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The Effects of Intentional Teacher Professional Development in Response to Intervention on Teachers' Knowledge and Self-Efficacy

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THE EFFECTS OF INTENTIONAL TEACHER PROFESSIONAL DEVELOPMENT IN RESPONSE TO INTERVENTION ON TEACHERS' KNOWLEDGE AND SELF-EFFICACY

by

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ABSTRACT
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This study was designed to address a crucial organizational construct for implementation of Response to Intervention (RTI), ongoing teacher professional development, by examining its effect on teacher knowledge and self-efficacy. Twenty-five teachers from rural Illinois participated and were randomly assigned to either receive a 10-week professional development course in RTI or a single after-school condensed training session. The teachers completed self-report measures of knowledge and self-efficacy in RTI prior to their first instruction and 1 week following the end of their instruction. A mixed ANOVA analysis was used for comparison of the two groups from pre- to post-test and showed significantly greater improvements in knowledge and self-efficacy for the ongoing professional development group when compared to the single after-school session professional development participants. Assumptions of homogeneity of variances were not met for the self-efficacy analysis which may have compromised the results. The teachers receiving the 10-week course were assigned homework assignments with the aim of deepening their understanding and application of their learned knowledge. The relationship between the homework assignment grades and improvement in knowledge and between homework assignment grades and improvement in self-efficacy gains were

non-significant. The results from this study support the need for ongoing professional development when implementing RTI and demonstrate the benefits of intentional and ongoing training on teacher outcomes especially in comparison to single after-school trainings. Future research is needed to examine the effects of professional development on teacher and student outcomes and to explore further whether teacher assignments are useful for improving related teacher and student outcomes.

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CHAPTER ONE: INTRODUCTION

Education is often on the forefront of our nation's news and political agendas. Our educational systems and theoretical orientations have constantly evolved and sought improvement. From the focus on math and science achievement and higher education to compete with the Soviet Union in developing nuclear technology following World War II (Ambrose, 1990) to the focus on the individual child during the civil rights movement and the passage of the Education for All Handicapped Children Act, our educational systems have continually aimed for improvement. By promoting educational achievement and ensuring everyone has the right to obtain an appropriate education, our nation's educational policies began to improve and shape how we approach education in the present day.

Although our educational system included respectable and admirable transformations, it has also been under considerable scrutiny. National media published articles on the failures of our educational system in the early 1980s (Burton & Kappenberg, 2012). In 1983, the National Commission on Excellence in Education published *A Nation at Risk* under Reagan's administration. This report documented the poor academic achievement of America's students backed by information from falling Scholastic Assessment Test (SAT) scores; poor reading, writing, and achievement results; and the unfavorable achievement comparisons between American students and other students from industrialized nations (National Commission on Excellence in Education, 1983). National attention on education spurred research in education to identify and promote solid educational pedagogy to improve our nation's achievement (Burton & Kappenberg, 2012). The No Child Left Behind (NCLB) Act of 2001 provided a

connection between research, accountability, and maintaining a child-focused education. As a result, Response to Intervention's (RTI) theoretical framework was formed and became appealing.

The theoretical framework of RTI gains its appeal from its basic premises. RTI is based on giving high quality, research-based instruction in the general education classroom (National Joint Committee on Learning Disabilities [NJCLD], 2005). Additionally, RTI provides preventative and remedial services to at-risk children by using scientific, research-based interventions focused on individual needs. Student progress on interventions is measured so teams can make data-based decisions on an individual student's programming (NJCLD, 2005). RTI's acceptance has been growing with many states and districts adopting its theoretical framework. Even national legislation recognized RTI as an alternative model to identify students with learning disabilities with the reauthorization of the Individuals with Disabilities Education Act (IDEA) in 2004 (Bradley, Danielson, & Doolittle, 2007).

With the increasing number of schools using RTI principles to guide their instruction, understanding the effectiveness of its application is critical. Ample amounts of research have shown RTI can be an effective model in decreasing special education rates and referrals (Barnhardt, 2009; Bollman, Silberglitt, & Gibbons, 2007; Kovaleski, Tucker, Duffy, Lowery, & Gickling, 1995; Marston, Muyskens, Lau, & Canter, 2003; VanDerHeyden, Witt, & Gilbertson, 2007). Additionally, research has documented the needed common components to successfully implement RTI (Bollman et al., 2007; Bradley et al., 2007; Burns, Christ, Kovaleski, Shapiro, & Ysseldyke, 2009; NJCLD, 2005; Porter, 2008). Experts have found common components that include (a) research-

based curricula and access to effective interventions, (b) strong measurement tools for progress monitoring and determining benchmarks, and (c) having solid organizational structures (e.g. access to data, problem-solving systems, administrative support, and professional development). Research indicates these different components lead to positive student outcomes especially when studying the separate components of RTI in isolation (Deno & Mirkin, 1977; Duhon, Mesmer, Atkins, Greguson, & Olinger, 2009; Mathes & Babyak, 2001).

However, not all components have been studied extensively with organizational components of RTI being the most notable with little research base, and one of the organizational components of RTI not studied well is the effect of teacher professional development on the implementation of RTI. Teachers are critical to the implementation of RTI as they are at the forefront of teaching research-based curriculums, evaluating data on students at risk for not meeting outcomes, and commonly implementing interventions to improve student skills. Teacher professional development has been shown to have a positive effect on student outcomes (Blank & de las Alas, 2010; Correnti, 2007; Klingner, Ahwee, van Garderen, & Hernandez, 2004) especially when the content is focused on specific instructional practices (Desimone, Porter, Garet, Yoon, & Birman, 2002). Professional development may help increase teachers' self-efficacy which in turn improves teachers' instruction (Bandura, 1997; Holzberger, Philipp, & Kunter, 2013; Lohman, 2006; Ross, 1994). Studies have shown there is a link between teachers' self-efficacy and the outcomes of their instruction (Caprara, Barbranelli, Steca, & Malone, 2006; Ross, 1992). Simply stated, when a teacher's self-efficacy increases, so does the teachers' instruction, which leads to better student outcomes.

As RTI is seen as a viable and strong method for targeting at-risk children and improving the academic outcomes of these children, it is important to understand its components to help educators with their respective RTI implementation. Improving teachers' knowledge of RTI and its implementation is a core component of RTI that has not been researched yet, and by doing so, a better understanding of professional development's role in RTI implementation could be rendered.

Overview

This study aims to address literature gaps of the role professional development has on key RTI teacher outcomes because of their critical role within the implementation of an RTI framework. Addressing specific RTI components is necessary because it is difficult to generalize results from system-level RTI implementation models. System-level implementations have uncontrollable and unforeseen extraneous variables (e.g., varying curricula, district-level support, differing progress monitoring tools, varying needs within the district) even though some large-scale RTI sites have seen great success (Bollman et al., 2007; Liu, Alonzo, & Tindal, 2011; Wallace, Marston, Ticha, Lau, & Muyskens, 2011; Zigmond, Kloo, & Stanfa, 2011). RTI could be implemented in various ways depending on the needs and structures of a school or district, and although this gives districts flexibility in their implementation, it also makes it difficult to generalize the results from the large-scale implementation. In spite of many components of RTI being well-researched and regarded as effective, teacher professional development has not been researched although it is regarded as an essential piece of RTI implementation (Kratochwill, Volpiansky, Clements, & Ball, 2007).

Given the lack of literature on the effects of teacher professional development within RTI, this study addresses this lack of literature by examining the effects ongoing teacher professional development has on teacher's knowledge and self-efficacy in relation to implementing RTI by comparing a 10-week RTI professional development course in comparison to a single after-school training. The research questions of this study are:

1.) *What is the effect of a 10-week teacher professional development course in RTI in comparison to a single training session on teachers' knowledge of RTI?*

2.) *What is the effect of a 10-week teacher professional development course in RTI in comparison to a single training session on teachers' RTI self-efficacy?*

3.) *What is the relationship of understanding and application of skills of the experimental group as indicated by their performance on homework assignments and their improvement in RTI knowledge?*

4.) *What is the relationship of understanding and application of skills of the experimental group as indicated by their performance on homework assignments and their improvement in RTI self-efficacy?*

The hypotheses of this research all embody the idea of intentional and ongoing teacher professional development increasing and improving teacher knowledge and self-efficacy within an RTI framework. The first hypothesis is that teachers receiving the ongoing professional development in RTI will have greater improvement in knowledge of essential RTI principles, practices, and potential outcomes than teachers receiving a single after-school session after controlling for teachers' experience and education levels.

The second hypothesis is ongoing professional development in RTI will lead to greater improvement in self-efficacy of using RTI principles and strategies than a single after-school training session after controlling for teachers' experience and teachers' education levels. The final two hypotheses examine the relationship between the ongoing professional development teachers' homework assignments designed to increase their understanding and application with their gains in knowledge and self-efficacy, respectively.

These hypotheses were established through theory and a review of the literature on teacher professional development. Theories suggest an increase in teachers' self-efficacy can increase instructional quality (Holzberger et al., 2013) and self-efficacy is promoted through professional development. Albert Bandura (1997) contended that higher levels of self-efficacy were shaped by one's desire to improve including those who do more informal learning activities, which relates directly to teachers. Lohman (2006) studied this theory and concluded teachers' motivation to engage in additional learning activities was directly influenced by self-efficacy among other personal characteristics. With self-efficacy being tied to seeking out additional training to continue to develop teaching skills, there should be little surprise that higher teacher self-efficacy has been linked to better student outcomes as well as teacher outcomes. Ross (1994) analyzed 88 studies on the antecedents and consequences of teacher efficacy and found teacher efficacy to be linked to improved teacher and student outcomes. Higher self-efficacy may lead teachers to seek out more professional development and/or teachers with more professional development may become more efficacious.

Quality teacher professional development not only results in teacher outcomes but also improved student outcomes. Increased student achievement is affected by quality teacher professional development. In a three-year study, Desimone and colleagues (2002) found focused professional development on specific practices in mathematics and science increased the use of these desired practices in the classroom. Additionally, Correnti (2007) studied the effects of professional development on teachers' literacy instruction. After looking at over 75,000 lessons from almost 2,000 classrooms, teachers receiving specific professional development instruction improved their use of comprehension and writing instruction compared to teachers not receiving the professional development course. In a meta-analysis on teacher professional development on math or science subject areas, elementary and secondary school teachers teaching math or science produced significant student achievement outcomes after completing professional development courses in math or science (Blank & de las Alas, 2010).

When designing teacher professional development, there are some key elements that should be addressed. Already mentioned, teacher professional development needs to be intentional, specific, and connected to practice (Croft, Coggshall, Dolan, Powers, & Killion, 2010). Another key element is the amount of time teachers are involved in the professional development activities. In a large review of teacher professional development, the need for lengthier professional development opportunities rather than the prevalent single-session workshops was detailed (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). To have a significant effect on student outcomes, Yoon and colleagues (2007) found the professional development series needed to be 15 hours or greater.

Teacher professional development plays a crucial role in implementing a strong RTI system. District organizational support is essential in any RTI model, and part of this organizational support is providing ongoing teacher professional development. Teachers will be involved with many of the RTI processes including utilizing a research-based core curriculum, analyzing student data, progress monitoring students, implementing interventions targeting specific academic skills, and using a problem-solving model (Bollman et al., 2007; Burns et al., 2009; NJCLD, 2005; Porter, 2008; U.S. Department of Education, 2006). Teacher professional development is an organizational support that is necessary for teachers to develop and maintain skills and knowledge needed within RTI implementation (Burns et al., 2009; Kratochwill et al., 2007).

With RTI being a model founded on providing research-based instruction and early remediation of skill deficits, natural outcomes include reduced special education referrals, increased student achievement, and a higher proportion of referred students qualifying for special education and research has shown these outcomes materialize (Bollman et al., 2007; VanDerHeyden et al., 2007). Teachers learning foundational RTI practices encapsulated with research-based instruction, prevention, and early remediation should increase teachers' knowledge and self-efficacy of implementing these strategies eventually leading to reduced special education referrals, increased proportion of referred students qualifying for special education services, and increased student achievement.

Teachers' level of education and experience were both compared during the preliminary analysis of the randomly assigned groups. Conflicting research has been presented on the effects of certain teacher characteristics and their effect on student outcomes. The U.S. Secretary of Education concluded in the 2002 annual *Meeting the*

Highly Qualified Teachers Challenge report that teachers matter when looking at student outcomes, their certification and education were not related to the same outcomes (Paige, 2002). However, other researchers have documented some connection between teacher education and student outcomes (Darling-Hammond & Youngs, 2002). Experience has also had some evidence of improving student outcomes (Jacob, 2012). Although unequivocal evidence has not been provided with the effects of teacher education and experience on student outcomes, it was needed to confirm the groups were not significantly different with their levels of experience and education.

Contribution to the Literature

This research study may start to fill a gap in the literature surrounding a very important aspect in the RTI service delivery model, ongoing teacher professional development. The literature strongly supports many components of RTI including utilizing interventions to provide remedial support to students, adjusting intensity of interventions, using progress monitoring and other data to guide student instruction, and having problem-solving models to guide educational decisions. However, in the review of the literature, organizational components do not receive as much attention as the other components. Organizational components have not been studied extensively, although many argue their value in producing a sound RTI model (Bollman et al., 2007; Burns et al., 2009). This study focuses on one such critical component, ongoing teacher professional development, within a district's RTI service delivery.

Much of RTI's focus is on general education programming by providing preventative services to students before they fall behind their same-aged peers. Teachers will be at the forefront of this RTI initiative in the general education arena. Teachers need

to have tools and resources to identify when a student is not responding well to the evidence-based core curriculum and have additional resources to provide to students identified as needing additional support. One of the resources needed by teachers is professional development in the area of RTI. Past evidence has indicated teacher professional development has positive effects on student outcomes (Blank & de las Alas, 2010; De La Paz, Malkus, Monte-Sano, & Montanaro, 2011) as well as teacher outcomes including improving teacher self-efficacy and knowledge (Bandura, 1997; Lohman, 2006; Ross, 1994). Teacher professional development is generally not effective when given in a single-day workshop and needs to be ongoing, intentional, and connected to practice (Croft et al., 2010; Desimone et al., 2002; Yoon et al., 2007). The proposed research study would address this gap by giving educators more insight on the need of ongoing professional development when initiating an RTI model.

CHAPTER TWO: LITERATURE REVIEW

This study has the goal of examining the effects of specific, intentional, and ongoing teacher professional development on essential teacher outcomes. The teacher professional development will primarily focus on principal RTI components and practices. This literature review will provide definitions of RTI, describe theory of RTI's practice through a review of its history, identify RTI's components and the components supported through research, review the theories behind providing teacher professional development, and detail the research supporting providing teacher professional development to improve targeted outcomes.

Definition of RTI

RTI is a framework educational systems can utilize to improve the outcomes of all students. RTI's framework is hinged on providing students with research-based instruction, using sound measurement tools to screen and identify those who are at risk for not meeting desired outcomes, applying research-based interventions that supplement the general education curricula, measuring student's progress in the chosen intervention, and designating a model to help decide appropriate decisions based on the problem and data. In fact, the National Center on Response to Intervention defines RTI as: a combination of high quality, culturally and linguistically responsive instruction; assessment; and evidence-based intervention. Comprehensive RTI implementation will contribute to more meaningful identification of learning and behavioral problems, improve instructional quality, provide all students with the best opportunities to succeed in school, and assist with the identification of learning disabilities and other disabilities (National Center on Response to Intervention [NCRTI], 2012).

There is no universally accepted definition of RTI even though many of the core concepts are consistent. The National Research Center for Learning Disabilities includes similar features to the National Center on Response to Intervention's definition when describing RTI. According to the National Research Center for Learning Disabilities (2007), RTI includes using "a step-by-step teaching process using scientifically proven teaching techniques and frequent brief assessments to monitor progress" (para. 4). Using a process incorporating teaching with scientific backing followed by assessments to monitor progress helps in the determination of the possible causes that lead to students' lower academic performance whether it is due to instruction, behavior, or the possibility

of a learning disability (National Research Center for Learning Disabilities [NRCLD], 2007). In yet another definition, Fuchs, Mock, Morgan, and Young (2003) described RTI as:

> (a) students are provided with 'generally effective' instruction by their classroom teacher; (b) their progress is monitored; (c) those who do not respond get something else, or something more, from their teacher or someone else; (d) again, their progress is monitored; (e) those who still do not respond either qualify for special education or for special education evaluation (p. 159)

Although there is no universally accepted definition of RTI, there is a general consensus that RTI encompasses *research*-based core curriculum, progress monitoring tools used to measure students' progress and identify students at risk for not meeting expected outcomes, and systems of interventions used for remediation for the students identified as at-risk for not meeting future academic outcomes.

RTI is often conceptualized and closely associated with a triangle depicting three levels, or tiers, of service (NCRTI, 2010; Shapiro, 2013). Although the number of levels or tiers may differ from district to district (Barnes & Harlacher, 2008), the application remains consistent. Shapiro (2013) and the National Center on Response to Intervention (2010), as well as others, suggest RTI is established on having a research-based core curriculum (Tier 1), and approximately 80% of the students should respond and make sufficient progress.

Students who do not respond well to the general curriculum receive more specialized support (Tier 2) in conjunction to the general curriculum with the percentage of students receiving this supplemental support being around the rate of 15%. Finally,

students who do not respond to the additional supports in the Tier 2 are provided with more intensive services in Tier 3. Sometimes Tier 3 is a supplemental support system, or it can also be considered special education (NRCLD, 2007; Shapiro, 2013).

