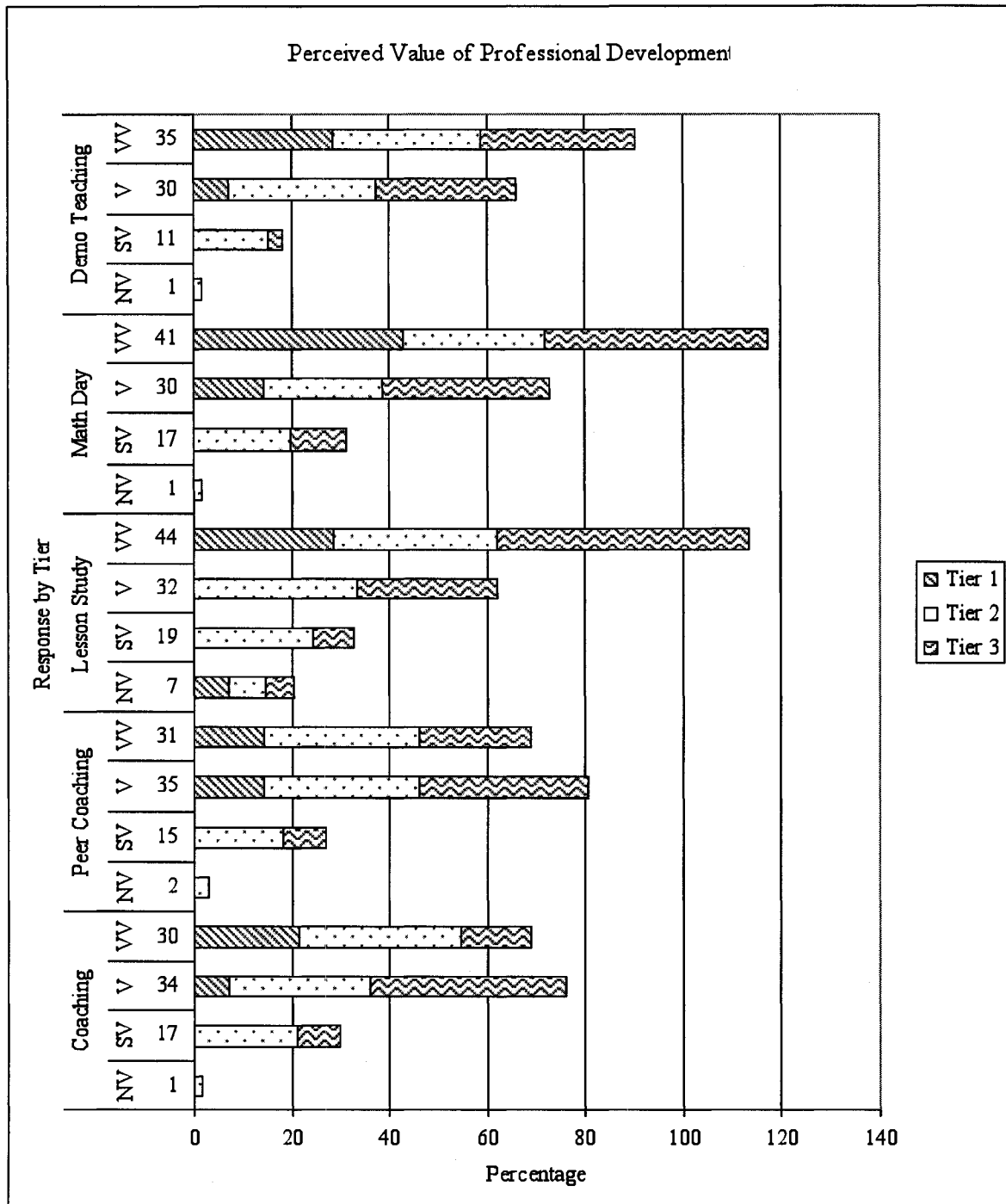
Note. Possible answers range from 1-4

Note. Sample size is listed next to response stem

Perceived Value of Professional Development
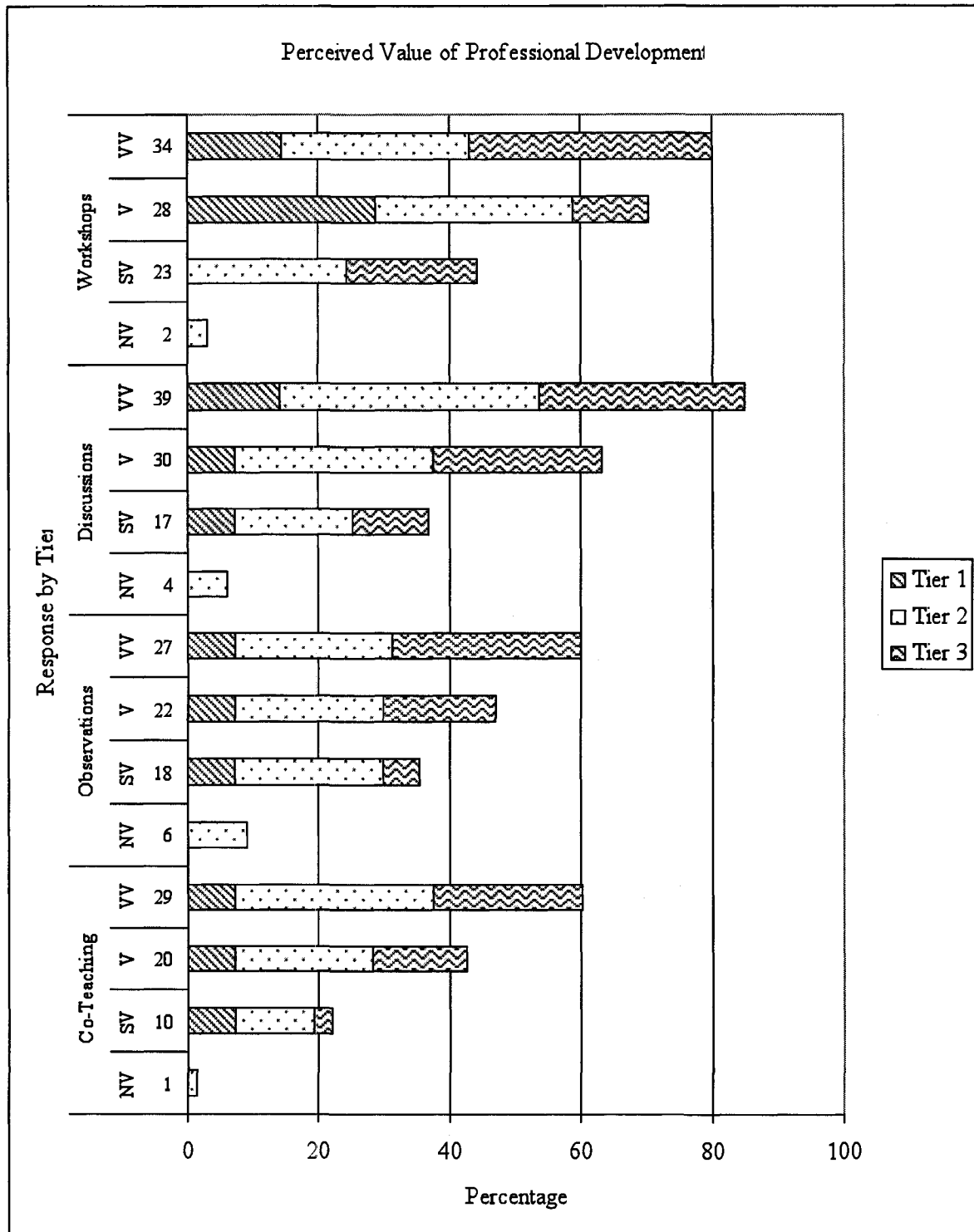
Note. Possible answers range from 1-4

Note. Sample size is listed next to response stem

Focus Group Findings

Focus group participants shared their thoughts about the value of each component of the school-based professional development program at four different time intervals. The themes that emerged during axial coding of the data collected during focus group sessions are: collaborative learning, peer supported learning, teacher in student role, and increased personal knowledge.