Tier 1

Tier 1 is driven by high quality instruction (NJCLD, 2005). All students are administered universal screeners to assess the students' academic skills and identify students who are not at desired levels of proficiency. Typically, students at this level are screened three times per year. Most students should respond well to the high quality instruction and will make adequate progress without any significant additional support.

Tier 2

Tier 2 supports are for students who do not meet benchmark during the universal screenings. Problem-solving models and standard-protocol approaches can both be used to address and identify students' needs in Tier 2 (Hilt-Panahon, Shapiro, Clemens, & Gischlar, 2011; Vaughn & Fuchs, 2003). According to Vaughn and Fuchs (2003) and Hilt-Panahon and colleagues (2011), a problem-solving model incorporates using a process to identify specific deficits or needs the child has and using interventions to address these needs. In contrast, the standard-protocol approach applies a universal empirically validated treatment for all students who need to build upon a particular skill. In each model, the Tier 2 student receives intervention support in addition to receiving the regular instruction that the Tier 1 students receive. Progress is monitored more frequently in Tier 2 to see if students are improving and closing the performance gap between the Tier 1 students and themselves. Typically, progress monitoring occurs on a biweekly schedule in Tier 2, which includes about 15% of the population (Hilt-Panahon

et al., 2011; Shapiro, 2013). The fluidity of RTI allows for a student in Tier 2 to move up to Tier 1 if adequate progress is made, remain at Tier 2 if the intervention is working but not enough progress is made, or move to Tier 3 if the supports are not enough.

Tier 3

Tier 3 requires more intervention support than Tier 2 and can be dissimilar across various districts. In some school districts, Tier 3 support is considered special education while in other districts, Tier 3 is another layer of intervention prior to special education (Shapiro, 2013). In the National Joint Committee on Learning Disabilities' (2005) definition of RTI, Tier 3 is considered the level when a student is evaluated for special education services. However, in a well-known RTI system, Project MP3 at Lehigh University in Pennsylvania, Tier 3 is considered an extension to Tier 2 with more intensive interventions being implemented before a special education referral is made (Hilt-Panahon et al., 2011). Tier 3 services, whether being a step prior to special education or being special education services, are often hallmarked by having more intensive intervention support with more frequent progress monitoring. Interventions in Tier 3 may not differ than the interventions in Tier 2, but the frequency and intensity may be increased (Shapiro, 2013). Shapiro writes, "Tier 2 may receive this additional instruction 30 minutes per day for five days per week, while those in Tier 3 receive the instruction 45 minutes per day, five days per week, plus an additional 60 minutes each week" (2013, para. 9). Progress monitoring commonly occurs once per week in Tier 3 to track the progress of these students. Like Tier 2, Tier 3 students also receive the regular core instruction and obtain the additional intervention support. If Tier 3 is not considered special education, students who do not respond well to Tier 3 interventions are likely to

be referred for a special education evaluation. However, if students respond well to Tier 3 interventions, they may be moved back up to Tier 2.

RTI's framework is conceptualized through a fluid system of supports in that students can move between the tiers or levels of service delivery depending on their progress. Students who do not respond well to Tier 1 will receive additional support in Tier 2, and if these students make sufficient progress in Tier 2, they can move back to Tier 1. Teachers and support staff are asked to continually monitor and adjust instruction to the students especially as the student moves beyond Tier 1 (NCRTI, 2010; Shapiro, 2013). RTI embodies the application of evidence-based practices throughout its application. The core curriculum be research-based, and interventions used to address skill deficits should be evidence-based to assure students are receiving supports that have been proven to work.

RTI, in theory, is a very simple system in terms of its design. Face perception of RTI indicates a strong and commonsense approach to helping children by using research-based curriculum, identifying which students are not progressing at desired rates, providing evidence-based strategies to help the underperforming students achieve at an adequate rate, and using data and collaboration through a defined process to determine effectiveness and need for supplementary supports. However, implementation and sustainability of RTI is indeed a difficult undertaking (Kratochwill et al., 2007; Shapiro, Zigmond, Wallace, & Marston, 2011). Differences in school districts' student populations, organizational structures, physical constraints, accessibility to research-based curricula and evidence-based interventions for districts' specific population, and

opportunities to receive the needed quality professional development are among many reasons it is difficult to implement services through a RTI framework.

History of RTI

RTI has evolved from multiple educational sources including special education law and policies intended to improve the constantly evolving U.S. educational system. Following World War II, our nation's educational programming received massive amounts of financial support to improve the competitiveness of our graduates so we could better compete with the Soviet Union in nuclear technologies (Ambrose, 1990). During the 1950s and 1960s, a heavy emphasis was put on higher education along with math and science achievement (Burton & Kappenberg, 2012).

Our nation soon started to focus on the child with the start of the civil rights movement in the 1960s. One of the most well-known cases in educational history, *Brown v. Board of Education* in 1954, forever transformed the educational landscape with the determination of segregated schools being unequal. Our nation further progressed as it turned its eye to students with disabilities. In 1975, our nation passed the Education for All Handicapped Children Act (EHA), which eventually became the Individuals with Disabilities Education Act (IDEA) that we know today. Under such legislation, every child was awarded the right to a free and appropriate public education. Our nation's educational system began to evolve to include the precepts of promoting educational achievement and ensuring everyone has the right to obtain an appropriate education.

Although our educational system included respectable and admirable transformations, it has also been under considerable scrutiny. National media such as *TIME Magazine, Newsweek,* and *U.S. News & World Report* began publishing articles

over the failures of our educational system in the early 1980s (Burton & Kappenberg, 2012). In 1983, the National Commission on Excellence in Education published *A Nation at Risk* under the Ronald Reagan administration detailing the underachievement of America's students (National Commission on Excellence in Education, 1983). National attention on education spurred research in education to identify and promote solid educational pedagogy to improve our nation's achievement (Burton & Kappenberg, 2012).

The No Child Left Behind (NCLB) Act of 2001 was one of the next major pieces of educational legislation, and it provided a connection between research, accountability, and making sure our education was still child focused. NCLB's foundation included scientifically-based practices founded through research and maintaining focus on the child. As a result, RTI's theoretical framework was formed and became appealing.

The theoretical framework of RTI gains its appeal from its basic premises. The National Joint Committee on Learning Disabilities (2005) states RTI is based on giving high quality, research-based instruction in the general education classroom. Additionally, RTI provides preventative and remedial services to at-risk children by using scientific, evidence-based interventions focused on individual needs. Student progress on interventions is measured so teams can make data-based decisions on an individual student's programming (NJCLD, 2005). RTI is very child focused and based on strong educational practices, but it also has another strong feature: it is able to bridge a very important gap between general education and special education programming.

Under NCLB, schools are now more focused on demonstrating academic progress. RTI's high-quality research-based instruction is coherent with the need to show

progress with student achievement since RTI requires utilizing curricula with strong supported foundations. NCLB was a key factor in the development of RTI, but before the passage of NCLB, RTI grew out special education policy and law.

As part of the EHA and IDEA, school districts were required to help find and identify students with disabilities, commonly referred to as Child Find (Prasse, 2013; Shapiro, 2013). During the same time that special education was trying to identify students with disabilities, general education learned to refer students for special education who were not learning at the desired rates, ultimately concluding that failure in general education meant the child had a disability. Failure to learn at adequate rates, therefore, was interpreted as the child having something inherently wrong with him/herself and not much credence was placed on the curriculum and/or mode of teaching (Buffum, Mattos, & Weber, 2010; Prasse, 2013; Shapiro, 2013). Buffum and colleagues (2010) noted schools typical first response when a student was struggling was to refer them for a special education evaluation instead of assessing the quality of instruction. Prasse (2013) added that general education began to narrow expectations of students, and failing to meet grade-level expectations ultimately meant there was something wrong with the child. Educators could simply attribute a student's lack of learning to a disability rather than to the provided instruction.

The conceived theoretical approach of RTI is commonly associated with the dissatisfaction of service delivery to struggling students suspected of having learning disabilities. Prior to the reauthorization of IDEA in 2004, students could only qualify for learning disability special education services by exhibiting a severe discrepancy between their intellectual ability and their academic achievement. This model, coined the

discrepancy model, has received abundant criticisms for failing to optimally provide services to struggling students. This idea has caused undesired outcomes because of the definition of a learning disability that included a discrepancy between the child's intellectual quotient (IQ) and their academic achievement. The discrepancy model has been referenced as the "wait-to-fail" model because students commonly do not start to receive additional services until they are in fifth grade (Barnes & Harlacher, 2008; Bradley et al., 2007; Fuchs & Fuchs, 2007; Klotz & Canter, 2006; NJCLD, 2005). The delay in providing services becomes very alarming when considering children who fall behind grade level have increased chances of continually producing behind grade-level performance (Downer, Rimm-Kaufman, & Pianta, 2007). Many researchers have claimed the discrepancy model has numerable faults (Fletcher et al., 1994; Francis, Fletcher, Shaywitz, Shaywitz, & Rourke, 1996; Vaughn & Fuchs, 2003). Francis et al. (1996) inspected the discrepancy model and listed the following shortcomings: (a) the conceptualization and measurement of discrepancy is controversial, (b) using IQ tests on children with language and/or learning disabilities does not produce valid results, and (c) psychometric theory surrounding discrepancy is disputed. Additionally, the discrepancy model may inadequately measure certain populations leading to overrepresentation in special education (Marston et al., 2003; NJCLD, 2005; Waitoller, Artiles, & Cheney, 2010).

The limitations present in the discrepancy model led to conceptualizing other theoretical models of service delivery to students. RTI was born out of the unfavorable discrepancy model by attending to some its key criticisms. Meant to be a preventative model, RTI uses data-based practices to identify students' needs early and offer remedial

services before the problem intensifies. Vaughn and Fuchs (2003) state an RTI approach can yield benefits of: "(1) identification of students using a risk rather than a deficit model, (2) early identification and instruction of students with LD, (3) reduction of identification bias, and (4) a strong focus on student outcomes" (p. 140). Furthermore, Vaughn and Fuchs (2003) state RTI may be advantageous by improving core academic and behavioral programming and assisting in screening and instruction of students not responding well to instruction.

RTI is seen as a viable approach to educating our children by providing early intervention and remediation through scientifically research-based practices, supporting practices embodied by NCLB. RTI's acceptance has been growing with many states and districts adopting RTI's theoretical framework and applying it within their districts. Even national legislation has turned to RTI as an alternative to using the discrepancy model for identification of students with learning disabilities with the reauthorization of IDEA in 2004 (Bradley et al., 2007). In spite of this federal recognition of allowing districts to use RTI instead of the discrepancy model for special education identification, there has been no accepted RTI model endorsed (Bradley et al., 2007).

RTI serves two key purposes by providing systems of prevention and intervention to improve students' academic and behavioral outcomes and is an alternative method of identifying students with disabilities (Hilt-Panahon et al., 2011). Now, states are no longer required to rely on using the discrepancy model to identify students with specific learning disabilities and must allow a model where research-based interventions are applied. Although there are strong connections with special education, RTI is not solely a special education model. The National Center on Response to Intervention addresses this

perception by stating RTI is “a school-wide, multi-level instructional and behavioral system for preventing school failure” (2010, p. 1) and is “to provide all students with the best opportunities to succeed in school” (2010, p. 8).

RTI is a model used for all students, special education students and general education students alike. The reauthorization of IDEA allows districts to use information gained throughout the process of RTI to identify students with specific learning disabilities. However, RTI is also closely related to beliefs held by NCLB: research-based instruction, accountability, and being child-focused. RTI is predicated through a theory of identifying at-risk students early enough so remediation can be effective. Through the application of scientific research-based interventions, students should be able to respond to preventive measures instituted by the general education curriculum. Students who do not respond may be candidates for special education services and may be considered to have a disability.

Outcomes of RTI

RTI has evolved as being both an applied model to improve the identification of students with disabilities, reduce the disproportional rates of those qualifying for special education services, and improve student achievement (Burns et al., 2009; NCRTI, 2010; NJCLD, 2005). With the increasing number of schools using RTI principles to guide their instruction, understanding the effectiveness of its application is critical given the current position of our schools’ need to demonstrate academic proficiency. Considerable research has shown RTI can be an effective model in decreasing special education rates and referrals (Barnhardt, 2009; Bollman et al., 2007; Kovaleski et al., 1995; Marston et al., 2003; VanDerHeyden et al., 2007). In addition to decreasing student referral rates,

researchers have demonstrated that an RTI system can decrease the disproportional rates of minorities being referred and subsequently qualifying for special education services (Marston et al., 2003; VanDerHeyden et al., 2007).

Although RTI has been shown to have positive effects on special education referrals and rates of disproportion, the results on academic achievement have been mixed. Some investigations of the effects of RTI implementation on student achievement have not resulted in the desired achievement gains (King, 2012; Kucera, 2008) while other studies have shown some very positive effects of system-wide RTI implementations on academic achievement (Bollman et al., 2007; Burns et al., 2009; Clemens, Shapiro, Hilt-Panahon, & Gischlar, 2011; Liu et al., 2011; Wallace et al., 2011; Zigmond et al., 2011). However, it is difficult to generalize outcomes of any system-wide RTI implementation because of the present variance among schools, districts, and states. Several leaders in the RTI movement have advocated that schools need many supports in place to implement RTI successfully including time to implement interventions, knowledge of the RTI process, available resources, principal and district leadership, professional learning communities, professional development, and parental support (Barnhardt, 2009; Burns et al., 2009; Lilly, 2011; Porter, 2008).

Inherently, districts will vary in these aforementioned organizational structures. As RTI encompasses the belief of providing early remediation to prevent further at-risk students and interventions have been shown to be very effective in increasing academic skills, a system-wide model of RTI should theoretically raise academic achievement. In fact, sites like the St. Croix River Education District (Bollman et al., 2007), Project MP3 in Pennsylvania (Clemens et al., 2011; Zigmond et al., 2011), Minneapolis Public

Schools (Wallace et al., 2011), and the Eugene School District (Liu et al., 2011) have been implementing RTI successfully for up to twenty years and have all shown to have very positive effects on student achievement. The St. Croix River Education District significantly increased the percentage of students meeting benchmark on reading measures, increased the reading curriculum-based measurement scores for those who were at the 10^{th} percentile, had lower rates than the state of Minnesota for students in the lowest level on the state reading test, and had lower rates of students identified as having learning disabilities than the state even though the district's rates were very similar to the state's levels before their implementation of RTI (Bollman et al., 2007). Project MP3 saw commendable increases across two separate districts after they implemented RTI. These schools experienced large increases in students' oral reading fluency scores, students' state reading assessment scores, a large increase in students who were considered at grade level in reading, and a large reduction in the percentage of students considered at-risk for not meeting later reading outcomes (Clemens et al., 2011; Zigmond et al., 2011). The Minneapolis schools also saw similar results as the St. Croix River Education District and Project MP3. Over the course of three years of implementation, the schools saw a rise in their curriculum-based measurement scores, a rise in their state assessment scores, and a decrease in their special education referrals and students qualifying for services (Wallace et al., 2011). In addition to these outstanding gains, Wallace and colleagues (2011) showed data suggesting the RTI initiatives may have also helped increase student attendance and academic engaged time in conjunction with teachers' positive perceptions of RTI.

Examining the ways in which districts have successfully implemented a RTI system is very valuable and necessary. Shapiro (2011) recommends the need to detail the process of implementing successful RTI systems so other districts and states can use this as a learning tool when implementing their own systems. However, when researching RTI's effectiveness, it may be more favorable to assess the specific components involved in RTI. By examining specific components, researchers and practitioners alike can determine what components are essential and have the most profound effects as well as assess what components are personally strong and/or weak in their respective systems.

Research has found common components needed to successfully implement RTI (Bollman et al., 2007; Bradley et al., 2007; Burns et al., 2009; NCRTI, 2010; NJCLD, 2005; Porter, 2008). Core features of an RTI model include using research-based curriculum in the general education setting with selected available interventions for students not responding to the general curriculum. RTI systems also need strong measurement tools to collect data on student achievement to ensure students are meeting benchmark goals in the general curriculum and/or students' progress on the selected interventions is adequate. Finally, quality organizational systems need to be rooted within the district and school where RTI is being implemented.

Researchers have documented the strong effects brought about by the separate components of RTI. (Deno & Mirkin, 1977; Duhon et al., 2009; Mathes & Babyak, 2001). These components have helped increase student achievement, reduce special education placements, and reduce the disproportionate rates of minority students being referred and qualifying for special education services. However, the effective components found in the literature are still relatively vague and could be initiated inconsistently

across states, districts, and schools. Furthermore, each state, district, and school has different needs based on their individual contextual factors including student demographics, funding, and resources. The discrepant needs of our schools results in the no two identical RTI systems.

Identified Components of RTI

There are many variations in the definition of RTI, but they all incorporate some of the same concepts. The National Center on Response to Intervention (2010) has documented four "essential" components of RTI: (a) a school-wide, multi-level instructional and behavioral system for preventing school failure; (b) screening; (c) progress monitoring; and (d) data-based decision making for instruction. In a review of the literature (Coleman, Buysse, & Neitzel, 2006; Mellard, 2004; Miller, 2006; NRCLD, 2007; U.S. Department of Education, 2006), Porter (2008) reported eight essential components of RTI: (a) students need to receive high quality instruction in the general education setting, (b) the general education curriculum is research-based, (c) staff members in the classrooms design and complete student assessments, (d) schools conduct universal screenings for academics and behaviors, (e) class progress is measured continuously, (f) research-based interventions are implemented on students identified as having difficulty, (g) progress monitoring data is kept to track student progress on interventions, and (h) fidelity measures are used to certify interventions are implemented as intended.

Other researchers have stated similar components need to be included in a successful RTI model. Burns et al. (2009) found nine components in successful RTI implementation: (a) evidence-based instruction, (b) differentiated instruction, (c)

sufficient academic engaged time, (d) time for practice, (e) frequent and psychometrically sound assessment, (f) real-time use of data, (g) best use of technology, (h) parental and community involvement, and (i) professional development. The St. Croix River Education District in Minnesota has been implementing RTI models for over 20 years and has shown promising results with their implementation. Bollman, Silberglitt, and Gibbons (2007) identified three elements of RTI they considered critical: (a) frequent and continuous measurement using general outcome measures, (b) evidence-based instruction, and (c) school-wide organization to ensure the most effective instruction possible for each student. Like Bollman et al. (2007), the National Joint Committee on Learning Disabilities (2005) was also succinct in listing their components of RTI with three core components: (a) there needs to be a systematic application of scientific, researched interventions in general education, (b) the student's progress needs to be measured, and (c) the RTI data should drive instruction (NJCLD, 2005).

In spite of the perceived ambiguity of what RTI is and the variability in opinion of essential component features (Barnes & Harlacher, 2008), there is consensus on critical components of RTI. Conceptually, the components of RTI can be classified into one of three main categories based on the review of the research. The first category is a system of research-based teaching strategies including a strong core curriculum and intervention strategies in place for students not responding to the curriculum. The first category would include the National Center on Response to Intervention's (2010) first component of school-wide, multi-level instructional and behavioral systems; Burns et al.'s (2009) components of evidence-based instruction, differentiated instruction, and sufficient academic engaged time; Bollman et al.'s (2007) evidence-based instruction; and the

National Joint Committee on Learning Disabilities' (2005) component of applying scientific, researched based interventions in the general education.

Secondly, strong measurement tools need to be in place to measure student progress and the effectiveness of interventions and curricula. Examples of strong measurement components from other definitions include the National Center on Response to Intervention's (2010) screening and progress monitoring; Burns et al.'s (2009) frequent and psychometrically sound assessment; Bollman et al.'s (2007) frequent and continuous measurement using general outcome measures; and the National Joint Committee on Learning Disabilities' (2005) component of measuring students' progress.

Finally, the correct organizational structures need to be available. Organizational structures incorporate the National Center on Response to Intervention's (2010) component of data-based decision making for instruction (e.g., using a problem-solving model) and Burns et al.'s (2009) time for practice, real-time use of data, best use of technology, parental and community involvement, and professional development; Bollman et al.'s (2007) definition including school-wide organization; and the National Joint Committee on Learning Disabilities' (2005) last component of data driving instruction.

In a simple sense, RTI's components could conceptually be considered part of three distinct categories of research-based teaching strategies (e.g., research-based core curriculum and evidence-based interventions), having strong measurement tools in place (e.g., progress monitoring and benchmark assessments), and organizational structures (e.g., professional development, access to data, parental involvement, using technology, and using a process to analyze data and/or problems). Recent qualitative research designs

have identified some needed organizational supports such as knowledge of the RTI system and process, having the available resources, needing time to meet, principal and district leadership support, professional learning, and parental support (Barnhardt, 2009; Lilly, 2011). Teachers and other school personnel should have easy access to data, and there should be opportunities for learning and applying skills necessary to implement RTI. Other organizational structures include administrative support and processes and resources for teachers and personnel to utilize, like a problem-solving model, interventions, and professional development.

The literature has focused on many of these components with results showing support for their application, especially the first two components of research-based teaching strategies and strong measurement tools. The last and final component, organizational supports, has received the least amount of attention. Inevitably, without organizational support, an RTI system will not be successful. Teachers need to have access to data, knowledge of RTI, opportunities to learn and apply their skills, resources to implement instruction and interventions with fidelity, and have support from their leaders. The following section will highlight how different components of RTI have proven to be effective and the need to have further research on the organizational structures supporting the implementation of an RTI system.

First Component: Core Instruction and Supplemental Interventions

The first component in an RTI model is having the correct academic structures in place. These structures include having research-based core curricula and evidence-based intervention strategies to exercise when a student is not responding well to the core curriculum. Research is fairly extensive in regards to curricula and specific interventions

districts can use. This section will briefly highlight some of the effects a strong core curriculum can have on student achievement but most of the focus will attend to interventions and will highlight research completed on intervention effects, intensity of interventions, and implementing interventions with fidelity.

Research-Based Curriculum. Using a research-based curriculum is a commonsense first step in trying to raise student achievement. The theory behind RTI suggests approximately 80% of the students should respond adequately to Tier 1 curriculum when it is taught with fidelity (Fuchs & Fuchs, 2006; NCRTI, 2010; NJCLD, 2005; Shapiro, 2013). When implementing a multiple-tiered system of interventions, the foundation should be strong, and with a strong foundation, students will receive essential skills that will help them progress no matter what tier of support they are receiving.

To illustrate the power of a strong core curriculum, Zigmond, Kloo, and Stanfa (2011) discussed the gains students made after 1 year of RTI implementation which included a very strong focus on adhering to the guidelines set forth by the district's core elementary reading curriculum. As part of Project MP3 at the University of Pittsburgh, Alliance School District partnered with university researchers to improve their schools reading scores and implement an RTI system. The school district had a sizable minority population and had over 50% of the student population eligible for free/reduced lunches. The district was also considered a severely underperforming school district. Upon entering the schools, the university found that the district had a research-based curriculum using the Harcourt *Trophies* reading series (Beck, Farr, & Strickland, 2003), but the series was rarely used. One elementary school did not use the series, and in another elementary school, only the fourth grade teachers had explicit lessons from the

series. A critical first step in implementing RTI in this district was the need to implement the core reading instruction with fidelity.

After the first year of implementing the curriculum with fidelity, this district saw some drastic changes. Although the researchers focused on other aspects of RTI during the first year such as interpreting data, utilizing progress monitoring, and teacher professional development, a primary focus was using the core curriculum as intended (Zigmond et al., 2011). Their lowest performing school saw vast improvements in key areas. In first grade, the average oral reading fluency scores improved from approximately 20 words read correct (wrc) per minute to almost 40 wrc per minute. Grades 2 and 4 also saw considerable oral reading fluency gains with grade 3 sustaining their performance. In 2006, the most at-risk elementary school had over 60% of its population considered at-risk of not meeting future reading outcomes and only approximately 10% of the population being considered low-risk. In only one year, the same school had about 50% of its population in the at-risk range and about 25% of its population in the low-risk range. In the overall district, the percentage of students reading at grade level on the state reading assessments jumped from 22% to 40% in the just the first year of focusing on the core curriculum alone.

Prior to implementation of RTI and using the research-based curriculum, the poorest performing school had 10% of its population in Tier 1, 23% in Tier 2, and 67% in Tier 3. This is significantly discrepant from the theoretical 80%, 15%, and 5% for the three tiers, respectively. Three years later, this school had 42% (increase of 32%) of the population in Tier 1, 21% in Tier 2, and 37% (reduction of 30%) in Tier 3. Although this is still not admirable in terms of its relation to RTI's theoretical goals, the school made

momentous strides in improving their students' reading. Other aspects of RTI were implemented and accounted for some of this change; however, implementing the core curriculum was the one of the first targeted outcomes leading to profound effects. Implementing RTI requires to prioritize implementing the research-based core curriculum with fidelity (Zigmond et al., 2011).

Academic Interventions. A core ingredient in RTI is the actual interventions used to increase student outcomes. There are multitudes of academic and behavioral interventions available for teachers and school districts. To highlight how effective these interventions can be, two research studies will be reviewed on interventions focusing on reading and math skills.

Research has shown the strong effects interventions can have on reading achievement of students. To demonstrate the strong intervention effects in reading, a research study using a commonly known intervention, Peer-Assisted Learning Strategies (PALS), will be reviewed. PALS primarily focuses on early literacy skills such as phonemic segmentation, alphabetic knowledge, and decoding. Mathes and Babyak (2001) studied the implementation of PALS in 30 classrooms in five southeastern schools and randomly assigned teachers to experimental or control groups. PALS was implemented for 14 weeks, and students were measured with the Woodcock Reading Mastery Test-Revised (WRMT-R), oral reading fluency measures (orf), and phonological awareness segmenting measures. Students in the PALS group scored significantly higher than the control group on WRMT-R's Word Identification, Word Attack, and Basic Skills for both low and average achieving students. Average achieving students also scored significantly higher than the controls on Passage Comprehension. Interestingly, the low and high

achieving groups experienced significant growth from baseline on progress monitoring measures while the average achieving group did not. Even though there was some variability in gains made by the average and high achievers, all groups experienced strong growth especially when compared to the control group. Effect sizes were typically very strong for each dependent variable measure. Teachers and students alike also rated the intervention as effective and acceptable (Mathes & Babyak, 2001).

Interventions have also been shown to be effective when focusing on mathematical skills. Fuchs, Fuchs, and Prentice (2004) studied third grade students during a 16-week mathematical problem-solving intervention in a design where teachers were randomly assigned to experimental or control conditions. Fuchs et al. (2004) studied students at risk for a disability in math, reading, and math and reading combined. The control group was required to adhere to their district's math curriculum while teachers in the experimental group focused on basic math problem solving and transfer of instruction with self-regulation. The additional interventions resulted in significantly better outcomes for the intervention treatment groups with vast improvements in percentage correct improvement from pre- to post-test. These results occurred for all students at risk for a disability: math, reading, and math and reading combined (the interventions also had significant effects on students not at risk for disabilities). Effect sizes were almost entirely very large with most treatment by disability effect sizes showing an increase in students' scores by over a standard deviation (range = 0.12 to 2.45) (Fuchs et al., 2004).

These two studies highlight the effect interventions can have on struggling students. The literature base on intervention efficacy is extensive for academic skills. A key feature of RTI includes the expectation students will respond to interventions when

given additional support beyond the evidence-based core curriculum, and as the two research studies by Mathes and Babyak (2001) and Fuchs et al. (2004) demonstrate, interventions can significantly improve academic skills of students receiving the intervention.

Intervention Intensity. A key practice used with RTI is adjusting the intervention when student response is deemed inadequate. When providing intervention support, student response is evaluated to determine the effectiveness of the intervention. If a student does not respond, intervention teams can make multiple decisions including increasing the intensity of the interventions. Although intensity of intervention is a broad concept, Duhon, Mesmer, Atkins, Greguson, and Olinger (2009) studied increasing time in an intervention to determine if intensity can have a positive effect on student achievement.

To study an intervention's intensity, Duhon et al. (2009) implemented a multiple baseline across subjects design and used the same intervention on students identified as having need of additional math instruction. The intervention called for simply increasing the amount of time students received the intervention. Students not at benchmark were given approximately 15 minutes of intervention support in their classroom once per day for 1 month. Following this first month of intervention, 3 of 35 students still did not reach the benchmark goals. The three students not meeting benchmark after the first phase of the intervention started to receive the 15-minute intervention five times per day. When a student met the benchmark goal of 40 digits correct (DC) for three consecutive days, the intervention was discontinued. Two of the three remaining students responded well within days of the second phase of intervention. The researchers decided to increase the

intervention to 10 times per day for the one remaining student who still did not meet benchmark goals. The last student reached benchmark after 3 days of this increase in intensity (Duhon et al., 2009). One month following the interventions, the two students who responded to the five times per day intervention either maintained their skills or were slightly below benchmark, showing the interventions produced a relatively lasting effect. The student who needed the 10-per-day intervention to reach benchmark reverted back to his baseline performance. Although this study is not a large-scale study, it does show a real-life application of simply increasing the amount of time in an intervention and its ensuing effect on student success. It also shows that a simple intervention (15 minutes per day) can have a profound effect on students considered as at-risk. Thirty-two of 35 students met benchmark goals after 1 month of 15-minute daily interventions.

Intervention Fidelity. A critical component to an intervention's success is implementing an intervention in a manner it was intended to be implemented. In reviewing the literature on fidelity of intervention plans, the effectiveness of the intervention treatment abates when the intervention treatment plan is not followed as intended (Burns, Peters, & Noell, 2008). This idea may be considered commonsense but is also backed by research. When system-wide RTI models have high levels of implementation fidelity, they outperform RTI models with lower levels of implementation of fidelity (Kovaleski, Gickling, Morrow, & Swank, 1999). Kovaleski et al. (1999) studied implementation integrity of Pennsylvania's instructional support teams (IST) on academic learning time (ALT) and compared high-implementation and low-implementation schools on task comprehension, task completion, and time on-task.

Results indicated significant differences between high-implementation and low-implementation schools in favor of the high-implementation schools.

Burns et al. (2008) extended the literature on implementation fidelity by analyzing fidelity of problem-solving teams' implementation of critical practices in a problem-solving model. In a multiple-baseline design across three schools, the problem-solving teams at these schools noticeably increased their compliance with essential problem-solving team procedures after receiving feedback on their performance. Burns et al. (2008) discussed the importance of these findings by highlighting that increasing the effectiveness of a problem-solving team will help in the overall process of making better data-based decisions on students' need and response to interventions.

Interventions can be highly successful in improving student outcomes when they address the correct problem, are provided at an intensity and frequency beneficial to the student, and are implemented as they were intended. Although this section on interventions and their effects is brief, there is a strong literature base on interventions and their effects on student outcomes.

Second Component: Sound Measurement Tools and Data Collecting

Using data to help guide instructional practice is a core feature in RTI (Bollman et al., 2007; Burns et al., 2009; NJCLD, 2005; Porter, 2008). Progress monitoring is a data-based feature that provides good information on how data can be used in an RTI model. Zamora Durán, Hughes, and Bradley (2011) define progress monitoring as "a formative instructional design that allows teachers to supervise student progress by recording student performance on short assessments over time" (p. 1). Progress monitoring data are

collected, which are then used to help identify students who are not at established benchmarks.

Progress Monitoring/Formative Assessments. Progress monitoring tools, a formative assessment, are pivotal in helping teams decide if students are making adequate progress. The strong effects of formative evaluation have been well-known for many years based on Stan Deno and Phyllis Mirkin's model of basing decisions on collected data (Cohen, Cohen, West, & Aiken, 2003; Deno & Mirkin, 1977). In a meta-analysis on the effects of systematic formative evaluation on academic performance, formative evaluation was found to have substantial effect on students' growth (Fuchs & Fuchs, 1986). From 21 studies meeting the criteria of measuring academic behaviors and having sufficient data to calculate effect size statistics, using formative assessments conducted multiple times per week had an unweighted effect size of .70 on student progress. Fuchs and Fuchs (1986) also found the strongest effects when data were measured twice per week compared to more frequently, for handicapped students compared to non-handicapped students, and if the treatment lasted more than 10 weeks (Fuchs & Fuchs, 1986).

Another research study focused on the effects of progress monitoring by examining the effects of a form of progress monitoring, curriculum-based measurement (cbm) (Fuchs, Deno, & Mirkin, 1984). In this study, randomly assigned special education teachers either used cbm or conventional special education evaluation techniques. Teachers in the experimental group set an annual goal, developed cbm to help measure progress, measured oral reading performance at least twice weekly, graphed the progress of the student, and exercised another instructional strategy if the student failed to make

adequate progress across 7 to 10 data points. At the end of the study, the experimental group increased their reading on average by 28.65 words correct per minute (wcpm) (M = 70.23 wcpm), and the control group did not experience an average increase resulting in a significant difference between the experimental and control group. The experimental group was also stronger on the Structural Analysis and Reading Comprehension subtests of the Stanford Diagnostic Reading Test. Besides the academic gains experienced, teachers in the experimental group may have been more realistic when judging if their students would meet their academic goals. There were greater percentages of experimental students who could state their goals and accurately judge if they would reach their goals (Fuchs et al., 1984).

In order to determine if a student is making adequate progress in the core curriculum or in applied interventions, measuring tools need to be applied. Reliable and valid tools will allow educators to decide on appropriate educational programming. By using measurement tools such as formative assessments, beneficial practices will be in place to help improve student outcomes.

Third Component: Organizational Structures

Organizational structures could be defined as support from the school's principal and the district's leadership, professional development opportunities, and access to data and other support systems to assist in the implementation of the RTI model. Although important to the RTI model, organizational structures likely have the least amount of research focus when compared to the two other components. One of the most studied organizational supports is engaging in a problem-solving process that helps make decisions on specified student problems when other components of RTI are in place.

Problem-Solving Models. Problem-solving models are organizational structures with defined procedures to guide the implementation of RTI models. Problem-solving models are designed to provide individualized interventions based on an analysis of instructional and/or environmental conditions and skill deficits (Tilly, Reschly, & Grimes, 1999). Typically, problem-solving models have four main steps in their applications including conceptualizing the problem, analyzing factors involved with the problem, implementing interventions targeting the problem, and evaluating the results of the intervention (Allen & Graden, 2002). Problem-solving models are closely related to RTI and have been shown to be effective components in RTI frameworks.

In one research study, VanDerHeyden, Witt, and Gilbertson (2007) evaluated the effectiveness of the System to Enhance Educational Performance (STEEP); (Witt, Daily, & Noell, 2000). STEEP involves four steps when implemented. First, universal screening is applied. Second, class-wide interventions are put into place. Third, there is an assessment on the incentives for the student's performance, and lastly, there is an evaluation of the student's response to the intervention delivered with fidelity. VanDerHeyden et al. (2007) studied the effects of STEEP in a five schools using a multiple baseline across school research design. The results from VanDerHeyden et al.'s (2007) study showed some significant trends. Schools implementing STEEP had a significant drop in initial special education evaluations. For instance, the first school had a rate of nine initial evaluations in a year with a decrease to seven initial evaluations after the implementation of STEEP. After a return to baseline, there was a rate of 50 evaluations in a year, which then decreased to 7 again following the reimplementation. Implementing STEEP also greatly reduced the number of evaluations conducted on

minority students. For example, approximately 40% of the evaluations were conducted on minorities at the first school although only 25% of the student population was minority. Following the implementation of STEEP, both the actual and expected percentage of evaluations on minorities were around 25%. Additionally, STEEP also had a strong effect on the disproportional rates between male and female students being evaluated.