Collaborative learning. Teachers participating in all three tiers of the professional development program shared how the power of collaboration during both the content/methods courses and the school-based professional development activities was an avenue for changes in their instruction for all students by increasing their personal knowledge of mathematics content in addition to pedagogy. A common statement among all focus groups by teachers representing all three tiers of participation was

> *I have actually taken what I have learned in classes back to my school and shown them (both students and colleagues).* [TI_F]

Other perspectives related to collaborative learning were

> *What we get is an opportunity to interact with our peers, which allows us to see it from the students' perspective when we ask them to work together.* [TIII_A]

Teachers also shared with the researcher how collaborative learning impacted their instructional practices:

> *The collaboration is important too because I got to see how other teachers would teach content at different grade levels. Also, those who teach at the same grade level are teaching the same concepts but in different ways and we can talk about it. They have wonderful ideas that I can see working in my class.* [TIII_K]

Another teacher [TII_C] shared that opportunities to observe her colleagues teaching lessons during the lesson study component of the professional development program was enlightening for her:

> *I did not want to go into my colleagues classes as I did not want them coming to mine. After the first observation, I found that I was able to find reasons why my students disengage during my lessons. I had to smile at the number of times I saw similar student behaviors, but I had time to think about what the causes of the behaviors were because I was not in the teacher role. I also found great benefit is talking about the lessons with my colleagues because I may not have thought about all the causes for why students disengage from the lesson.*

Peer supported learning. Teachers in both Tiers II and III shared many experiences stemming from their participation in school-based professional development activities with a common resulting theme: peer supported learning. Teachers discussed how lesson study experiences, co-teaching experiences, demonstration teaching experiences, and collaborative planning helped them learn how to design and implement mathematics lessons that were not only engaging a majority of their students during each class, but demonstrated more positive learning outcomes. One teacher [TIII_E] shared the following experience:

> *When the math specialist started planning with us, I thought this was crazy to expect veteran teachers to work with someone to study our lessons and then teach them so our colleagues could watch what we do. I was determined not to teach the lesson. After a couple of planning meetings, I realized that we were bringing all our best ideas to the table. I couldn't believe how many of my colleagues taught fractions with manipulatives. By sharing our favorite methods, we discovered that our students have a favorite way of working with math. You know, they all learn differently – so we need to teach so everyone can learn.*

Teacher in student roles. Another consistent theme with both Tiers I and II teachers was the opportunity to assume the role as student during the summer content/method courses. Multiple Tier I and Tier III teachers shared how the content/methods courses allow them to step into the student perspective and the experience allowed them to see the content from this perspective. Teachers also shared how this vicarious experience built understanding for how

their instructional practices needed to change to meet the needs of the diverse student

populations in their classes.

> *By being students ourselves, we are finding that it helps us learn about them. If we have a problem and we are able to work with a partner and talk it through – we value that peer teacher. As a teacher, I now understand that I need to provide more of these opportunities for my students because that was what I needed.* {TIII_P]

> *I really appreciate the fact that they are during the summer because I can take off my teacher hat and put on my student hat. I then can really put the time I need to into the course to be successful. In a regular semester when you are juggling school responsibilities with course work, you are not as invested in the learning.* [TIII_L]

Increased personal knowledge. Teachers shared how their experiences in the

content/methods courses and professional development activities increased their own content

or pedagogical knowledge about teaching mathematics in inclusive settings. One teacher

shared how the content/methods courses allowed her to greatly increase her mathematics

pedagogical content knowledge.

> *I am a self-taught Geometry student. The things that we are expected to teach our student, I have no idea about what to do. Since I have been in these courses, it is like – oh wow – you can do this or that. Now I understand how to teach it to students. I am no longer figuring it out on my own.* [TI_G]

Another teacher shared how she sought out the courses in order to increase her mathematics

pedagogical content knowledge.

> *I began the courses because I wanted to increase my content knowledge as well as my pedagogical knowledge and I haven't been disappointed at all. I have gotten more content knowledge than I thought I would.* [TIII_R]

Several teachers shared how their experiences with different professional development

activities provided them with learning experiences while implementing their new

pedagogical content knowledge. One teacher [TIII_E] stated,

> *I think that you learn it when you implement it back into the classroom, then you find out how you can better adapt it for your students using manipulatives or other strategies to help them internalize it.*

Summary

Frequency counts for responses to the survey items related to perceived value of each component of the professional development component showed that most teachers regardless of their level of participation rated each component as either valuable or very valuable. Only Tier I teachers found some of the components of professional development not valuable. The three components of professional development that received the highest ratings were the Math Day conference, discussions and dialogues with the Mathematics Specialist, and lesson study.

Teachers shared their mastery and vicarious experiences relative to the value they placed on the components of the professional development program. Each component of the professional development program was discussed by each tier of participants; however, two components received the most attention during the focus groups – content/methods courses and lesson study. Participation in the other components of the professional development program (demonstration lessons, co-teaching, and co-planning) was limited as not all Tier II teachers were presented with these professional development opportunities due to the number of participants in each school building.

During the focus groups teachers participating in all three tiers of the professional development program shared how talking with a knowledgeable mathematics specialist/coach allowed those to further explore how to improve teaching and learning in their classrooms. Teachers also shared that the discussions and/or dialogues were very helpful as they knew the mathematics specialist wanted to support them and their students. These discussions and/or dialogues were also an essential part of each component of the professional development program. Teachers shared how lesson study provided them with

opportunities to share ideas with their colleagues as well as see instruction through another lens.

Question Four

How do teachers perceive changes in their teaching practice based on participation in the professional development program and/or content/methods courses?

The last section of the TMIS survey asked teachers to rate how much change they perceived specific components of the professional development program had on their teaching practices. Teachers responded to questions rating their perception of how their teaching practices changed relative to their participation in each component of the professional development program. Responses range from one meaning no impact to four meaning a great deal of impact. The frequency counts for each of the participants' responses indicated that a majority of participants in all three tiers found the professional development activities either valuable or very valuable if they participated in the specified activities (see Table 15).

Table 15

Impact of professional development on teaching practices
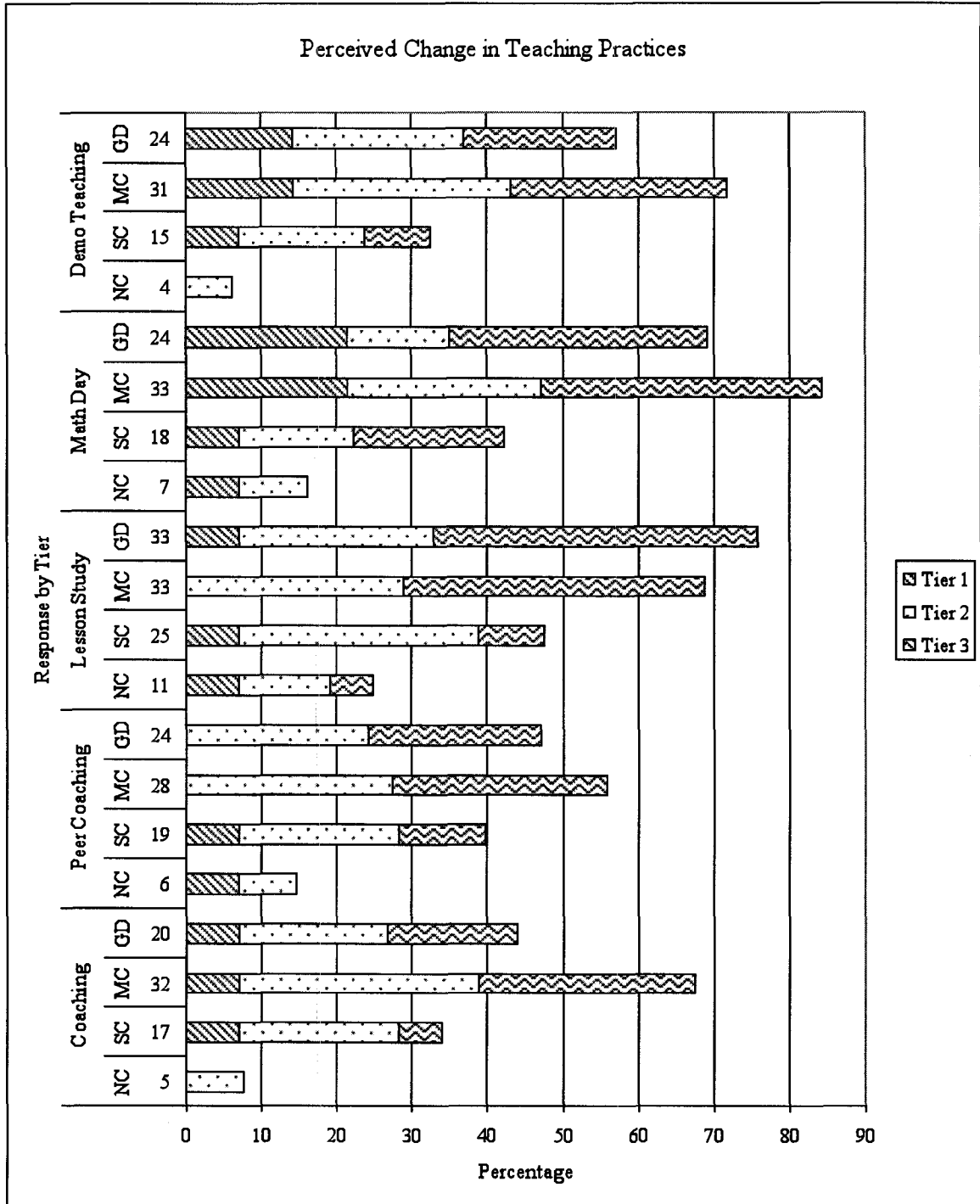
Note. Possible responses range from 1-4