Another instance of researching the implementation of a problem-solving model was the utilization of this decision process in the Minneapolis Public School (MPS) district (Marston et al., 2003). MPS used a problem-solving model to guide its special education referral process, and the model revolved around four steps: describe a student's problem with specificity, generate and implement strategies for instructional intervention, monitor student progress and evaluate effectiveness of instruction, and continue this cycle as necessary. This problem-solving model was found to be very effective in a number of areas. Placement rates in special education remained relatively consistent both before and after implementation of the problem-solving model. In an independent evaluation of their problem-solving process, findings were noteworthy. First, students received special education services earlier than traditional methods. Second, educational staff generally held the problem-solving model in good esteem. Lastly, implementation of this problem-solving model drastically reduced disproportional rates of African Americans in special education. Before the implementation of the problem-solving model, 68.90% of special education students were African American even though only 44.33% of the entire population were African American. After a few years of implementing the problem-

solving model, 55.40% of special education students were African American with 45.00% of the entire population was African American.

Beyond using problem-solving models to guide RTI practices, the literature base is relatively weak in the organizational structures of RTI. Some qualitative research designs have been used to study barriers, teacher perceptions, and effects of leadership on the implementation (Barnhardt, 2009; Porter, 2008), but there is still not as much focus on organizational structures as other components of RTI. Barnhardt (2009) illustrated how some of the organizational factors may have contributed to the strong or weak effects of a school's implementation of an RTI model. The Florida Problem Solving/Response to Intervention Project (Castillo, Hines, Batsche, & Curtis, 2011) began exploring some of these organizational factors such as their state's support which has benefited the implementation to date. Their organizational factors have helped with consensus, infrastructure development, and support and commitment from district levels (Castillo et al., 2011). However, the literature is still scarce with information on how portions of these organizational structures affect student results. Researching what organizational structures are needed in an RTI model would help many districts to improve their results when adopting RTI as a service delivery model.

Teacher Professional Development and Its Relationship with RTI

As already noted, organizational factors play a pivotal role in the implementation of RTI (Bollman et al., 2007; Burns et al., 2009; NJCLD, 2005; Porter, 2008). Qualitative research has documented the need for these organizational supports within a system of RTI including principal and district leadership, utilizing professional learning communities, letting parents play a role, gaining knowledge of the RTI process, having

necessary resources, and having the appropriate time to implement RTI (Barnhardt, 2009; Lilly, 2011). Two of the identified organizational structures needed are professional learning and having time to apply learned skills. Spear-Swerling and Cheesman (2012) commented on this issue by stating few studies have focused on teachers' knowledge of RTI. Educating teachers on the main tenets of RTI and the application of necessary components within a district's RTI model is an essential need. Spear-Swerling and Cheesman (2012) provided some insight on this need through a study they completed on teachers' knowledge of RTI concepts specifically focused in the area of reading. They found many teachers have a basic understanding of RTI but are weaker in more applied areas including assessment and available interventions (Spear-Swerling & Cheesman, 2012).

As part of their proposed RTI initiative, many researchers include professional development, the instruction of educational staff, and/or involving teachers in the implementation process (Barnes & Harlacher, 2008; Danielson, Doolittle, & Bradley, 2007; Kratochwill et al., 2007; Richards, Pavri, Golez, Canges, & Murphy, 2007; Shapiro et al., 2011). Teachers are at the center of our nation's educational system and will play an imperative role in making any theorized educational practice effective, including RTI. Richards and colleagues (2007) noted the critical responsibilities of general and special education teachers within an RTI framework are imperative for student success. These responsibilities will demand more flexible teacher roles, team involvement, and more ongoing professional development (Barnes & Harlacher, 2008; Danielson et al., 2007; Richards et al., 2007). Ongoing professional development is integral within a system-change process like that of RTI because continuous support needs to be provided so staff

can understand processes, learn how to perform their roles, and become proficient with their skills (Barnes & Harlacher, 2008; Danielson et al., 2007). Teacher professional development in RTI should build teachers' knowledge because they will be practicing the concepts and strategies within this pedagogical approach. Previously studied theoretical frameworks provide explanations of the underlying mechanisms that result from knowledge and professional development.

Theory suggests higher incidences of self-efficacy are a by-product of knowledge, and greater self-efficacy leads to more efficacious results. Within an RTI model, knowledge of the specific components should ultimately lead to more advantageous outcomes for both teachers and students. In Barnes and Harlacher's (2008) review of the literature, they mentioned the need to understand processes of RTI so staff can learn how to do RTI. Teacher professional development is grounded within an intertwined relationship between self-efficacy and knowledge.

Theoretical Framework of Teacher Professional Development

Self-efficacy has been a central area studied by Bandura for many years. Bandura (1997) states self-efficacy is a motivational mechanism brought about by a person's belief that they can complete a task. Bandura and Cervone (1983) state that "knowledge, transformational operations, and component skills are necessary but insufficient for accomplished performance" (p. 122). Bandura proposed self-efficacy is an integral part of later performance, and he noted judgments made by people have great bearings on their thoughts and emotional reactions in both anticipatory and subsequent actions within their environment (Bandura, 1982). Increases in perceived self-efficacy will fundamentally lead to higher performance for both single subjects and groups alike.

Bandura argued that people are actually more influenced by their perceived performance than their actual successes, and he concluded perceived self-efficacy was a greater predictor of ensuing behaviors than actual performance attainment. He also proposed that learning new skills can affect self-efficacy in a cyclical fashion. Bandura noted judgments of self-efficacy can lead to higher rates of skill acquisition, and this will lead to performance mastery. The performance mastery then leads to better judgments of self-efficacy. Bandura and Cervone (1983) found this to be true as they found higher self-dissatisfaction with substandard performances and stronger self-efficacy being related to goal attainment, and both of these conditions lead to more intense efforts in the future.

Self-efficacy has long been thought to be related to teacher performance that leads to greater educational outcomes for teachers and students. Given Bandura's theory of self-efficacy, this idea has good backing as teachers who have higher self-efficacy should have better outcomes. Accordingly, Holzberger, Philipp, and Kunter (2013) define teacher self-efficacy as "their beliefs about their capability to teach their subject matter even to difficult students" (p. 1). Ross (1994) defined teacher efficacy as, "the extent to which teachers believe their efforts will have a positive effect on student achievement" (p. 3). Given Bandura's thoughts on the cyclical effects of self-efficacy, the effects of teacher self-efficacy should be positive in nature. Teachers with higher self-efficacy will acquire more skills (applied knowledge) that will increase their performance mastery, which includes teacher instructional strategies and student educational outcomes (e.g., student achievement, socio-emotional outcomes, functional skill development). In a meta-analysis of teacher professional development on academic achievement, professional development was thought to raise achievement through three steps: a)

professional development increases knowledge and skills, b) better knowledge and skills improve classroom teaching, and c) improved teaching raises student achievement (Yoon et al., 2007). In this sense, acquiring more knowledge and skills will lead teachers to higher levels of self-efficacy through performance mastery, which lends itself to higher student achievement. The cycle of self-efficacy should continue with the higher student achievement resulting in higher self-efficacy which in turn should produce the acquisition of more knowledge and skills.

Bandura's theory of self-efficacy has been researched in its relation to its effects on educational instruction. The cyclical nature of self-efficacy, acquiring more skills, and performance mastery exists in real-world applications. Holzberger and colleagues (2013) examined the relationship of self-efficacy and instructional quality with a longitudinal analysis. Holzberger and colleagues entertained the idea that self-efficacy is commonly thought of as a mechanism for motivation that drives behavior, but not much attention has been given to self-efficacy being a byproduct of results. Their study included 155 secondary mathematics teachers and over 3,400 students in grades 9 and 10. Students involved in the study were part of larger national project and were measured at the end of grade 9 and grade 10. Instructional quality was defined as three key concepts, cognitive activation, classroom management, and individual learning support, and both teachers and students were asked to rate instructional quality of the teachers. Positive significant correlations were present in teachers' self-efficacy beliefs and student and teacher instructional quality at both measured timeframes. Holzberger and colleagues understood these correlations did not control for levels of self-efficacy developed earlier in the teachers' career. To address this concern, they conducted structural equation analyses and

found no significant correlations between teachers' self-efficacy and teachers' ratings of cognitive activation or any of the students' ratings of instructional quality. Teachers with high self-efficacy during the first measurement timeframe had higher self-ratings of classroom management and individual learning support during the second timeframe. Additionally, teachers who rated themselves as having higher rates of classroom management during the first timeframe had higher rates of self-efficacy during the second timeframe (Holzberger et al., 2013).

The study completed by Holzberger and colleagues (2013) strongly supported the cycle self-efficacy can have on instructional quality. More specifically, stronger rates of self-efficacy have also been found to have positive effects on both teacher and student outcomes. Ross (1994) completed a meta-analysis on the effect of teacher self-efficacy on student achievement. His analysis yielded 88 studies he deemed appropriate with requirements of having an empirically supported measure of teacher self-efficacy and needing to identify specific antecedents and consequences for teachers and students. In Ross's review, he found some interesting themes including females having higher rates of self-efficacy than their male counterparts, the increase of personal teacher self-efficacy as teachers gain experience, the decrease in general efficacy (the school's ability) as teachers gain experience, and higher rates of self-efficacy for those who have higher educational levels. Ross's study also emphasized the relationship of teacher efficacy with both teacher and student outcomes. Teacher efficacy has been linked to teachers using more powerful instructional strategies, teachers' willingness to use new instructional programs, and teachers' accountability for special learning needs of students. In terms of

student outcomes, higher teacher self-efficacy was linked to higher student achievement and higher levels of student affect (Ross, 1994).

Ross (1994) hypothesized higher teacher self-efficacy is linked to higher student achievement because teachers with higher self-efficacy are willing to learn and implement new teaching strategies, more likely to implement better classroom management techniques, and willing to focus on students who need more support. Ross (1992) studied this idea when he examined teacher efficacy and coaching on student achievement. He studied 18 history teachers who were in charge of 36 classrooms. Teachers were asked to adopt new guidelines on curriculum based on education department guidelines. They were all given three half-day workshops on how to implement the curricula. Teachers were also given contact with coaches, although this varied in terms of contact hours. Some teachers had at least one face-to-face or telephone contact with a coach while others had dozens of contacts in 1 school year. Mean classroom achievement was found to be related to higher teacher self-efficacy and more frequent teacher use of coaching as they taught their new curricula. Significant correlations were present between mean student achievement and personal teaching efficacy ($r = .59$) and using a coach ($r = .67$). In a stepwise comparison, use of a coach accounted for 41% of the variance in student achievement ($p < .01$) and personal teaching efficacy accounted for a significant 16% additional variance beyond the use of a coach ($p < .01$) (Ross, 1992). This information is supportive of Bandura's theory of self-efficacy (1997) and Ross's hypotheses (1994) that teachers' self-efficacy is linked to higher student achievement and willingness to seek out new teaching strategies.

Increases in self-efficacy have been linked to teachers using more rigorous instructional strategies and gains in student achievement. Caprara, Barbaranelli, Steca, and Malone (2006) further studied the link between self-efficacy and student achievement and found teacher self-efficacy affected teachers' job satisfaction and students' academic achievement. Caprara and colleagues studied the cyclical effect of teacher self-efficacy by way of focusing on academic achievement on teacher self-efficacy and self-efficacy on student academic achievement at different time points. First, they examined the relationship between junior high academic achievement at time one and the teachers' self-efficacy beliefs the following year (time two). The researchers then studied the effect of teachers' self-efficacy (time two) on students' subsequent academic achievement (time three) while controlling for the students' previous academic achievement. The sample included 75 junior high schools in Italy between 2 school years, 1999-2000 and 2000-2001. Caprara and colleagues found significant relationships between the students' academic achievement at time one on the teachers' self-efficacy at time two. Additionally, the teachers' self-efficacy beliefs significantly predicted students' academic achievement at time three when controlling for previous academic achievement. Teachers' self-efficacy accounted for 8.2% of the variance in time three's academic achievement beyond time one's academic achievement. Caprara and colleagues (2006) also found the teachers' job satisfaction was also significantly predicted by the teachers' self-efficacy; however, student academic achievement did not have a significant relationship with job satisfaction at either time one or time three.

Teachers' self-efficacy tends to affect many outcomes for both teachers and students alike and has been linked to greater instructional quality (Holzberger et al.,

2013), higher student achievement (Caprara et al., 2006; Ross, 1992; Ross, 1994), and a likelihood of seeking out more instructional strategies they can use as part of their instructional repertoire (Ross, 1992; Ross, 1994). Learning new instructional strategies should better assist students in their learning outcomes with much more of a current emphasis on research-based strategies. Lohman (2006) looked at various factors that contributed to teachers' engagement in informal learning activities. In Lohman's review of the research, she defined informal learning as "activities initiated by people in work settings that result in the development of their professional knowledge and skills" (Cofer, 2000; Lohman, 2000, p. 142). Lohman noted informal learning activities can have structure or no structure, and they can be planned or unplanned. With the increasing demands on today's teacher, Lohman wanted to investigate factors that led to teachers' informal learning. Six hundred teachers were randomly selected from a national database of public teachers, and 166 responded. Lohman found that personal characteristics of initiative, self-efficacy, love of learning, and interest in the profession all contributed to teachers' motivation to engage in informal learning activities (2006).

Much attention has been given to teacher qualities that impact educational outcomes such as education, professional development, years of experience, and many others. Although these are all important, teacher self-efficacy has been shown to be a strong predictor of both teacher and student outcomes. When preparing teachers to teach or expanding their skills through professional development, increasing their self-efficacy is an essential ingredient.

Teacher Professional Development

Teacher professional development is an essential component of RTI (Barnes & Harlacher, 2008; Barnhardt, 2009; Kratochwill et al., 2007; Lilly, 2011; Shapiro et al., 2011). The theoretical underpinnings of the effects of teacher professional development are thought to be connected to the self-efficacy levels of teachers (Bandura, 1997; Holzberger et al., 2013). Within the framework of RTI, teachers need to gain the knowledge needed to successfully implement multi-tiered instruction. Kratochwill and colleagues (2007) as well as other researchers (Barnes & Harlacher, 2008; Danielson et al., 2007; Richards et al., 2007) addressed this issue and called for training focused on new assessments, intervention/prevention activities, and systemic change skills. In Kratochwill et al.'s (2007) review of the literature, they found low levels of applied behavioral practices in master's level teachers and a lack of districts using research-based curriculum. When implementing RTI, teacher professional development is pivotal for teachers so they can gain knowledge of the concepts involved in RTI with research indicating gaps in teachers' knowledge of RTI applications (Spear-Swerling & Cheesman, 2012). Although teacher professional development is essential, there has not been a lot of research on this organizational component of RTI (Kratochwill et al., 2007; Spear-Swerling & Cheesman, 2012).

Teacher professional development has been commonly targeted by research and been a focal point in the determination of highly qualified teachers. Recently as 2002, the U.S. Secretary of Education concluded that although teachers matter and affect student achievement, teacher certification and education are not related to their effectiveness (Paige, 2002). In fact, the Secretary extended these conclusions by also stating teachers

are not well prepared for the teaching profession in part because of less than optimal teacher education programs. The Secretary's stance on teacher training and development contradicts literature supporting the positive effects of teacher education (Darling-Hammond & Youngs, 2002; Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Yoon et al., 2007). Within the paradigm shift of applying an educational model like RTI that embraces strategies like using data to guide educational decisions, interventions to target students in need, and an orientation focused on prevention rather than reaction, districts need to be certain on the role of teachers in their respective RTI initiatives. Districts need to be able to identify and target the most salient organizational structures needed to efficiently transition into a RTI service delivery. By understanding the necessity and extensiveness of this critical organizational structure, teacher professional development, the implementation of RTI can be enhanced.

Evidence of increasing teachers' knowledge of effective teaching strategies through professional development has been mixed with some experts even calling for the rehabilitation of our country's current teacher training (Paige, 2002). However, plenty of support has been documented for the education of our teachers by means of their college training before teaching and their professional development acquired while teaching. One of the more recent studies was a meta-analysis examining multiple studies on the effects of professional development on student achievement outcomes (Blank & de las Alas, 2010). Blank and de las Alas (2010) focused on math and science subjects and identified 16 studies to review. Their meta-analysis included both published and unpublished research as well as reports from federal and state development projects. The researchers noted the final 16 studies used in the analysis had commonalities in their professional

development designs including: emphasis on learning specific subject content, reinforcement for skills and practices taught, using multiple activities to teach the professional development content, and providing assistance when needed. Overall, there was a mean effect size of 0.21 for mathematics professional development with the median effect sizes of the individual studies ranging from -.19 to .77. The effect sizes were larger when the outcome measure was linked to the course content instead of large-scale assessments. Teachers received the professional development for 91 hours spread over 6 months, on average (Blank & de las Alas, 2010).

Prior to the findings found in Blank and de las Alas' (2010) meta-analysis, a research study was conducted on a Professional Development School (PDS) in Miami (Klingner, Ahwee, van Garderen, & Hernandez, 2004). A local elementary school partnered with a university to allow researchers firsthand experience in public schools and to provide professional development from the university to the teachers in the school. The school consistently recorded a 90% Hispanic student population with over 75% receiving free and reduced lunch and over 36% considered Limited English Proficient. The selected PDS had professors provide instruction on evidence-based practice and held workshops with the public school teachers. This school saw dramatic increases in student outcomes in comparison to other schools in the district. Klingner et al. (2004) followed students in first grade until the sixth grade, and the students in the PDS had noticeably greater gains than the district average on the Stanford Achievement Test (SAT) even though the PDS school started lower. The PDS had a mean SAT score of 40 in first grade and increased it to a 57 in sixth grade while the district average SAT score was 37 in first grade and 36 in sixth grade (SAT scores are percentiles). Klingner et al. (2004) also

analyzed sixth grade students' scores on the SAT during the eight years used in this analysis. The PDS's mean sixth grade SAT score was a 41 during the first year and a 57 eight years later while the district average remained relatively constant between 33 and 38. The results from Klingner et al. (2004) contest the Secretary's position of inadequate university training programs and documents the large effects ongoing professional development can have out targeted outcomes.

Professional Development in Specific Content Areas. Research by Desimone, Porter, Garet, Yoon, and Birman (2002) found professional development focused on specific instructional practices in math will increase the teachers' application of the instructional practices in the classroom. Desimone et al. (2002) studied professional development over the course of 3 years using 30 different schools from 10 districts. Each year, over 429 teachers participated in the study. Desimone et al. (2002) found that using professional development incorporating technology, higher order instructional methods, and alternative student assessments resulted in increasing teachers' use of these methods, which according to Desimone et al. (2002), corresponded with higher student achievement outcomes based on previous research. Interestingly, the researchers also noted that the professional development activities not only supported the areas of focus, math and science, but a "spillover" effect was present in other classes these teachers taught, although these results were not statistically significant.

Desimone et al. (2002) may have been on the right track when investigating the effects of specific professional development training in math also affecting the instruction in other subjects. Professional development has also shown to have effects on other academic subjects besides math. Correnti (2007) studied the effects of professional

development of literacy instruction to determine if teachers utilized what they learned during their professional development. Correnti's (2007) study used data from the Study of Instructional Improvement and included 112 elementary schools. Teachers received intense professional development and were required to keep logs on their teaching. In this study, reading comprehension and writing were of primary interest. Intense professional development resulted in teachers having significantly more frequent writing instruction than teachers not having the intense professional development. It did not have the same effects of increased instruction for reading comprehension, although there were other interesting findings within the analysis of reading comprehension. Teachers receiving the intense professional development taught more reading comprehension strategies and would provide more intense reading comprehension instruction than the teachers without the professional development. In sum, teachers with the professional development taught more skills and strategies to their students (Correnti, 2007).

Although the U.S. Department of Education (2002) noted teachers' knowledge gained through professional development is mixed, they also concluded in another examination of teacher professional development that it can have a profound effect on student achievement if they receive substantial ongoing professional development (Yoon et al., 2007). Yoon and colleagues examined more than 1300 studies addressing teacher professional development and only found 9 meeting What Works Clearinghouse evidence standards. In spite of the low levels of strong research on teacher professional development, Yoon et al. found teachers receiving substantial professional development in key content areas will increase their students' achievement level by an average of 21 percentile points. Their review of the literature showed professional development can

work well across different academic subjects. Out of the 20 effect sizes that were calculated across the nine studies, 18 were positive, one was negative (fractions computation), and one resulted in an effect size of zero. Yoon and colleagues pointed out some commonalities across the research studies they analyzed. First, the studies were not one-day workshops. Instead, teachers logged many hours on a specific topic. Studies that had over 14 hours of professional development all had positive effects on student achievement while the three studies giving teachers 5-14 hours of professional development did not result in any statistically significant effects on student achievement. All nine studies were workshops or summer institutes (Yoon et al., 2007).

Some of the principal findings by Yoon and colleagues (2007) have been supported by other researchers. Teachers receiving more than 30 hours of professional development tend be more effective in improving student outcomes (Darling-Hammond et al., 2009; Guskey & Suk Yoon, 2009). Darling-Hammond et al. (2009) and Croft et al. (2010) also noted professional development needs to be collaborative, intensive, ongoing, connected to the practice, focused on teaching and learning of specific content, and connected to other school initiatives.

Professional development activities have had a significant impact on teachers' use of effective instructional strategies and student achievement (Blank & de las Alas, 2010; Correnti, 2007; Desimone et al., 2002; Klingner et al., 2004; Yoon et al., 2007). Intentional and ongoing professional development has also been shown to be effective in some multi-tiered behavioral interventions, adding to the evidence of the strong effects teacher professional development may have.

Professional Development on Multi-Tiered Behavioral Interventions. The positive effects associated with teacher professional development has reached beyond student academic achievement as well. Behavioral practices can also acquire the favorable outcomes stimulated by professional development. Gettinger, Stoiber, and Koscik (2008) studied an 8-month training program focused on collaborative consultation and positive behavioral support with three specific groups: pre-service trainees, classroom teachers, and target children. The consultants were graduate and undergraduate students in education related fields, and they received additional ACTION training to assist them in their consultation. Nine additional students were recruited to serve as a comparison group. Kindergarten through fourth grade classroom teachers were part of schools that were practicum sites using the ACTION training and were asked to identify one student whose behaviors put them at risk for a special education referral. Training sessions were separated into two 16-week phases and consisted of promoting accommodations for children with challenging behaviors through a functional assessment and a positive behavior support (PBS) approach. Measurement included knowledge, skills, and efficacy beliefs for consultants; knowledge and self-efficacy for teachers; and goal attainment scaling (GAS) and global ratings for children. Consultants receiving the additional training had significantly higher rates of knowledge, competency self-ratings, and consultation simulation scores than their counterparts who did not receive the additional trainings. Teachers had significant gains in knowledge and self-efficacy scores, and students had significantly higher scores on the GAS and global ratings (Gettinger et al., 2008). Gettinger and colleagues demonstrated providing teacher professional development can have strong outcomes on teachers and students in the context of

providing effective intervention support through a PBS system. PBS is conceptually very similar to RTI with a primary focus on intervention for problematic and challenging behaviors.

Summary

The multi-tiered framework and utility of RTI has evolved in our nation's continual focus on improving our nation's education system. RTI's basic premises of high quality, research-based instruction; preventative and remedial services for at-risk students; continually monitoring student progress; and data-based decision making are very appealing. RTI not only serves as a system to improve student achievement in the general education setting, but it also services as an alternative method for identifying students with disabilities (Hilt-Panahon et al., 2011). With the reauthorization of IDEA in 2004, RTI was seen as an acceptable model of identifying students for special education, and local education agencies were allowed to use RTI within this process. RTI implementation has resulted in positive effects for all students, both general and special education students alike. Research has shown it can improve the identification of those with disabilities, reduce the disproportional rates of those qualifying for special education, and improve overall student achievement (Burns et al., 2009; NCRTI, 2010; NJCLD, 2005).

Although a general consensus exists on the essential components of RTI including research-based core instruction and supplemental interventions, using sound measurement tools and data collecting, and providing the appropriate organizational structures, RTI systems will vary from state to state, district to district, and school to school because of inherent differences based on student population, school climate,

organizational support and structures, funding, physical characteristics, etc. Because of these engrained differences, studies on RTI have generally studied components of RTI because generalizing systems-level applications to other sites with varying school characteristics will be difficult to impossible. Some systems-level applications of RTI have been shown to be effective (Bollman et al., 2007; Clemens et al., 2011; Liu et al., 2011; Wallace et al., 2011; Zigmond et al., 2011), but most studies have generally targeted specific components of RTI. Evidence of teaching a research-based curriculum with fidelity, implementing research-based interventions, using progress monitoring/formative assessments, and utilizing problem-solving models shows these components are effective in promoting RTI outcomes (Fuchs & Fuchs, 1986; Fuchs et al., 2004; VanDerHeyden et al., 2007; Zigmond et al., 2011).

Beyond the evidence on problem-solving models, there is not much research support on specific organizational constructs that aid in the implementation of RTI. Experts have agreed these organizational constructs are vital to the successful implementation of RTI (Barnes & Harlacher, 2008; Barnhardt, 2009; Bollman et al., 2007; Burns et al., 2009; Danielson et al., 2007; Kratochwill et al., 2007; Lilly, 2011; Richards et al., 2007; Shapiro et al., 2011). With teachers being at the forefront of this initiative, it is imperative they receive the knowledge and skills through ongoing teacher professional development for a successful RTI implementation (Barnes & Harlacher, 2008; Danielson et al., 2007; Richards et al., 2007). However, an understanding of whether and how teacher professional development affects specific teacher outcomes such as knowledge and self-efficacy is relatively unknown.

Providing teacher professional development should increase teachers' knowledge, skills, and self-efficacy (Bandura, 1997; Ross, 1994; Yoon et al., 2007), which in turn, should increase teacher and student outcomes (Holzberger et al., 2013; Ross, 1994). Bandura described a cyclical effect of increasing more knowledge and skills that leads to higher rates of self-efficacy. Higher rates of self-efficacy should continue to motivate to acquire more knowledge and skills (Bandura, 1982). Research has documented that higher rates of teacher self-efficacy have been linked to higher student achievement (Caprara et al., 2006; Ross, 1992; Ross, 1994). In terms of multi-tiered support systems, researchers have demonstrated teacher professional development as leading to significant gains in teachers' knowledge and self-efficacy as well as goal attainment for students whose behaviors put them at risk for special education referral (Gettinger et al., 2008).

The focus of the proposed research study is to address the literature gap in RTI-related organizational constructs by examining one of the more pivotal organizational constructs, ongoing teacher professional development, and its effect on essential RTI outcomes. Through a theoretical standpoint, providing ongoing teacher professional development in comparison to a single session of training should result in greater gains in teachers' knowledge and self-efficacy in RTI and its applications. This study will specifically address the following research questions:

1.) *What is the effect of a 10-week teacher professional development course in RTI in comparison to a single training session on teachers' knowledge of RTI?*

2.) *What is the effect of a 10-week teacher professional development course in RTI in comparison to a single training session on teachers' RTI self-efficacy?*

3.) *What is the relationship of understanding and application of skills of the experimental group as indicated by their performance on homework assignments and their improvement in RTI knowledge?*

4.) *What is the relationship of understanding and application of skills of the experimental group as indicated by their performance on homework assignments and their improvement in RTI self-efficacy?*

CHAPTER THREE: METHODS

The present research study examined the effects of ongoing teacher professional development on specific RTI outcomes for teachers by examining whether ongoing teacher professional development in RTI affects teachers' knowledge of RTI and teachers' self-efficacy in the implementation of RTI. Through the use of pre- and post-test measures of teacher knowledge and self-efficacy of RTI, the effects of teacher professional development were evaluated comparing the interaction the repeated pre- and post-test measures and each dependent variable, knowledge and self-efficacy.

Participants

This study included teachers from three rural school districts in east central Illinois. Combined, these districts serve 1,868 students with the low income rates ranging from 28% to 61% among the districts. The number of students identified as having disabilities ranges from 8.5% to 12.7%. Ethnicity of the students is predominantly White with approximately 90% considered White, 4% Hispanic, 4% reported as Multi-Racial, and the remaining 2% Black, Asian, or American Indian. Teachers were recruited through district email and school staff meetings. Superintendents were contacted and asked if their school administrators could be contacted for participation. After receiving

approval from the districts' superintendents, building principals were contacted. Those principals who responded then sent out information on the opportunity to teachers and gave permission to the principal investigator to speak at staff assemblies.

Teachers were used as the participants to determine teacher outcome data including improvements in teacher knowledge and self-efficacy related to their professional development in RTI. The teachers participating in this study were required to have a valid teaching certificate from the state of Illinois. The grades taught by the teachers ranged from Kindergarten to 12^{th} grade, and because this study was primarily focused on increasing knowledge and self-efficacy in RTI, teachers instructing any academic subject were able to participate. Subjects primarily taught by the teachers included typical instructional duties by elementary teachers (all academic areas), special education, Title I reading, science, and business. In addition to the teachers involved, one elementary level administrator was involved in the study.

A preliminary power analysis was completed using Lenth's (2009) power analysis software for teacher outcome goals. The analyses compared 27 teachers who agreed to participate that were randomly assigned to the experimental and control groups (14 for experimental and 13 for control). This design had 80% power to detect a large effect size, $d = .80$. Based on previous research on teacher professional development and its effect on teacher outcomes, the likelihood of a large effect size for teacher knowledge and self-efficacy is strong (Gettinger et al., 2008).

Twenty-five teachers completed the entirety of the project with two teachers from the control group discontinuing their participation for personal matters. Fourteen teachers were randomly assigned to the experimental group that received the 10-week professional

development course, and 11 teachers were assigned to the control group that received a single after school professional development course. The teachers had an average of 14.76 years (*SD* = 8.04) of educational experience. Table 1 shows the demographic information of the overall sample of teachers as well as the experimental and control groups.

Table 1

Participant Demographics

	Experimental Group		Control Group		Total Sample	
	n	*%*	*n*	*%*	*N*	*%*
School Setting						
Elementary	10	71.43%	4	36.36%	14	56.00%
Middle	2	14.28%	3	27.27%	5	20.00%
High	0	--	2	18.18%	2	8.00%
Middle and High	2	14.28%	1	9.09%	3	12.00%
Elementary and Middle	0	--	1	9.09%	1	4.00%
Gender						
Male	4	28.57%	1	9.09%	5	20.00%
Female	10	71.43%	10	90.90%	20	80.00%
Ethnicity						
Hispanic	1	7.14%	0	--	1	4.00%
White	13	92.86%	11	100.00%	24	96.00%
Teacher Educational Level						
Bachelor's Degree	4	28.57%	6	54.55%	10	40.00%
Master's Degree	10	71.43%	5	45.45%	15	60.00%
Hours of RTI Professional Development						
None	1	7.14%	2	18.18%	3	12.00%
1-5 Hours	6	42.86%	6	54.55%	12	48.00%
6-10 Hours	3	21.43%	1	9.09%	4	16.00%
11-15 Hours	0	--	0	--	0	--
16-20 Hours	1	7.14%	0	--	1	4.00%
More than 20 Hours	3	21.43%	2	18.18%	5	20.00%

The experimental group was divided into two with each group being randomly assigned to a separate instructor to decrease possible instructor effects. The groups were determined by location to increase the convenience for the teachers. The mean years of

educational experience was 14.44 years (*SD* = 6.31) for the 9 teachers in the first experimental group, 18.80 years (*SD* = 6.61) for the 5 teachers in the second experimental group, and 13.18 years (*SD* = 9.75) for the 11 teachers in the control group.

Measures

Independent Variables

The experimental variable of this study was the instruction of RTI core features to randomly assigned teachers. Teachers were randomly assigned to either receive an ongoing 10-week professional development series or a single after-school session. PowerPoint modules were adapted from the National Center on Response to Intervention's (NCRTI) website (NCRTI, 2013). The NCRTI was created out of the American Institutes for Research and researchers from Vanderbilt University and the University of Kansas with funding provided by the U.S. Department of Education's Office of Special Education Programs (OSEP). NCRTI's mission is "to provide technical assistance to states and districts and building the capacity of states to assist districts in implementing proven models for RTI" (NCRTI, 2013).

The NCRTI modules included the core components of RTI including screening, progress monitoring, and providing multi-leveled support systems. The curriculum for the professional development is found in Table 2. The PowerPoint presentations were primarily created from the NCRTI's modules with added supplemental information and activities. The ongoing professional development occurred over a 12-week period at local schools within the participating districts. One weekly session was postponed because of inclement weather, and teachers were allowed a break during their district's spring break.

Table 2

General Professional Development Curriculum and Objectives

Topic	Week	Objectives/Features	Teacher Activities
Introduction	1-2	General overview of RTI and its components General overview of screening General overview of progress monitoring General overview of multi-level prevention system Provide evidence from literature on component and system-wide applications of RTI	Complete initial self-efficacy and knowledge assessments Identify benchmark assessment(s) Evaluate classroom breakdown of percentages meeting desired outcomes Identify Tier 2 supports Discuss how their respective schedules affects RTI implementation
Screening	3-4	Discuss the screening tools the district utilizes Demonstrate how the tool can be used to predict performance on the state reading assessment and how it can identify at-risk students	Evaluate classroom data on benchmark assessments Identify students who need supplemental supports and discuss options to receive additional instruction Evaluate percentage of students who met benchmark levels last year that eventually met standards on state assessment
Progress Monitoring	5-7	Show tools teachers can use for progress monitoring Explore available information on technical information of progress monitoring tools Examine predictive validity of progress monitoring probes Discuss methods of interpreting student progress Instruct teachers how to track data in Microsoft Excel	Have teachers begin monitoring progress of one of their students Keep track of progress in Excel document and construct baseline, intervention, aim-line, and progress line of intervention Determine effectiveness of intervention and decide on subsequent actions
Multi-Level Prevention System	8-9	Communicate the different levels of instruction and intervention Clearly define each tier with examples of possible intervention/service delivery Emphasize the application of RTI to all students Exhibit the continuum of intervention delivery between the tiers Provide information on ideal organizational systems needed for successful RTI implementation	List possible interventions accessible by the school Discuss integrity of curriculum and interventions Examine interventions online at reputable online sites Identify organizational structures that work well and that need improvement
Review	10	Cover materials needing more in-depth instruction Allow for more questions on specific topics	Complete final analysis on specific intervention teachers completed Discuss roles teachers can plan in the further expansion of RTI in their schools Complete final self-efficacy and knowledge assessments

The single after-school session included the same information as the 10-week program but was condensed to a single 2-hour session. The same objectives and features listed in Table 2 were covered during the control group's single session training; however, the teacher activities were not completed. Teachers receiving the single after-school session did not have the opportunity to use Microsoft Excel to graph student data and were not provided any review activities. The content provided in the single after-school session was very similar to the 10-week course.