Note. Sample sizes are listed next to response stems

Perceived Change in Teaching Practices
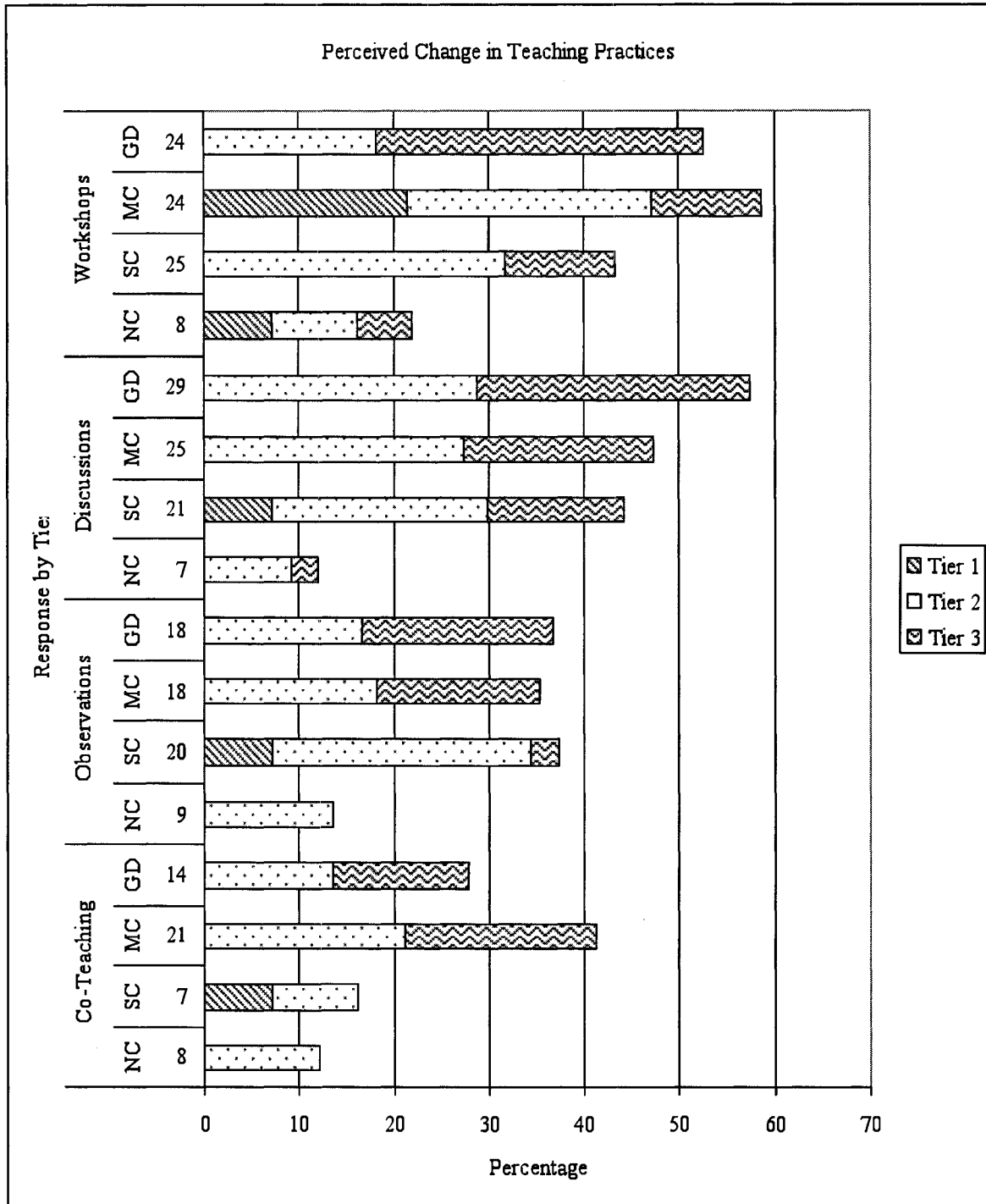
Note. Possible responses range 1-4

Note. Sample size is listed next to response stem

Focus Group Findings

Changes in teaching practices were also discussed during focus group sessions conducted at four time intervals during the course of the intervention. Emergent themes presented by the thoughts, ideas, reflections, and experiences shared by teachers participating in the focus groups were: integration of instructional strategies into teaching practice, changes in instructional methodology, and collegial sharing. Teachers representing all three tiers of participation shared experiences related to how they are integrating the instructional strategies learned during courses and/or professional development activities into their instruction on a consistent basis. Other thoughts shared during the focus group sessions focused on how teachers were changing the way they taught from a traditional direct instruction format to a more student-centered format with teachers facilitating the construction of new knowledge and understanding among diverse student populations. Lastly, another common theme that arose from the focus group discourse was professional sharing where teachers discussed how they took information and new technical pedagogical content knowledge back to their schools and share it with receptive colleagues.

Integration of instructional strategies into teaching practice. Tier II participants shared how experiences related to school-based professional development activities had impact in their teaching practices. Several teachers shared how their experiences of working with a math specialist increased their awareness and understanding of how to integrate research-based instructional strategies to help all their students develop a better understanding of the mathematical content presented during the lesson.

> *I thought I planned and implemented great lessons, but my students were not being successful on the SOL tests. I didn't understand why they didn't get it – they knew what I had taught. By doing lesson study, I found that my lessons did not always present the information so that everyone got it. I learned how to think about lessons*

from the students' point of view to understand how they would make connections to the content. [TII_W]

Teachers in Tiers I and III discussed how the information presented in the content/methods courses was not only valuable and how it impacted their current and future teaching.

> *The different strategies that we have talked about in these classes apply to all my students. I can see the different ways I was actually using them in my classroom. Other applications also of what I was doing – letting me take it to the next level. Even today with the proofs, I am able to say that is very applicable to my kids.* [TIII_F]

Changes in instructional methodology. During the course of the professional development program, general education teachers have been presented opportunities to learn about inclusive practices as well as the technical issues concerning the delivery of special education services in their classrooms. Teachers also shared how their developing special education pedagogical content knowledge (SPECK) will allow them to integrate research-based instructional strategies to meet the learning needs of students with disabilities into their lessons.

> *I looked for better ways to teach my students and now I feel that I have more skills to use to teach all my students. I have been to workshops that don't give you what you need to teach it. Like, now I understand how to use the hands-on Algebra that has been sitting in my closet at school. Now, I can go back and actually be comfortable teaching it.* [TIII_M]

Other examples of teachers reflecting on their developing SPECK:

> *Sort of the same thing. I knew how to use manipulatives from college, but I never implemented them in the classroom. I have discovered more ways to implement them.* [TI_H]

> *Well, I think that before the class I learned you can do this* (informal geometric proofs), *but no real discussion about why it works and how kids thinking is shown.* [TIII_B]

Like the proofs today, I actually knew that $a^2 + b^2 = c^2$, but to actually see that area with the manipulatives that was new to me. I just knew a formula and I knew how to use it. [TIII_Q]

Like even estimating square roots, it is like that makes sense now. It's not just about doing the computations; it is about seeing how it works. [TIII_AA]

There are things that I can interject into the classroom now that are more worthwhile than before and the students will probably hang onto it longer. They can't go to their next class saying we never learned that or I have never seen that before. Now, I know what the next teacher needs. [TII_R]

Collegial sharing. Teachers shared multiple experiences about how they shared their new knowledge and understanding about mathematics instruction with their colleagues. New mathematics pedagogical knowledge that is shared among colleagues through various means of communication may greatly impact the effectiveness of mathematics instruction. One teacher was excited about starting the new school year so that she could share the things she had learned during the summer courses.