Instructors included the principal investigator and a local school psychologist who is competent in RTI practices and applications. The use of two instructors improved the design of the study and recruitment of participants. The instructors were randomly assigned to exclusively teach one experimental 10-week group.

The professional development series was delivered in a uniform, standardized method. The PowerPoint presentations included strict notes, or a script, specifying what the instructors needed to say for each slide. This standardized approach was selected to guarantee the professional development series were presented with consistency. The standardized delivery of the slides was evaluated through audio recordings of four sessions by an independent party with a Bachelor's degree. Forty random slides were evaluated by calculating the percentage of sentences correctly conveyed by the presenters to the participants for each selected slide. The evaluation of accuracy involved comparing the actual presentation of the information (e.g., audio recording) with each slide's script. If the presenter correctly conveyed the sentence, it was counted as correct. In contrast, if the presenter did not read a sentence or did not reasonably convey what was intended, the sentence was counted as incorrect. The principal investigator had an accuracy rate of 95%

over all of the selected slides, the local school psychologist presenter had an accuracy rate of 93.6%, and the total combined accuracy rate for both presenters was 94.3%.

Dependent Variables

This dependent variables in the current study included measures of teacher outcomes, specifically their knowledge and self-efficacy in RTI.

Teacher knowledge. An 11-item measure of teachers' knowledge (Appendix A) was used to assess the gains in RTI knowledge before and after the professional development course. This knowledge assessment compared the experimental group and the control group before and after the completion of the professional development course to determine differences between the groups. During piloting and through the course of the study, its applicability was found to have enough difficulty to measure growth from pre- to post-test assessments, and the Cronbach's alpha during piloting was found to be .66. Cronbach's alpha was found to be .27 during the pre-test and .63 on the knowledge post-test assessment.

Teacher self-efficacy. A 21-item measure of self-efficacy (Appendix B) was used to assess the teachers' perception of how effective they believe they are with RTI components including determining students who are at-risk or below benchmark, using a problem-solving process, making data-based decisions, providing interventions to students who need them, and evaluating the progress of their process. This assessment was used to compare the experimental and control groups before and after the introduction of a professional development course. The developed self-efficacy scale was adapted from previous research on teacher self-efficacy of accommodating children with challenging behaviors in the general education setting (Gettinger et al., 2008). The scale

included ratings from 1 to 4 with 1 indicating a strong agreement and 4 indicating a strong disagreement. Smaller scores on this scale represented higher levels of self-efficacy, and the scale had a possible range of 21 to 84. Cronbach's alpha was .94 based on the self-efficacy post-test.

Homework. Teachers were asked to complete seven homework assignments designed to promote their learning and application of essential RTI skills. Homework activities were brief but included: (a) evaluating their class percentage of students who would be considered representative of primary, secondary, or tertiary levels of support; (b) identifying their school's Tier 2 (secondary level) supports; (c) identifying students needing additional supports beyond the core curriculum; (d) evaluating what percentage of students met benchmarks on screening measures the previous year who eventually met standards on the state assessment; (e) selecting a student needing additional assistance, collecting baseline data on the student with an appropriate progress monitor measure, and determining an appropriate goal for the student; (f) continuing to progress monitor the student; and (g) evaluating student progress toward selected goal. The teachers were blindly rated independently by both instructors on a scale of 1 to 10 for each assignment (Appendix C). Receiving a rating of 10 suggested the teacher provided evidence of exceptional effort and understanding of the curriculum. An example of a homework assignment is provided in Appendix D, and examples of the scoring are provided in Appendix E.

Procedures

Teachers were recruited from the districts' elementary, middle, and high schools by means of email, flyers, and encouragement from school principals at school meetings.

Teachers were randomly assigned to either the experimental group that received the ongoing 10-week professional development (PD) or the control group that received a single condensed version of the RTI training given at an after-school assembly. The experimental group was divided into two sections, with each instructor providing the PD at separate times and locations. The teachers from the experimental and control groups received PD credits used toward their application to renew their education license. By completing this course, the teachers in the experimental group received 15 continuing professional development units (CPDUs) while the control group teachers received 2 CPDUs. Upon completion of this study, the control group teachers, along with the school district, received an opportunity to receive the training provided to the experimental group.

Teachers in the experimental group completed weekly 90-minute professional development sessions over 10 weeks during the end of their spring semester. The control group received their single after-school professional development session during the final week of the experimental group's 10-week course. Teachers were instructed on core assumptions and practices, and teachers in the experimental group were asked to complete small homework assignments to help increase their understanding and application of RTI. They were introduced to the fundamentals of RTI and concepts such as using and understanding screening data, using and understanding progress monitoring, implementing a multi-level prevention systems, and making data-based decisions.

Both sets of teachers were recruited at the beginning of the second semester. Teachers were asked to complete an assessment of their knowledge of RTI and their self-efficacy of implementing RTI prior to the PD courses. Both control and experimental

groups repeated the knowledge and self-efficacy assessments one week after the completion of their respective professional development course. With the experimental and control groups both receiving their final professional development session during the same week, the time lapse between their last session and their final assessment of knowledge and self-efficacy was the same.

Teachers in the experimental group were assigned homework activities to deepen their understanding of the course material and apply their learned knowledge. Overall, there were seven activities listed in Table 2 that teachers were graded on: (a) identifying benchmark assessments, (b) evaluating classroom breakdown of percentages of students meeting desired outcomes, (c) identifying Tier 2 supports, (d) identifying students who need supplemental supports, (e) evaluating percentage of students who met benchmark levels last year who recently met state standards, (f) monitoring progress and determining intervention effectiveness through Excel produced graphs, and (g) listing possible interventions accessible by the school. For each completed activity, the teachers were assessed on their expended effort and how well they applied skills they learned. Teachers were rated by both instructors separately on a scale of 1 to 10 with a 10 indicating they produced a product showing exceptional effort and sound understanding of the information presented (Appendix C). Each instructor blindly rated the homework assignments without knowing what the other instructor had rated each teacher assignment. Teachers could receive scores from 2 to 20 on each homework assignment. Reliability between the two instructors was assessed, and the intraclass correlation coefficient completed in SPSS was found to be .70, a moderate relationship. The total average of the grades was used to determine if there was a connection between the

teachers' understanding and application of skills and their gains in RTI self-efficacy and knowledge.

Analyses

Preliminary Analyses

Preliminary analyses were conducted to assess the comparability of the randomly assigned experimental and control groups. In these analyses, demographic information was gathered for comparison including: years of education-related experience, teacher educational levels, hours of training in RTI, gender, and ethnicity. Additionally, initial teacher levels of knowledge of RTI and self-efficacy in implementing RTI concepts were measured and compared in the preliminary analyses. Univariate analyses were completed to examine differences between the experimental and control groups in terms of experience and initial levels of self-efficacy and knowledge. Chi-square analyses were used to examine nominal variables such as gender, ethnicity, hours of previous RTI trainings, and educational levels.

Teacher Outcomes

Table 3 lists the research questions and corresponding variables used in this study. Teacher outcomes focused differences in knowledge of RTI and self-efficacy in implementing RTI concepts before and after the professional development training in RTI. A mixed 2 x 2 ANOVA design was used for each dependent variable to analyze the interaction between time (i.e., pre- to post-test scores) and the specific dependent variable (i.e., knowledge and self-efficacy scores). The mixed ANOVA designs addressed the first two research questions. These analyses were designed to address the proposed research questions, which focused on whether a 10-week teacher professional development course

in RTI will have an effect on teachers' knowledge and self-efficacy in RTI when compared to a single after-school PD session.

Table 3

Research Questions and Corresponding Variables

Independent Variables	Dependent Variables
Research Question 1: What is the effect of a 10-week teacher professional development course in RTI in comparison to a single training session on teachers' knowledge of RTI?	
Teacher Professional Development	Teachers' RTI Knowledge Scores on Pre- and Post-tests
Research Question 2: What is the effect of a 10-week teacher professional development course in RTI in comparison to a single training session on teachers' RTI self-efficacy?	
Teacher Professional Development	Teachers' RTI Knowledge Scores on Pre- and Post-tests
Research Question 3: What is the relationship of understanding and application of skills of the experimental group as indicated by their performance on homework assignments and their improvement in RTI knowledge?	
Average Homework Composite Score	Improvement in Teachers' RTI Knowledge
Research Question 4: What is the relationship of understanding and application of skills of the experimental group as indicated by their performance on homework assignments and their improvement in RTI self-efficacy?	
Average Homework Composite Score	Improvement in Teachers' RTI Self-Efficacy

The final two research questions explored the connection of the teachers' engagement and understanding and their gains in knowledge and self-efficacy. A bivariate one-tailed correlation analysis was completed. With the teachers being graded on their homework assignments based on effort and understanding, it was proposed that teachers with higher scores on homework assignments would also have higher gains in their RTI knowledge and self-efficacy.

CHAPTER FOUR: RESULTS

Preliminary Results

The experimental and the control groups were found to be similar across the measured demographic variables. A MANOVA analysis comparing pre-test levels of self-efficacy, pre-test levels of knowledge, and teachers' years of educational experience was completed, and no significant differences were detected between the experimental and control groups, Wilks' $\lambda = .91$, $F(3, 21) = 1.68$, $p = .20$. Teachers in the experimental group had an average of 16.00 years ($SD = 6.52$) of experience, and the teachers in the control group had an average of 13.18 years ($SD = 9.75$) of experience. Table 4 shows the experimental and control group pre-test values for knowledge and self-efficacy.

Table 4

Pre-Test Values for Experimental and Control Groups

		Knowledge			Self-Efficacy			
Group	*n*	*M* Correct (%)	Minimum Correct (%)	Maximum Correct (%)	*M* Score	*SD*	Minimum Level	Maximum Level
Experimental Total	14	4.86 (44.18%)	3.00 (27.27%)	9.00 (81.82%)	51.14	4.67	43.00	60.00
Experimental Group 1	9	5.11 (46.45%)	3.00 (27.27%)	9.00 (81.82%)	50.22	4.79	43.00	57.00
Experimental Group 2	5	4.40 (40.00%)	3.00 (27.27%)	7.00 (63.64%)	52.80	4.44	48.00	60.00
Control	11	4.91 (44.64%)	3.00 (27.27%)	8.00 (72.73%)	44.09	11.58	27.00	66.00

Chi-square tests were conducted and no significant differences were found between experimental and control groups for gender, X^2 (1, $N = 25$) = .82, $p = .37$, ethnicity, X^2 (1, $N = 25$) = .82, $p = .37$, teacher educational level, X^2 (1, $N = 25$) = 1.73, $p = .19$, and hours of previous RTI training, X^2 (4, $N = 25$) = 2.21, $p = .70$. Table 1 displays the demographic information of the participants.

Experimental Group Differences

To examine instructor effects within the experimental group, change scores on the knowledge and self-efficacy measures were compared for the two instructional groups. The principal investigator's group had a mean improvement of 3.78 (*SD* = 2.73) on the knowledge assessment and a mean increase of 13.33 (*SD* = 5.59) on the self-efficacy measure. The other instructor's group, led by a local school psychologist, had a mean improvement of 2.00 (*SD* = 1.00) on the knowledge assessment and a mean improvement of 14.40 (*SD* = 8.29) on the self-efficacy measure. Neither difference between the knowledge, $t(12) = 1.38$, $p = .10$, or self-efficacy, $t(12) = 0.29$, $p = .39$, was statistically significant.

When observing the two largest and smallest improvements for each group, the experimental group had eight participants that improved 1 or 2 items correct, and two participants had 7- or 8-item improvements, respectively. Both of the largest improvements were seen in the principal investigator's group; the largest improvement in the local school psychologist's group was 3. The experimental group's smallest self-efficacy improvements were 6 points (one participant) and 7 points (four participants). Their greatest self-efficacy increases were 27 points and 22 points with the greatest improvement occurring in the local school psychologist's group and the 22-point improvement occurring in the principal investigator's group.

Relationship among Dependent Variables

Bivariate correlations were obtained between the dependent variables to gain better perspective on their potential relationships. Table 5 shows the relationships between pre- and post-test values of knowledge and self-efficacy for the overall sample,

experimental group, and control groups. Because self-efficacy measures were reverse coded (i.e., lower scores represented higher levels of self-efficacy), positive correlations between self-efficacy and knowledge scales were negative as expected. For instance, the improvement in self-efficacy had a correlation of -0.30 with the knowledge improvement for the overall sample. An improvement in self-efficacy resulted in lower scores on the measure while an improvement in knowledge was represented by higher scores.

Table 5

Relationship between Dependent Variables

Variable	Pre SE	Post SE	SE Improvement	Pre KN	Post KN	KN Improvement
Overall Sample (N = 25)						
Pre SE	1.00	0.52**	-0.41*	-0.34	-0.06	0.20
Post SE	--	1.00	0.57**	-0.38	-0.39	-0.10
SE Improvement	--	--	1.00	-0.09	-0.36	-0.30
Pre KN	--	--	--	1.00	0.38	-0.38
Post KN	--	--	--	--	1.00	0.71**
KN Improvement	--	--	--	--	--	1.00
Experimental Group (n = 14)						
Pre SE	1.00	0.41	-0.31	-0.37	-0.23	0.12
Post SE	--	1.00	0.74**	-0.44	-0.34	0.07
SE Improvement	--	--	1.00	-0.18	-0.19	-0.01
Pre KN	--	--	--	1.00	0.34	-0.55*
Post KN	--	--	--	--	1.00	0.60*
KN Improvement	--	--	--	--	--	1.00
Control Group (n = 11)						
Pre SE	1.00	0.70**	-0.23	-0.50	-0.36	-0.05
Post SE	--	1.00	0.54	-0.47	-0.42	-0.14
SE Improvement	--	--	1.00	-0.05	-0.14	-0.14
Pre KN	--	--	--	1.00	0.62*	-0.04
Post KN	--	--	--	--	1.00	0.76**
KN Improvement	--	--	--	--	--	1.00

* $p < .05$, ** $p < .01$

Primary Research Question Analyses

Four research questions were addressed during the course of this study. The first two research questions addressed the effects on teachers' knowledge and self-efficacy when comparing an ongoing professional development series in RTI to a single session training of RTI. The two additional research questions addressed the relationship in

teacher's understanding and application of skills with their improvement in knowledge and self-efficacy, respectively. A mixed ANOVA design for each dependent variable was completed to determine if differences were present between the teachers receiving the 10-week training and the teachers receiving the single after-school training for the dependent variables of knowledge and self-efficacy. Teacher experience and educational levels were entered into each model as control variables. Assumptions were analyzed including detection for outliers, normal distribution of dependent variables, and homogeneity of variances-covariance matrices normality. Plots of studentized residuals and an examination of the descriptive data did not result in any observed outliers within the dataset. The dependent variables, knowledge and self-efficacy, were normally distributed based on visual inspection of histograms of each dependent variable. Equality of variances were assessed with Levene's Test, and no significant differences were found on the knowledge assessment between the experimental and control groups for the pre-test, $F(1, 23) = 2.82$, $p = .11$, or the post-test, $F(1,23) = 0.25$, $p = 0.62$. The self-efficacy assessment did not have equal variances determined by Levene's test. The pre-test self-efficacy, $F(1, 23) = 7.50$, $p = .01$, and the post-test, $F(1, 23) = 7.77$, $p = .01$, indicated variances were not equal. Box's M was used to test the equality of the covariance matrices. For the knowledge assessment, Box's $M = 3.47$, $p = .37$, the covariance matrices were considered equal. The self-efficacy assessment showed significant differences between the experimental and control groups covariance matrices, Box's $M = 11.37$, $p = .02$.

Effects of 10-Week Professional Development in Comparison to Single-Session Training

Teacher knowledge. A 2 x 2 mixed ANOVA design was used to analyze the effects between the experimental group receiving the 10-week PD course and the control group receiving the single after-school PD session. The results from this analysis showed there was a significant interaction from pre- to post-test knowledge scores and the amount of training the subjects received, $F(1, 23) = 5.93$, $p = .02$. The scores on the knowledge assessment had ranges of 3 to 9 on the pre-test and 5 to 11 on the post-test. Table 6 displays the results of the knowledge assessment scores.

Table 6

Comparison of Knowledge and Self-Efficacy Gains

	Experimental Group (n = 14)			Control Group (n =11)			Between Group	
Area	Pre *M* (*SD*)	Post *M* (*SD*)	*M* Improvement	Pre *M* (*SD*)	Post *M* (*SD*)	*M* Improvement	*M* Improvement Difference (*SD)*	Cohen's *d* [95% CI]
Knowledge	4.86 (2.03)	8.00 (2.11)	3.14 (2.38)	4.91 (1.38)	6.00 (2.10)	1.09 (1.64)	2.05* (2.30)	0.93 [0.78, 1.08]
Self-Efficacy	51.14 (4.67)	37.43 (6.63)	13.71 (6.38)	44.09 (11.57)	40.45 (13.34)	3.64 (9.78)	10.07* (9.38)	1.13 [0.98 1.34]

Note. CI = confidence interval.
* $p < .05$

These results supported the first hypothesis that the ongoing PD would have a stronger effect on teachers' knowledge of RTI than a single training session.

Teacher self-efficacy. Similar to the analysis for teacher knowledge, a mixed ANOVA design was used to test the interaction of pre- to post-test self-efficacy scores and the amount of training the subjects received. The interaction was found to be significant, $F(1, 23) = 9.69$, $p = .01$, suggesting the experimental group showed greater improvements on the self-efficacy scale than the control group. These results should be interpreted with caution with the assumption of homogeneity of variances not being met. The results of these analyses are listed in Table 6. The second hypothesis was supported with these results as the teachers receiving the ongoing professional development had significantly improved scores on self-efficacy than the teachers in the single-session control group.