I am ready to go back and share what I have learned with other teachers in my building especially about vertical alignment. I want to get them excited too. My goal each year is about how much I can get the word out about the great things to do in math instruction. [TIII_S]

A group of teachers participating in a school-based lesson study shared how the process of evaluating a lesson in a collaborative group was very enlightening as each person was able to share how they taught the concept and which instructional strategies and practices worked best for them or for groups of students.

I found it amazing that we all taught addition of fractions the same way, but only some of us were successful in getting our students to mastery. [TII_F]

Summary

The impact of the components of the professional development program was described in detail by teachers participating at all three tiers. Changes in instructional practices to include

the integration of differentiated instructional strategies to address the learning needs of diverse learning populations were evident during the discussions and dialogues during the focus groups. Teachers shared their new knowledge and understanding related to technical pedagogical content with their peers so that they could also change their teaching practices.

Conclusion

The findings of the quantitative and qualitative analyses showed that mathematics teachers who participated in both content/methods courses and school-based professional development activities demonstrated significant changes their self-efficacy for teaching mathematics in inclusive settings. Teachers participating in just content/method courses or professional development activities also experienced positive changes in their self-efficacy although the changes were not found to be significant. The repeated-measures MANOVA showed that tier of participation was significant between subjects and change scores from pretest to post-test timeframes was also significant.

Changes in teacher beliefs about teaching mathematics in inclusive settings were not significant for all factors or all tiers. Paired samples t-tests showed that Tier I and Tier III teachers experienced significant changes in their beliefs about providing students with disabilities access to the general education curriculum. Additionally, Tier I teachers also showed significant changes in their beliefs about the amount of time invested in providing instruction for students with disabilities in inclusive settings. Beliefs are very stable constructs, which require on-going interventions to effect significant changes in belief systems.

Focus group findings showed the depth and types of changes that occurred among all teachers related to self-efficacy and beliefs about teaching mathematics in inclusive settings.

The shared experiences of teacher allowed for deeper understanding and appreciation of the increases in mathematics pedagogical content knowledge that support changes in teacher self-efficacy and beliefs. Teachers shared many positive mastery and vicarious experiences to validate their self-reported changes on the Teaching Mathematics in Inclusive Settings survey instrument.

Chapter 5
IMPLICATIONS

Introduction

Why is teacher self-efficacy an important construct to explore when examining

general education teachers' beliefs and understanding about inclusive practices? There is a

strong connection between teacher self-efficacy and positive student outcomes (Tschannen-

Moran & Woolfolk Hoy, 2001). If general education teachers had high self-efficacy about

their ability to teach students with disabilities, then students would be more likely to have the

same level of access to the general education curriculum increasing their opportunities to

experience more positive student outcomes on high-stakes tests. The challenge arises to find

what professional development activities or combination of activities will produce significant

changes in teacher self-efficacy in teaching mathematics in inclusive settings.

Changes in Teacher Self-efficacy

Research shows that teacher self-efficacy is a robust construct (Bandura 1986;

Bandura, 1997; Tschannen-Moran & Woolfolk Hoy, 2001; Parajes, 2003). Changes in

teacher self-efficacy occur in small increments over extended periods of time. The focus of

this study was to show how an "optimal mix" of professional development activities could

support essential changes in teacher self-efficacy needed to provide quality instruction in

inclusive settings to meet the learning needs of diverse student populations. The findings of

this study showed that participation in content/methods courses in conjunction with school-

based professional development activities influenced significant changes in teacher self-

efficacy. Teachers experienced increases in their self-efficacy in instructional strategies

(pedagogical knowledge) and adapting instruction for students with disabilities based on their

learning characteristics and mathematics topics.

The Teacher Self-efficacy Scale

The short form of the Teacher Self-efficacy Scale was selected as the 12 questions

provide a clear snapshot of self-efficacy at the time the instrument is completed. Although

the factor analysis in this study produced two factors instead of expected three factors, the

self-reported data provided information relevant to teacher self-efficacy beliefs at the

initiation of the intervention and again at the conclusion of the intervention.

Self-efficacy in classroom management. Teachers participating in all three levels of

the intervention experienced changes in their self-efficacy related to classroom management.

The change scores were not found to be significant in the paired samples t-test; however, the

repeated-measures MANOVA showed that change scores and level of participation was

significant. What factors influenced changes in teacher self-efficacy in classroom

management when none of the components of the professional development program were

designed to support teachers in classroom management issues? Focus group discussions

provided some insight into how teachers connected changes in levels of student engagement

during instruction to their instructional delivery. When students connected with the research-

based instructions strategies, distracting student behaviors decreased allowing teachers and

students to focus on teaching and learning. .

Self-efficacy in instructional strategies. Significant changes in teacher self-efficacy

about instructional strategies occurred for teachers participating in both content/methods

courses and school-based professional development. Teachers participating in either just

courses or professional development also experienced some positive changes in their self-

efficacy in instructional strategies. Tier III teachers not only received modeling of research-

based mathematics instruction during the courses, they also received school-based support

from a mathematics specialist. The mathematics specialist provided opportunities to brainstorm and problem solve with teachers regarding how to effectively integrate the research-based instructional strategies into the instruction.

Support for changing teacher self-efficacy came through co-teaching, demonstration teaching, discussions and dialogues, and lesson study. When teachers see the impact of their selection of instructional strategies on student outcomes, their beliefs about their ability to design and plan effective instruction for diverse student populations change. Teachers participating in all three tiers of the intervention shared their experiences about how student outcomes were more positive when students were engaged during instruction. Student engagement was linked to teachers being able to design lesson that included instructional strategies that met the learning styles of students regardless of their ability level. Teachers also shared how they were also able to differentiate instruction through the incorporation of multiple instructional strategies that met the same lesson objective.

Self-efficacy in Adapting Instruction for Students with Disabilities

It is important for general education teachers to feel comfortable with designing and implementing instruction that allows all students, but especially students with disabilities, access to the general education curriculum. As the focus of education turns to more rigorous curriculums and high-stakes testing, general education teachers need to feel comfortable and confident in their ability to provide instruction for students with diverse learning needs in ways that address their learning styles and motivate them to become engaged in the content. In order for these changes in teaching practices to occur, teachers need instruction in research-based instructional strategies that work for students with disabilities as well as

struggling learners. Another essential component to for the professional development of general education teachers is classroom support by a mathematics specialist.

The mathematics specialist was a non-threatening support for teachers as they begin to integrate new methodologies and strategies into their instruction. As a soundboard and coach, the mathematics specialist may provide insights for teachers as to what is and is not working for each class. Teachers are then able to see that they need to adjust their instruction based on the learning needs of the students rather than follow the same lesson plan for each class during an instructional day. Teacher participating in this study shared how the mathematics specialist either confirmed their own hypotheses about student outcomes or provided them with an opportunity to reflect on alternate methods for presenting content so that students were better able to connect with the presented information.

Teachers also shared how the mathematics specialist supported departmental communication. As the mathematics specialist encouraged teachers to talk about and examine their instructional practices during lesson study, teachers began to realize the power of collegial sharing. When teachers began to focus on how to design instruction so that it was student centered, their self-efficacy related to their ability to provide effective instruction for all students increased. Supported integration of new instructional practices where teachers received constructive feedback about the impact of instruction on student engagement and outcomes also affected teacher self-efficacy.

Learning characteristics. Tier III teachers experienced significant changes in their self-efficacy related to adapting instruction for students with disabilities based on their learning characteristics. The question stems about adaptations ranged from students who have difficulty attending tasks to difficulty with oral communication in mathematics. As part

of the courses, Tier I and Tier III teachers were challenged to integrate mathematics

discourse into their instruction. The professors modeled the power of mathematics discourse

for teachers as well as assigned research articles related to how mathematics discourse

produces more positive student outcomes. Mathematics discourse is an empowering

instructional strategy for both students and teachers as students are provided an opportunity

to articulate their conceptual understanding of content while teachers are able to informally

assess where student progress toward mastery. During focus groups, teachers discussed how

they learned about the power of differentiation of instruction. Tier III teachers shared how

seeing professors demonstrate multiple ways to teach the same content (e.g., equivalent

fractions with fraction strips, fraction circles, and pattern blocks) helped them understand

how to design instruction to meet all levels of learning styles and needs present in their

classrooms. Also, Tier III teachers shared that the mathematics specialists were able to help

them in finding ways to differentiate instruction in addition to what they had learned during

the summer courses. Essentially, teachers participating in all three tiers of the intervention

shared experiences related to their increasing pedagogical knowledge content, including an

increased understanding of special education services.