Relationship of Homework Assignments with Knowledge and Self-Efficacy

The final two research questions addressed the relationship between the experimental groups' completion of homework assignments and their improvements in knowledge and self-efficacy. The participants completing the 10-week course had their average homework score computed, and the groups' overall mean was 13.16 out of 20 with a standard deviation of 2.48. The one-tailed bivariate correlation between the teachers' mean homework assignments and their improvements in knowledge, $r(13) = .31$, $p = .14$, and self-efficacy, $r(13) = .05$, $p = .44$, was non-significant. The final two hypotheses of homework grades having a significant relationship with the teachers' improvements in knowledge and self-efficacy were not supported.

CHAPTER FIVE: DISCUSSION

With the initiation of recent legislation, more attention has been placed on RTI's theoretical approach. Given NCLB's design of increasing accountability, connecting

practice with evidence from research, and continuing the focus on the child, a strong connection was formed with the reauthorization of IDEA in 2004 that gave states the alternative option to use RTI instead of the long-standing discrepancy model. RTI is a school-wide initiative focused on preventing poor outcomes behaviorally and academically while also providing an alternative method of identifying students with disabilities (Hilt-Panahon, Shapiro, Clemens, & Gischlar, 2011; NCRTI, 2010). The literature includes information supporting the use of an RTI framework and has shown using an RTI model can help reduce special education rates and referrals which arguably indicates better accuracy of identifying the students with actual disabilities (Bollman et al., 2007; Marston et al., 2003; VanDerHeyden et al., 2007). Additionally, utilizing an RTI model has been shown to decrease the disproportionality of minorities qualifying for special education (Marston et al., 2003; VanDerHeyden et al., 2007) and increase overall academic achievement (Bollman et al., 2007; Clemens et al., 2011).

Researchers and experts have called for ongoing professional development as a critical piece when practicing core RTI strategies (Burns et al., 2009; Kratochwill et al., 2007; Spear-Swerling & Cheesman, 2012); however, research in this area is somewhat scarce. This current study focused on the effects of ongoing teacher professional development on teachers' knowledge and self-efficacy with implementing RTI. Specifically, participants in this study were randomly assigned to a single session of after-school training or an ongoing 10-week training. Previous research indicated professional development activities will have stronger effects on student achievement if teaching staff obtain over 14 hours of training (Yoon et al., 2007). Although this study did not address student achievement, the teachers in the 10-week course received

approximately 15 hours of training compared to 2 hours for the control group receiving the single training session. Teachers in both groups received instruction on core features of RTI implementation: screening, progress monitoring, multi-level prevention system, and making data-based decisions. They learned how RTI impacted them based on current state legislation and were provided information on their respective special education agency's model of RTI that detailed the necessary procedures for a student to qualify for specific learning disability services through an RTI framework. Teachers in the experimental group receiving the 10-week course were assigned homework assignments to increase their understanding of the curriculum and learn how to apply key RTI concepts and ideas.

This study addressed four research questions. The first two questions analyzed within-group gains between the experimental group receiving the 10-week PD and the control group receiving the single after-school session of PD. It was hypothesized that experimental teachers who completed PD over a 10 weekly sessions would demonstrate significantly better scores on teachers' knowledge and self-efficacy measures in RTI in contrast to teachers in the single after-school PD training. The final two research questions were developed to examine the relationship between the experimental groups' homework scores and their gains in knowledge and self-efficacy, respectively. A significant relationship between higher homework scores and higher gains in knowledge and self-efficacy was hypothesized because teachers were graded on effort and understanding.

The first and second hypotheses were confirmed with the experimental group having significantly stronger improvements with their knowledge and self-efficacy in

RTI. The experimental group had participants who demonstrated increased knowledge and self-efficacy especially when compared to the control group receiving the single after-school training, and the effect sizes between the mean gains in knowledge and self-efficacy were found to be large. Although this research design did not look specifically at teacher instructional strategies or student outcome data, the significant increase in knowledge and self-efficacy may have a strong impact on outcome variables as previous researchers have detected significant relationships with instructional quality and student acheivement (Caprara et al., 2006; Holzberger et al., 2013; Ross, 1992; Ross, 1994).

The final two hypotheses examined the relationship between the experimental group's scores on homework assignments and their improvement in knowledge and self-efficacy. With teachers being graded on their effort and understanding, it was hypothesized that better homework assignments would be connected with higher gains in knowledge and self-efficacy. The relationship between the grades on the homework assignments and teachers' improvement in knowledge and self-efficacy was not found to be significant. This aspect of professional development is an area that should continue to be explored. Although the relationship between homework scores and knowledge was not significant, there was a small to moderate correlation, and the analysis may have suffered from insufficient power due to the smaller sample size.

Summary of Results

This study demonstrated that ongoing professional development in RTI is more effective with increasing teachers' knowledge and self-efficacy in RTI when compared to a single after-school training. In this study, the teachers receiving the ongoing professional development received approximately 15 hours of training in 10 individual

sessions. The teachers in the control group that received the single after-school training had the same core information provided to them as the experimental group but only received approximately 2 hours of training.

The findings of this study support previous research findings in a number of ways. First, this research is connected to previous research that showed ongoing professional development is more effective than a single training. When examining the literature on teacher professional development, Yoon and colleagues (2007) noted professional development is a key ingredient for improving instructional strategies and increasing student achievement. Additionally, these researchers commented on the prevalence of workshops provided in a single session and the potential ineffectiveness of these practices. Through their meta-analysis, Yoon and colleagues (2007) found professional development training lasting 15 hours or longer tend to have more significant positive impact. Other researchers have found teachers receiving more than 30 hours of professional development have the greatest impact on improving student outcomes (Darling-Hammond et al., 2009; Guskey & Suk Yoon, 2009). The design of this research study was constructed in a manner that the teachers would receive at least 15 hours of professional development, and the results would be compared to a single after-school workshop. The experimental group experienced significantly larger improvements in knowledge and self-efficacy than the control group, which supports findings from past research on the likely benefit of PD training that spans at least 15 hours.

Second, the results from this study support descriptions of effective professional development. Past research has demonstrated professional development needs to be collaborative, intensive, ongoing, connected to practice, focused on learning of specific

content, and connected to other school initiatives in order to be efficacious (Darling-Hammond et al., 2009; Croft et al., 2010). The ongoing professional development provided to the experimental group met these guidelines. The sessions were collaborative with the opportunity to discuss covered topics, and teachers commonly talked about their school's screening, progress monitoring, and resources for interventions. The program was intensive and ongoing, and it was connected to practice. The core instruction was very specific for practical applications such as using screening data to identify students in need and evaluate core curricula, using progress monitoring data to confirm risk status and evaluate intervention progress, and to identify various levels of support in a multi-level prevention system.

Implications for School Psychology

School psychologists play a pivotal role in helping a school or district adopt initiatives focused on implementing RTI. Because of their training, school psychologists have good knowledge of general and special education practices and know how to use data to help make crucial educational decisions. The results from this study should help school psychologists in their service delivery especially if they are helping a district with their RTI implementation.

As RTI is a school-wide initiative that involves both general and special education students, school psychologists are in an excellent position to assist with the development of RTI frameworks because of their unique training. School psychologists understand RTI is a preventative model used to promote learning and behavior for all students. When generally effective interventions are not successful for individual students, school psychologists can help with the examination of special education criteria and determine if

providing special education supports is a viable option. More states have begun to use an RTI framework for specific eligibility categories and decisions with the reauthorization of IDEA, and school psychologists will likely be expected to assist with this process.

School psychology training puts a strong emphasis on making data-based decisions. They are trained to decipher and interpret individualized data, help determine special education eligibility, evaluate programs and interventions, and answer posited research questions. This training makes school psychologists a perfect fit in making data-based decisions that are highly immersed in RTI's conceptualization.

Because school psychologists have the unique blending of skills that will help with adopting RTI, this research has implications for their practice. Teachers will need ongoing professional development in key RTI areas to help them gain knowledge of effective and appropriate practices (Burns et al., 2009; Kratochwill et al., 2007; Richards et al., 2007; Spear-Swerling & Cheesman, 2012). School psychologists can help lead the professional development activities, and they can determine which areas need to be addressed through their work consulting with teachers or by completing surveys of teacher knowledge. School psychologists are called upon to be advocates for children and families, and in a similar fashion, they should advocate for continued, quality professional development so districts and schools can meet the needs of their students.

Implications for Research

A significant gap in the literature has been addressed with this study and its results. Although many components of RTI have been studied and found to be effective, the literature was lacking on the effects of ongoing professional development in RTI. Professional development activities are an essential organizational construct when

implementing RTI, and this study has demonstrated ongoing professional development can have a strong impact on teachers' knowledge and self-efficacy in RTI.

Limitations

As with any research study, there were limitations present in this design. First, the knowledge assessment had less than ideal reliability with Cronbach's alpha less than .70. Due to researcher error, the knowledge measure was mistakenly reduced from 20 items to 16 items during piloting. The four deleted items were later found to be adequate predictors of the subjects' final knowledge score, and five additional items were eventually deleted because of being a poor predictor. This led to a knowledge assessment with 11 items, and reliability and ensuing validity could have been increased by starting with a measure with more items. In addition to the issues with the reliability of the knowledge assessment, there were unequal variances present in self-efficacy scores between the experimental and control groups. The significant differences between the groups may have impacted the results although the significance level between the groups was potentially strong enough to correct for the unequal variances.

An improvement could have been made to this study by better accounting for time. One such improvement would involve having a longer period between the subjects' final date of training and their final assessments to better account for latency effects. The original proposal of this design included a plan to have more time between the final training and the final assessment, but inclement weather delayed the start of the training and the final training dates. Another improvement would involve controlling another variation of time. The experimental group received their instruction over 12 calendar weeks which gave them the opportunity to research, question, and solidify their learning

when compared to the control group who had 1 week between their training and the final assessment.

A key limitation to this study is the possible differential effects of the experimental training instructors. Although no statistical differences were present between the gains in knowledge and self-efficacy between the principal investigator and the local school psychologist, the principal investigator's group had nearly double the increase in knowledge than the local school psychologist's group. Furthermore, the principal investigator conducted every one of the control group's single after-school training sessions. The use of independent instructors would help address the concerns that may be present in the completed research design.

The sample of this study makes generalization of the results difficult. First, this study was conducted with teachers in a rural educational setting, and most of the teachers were White females; and second, the sample size was small. These sample characteristics makes it difficult to confidently predict if the current results would be similar in other locations with more diversity and larger populations.

Likely the most pertinent limitation is not having a connection between the teachers' self-ratings of knowledge and self-efficacy and other important outcome variables such as actual teacher practices and student outcomes. This research design did not address any outcome data such as teacher practices or student achievement. It would be extremely valuable to observe whether the training had any effect on teachers' actual instructional delivery. Although gaining perspective on teachers' gains in knowledge and self-efficacy is important, the next step is to determine if these effects are present in the teachers' instruction and if it benefits the students.

Future Research

Future studies should continue to explore this topic and other organizational components of RTI including availability of data, time to practice key components of RTI, schedules that are encouraging and supportive of multi-level prevention systems, and administrative support. Specifically to teacher professional development, future studies should address how much effect ongoing professional development has on targeted outcome variables including student academic and behavioral outcomes and teacher instructional practices. One could postulate that an increase in teacher knowledge and self-efficacy will lead to improved student achievement and behaviors as well as teachers use evidence-based instructional strategies. Research designs could also address how long effects of teacher professional development continue.

As schools and districts continue to adopt RTI frameworks and strategies, it is crucial to transition into the core practices in the most efficient and effective manner possible. Professional development is integral in this process, and continued research in this area will help educators make the best decisions possible to address their school's and students' needs.

Conclusion

RTI is regarded as a laudable framework because of its focus on prevention, data-based decision making, using research- and evidence-based curricula and interventions, and focusing on all students. Many components of RTI have been studied and found to be effective. However, organizational components of RTI typically have not been well studied, including teacher professional development. This study addressed some of the research gaps related to professional development, specifically in RTI. Results supported

ongoing professional development series were significantly stronger than single training sessions in raising teachers' knowledge and self-efficacy in RTI.

Although this study found significant results in favor of the ongoing PD group, there were some key limitations such as small sample size, limited geographic location, possible presenter effects/bias, and lack of attention toward critical teacher and student outcomes. Future research needs to continue to address teacher professional development because of the necessary roles teachers play in RTI implementation, the continuing and advancing use of RTI in schools nationwide, and the need to find effective and efficient implementation strategies when adopting an RTI service delivery.

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Appendix A

Response to Intervention Knowledge Assessment

For the following questions, please select the BEST answer for each question. Please completed all 16 items and select one answer for each question.

1. What percentage best represents the theoretical rate of students who should respond well to Tier 1 instruction?
    a. 60%
    b. 70%
    c. 80%
    d. 90%

2. Tier 3 services are:
    a. provided before special education services
    b. are the most intense services provided in an RTI model
    c. special education services
    d. both a and c

3. In an ideal schedule, Tier 2 supports
    a. are provided at a designated time following regular instruction
    b. are provided simultaneously with the regular instruction for efficient use of time
    c. are provided instead of the regular instruction so intense instruction can assist with students' identified weaknesses
    d. none of the above

4. When a student does not respond to instruction provided in Tier 1,
    a. the student's unique needs should be addressed through an intervention
    b. the student should be provided an intervention that is universally applied
    c. the student should be referred for a full psycho-educational evaluation
    d. either a or b

5. Oral reading fluency probes are examples of
    a. benchmark assessments
    b. progress monitoring tools
    c. indicators of the student's likelihood of meeting standards on the state reading assessment
    d. all of the above

6. Essential parts of intervention are
    a. using evidence-based strategies, supplementing the regular classroom instruction, and ensuring the intervention is implemented with integrity
    b. using evidence-based strategies, progress-monitoring effects of intervention, and evaluating its match with the core curriculum
    c. supplementing the regular classroom instruction, progress-monitoring the effects of the intervention, and evaluating its match with the core curriculum
    d. ensuring the intervention is implemented with integrity, progress-monitoring effects of interventions, and analyzing how the intervention could transition to special education

For the following questions, please select the BEST answer for each question. Please completed all 16 items and select one answer for each question.

7. Essential components of RTI do not include
    a. assessment tools to monitor students' progress
    b. differentiated and intentional instruction for non-responders to Tier 1
    c. research-based core curriculum
    d. having three tiers of instruction

8. RTI is primarily applied to provide
    a. preventative academic supports
    b. preventative behavioral supports
    c. both a and b
    d. a means to get special education services

9. RTI has been proven to help with
    a. reducing rates of learning disabilities
    b. reducing disproportion of minorities in sped
    c. identifying students earlier for special education
    d. all of the above

10. In analyzing a classroom's data, 30% of the students are considered Tier 1, this is an example of:
    a. measurement error
    b. an issue with the core curriculum
    c. a need for intensive interventions given the population's poor performance
    d. the school's need to address behavioral concerns.

11. Tier 3 may differ from Tier 2 by:
    a. intensity
    b. frequency
    c. receiving support through special education instead of general education
    d. all of the above

12. Progress monitoring tools are meant to be
    a. information on the student's specific strengths and weaknesses
    b. measurement of progress on specific skills
    c. sensitive to change
    d. both b and c

13. Federal law states
    a. RTI is mandatory for states to implement
    b. RTI is an acceptable method to identify students with learning disabilities
    c. RTI is the only method to identify students with learning disabilities
    d. RTI is not an approved practice but applying individual interventions is

14. Research has indicated RTI can be used for what outcome?
    a. increasing student performance
    b. decreasing special education referrals
    c. improving the identification of students with learning disabilities
    d. all of the above

15. How often is universal screening done each year in most conceptualized RTI models?
    a. two times
    b. three times
    c. four times
    d. five times

For the following questions, please select the BEST answer for each question. Please completed all 16 items and select one answer for each question.

16. What are options if a student in Tier 2 shows adequate progress toward year-end objectives?
    a. slowly decrease intensity of Tier 2 intervention to determine if student continues to make progress
    b. continue providing Tier 2 interventions until the end of the school year to aid in transition
    c. move student back to Tier 1
    d. either a or c

*Note: Items 1, 2, 5, 7, and 16 were removed from this scale during post-assessment analysis.

Appendix B

Teacher Assessment of Knowledge and Self-Efficacy

Please indicate your agreement or disagreement with the following statements. There are no right or wrong answers. The best answers are those that reflect your true feelings. Please answer all 21 questions with one answer to each question.

Use the following scale:

1 = STRONGLY AGREE
2 = AGREE
3 = DISAGREE
4 = STRONGLY DISAGREE

1.	I know how to select appropriate academic goals for children who are at-risk for not meeting benchmark goals.	1	2	3	4
2.	My knowledge of multi-tiered instructional strategies positively affects my ability to help students make academic progress.	1	2	3	4
3.	I am able to communicate effectively with other school staff about my concerns or ideas for classroom-based interventions.	1	2	3	4
4.	I do NOT think that I have the necessary skills to make data-based decisions on students with specific academic needs.	1	2	3	4
5.	I know who to contact in my schools when I have questions related to Response to Intervention practices and framework.	1	2	3	4
6.	I am confident I can evaluate the effectiveness of Response to Intervention applications by analyzing its essential outcomes.	1	2	3	4
7.	I can make a difference in children who struggle academically with my skills in implementing a multi-tiered instructional framework.	1	2	3	4
8.	Children at-risk of not meeting year-end benchmark goals receive appropriate services to promote their learning and development in our school/program.	1	2	3	4
9.	I am confident that I have the ability to develop appropriate strategies to promote the learning of all children.	1	2	3	4
10.	Children at-risk of not meeting year-end benchmark goals make good progress toward individual goals in our school/program.	1	2	3	4
11.	I know the various research-based interventions my school has available for those at-risk of not meeting year-end benchmark goals.	1	2	3	4

Please indicate your agreement or disagreement with the following statements. There are no right or wrong answers. The best answers are those that reflect your true feelings. Please answer all 21 questions with one answer to each question.

Use the following scale:

1 = STRONGLY AGREE
2 = AGREE
3 = DISAGREE
4 = STRONGLY DISAGREE

12.	I know how to use data to determine if the right amount of students is responding to the core curriculum.	1	2	3	4
13.	I am confident with my ability to apply best practices in measuring progress of students' interventions.	1	2	3	4
14.	I am dissatisfied with my present level of knowledge on Response to Intervention and its applications for my class.	1	2	3	4
15.	I am knowledgeable and confident in implementing a problem-solving model and/or a standard protocol approach of intervention.	1	2	3	4
16.	I feel ill-prepared to work with children who are struggling academically.	1	2	3	4
17.	When a student is really struggling with learning, there is little I can do, and the student should be evaluated to determine if a disability is impacting their learning.	1	2	3	4
18.	If my initial attempt of intervening with a child who is at-risk of not meeting year-end benchmarks is unsuccessful, I am able to think of an alternative solution or approach.	1	2	3	4
19.	I am often NOT able to communicate effectively with parents about concerns or ideas for home-based interventions.	1	2	3	4
20.	I am knowledgeable of the theoretical foundations of Response to Intervention.	1	2	3	4
21.	I can communicate the organizational structures we need to successfully implement a multi-tiered instructional model.	1	2	3	4

Appendix C

Grading Rubric

1= Did not turn in assignment

2

3=Minor evidence of understanding material; little effort, not completely linked to professional development

4

5=Shows some evidence of understanding material; not exceptional effort; not completely linked to professional development

6

7=Good evidence of understanding material, moderate effort, slightly linked to professional development

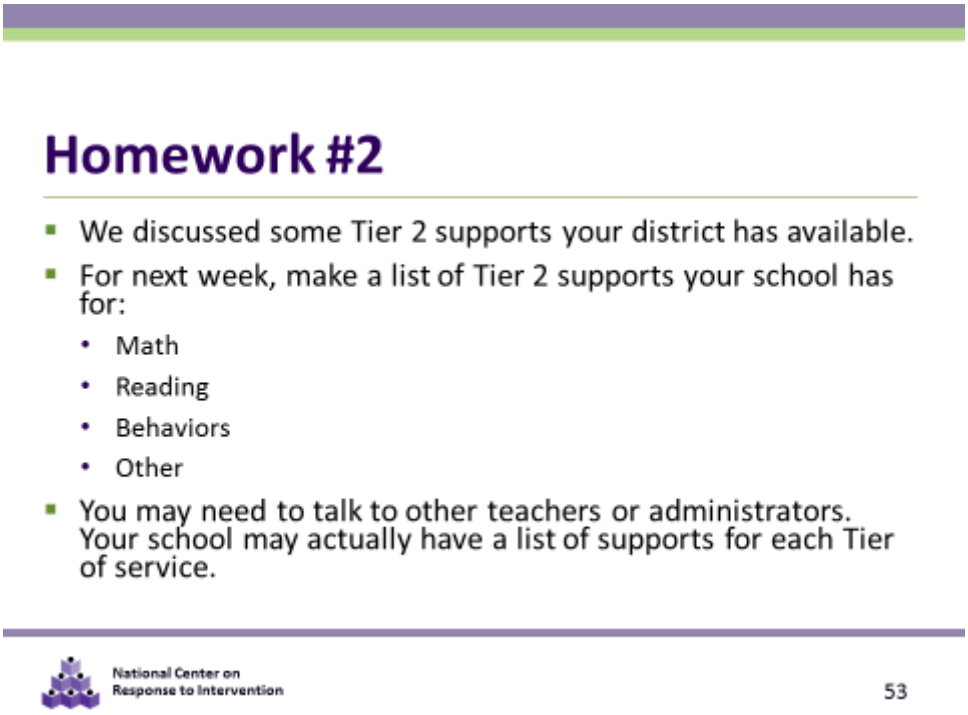
8

9

10=Exceptional effort and evidence of understanding materials, linked well with professional development

Appendix D

Sample Homework Assignment



Appendix E

Example of Homework Scoring

The following are two examples of the blind rating of homework assignments by the two instructors. For the first example, the example scoring demonstrates an instance when the raters scored the homework similarly, and in the second example, it demonstrated an instance when the homework was not rated similarly.

Example One

This first example includes an assignment of finding possible Tier 2 supports their school has available. The teacher listed intervention supports for reading and math in the elementary school. The first instructor rated the homework sample as an 8, and the second instructor rated it as a 9. When referencing the grading rubric (Appendix C), this teacher showed very good evidence of understanding the material and very good effort. The homework assignment was well linked with the professional development. The actual completed homework assignment is included on the next page.

13 – Personally, I simply work with the skills of the day with which my students struggle. This could be any student in any subject with any skill.

Reading – Elementary supports

Tier 1 Supports

- Michael Haggerty
- Saxon Phonics
- Scott Foresman Reading
- Accelerated Reader
- Success Maker
- Phonics Dance

Tier II Supports

- All of the above – supplemented by
- Smarty Ants
- Starfall
- Miscue Analysis
- Fast Start
- Daily Word ladders
- Making Words

Tier III Supports ??

Math

Tier I

- Saxon Math
- Number Talks
- K-5 Math Resources.com

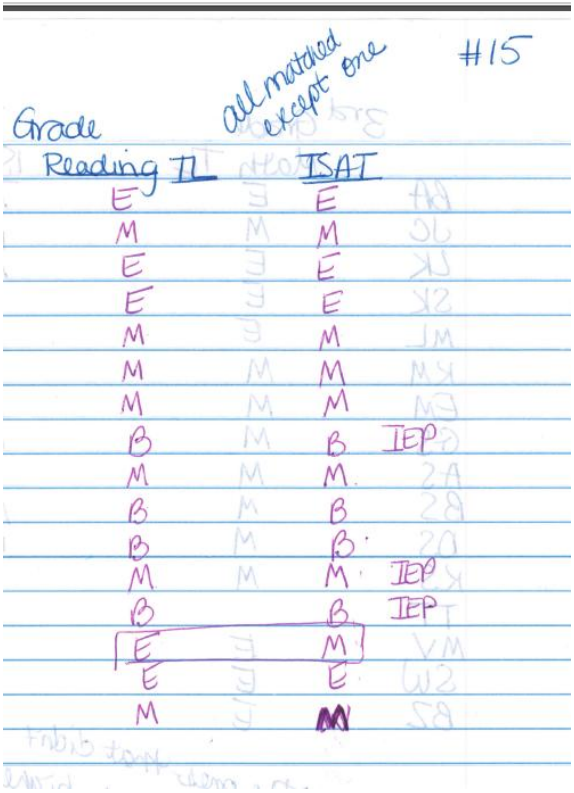
Tier II ??

Tier III ??

Junior High – From Think Link testing, the Reading and Math RtI personnel will look at the areas needing attention and use ISAT prep materials to review and practice concepts.

Example Two

The second example showed a product of the fourth homework assignment. The participants were asked to look at their class data from the previous school year. They were instructed to look at their fall screening assessment data and determine how well the data matched up with the subsequent state assessment scores given in the spring. The completed assignment denotes if the student exceeded standards (E), met standards (M), or was below standards (B). The third grade teacher analyzed her class in reading and math, and the teacher visually depicted the results for each student on the screening measure and state assessment. The first instructor rated the homework sample as an 8, indicating the teacher had at least good evidence of understanding the material, demonstrated moderate effort, and linked the assignment to the professional development. The second instructor rated the assignment as a 3 signifying the teacher had minor evidence of understanding the material, demonstrated little effort, and not completely linking the assignment to the professional development. The actual completed homework assignment is included on the next page.


#15
all matched except one
Grade
Reading IL
ISAT
E E
M M
E E
E E
M M
M M
M M
B B IEP
M M
B B
B B
M M IEP
B B IEP
E M
E E
M M


✓ = match up
3rd Grade
Math IL
ISAT
E M
M B
E M
E E ✓
E M
M M ✓
M M ✓
M M ✓
M M ✓
M M ✓
M B
M B
M
E E ✓
E M
E M
The ones that didn't match were higher for ThinkLink than ISATS

Curriculum Vitae

Ethan M. Schwehr

EDUCATION

Ph.D. in School Psychology Expected 08/2014
University of Wisconsin-Milwaukee – Milwaukee, WI
Dissertation: *The Effects of Intentional Response to Intervention Teacher Professional Development on Teachers' Knowledge and Self-Efficacy: A Comparison of a 10-week Course with an After-School Training*

Psy.S. in School Psychology 05/2008
Minnesota State University – Moorhead, Moorhead, MN

M.S. in School Psychology 08/2007
Minnesota State University – Moorhead, Moorhead, MN
Thesis: *Effect of Social Upward Comparisons on 6th Grade Students' Attitudes and Behaviors Towards Health Life Choices*

B.S. in Child Psychology 05/2005
Coaching Minor
University of Minnesota, Twin Cities Campus, Minneapolis, MN

CREDENTIALS

Nationally Certified School Psychologist 12/2013-Present
National Association of School Psychologists

School Psychologist Pre K-12 08/2007-Present
Minnesota Department of Education

TEACHING EXPERIENCE

Professional Development Instructor 03/2014-06/2014
- ✓ Provided professional development on a number of topics for Employing school districts involving topics such as Response to Intervention, special education referral processes, and academic/behavioral interventions
- ✓ Dissertation involved providing ongoing professional development
- ✓ In Response to Intervention curriculum to increase teachers' self-efficacy and knowledge with Response to Intervention practices

Teacher Assistant
University of Wisconsin – Milwaukee, Milwaukee, WI 09/2010-06/2012

- ✓ Responsible for lectures on the application of various assessments
- ✓ Assisted in teaching cognitive and academic assessments to graduate students
- ✓ Graded protocols and practice administrations to determine if students were proficient in administering intellectual assessments
- ✓ Managed and organized the school psychology library and assessment tools

CONFERENCE PRESENTATIONS

Schwehr, E.M., Schuh, J.M., Koop, J., & Heffelfinger, A. (2013, February). *Neuropsychological Predictors of Socioemotional Outcomes in Pediatric Brain Tumor Survivors*. Poster accepted at International Neuropsychological Society 41st Annual Meeting, Waikoloa, HI.

Schwehr, E., Bocanegra, J., Kwon, K., Sheridan, S. (2012, March). *The Impact of Child Disability Status and Parental Stress on Parent and Teacher Behavior Ratings.* Poster presented at Wisconsin School Psychology Association 2012 Spring Conference, La Crosse, WI.

PUBLICATIONS

Schwehr, E., Bocanegra, J., Kwon, K., & Sheridan, S. (2014). Impact of children's identified disability status on parent and teacher behavior ratings. *Contemporary School Psychology, 18,* 133-142.

INTERNSHIP EXPERIENCE

Illinois School Psychology Consortium Internship 08/2013-07/2014
Nexus-Onarga Academy/Iroquois County Special Education Association/
Iroquois Mental Health Center, Onarga/Crescent City/Watseka, IL

- ✓ American Psychological Association (APA) Accredited
- ✓ Shared time between three sites to gain broad internship experiences
- ✓ Conducted full and school psychological assessments for Adolescent males in residential facility.
- ✓ Administered intellectual, academic, behavioral, personality, and projective assessments
- ✓ Consulted with schools on correct intervention and individualized education plan goals and services
- ✓ Consulted with districts on the implementation of Response to Intervention and analyzed school data
- ✓ Provided therapy and completed mental health assessments at rural mental health center for variety of mental health issues
- ✓ Instructed school staff on new assessment tools
- ✓ Selected as internship representative to assist internship coordinator with managing and organizing materials for 10+ psychology interns

PROFESSIONAL EXPERIENCE

Licensed School Psychologist
Rochester School District, Rochester, MN 08/2012-06/2013

- ✓ Oversaw and led comprehensive evaluations for middle and elementary school
- ✓ Served as reference to school for state and federal due process regulations
- ✓ Participated and led intervention, teacher assistance, and child study teams
- ✓ Consulted school professionals to improve interventions and outcomes of at-risk children
- ✓ Presented and taught school-wide staff development on interventions
- ✓ Served approximately 1400 elementary and middle school students with diversity in learning, ethnicity, and cultures

Faribault School District, Faribault, MN 08/2007-06/2010

- ✓ Served on a team with administrators to develop implementation of Response to Intervention (RtI)
- ✓ Led school-wide trainings on RtI and served as a resource for teachers in implementing RtI
- ✓ Served approximately 1500 elementary and middle students with diverse student populations
- ✓ Led and facilitated Child Study Teams with principals, social workers, and teachers to help promote student and school improvement
- ✓ Led special education teachers with due process, special education law, and evaluation reports
- ✓ Conducted psychological evaluations and communicated written and oral results to parents and school personnel

PRACTICUM EXPERIENCE

Neuropsychology Practicum
Medical College of Wisconsin, Milwaukee, WI 09/2011-08/2012

- ✓ Administered selected batteries to children under the supervision of a licensed neuropsychologist
- ✓ Participated in interpreting assessments, making appropriate diagnoses, report writing, and communicating feedback with parents
- ✓ Engaged in pediatric brain tumor research project by compiling research database, gaining consent from parents, coding neuropsychological assessments, and leading research processes

Counseling and Therapy Practicum
Family Options Counseling, Wauwatosa, WI 01/2011-08/2011

- ✓ Provided individual counseling and therapy to adolescents who have displayed inappropriate sexual behaviors
- ✓ Assisted in group therapy sessions aimed to fortify previously learned skills and strategies

- ✓ Co-led court mandated anger management group with adolescents
- ✓ Collaborated in team meetings with other agencies to plan the best care possible for clients and their families

School Psychology Practica
Red River Alternative Learning Center, Moorhead, MN 01/2007-05/2007

- ✓ Co-led a 10-session anger management group with identified group of students with anger problems
- ✓ Facilitated a comprehensive assessment of a culturally diverse student
- ✓ Administered various mental health measures and inventories of behavior and mental health

Hawley School District, Hawley, MN 01/2006-05/2006

- ✓ Facilitated comprehensive assessments for students suspected of having learning disabilities using the discrepancy model
- ✓ Discussed results of assessments with parents and school personnel
- ✓ Administered a variety of rating scales, observations, and interviews
- ✓ Applied an individual academic intervention using AIMSWeb, used baseline data and national norms for benchmarks, and succeeded in helping student make gains toward grade-level goal

Horace Mann Elementary, Fargo, ND 09/2005-12/2005

- ✓ Worked primarily in special education setting
- ✓ Completed observations, interviews, benchmarking, and progress monitoring
- ✓ Completed assessments and collaborated with teachers to help students with special needs

RESEARCH EXPERIENCE

Master's Thesis 01/2006-07/2007
Minnesota State University – Moorhead, Moorhead, MN
Advisor: Gary Nickell, Ph.D.

- ✓ Thesis titled: *Effect of Social Upward Comparisons on 6th Grade Students' Attitudes and Behaviors Towards Health Life Choices*
- ✓ Used role models to help teach healthy lifestyle choices to 6th grade students
- ✓ Developed questionnaires by adapting questions from similar questionnaires used by other researchers
- ✓ Recruited volunteers to act as models and developed a curriculum to use for a 6th grade health class
- ✓ Conducted statistical analysis and found a short-term effect on attitudes and behaviors

Research Assistant 01/2004-05/2005
University of Minnesota, Minneapolis, MN
Advisor: Charles Nelson, Ph.D.

- ✓ Assisted research team in conducting various event-related potential (ERP) studies involving infants
- ✓ Organized data on various projects

- ✓ Recruited and scheduled participants for research
- ✓ Coded videos based on researcher-developed coding scheme

LEADERSHIP EXPERIENCE

Big Brothers Big Sisters of Southern Minnesota 06/2009-08/2010
Board Member
Rice, Steele, and Dodge County, MN

- ✓ Participated in monthly meetings to develop programs to help serve our counties' youth
- ✓ Served on committees to help plan, promote, and execute BBBS events
- ✓ Assisted in overseeing program results and planned goals accordingly
- ✓ Effectively incorporated bridge between school and BBBS to help create meaningful matches between students and mentors

NASP Student Leader 01/2006-05/2007
Minnesota State University – Moorhead, Moorhead, MN

- ✓ Represented university at NASP national convention and participated with other student leaders nationwide to plan for upcoming year
- ✓ Organized and led School Psychology Awareness Week by making posters, contacting potential students, and making our program more visible
- ✓ Was a resource for interviewing and other potential students on our program
- ✓ Informed current students on NASP information through emails and personal contact

President
FarmHouse Fraternity, St. Paul, MN 12/2003-12/2004

- ✓ Facilitated and ran chapter meetings
- ✓ Responsible for all affairs pertaining to the chapter
- ✓ Led Executive Committee on all pertinent tasks for the chapter house
- ✓ Served as liaison to the national organization

CURRENT PROFESSIONAL AFFILIATIONS

- ✓ American Psychological Association
- ✓ UWM School Psychology Student Association

ACADEMIC AWARDS AND HONORS

- ✓ Honors Program: University of Minnesota 09/2001
- ✓ Chancellor's Award: University of Wisconsin-Milwaukee 09/2010-05/2012