Mathematics topics. Similar experiences were shared by Tier III teachers related to

their increased pedagogical content knowledge in adapting instruction for students with

disabilities based on specific mathematics topics. While teachers in all three tiers of

participation experienced changes in their self-efficacy in adapting instruction for students

with disabilities based on topics of mathematics, Tier I and II teachers did not experience

statistically significant changes. Change scores for Tier II teachers were not as large as the

change scores for Tiers I and III. Is it possible that the focus of courses on developing

stronger pedagogical content knowledge was the influential factor? Teachers only receiving school-based professional development were not exposed to instruction in content and methods that focused on differentiation, learning styles, the intersection of conceptual and procedural knowledge, and research-based instructional strategies.

The experiences that teachers from Tiers I and III shared during focus group session show that they believe they are better able to design and implement instruction for all students in their classes, even students with disabilities. Teachers shared how they learned the specifics of how to differentiate instruction to align instruction not only with the learning needs of their students, but also their learning styles. Another common theme among focus group data was a change in instructional focus from teacher-directed instruction to more student-centered instruction. Changes in teacher understanding about the learning needs of students as well as increases in their pedagogical content knowledge may allow students greater access to the general education curriculum. This improved level of access to grade-level content may positively increase student outcomes.

Conclusion

Bandura (1977) described four sources of personal efficacy: performance accomplishments, vicarious experiences, verbal persuasions, and emotional arousals. Performance accomplishments demonstrate the greatest potential for raising self-efficacy beliefs as they directly involve the successful completion of individual task. The findings supporting changes in teacher self-efficacy in this study are directly related to performance accomplishments. These accomplishments were supported by colleagues, professors, and mathematics specialists. Teachers participating at all three levels shared how their personal learning increased during their experiences with the program.

Vicarious experiences impact self-efficacy when an individual observes someone else completing a task with success, believing that they too can be successful at completing the same task. Lesson study was one activity that allowed Tier II and III teachers to learn through the experiences of their colleagues. As part of the lesson study cycle, teachers observed each other present a lesson. During the observation periods, teachers recorded data about student engagement and reaction to instruction. Verbal persuasion allows an individual to overcome doubt when others express their beliefs in the individual's ability to achieve a goal or complete a task. Again, teachers shared how conversations, discussions, and dialogues with their peers during courses allowed them to see other ways of approaching the content. Peer supported learning was a strong theme during focus group sessions.

Emotional arousal employs the individual's anxiety, steering the individual away from a feeling of avoidance. If the task is not successfully completed, the individual's self-efficacy will be further influenced in a negative manner (Bandura, 1977, 1986, 1997; Smylie, 1990). Self-efficacy increases with repeated successful tasks just as a decrease will occur when failure is experienced after the non-completion of several tasks (Lewandowski, 2005). Teachers participating in this study shared they felt less anxiety about incorporating the research-based strategies they learned. A common rationale was the availability of colleagues and mathematics specialists to brainstorm how to overcome contextual roadblocks or to find instructional strategies that matched the learning needs of their students. Essentially, the experiences of teachers during the course of the professional development program aligned with the four sources of self-efficacy.

Teacher Beliefs about Inclusion

Changes in Teacher Beliefs Teaching in Inclusive Settings

The findings of the beliefs section of the TMIS survey was a bit surprising as few

significant changes occurred among the five factors measured by the instrument. Tier II

teachers did not experience any statistically significant changes in their beliefs about teaching

mathematics in inclusive settings. Even though general educators believe in inclusive

practices to allow students with disabilities access to the general education curriculum, they

also believe that the practice of inclusion is not feasible due to factors that impact their ability

to provide special education services in the general education setting. This sentiment was

echoed through the focus group sessions as teachers representing all three levels of

participation discussed the variety of contextual roadblocks that prevented them from

integrating more equitable practices. A common theme among the shared roadblocks was

lack of administrative support and understanding regarding the essentials for creating an

environment where all students are learning.

The main responsibility for the implementation of inclusive practices lies with

general education teachers (Smith & Smith, 2000). Teachers participating in this study

demonstrated that when general education teachers are presented with opportunities to

increase their special education pedagogical content knowledge (SPECK); they are more

likely to design and implement differentiated, student-centered instruction that meets the

learning needs of diverse student populations. Research has linked teachers' instructional

practices, as well as their attitudes regarding student learning, with student achievement and

performance including the relationship with inclusive education (Garvar-Pinhas &

Schmelkin, 1989; Larrivee & Cook, 1979). Instructional practices are also connected to

beliefs about learning, disability, and perception of available resources especially time

(Scruggs & Mastropieri, 1996).

Access to the General Education Curriculum

Research conducted by Bender et al. (1995), in addition to Gibson & Dembo (1984),

demonstrated that attitudes, beliefs, and knowledge related to inclusion impacted teacher

decisions about which inclusive instructional strategies would provide the greatest level of

access for students with disabilities to the general education curriculum. The findings related

to access to the general education curriculum demonstrated that there was a statistically

significant difference between the change scores for Tier II and Tier III teachers. It is

possible that teachers participating in Tier III participated in more collegial conversations

with special education teachers? Another factor may be more positive personal experiences

with inclusion. Surprisingly, none of the change scores among tiers were statistically

significant. As access to the general education curriculum is the first step in providing an

equitable education for all students, teacher beliefs need to be more positive. The question

now becomes which types of professional development opportunities allow teachers to

experience changes in their beliefs in this area.

Teacher Preparation Programs

Most teacher preparation programs for general educators do not include courses that

provide opportunities for teachers to learn specifics about the field of special education.

Teachers participating in this study shared how they desired to know more about the delivery

of special education services, especially how inclusion worked and its specific purpose. The

findings of this study did not showed any statistically significant results about teacher

preparation programs and their impact on teacher beliefs about inclusion.

Instructional Logistics

Stipek and colleagues (2001) argued that teachers should shift their beliefs to align more with NCTM standards, which advocate an "inquiry-oriented" or "constructivist" approach to mathematics instruction. His findings also suggested that teachers should adopt beliefs that inspire them to "give up some of their control over mathematical activity and allow students to initiate their own strategies to solve problem and grapple with contradictions" (p. 215). This perspective was supported by changes in teacher self-efficacy in adapting instruction; however, teacher beliefs related to the logistics of instruction (e.g., General education teachers are comfortable team teaching mathematics with special education teachers.) did not show significant changes. Perhaps, general education teachers may experience more positive changes when they receive more consistent support from administrators and/or a mathematics specialist in understanding the technicalities of special education delivery. Both members of a collaborative teaching team need to be supported as they develop a collegial relationship and learn to share their expertise with each other.

Role of the General Educator in Inclusive Education

The source of doubt and insecurity rest in the general educator's lack of understanding related to teacher roles and responsibilities in the inclusion classroom (Janney, Snell, Beers, & Raynes, 1995). We know "less about their role in inclusion than we do about any of the other participants involved" (Smith & Smith, 2000, p. 162). What are the primary responsibilities of the general educator in an inclusive setting? Do instructional leaders understand how to support both members of the collaborative teaching team? It is essential for both teachers to have on-going support as they learn how to work together to provide quality instruction for all students in an inclusive setting. Statistically significant changes

occurred among Tier I and III teachers' beliefs about the role of general educator in inclusive education. These changes in teacher beliefs may be the catalyst for developing a strong collegial relationship, which may be the key for creating a positive teaching and learning environment.

Time Issues in Inclusive Practices

Time is a consistent issue in education. So, it is not surprising that time issues also arise with regard to inclusive practices. Tier I teachers experienced a statistically significant change in their beliefs about issues involving time. Tier II teachers did not experience much change in their beliefs. The experiences they shared during the focus group sessions focused on how administrators did not support time for collaborative teams to plan collectively as special education teachers were continually pulled from classes and meetings for other responsibilities, such as Individual Education Plan (IEP) meetings. Focus group data did not reveal which factor(s) attributed to the significant changes for Tier I teachers. It is possible that teachers in Tier I saw that time was no longer an issue as they did not encounter as many contextual roadblock when implementing their new special education pedagogical content knowledge.

Professional Development Program

Finding the Optimal Mix

The professional development program that was the intervention in this study was visionary in its design and implementation. The project was design so that teachers could develop a stronger pedagogical content knowledge through rigorous content/methods courses. The courses were designed to include multiple opportunities for teachers to interact and connect with the content in ways that aligned with their learning styles. Rigor was a key

component of the courses as to allow teachers to experience how their students struggle with content.

School-based professional development activities were designed to provide consistent, on-going support for teachers. The essential ingredient of these opportunities was discussions. Teachers were provided multiple opportunities to talk either in collective or individual situations with a mathematics specialist. Co-teaching and demonstration teaching activities guided by a mathematics specialist allowed teachers to debrief and reflect on what was working and not working as they learned to integrate research-based strategies. The integration of these strategies created learning environments where students were the focus and teachers supported students as they worked toward conceptual and procedural mastery of mathematics content.

Both components of the professional development program were designed based on research on effective professional development, which is not reflective of traditional views of professional development. Traditionally, teachers participate in workshops, conferences, in-services, and other modes of professional development that were snapshots of new teaching methodologies. On-going, school-based support is a rare component of traditional professional development. This program was designed with the knowledge and understanding that teachers learn best through active involvement and reflection then being able to discuss and share what they have learned. "Processes, practices, and policies built on this view of learning are at the heart of a more expanded view of teacher development that encourages teachers to involve themselves as learners – in much the same way as they which their students would" (Lieberman, 1995, p. 591). Another perspective is that learning is "a self-regulated process of resolving inner cognitive conflicts that often become apparent

through concrete experience, collaborative discourse, and reflection" (Fosnot, 1993, p. 52).

In other words, vital knowledge and understanding are learner centered in addition to being

constructed through collaboration and reflection about personal experience. Bridges (1992)

popularized problem-based learning argued that learning is most effective when the learner is

actively involved in the learning process, when it takes place as a collaborative rather than an

isolated activity and in a context relevant to the learner. This dialectic and cyclical process is

comprised of four distinct stages: experience, observation, and reflection, abstract

reconceptualization, and experimentation (Kolb, 1984)

Teacher Perceptions of Professional Development

Results of the professional development section of the TMIS survey showed that

teachers in all three tiers rated all components of the professional development activities as

valuable or very valuable. Additionally, they also rated perceived changes in their teaching

practices based on the components of the professional development programs as "a great deal

of change" and "moderate change". Teacher responses showed that certain components were

rated very high in both their value and their effect on changes in teaching practices. These

components were: lesson study, the Math Day conference, discussions with the mathematics

specialist, and demonstration teaching.

Focus group findings related to professional development showed that teachers

participating in all three tiers found certain components more engaging and beneficial. The

Math Day conference is designed as a showcase for teacher-created lessons. Teachers shared

how this conference was unique compared to others they attended as they were not only

attendees, they were presenters. This unique opportunity allowed teachers to share their

growing mathematics knowledge for teaching with other teachers who were not necessarily

their colleagues. Tier II teachers were not presenters at the conference, but may have been attendees at the conference. Several Tier III teachers shared that they also presented their lesson to their peers at school.

Demonstration teaching and discussions with a mathematics specialists received very similar ratings. Both components supported teachers as they learn to integrate research-based instructional strategies into their teaching practices. Teachers shared how demonstration teaching allowed them to see how a new methodology, such as using fraction strips to teach addition of fractions, should work within the contextual of their classroom. They also shared how it was helpful to see how another teacher handled student questions and misconceptions. Discussions with a mathematics specialist provided teachers with opportunities to debrief and reflect on components of lessons that worked or needed improving without feeling their teaching was being continually evaluated.

<center>Limitations</center>

As the purpose of this study was to measure changes in teachers' sense of self-efficacy and beliefs about teaching mathematics in inclusive settings, the Teaching Mathematics in Inclusive Settings survey instrument did not include questions related to the general education teachers' prior knowledge of special education. Participants who registered for the content/methods courses had to complete an application process to be accepted into the courses. Information related to the number of special education and/or collaboration courses could have been accessed through a transcript examination. The information for tier two participants (professional development only) was not readily available to the researcher unless it was included in the demographics section of the survey.

Another limitation of the TMIS survey instrument is the use of the terms "confident" or "comfortable" to describe how teachers feel about adapting instruction for students with disabilities based on their learning characteristics or mathematical topics. A participant may rate themselves differently depending on their definition or interpretation of either term – confident or comfortable. The term, confident, implies that a teacher is certain, without doubt, that they are able to effectively adapt instruction for students with disabilities. Additionally, the term, comfortable, implies that a teacher is free from stress or tension while adapting instruction for students with disabilities. When used in the context of teacher self-efficacy, the term, comfortable, closely aligns with Bandura's notion of stress reduction. If general education teachers feel comfortable about adapting instruction for students with disabilities in their inclusive classrooms, then they may consistently differentiate instruction to meet the learning needs of students with disabilities in their classes. Conversely, the term, confident, strongly suggests that general educators' sense of self-efficacy is more aligned with their mastery and/or vicarious experiences. It is the researcher's belief that one must first be comfortable with new technical pedagogical content understanding before changes, either small or large, can occur in teaching practices. Confidence in one's ability to adapt instruction to meet the diverse learning needs present in any classroom comes after one has experienced some measure of success in the initial stages of changing teaching methodologies.

For the purpose of this research study, inclusive settings was defined as learning environment where students with disabilities have access to the general education curriculum while interacting with their non-disabled peers in a general education classroom (Stainback & Stainback, 1996). The term, inclusive settings, may have a variety of connotations for

participating teachers at any tier of participation as it was not defined specifically for them

unless they participated in the collaboration course, which was part of the professional

development program. A lack of shared meaning may also exist for professional

development workshop leading to an over or under reporting of the number of workshops

general education teachers previously attended before participating in the study.

Another consideration is the level of coercion or choice present to influence teacher

participation in the professional development program at any tier of the study. Teachers may

have been requested to participate by their administrator while other teachers may have felt

strong peer pressure to participate. Another motive for general education teachers to

participate in the study may have been to earn re-certification points without additional

personal monetary investment in addition to the number of resources (e.g., manipulatives,

books, and teaching tools) that were provided at no additional cost to each participant.

<center>Suggestions for Further Research</center>

Each section of the survey instrument used to collect data regarding teacher efficacy

and beliefs related to teaching mathematics in inclusive settings was either adapted or created

to collect data pertinent to answering the questions posed by this research study. An

extensive review of the survey instrument by the dissertation committee revealed that the

survey would benefit from the addition of a section to address teacher self-efficacy related to

adapting instruction by learning characteristics of students and mathematics topics for

students without disabilities. This addition to the Teaching Mathematics in Inclusive Settings

survey instrument would allow a comparison of teacher self-efficacy in delivering instruction

in inclusive settings for students with and without disabilities. This comparison is essential in

designing an optimal professional development program to support general education

teachers in increasing their knowledge and understanding of how to differentiate instruction for all learners.

A need is also present to explore the connection between a teacher's level of math anxiety and their sense of self-efficacy in teaching mathematics. During the course of this study, several general educators shared that with as the need to increase the rigor of mathematics courses at all grade levels has increased their level of anxiety as they do not feel proficient with all strands and levels of mathematics. Math anxiety may have a positive or negative effect on a teacher's sense of self-efficacy which may further impede their ability to increase the mathematical pedagogical content knowledge. The impact of this disconnect needs to be examined to determine the impact of mathematics instruction for all student populations.

Also, further exploration needs to be done related to the impact of teacher empathy on their self-efficacy in teaching mathematics to diverse populations of learners. If teachers are able to gain a student perspective in learning content, are they better able to design lessons that allow students to not only access the content, but to also successfully master the content information? Understanding the connection between teacher empathy for students and teacher self-efficacy may assist instructional leaders in designing professional development activities where teachers may gain insight and understanding into the student struggles in learning new and abstract content.

<div align="center">Conclusion</div>

Instructional leaders need to be cognizant of the power of contextually based professional development activities and/or programs. When teachers are presented with the opportunity to work in a professional learning community, they begin to value the power of

collaboration not only with the colleagues, but also with their students. An optimal environment for professional development opportunities is needed so that teachers are consistently supported as they develop their technical and mathematical pedagogical knowledge. The knowledge of a domain, such as mathematics and/or special education, differs from feelings about the same domain, a distinction similar to that between beliefs and sense of self-efficacy. Teachers often teach the mathematics content in inclusive settings according to the values held for the content itself. As with self-efficacy beliefs (Bandura, 1986), this mixture of affect and evaluation can determine the amount of energy that teachers will expend and how they will expend it with regards to instruction (Pajares, 1992).

When general educators are provided opportunities to learn about the specifics of special education as well as instructional practices that work for students with disabilities in the mathematics classroom, their beliefs become more positive and their sense of self-efficacy increases. As a result, general educators provide students with disabilities access to the general education curriculum thus providing greater opportunity for more positive student outcomes. The alignment of the components of a professional development program is crucial in order to produce contextually rich experiences for teachers related to teaching mathematics to students with disabilities.

Finally, when general education teachers believe they possess the essential knowledge and skills to provide effective instruction for students with disabilities in inclusive settings, the instruction delivered to all students in the inclusive setting is not only conceptually rich, but also designed to allow students to experience success in learning mathematics. Armed with a high sense of self-efficacy, general education teachers providing instruction in inclusive settings are aware of what is needed to differentiate instruction to

meet the learning needs of all students. When teachers believe that they can teach students with disabilities, they can. When teachers understand the student perspective, their acquired sense of empathy appears to lead to an increased sense of self-efficacy for teaching mathematics to students with disabilities. Increased teacher self-efficacy may lead to significant positive changes in beliefs about teaching students with disabilities in inclusive settings. When teachers' learning needs are met during professional development, they are then more capable of meeting the learning needs of their students.

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Appendix A

Teaching Mathematics in Inclusive Settings

There are no correct or incorrect answers. This questionnaire is designed to help us gain a better understanding of the kinds of things that create challenges for teachers. Your responses will remain confidential.

INSTRUCTIONS: Please indicate your personal opinion about each statement by circling the appropriate response at the right of each statement ranging from (1) "none at all" to (9) "a great deal" as each represents a degree on the continuum.

Please respond to each of the questions by considering the combination of your *current* ability, resources, and opportunity to do each of the following in your present position.

		None At All		Very Little		Strong Degree		Quite A Bit		A Great Deal
1.	To what extent can you control disruptive behavior in the mathematics classroom?	1	2	3	4	5	6	7	8	9
2.	To what extent can you motivate students who show low interest in mathematics?	1	2	3	4	5	6	7	8	9
3.	To what extent can you calm a student who is disruptive or noisy in the mathematics classrooms?	1	2	3	4	5	6	7	8	9
4.	To what extent can you help your students value learning mathematics?	1	2	3	4	5	6	7	8	9
5.	To what extent can you craft good questions for your students related to mathematics?	1	2	3	4	5	6	7	8	9
6.	To what extent can you get children to follow classroom rules?	1	2	3	4	5	6	7	8	9
7.	To what extent can you get students to believe they can do well in mathematics?	1	2	3	4	5	6	7	8	9
8.	How well can you establish a classroom management system with each group of students?	1	2	3	4	5	6	7	8	9
9.	To what extent can you use a variety of assessment strategies in mathematics?	1	2	3	4	5	6	7	8	9
10.	To what extent can you provide an alternative explanation or example when students are confused?	1	2	3	4	5	6	7	8	9
11.	How well can you assist families in helping their children do well in mathematics?	1	2	3	4	5	6	7	8	9
12.	How well can you implement alternative teaching strategies for mathematics in your classroom?	1	2	3	4	5	6	7	8	9

Adapted from Tschannen-Moran & Hoy, 1998
Used with permission from Dr. Megan Tschannen-Moran (2007)

Appendix B

Teaching Mathematics in Inclusive Settings

A number of statements about organizations, people, and teaching are presented below. The purpose is to gather information regarding the actual attitudes of educators concerning these statements. There are no correct or incorrect answers. This questionnaire is designed to help us gain a better understanding of the kinds of things that create challenges for teachers. Your responses will remain confidential.

Part I:

KEY: 1=Strongly Disagree   2=Moderately Disagree   3=Disagree slightly more than Agree
4=Agree slightly more than Disagree   5=Moderately Agree   6=Strongly Agree

		SD	MD	DS	AS	MA	SA
13.	Students with disabilities should be afforded every opportunity to learn mathematics with general education students.	1	2	3	4	5	6
14.	Students with disabilities are best taught mathematics in inclusive settings.	1	2	3	4	5	6
15.	Students with disabilities who are taught mathematics in inclusive settings will have a better chance succeeding in society than students taught in self-contained or resource settings.	1	2	3	4	5	6
16.	Students with disabilities cause the most behavioral problems in inclusive settings during mathematics instruction.	1	2	3	4	5	6
17.	In inclusive mathematics classrooms, general education teachers often are the primary ones responsible for modifying instruction for students with disabilities.	1	2	3	4	5	6
18.	In inclusive mathematics classrooms, general education teachers have the major responsibility of ensuring that students with disabilities succeed academically.	1	2	3	4	5	6
19.	In inclusive mathematics classrooms, students with disabilities require more time from teachers than general education students.	1	2	3	4	5	6
20.	General education teachers are given sufficient time to prepare to teach mathematics in inclusive settings.	1	2	3	4	5	6
21.	General education teachers are comfortable team teaching mathematics with special education teachers.	1	2	3	4	5	6
22.	For the most part, middle schools are effectively implementing inclusive programs.	1	2	3	4	5	6
23.	Resource rooms are effective in meeting the mathematics learning needs of students with disabilities.	1	2	3	4	5	6
24.	Teacher education programs help general education teachers to develop an instructional philosophy related to teaching mathematics to students with disabilities.	1	2	3	4	5	6
25.	Teacher education programs offer specific information about the characteristics and needs of students with disabilities in mathematics learning.	1	2	3	4	5	6
26.	Teacher education programs offer specific instructional strategies for teaching mathematics to students with disabilities.	1	2	3	4	5	6

Part II:

How comfortable do you feel in your ability to adapt your instruction for students with disabilities who have the following learning characteristics?

		Not Comfortable	Somewhat Comfortable	Quite Comfortable	Very Comfortable
27.	Difficulty attending to tasks	1	2	3	4
28.	Difficulty maintaining attention for the class period	1	2	3	4
29.	Difficulty keeping place on a page in the text or workbook	1	2	3	4
30.	Difficulty correctly identifying symbols or numerals	1	2	3	4
31.	Difficulty using a number line	1	2	3	4
32.	Difficulty reading math facts	1	2	3	4
33.	Difficulty with following a sequence of steps to find a solution	1	2	3	4
34.	Difficulty with memory of given information in word problems	1	2	3	4
35.	Difficulty with oral communication in mathematics	1	2	3	4
36.	Difficulty with written communication in mathematics	1	2	3	4
37.	Difficulty interpreting pictures and diagrams	1	2	3	4

How comfortable do you feel in your ability to adapt your instruction in the following topics for students with disabilities?

		Not Comfortable	Somewhat Comfortable	Quite Comfortable	Very Comfortable
38.	Reading and writing integers, rational and irrational numbers	1	2	3	4
39.	Describing equivalence of fractions, decimals, and percents	1	2	3	4
40.	Performing arithmetic operations on decimals and fractions	1	2	3	4
41.	Solving one- and two-step arithmetic word problems	1	2	3	4
42.	Understanding inverse relationships between x and $\div$, roots and exponents	1	2	3	4
43.	Constructing scale drawings	1	2	3	4
44.	Locating points on a coordinate plane	1	2	3	4
45.	Interpreting line and bar graphs	1	2	3	4
46.	Using compasses, rulers, and protractors	1	2	3	4
47.	Understanding square and cubic units	1	2	3	4
48.	Measuring size, quantity, and capacity	1	2	3	4
49.	Using graphing calculators	1	2	3	4
50.	Using computer spreadsheets	1	2	3	4
51.	Using estimation as a problem-solving strategy	1	2	3	4
52.	Identifying, describing, and creating patterns	1	2	3	4
53.	Solving one- and two-step equations	1	2	3	4
54.	Using different representations to describe a functional relationship	1	2	3	4
	Adapted from DeSimone, 2004; Used with Permission from Dr. Janet DeSimone (2007)				

Part III:

Rate each of the following professional development activities and courses based on their value.

		Did Not Participate	Not Valuable	Somewhat Valuable	Valuable	Very Valuable
55.	Coaching from mathematics specialist	0	1	2	3	4
56.	Peer coaching	0	1	2	3	4
57.	Lesson study	0	1	2	3	4
58.	Math Day conference	0	1	2	3	4
59.	Demonstration teaching	0	1	2	3	4
60.	Co-teaching with mathematics specialist	0	1	2	3	4
61.	Classroom observations by mathematics specialist	0	1	2	3	4
62.	Discussions and dialogues with mathematics specialist	0	1	2	3	4
63.	On-site workshops	0	1	2	3	4
64.	Courses	0	1	2	3	4
	a. Number and Number Sense	0	1	2	3	4
	b. Probability and Statistics	0	1	2	3	4
	c. Geometry and Measurement	0	1	2	3	4
	d. Algebra	0	1	2	3	4
	e. Rational Numbers	0	1	2	3	4

Part IV:

To what extent did these professional development activities and courses impact your teaching practices?

		Did Not Participate	No Change	Some Change	Moderate Change	A Great Deal
65.	Coaching from mathematics specialist	0	1	2	3	4
66.	Peer coaching	0	1	2	3	4
67.	Lesson study	0	1	2	3	4
68.	Math Day conference	0	1	2	3	4
69.	Demonstration teaching	0	1	2	3	4
70.	Co-teaching with mathematics specialist	0	1	2	3	4
71.	Classroom observations by mathematics specialist	0	1	2	3	4
72.	Discussions and dialogues with mathematics specialist	0	1	2	3	4
73.	On-site workshops	0	1	2	3	4
74.	Courses	0	1	2	3	4
	a. Number and Number Sense	0	1	2	3	4
	b. Probability and Statistics	0	1	2	3	4
	c. Geometry and Measurement	0	1	2	3	4
	d. Algebra	0	1	2	3	4
	e. Rational Numbers	0	1	2	3	4

Aerni, P (2008)

Part V: Background Information (*Please circle your answers.*)

1) Number of years teaching:

    1-2   3-8   9-14   more than 15

2) Number of years teaching in an inclusive classroom:

    1-2   3-5   6-10   more than 10

3) Gender: Male   Female

4) Type of school where you teach: *(please circle all that apply)*

    Urban   Suburban   Rural   Private   Public

5) Number of students in your school:

    1-200   201-500   501-800   801-1100   More than 1100

6) Average number of students in your inclusive classes:

    Less than 15   15-20   21-25   26-30   31-35

7) The number of professional development workshops related to teaching students with learning disabilities in which I have participated:

    0-2   3-4   5-6   7-9 10 or more

8) The following best describes my level of education:

    Completed bachelor's degree

    Pursuing master's degree

    Completed master's degree

    Pursuing professional diploma

    Completed professional diploma

    Pursuing doctoral degree

    Completed doctoral degree

9) In your undergraduate or graduate program, have you taken any mathematics teaching methods courses? If yes, how many?

    Yes (number of courses _____)   No

10) Certifications held: *(please circle all that apply)*

    Elementary education

    Secondary education

    Special education

    Other (name) _____

Appendix C

Tiers of Participation in the Professional Development Program

Tier I	Teachers participating at this level of intervention only took the content/methods courses during the summer of 2007 and 2008. There were four special education teachers that participated in the courses, but were not included in this study.
Tier II	Teachers participating in just the school-based professional development activities were classified as Tier II. At a few of the participating schools, special education teachers participated in the professional development activities, but they did not complete the Teaching Mathematics in Inclusive Settings survey nor did that participate in the focus group sessions. Of the 66 teachers participating in Tier II, an additional 8 special education teachers participated with their colleagues in the professional development activities.
Tier III	Teachers comprising this level of participation participated in both the content/methods courses and the professional development activities. No special education teachers were included in this tier of participation.

Appendix D

Descriptions of Professional Development Components

Content/Methods Courses	A total of five courses were offered to Tier I and Tier III teachers. The courses were taught by faculty members of The College of William and Mary representing both the mathematics education and mathematics departments. Each course was designed as an intensive two-week course where participants would receive 3 graduate credits. The courses were designed to introduce content to students through multiple methods while supporting students in integrating the methods into their own assignments.
Coaching from Mathematics Specialist	The Tidewater Team for Improving Middle School Mathematics provided for a Mathematics Specialist to support mathematics teachers in schools where at least two mathematics teachers were participating in the content/methods courses. One main responsibility of the Mathematics Specialist was to visit schools on a regular basis to support teachers as they began to integrate the research-based instructional strategies presented in the courses. Teachers who did not participate in the content/methods courses were exposed to the research-based instructional strategies and encouraged to integrate them in their instructional practices.
Peer Coaching	Peer coaching allowed teachers who were participating in the content/methods courses to share their new knowledge with their colleagues. Teachers were encouraged to visit their colleagues' classrooms to observe how they teach specific content or incorporate specific instructional strategies. Teachers were also encouraged to share their reflections with each other.
Lesson Study	The Mathematics Specialist introduced the process of lesson study based on the Japanese model to each school participating in the school-based professional development program. Teachers in Tiers II and III participated in two cycles of lesson study focusing on how to differentiate instruction while integrating the more student-centered instruction.

Math Day Conference	The Math Day Conference is held each year and sponsored by The College of William and Mary to showcase lessons created by teachers participating in the content/methods courses. Lesson creation is a requirement of the courses and this conference allows teachers to work in collaborative groups to present a lesson that they designed incorporating the new knowledge and understanding gained during their participation in the courses.
Demonstration Teaching	The Mathematics Specialist taught lessons when requested to show teachers how to use manipulatives or other resources to present content to students. The goal of demonstration teaching was to show teachers how to incorporate resources to increase student engagement.
Co-Teaching with Mathematics Specialist	The Mathematics Specialist also co-taught lessons with teachers. Co-planning sessions for teachers and Mathematics Specialist were held prior to the co-teaching sessions in order for both teachers to design and plan for their roles and responsibilities for carrying out research-based instruction. The purpose of co-teaching was to share instructional delivery roles and responsibilities to support teachers in their attempts to implement new instructional practices.
Classroom Observations	Classroom observations conducted by the Mathematics Specialist were not evaluative in nature. The observations were conducted to collect data for the teacher. Data collection was focused on student mastery, student engagement, implementation of instructional strategies, and student outcomes.
Discussions and Dialogues	The Mathematics Specialist provided multiple opportunities for teachers to share their thoughts, feelings, ideas, and concerns during their support visits to the schools participating in the study. These supportive conversations were also a component of the other professional development activities.
On-site Workshops	Some schools participating in the study provided opportunities for the Mathematics Specialist to provide workshops that expanded on the concepts and content presented in the courses as well as topics that teachers requested further assistance.

Appendix E

Focus Group Protocol
July 2007 and August 2008

Leader: Dr. John McLaughlin, program evaluator

Assistant: Pamela Aerni, doctoral candidate

Four sessions with 8 participants

Time allotment: 20-30 minutes

Questions:

1. Reflect back on your affiliation with the math project – think of a defining moment, when you were really energized, when you really new you had made a good decision to participate. Write about that moment – what were you doing, how were you feeling?

2. Looking back again to when you started the program and looking at you now – how have you changed – what new knowledge or skills do you have?

    a. Why are these important? What will they lead to?

3. How would you rate the project thus far with respect to giving you new knowledge or skill you will be able to use? 1-10?

4. Considering the ways you have changed, what aspects of the project lead to these changes? What about the program really worked for you? How would you rate the quality of the program using a 10-point scale?

5. How has your self-efficacy changed with regard to mathematics instruction? What about teaching students with diverse learning needs?

6. What concerns you most, right now, about your participation in this project?

7. How would you rate the project thus far using a 10-point scale?

Focus Group Protocol
February 2008

Leader: Dr. John McLaughlin, program evaluator

Assistant: Melinda Griffin, mathematics specialist

Three sessions with 10-12 participants

Time allotment: 20-30 minutes

Questions:

1. Thinking about your participation in this project. I want you to talk to me a little bit about what value does it add to you as a teacher?

2. Talk to me about what value it adds for your students?

3. How does that actually transfer into your instruction?

4. How does that change you as a teacher?

5. Are you noticing differences in how you provide instruction for the range of abilities among students in your classes?

Focus Group Protocol
May 2008

Leader: Pamela Aerni, researcher and mathematics specialist

Three sessions with 8-10 participants

Time allotment: 45-60 minutes

Questions:

1. Describe your experience with the professional development activities provided to you this year in teaching mathematics.

2. What experiences were most valuable to you during the school year?

3. What impact did these experiences have on your teaching practices?

4. Tell me about how your teaching practices have changed over the course of the year.

5. Describe how your teaching has changed in your inclusive classes?

6. How do you design instruction for students in your inclusive classes?

7. What is the most significant change that you have experienced this year?