

The Effects of a Multi-Tiered Support System Inspired Framework of Professional
Development on Teacher Implementation of Discrete Trial Teaching

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Abstract

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This study documents the effects of a modest multi-tiered system of support (MTSS) inspired professional development (PD) framework on teacher implementation fidelity of Discrete Trial Teaching (DTT). A concurrent multi-treatment, multiple-baseline design was used across a maximum of four conditions: baseline, workshop (Tier 1), peer-mentoring with self-monitoring (Tier 2), and mentor coaching (Tier 3), and teachers accessed. Six pre-school special education teachers participated in the study; all teachers accessed Tier 1 supports, three accessed Tier 2 supports, and four accessed Tier 3 supports. Results indicate that a strong improvement in implementation fidelity of DTT for all participants between baseline and the end of the MTSS intervention. Component PD strategies had varying effects on teacher behavior. Social validity surveys were used to evaluate the usability of the MTSS as a PD strategy and assess the systems support available for teachers to engage in this type of PD. All 6 teachers strongly agreed that workshops, mentor coaching, and a MTSS framework were useable PD strategies. There was moderate agreement that the systems supports necessary to utilize this form of PD would be made available to them. These findings suggest that a MTSS inspired framework can be utilized as a means of increasing DTT adoption among teachers. In addition, the use of a

MTSS framework that monitors and is responsive to teachers' progress may be a flexible and realistic framework of PD that adapts scientifically based research to meet teachers' individual and classroom needs (Odom, 2009).

Dedication

To my wife Sue, my dad, Vincent, and my mother-in-law Joan. To my late mam Sheila: the lessons she taught me continue to guide me and influence my life. She would be happy to hear I continue to follow my bliss.

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This dissertation process has been challenging, enlightening, and at times confounding. I see this work as the beginning of the next phase of my life, where I can apply the lessons I have learned from a multitude of professors, colleagues, friends, and students who have supported my learning over the last 6 years.

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CHAPTER ONE: LITERATURE REVIEW

The following study examines the impact of a multi-tiered system of support (MTSS; Dexter & Hughes, 2009; Fuchs & Deshler, 2007) inspired framework to increase teacher implementation of Discrete Trial Teaching (DTT); an evidence based practice that follows the scientific dimensions of Applied Behavior Analysis (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010).

Early multi-tiered models were first applied in special educational settings through targeted interventions based on identified needs and measured the students' response to the intervention (Ardoin, 2006; Fuchs & Fuchs, 2006; Gresham, 2004; Sugai, 2012; VanDerHeyden, Witt, & Gilbertson, 2007). Past applications of the MTSS framework primarily targeted academic domains, both as a mechanism for identifying students for special education and as a service delivery model (Gresham, 2004; Sugai, 2008). Within this framework all students are exposed to a high-quality and evidence-based curriculum, while their progress is monitored to determine level of responsiveness (Yoon, Duncan, Lee, Scarloss, & Shapely, 2007). Students not making sufficient progress in the general curriculum are determined to be "at-risk" and receive targeted, group-based interventions that incorporate more intensive evidence-based practices, more frequent progress monitoring, and intensified instruction. Students who do not respond at this secondary intervention tier move to tertiary interventions. Tertiary interventions are highly individualized, comprise more frequent and intensive supports, and may generate a referral to special education. Language about MTSS appears in the 2004 Individuals with Disabilities Education Improvement Act (IDEIA) and application of the model has become a dominant topic in education literature, research, and practice.

In this study, a MTSS is conceptualized as a service delivery framework for professional development (PD), that will allow us to explore how to best meet the needs of a variety of teachers with multiple learning needs (Feifer, 2008). A MTSS framework can address the variability that exists in the knowledge and skills of teachers, and when applied to teacher learning can help teachers implement evidence-based practices with the necessary levels of fidelity to occasion positive changes in student outcomes (Denton, Vaughan, & Fletcher, 2003).

This study will incorporate the following common features of a MTSS into a PD framework (Ardoin, 2006; Fuchs & Fuchs, 2006; Myers, Simonsen, & Sugai, 2011; Sugai, 2012).

- a) *Universal screening.* Within a MTSS framework screenings are typically conducted to identify or predict learners who may be at risk for poor outcomes (Burns, Appleton, & Stouhouwer, 2005; Dexter & Hughes, 2009). In this study, all teachers at the school were screened on their initial implementation of DTT through behavior observations and measures of the target skills (i.e. implementation fidelity of DTT). Such screenings are highly predictive of future outcomes (Jenkins, 2003).
- b) *Progress monitoring and data-based decision making.* Progress monitoring is used within a MTSS to assess the progress or performance of the learner over time (NCRTI, 2015). In addition, progress monitoring is used to assess the effectiveness of the supports provided to the learner (Dexter & Hughes, 2009). This dual purpose of progress monitoring was utilized in this study to determine the effects of specific professional development strategies on teacher adoption of DTT, while monitoring teacher progress. Ongoing monitoring and a data-based decision-making process was also utilized to

determine movement within the multi-level prevention system (Gresham, 2004; Myers et al., 2011). In this case, these data based decisions helped determine if teachers required more or less intensive interventions.

- c) *A continuum of evidence-based interventions.* No Child Left Behind (NCLB; 2004) highlights the importance of implementing scientifically based practices in schools. A MTSS framework systematically provides interventions that are proportional to learners' needs (Sugai & Horner, 2009; p. 226) and are supported by scientifically-based research (Sugai, 2012). In this study a continuum of high-quality, evidence based PD interventions were available to teachers and applied where necessary
- d) *Systems and procedures.* Systems and procedures must be in place to ensure implementation fidelity and the accurate implementation of the pre-designed systems and practices (Sanetti & Kratochwill, 2009; Sugai & Horner, 2009). In this study, systems and procedures were implemented to ensure accurate and timely implementation of systems and interventions within the MTSS framework (Fuchs & Fuchs, 2006; Gresham, 2004).

Results from this study can increase our knowledge of a) the efficacy of a MTSS on teacher implementation of DTT, and b) the impact of each component of a multi-tiered system of support on teacher implementation of DTT. It is hypothesized that this MTSS framework will impact teacher content knowledge, practice, and implementation fidelity. The factors that will mediate the social validity of a MTSS include teacher understanding of the professional development strategy, the acceptability and feasibility of the professional development strategy, and the systems support required to implement the professional development strategy. The following research questions were asked.

Research Questions

1. To what degree does a multi-tiered support system inspired framework impact pre-school special education teachers' implementation of DTT during instructional activities?
2. Which professional development activities included in a MTSS inspired framework (workshop, peer-coaching with self-monitoring, and coaching) have the greatest impact on teachers' fidelity of implementation of DTT?
3. Which professional development activities do teachers perceive as most efficient, effective, and usable in benefiting their practice?

Review of the Literature

The following study examines the application of a modest Multi-Tiered System of Support (MTSS) framework to professional development designed to enhance teacher implementation fidelity of discrete trial training (DTT) while building teacher fluency in this scientific based (evidence-based) practice.

In this chapter, three main areas that comprise the current study are discussed. First, interventions for children with autism spectrum disorders (ASD) that are considered evidence-based practices and beneficial to student learning outcomes were explored. Here, applied behavior analysis (ABA) is presented as a scientific approach to educating students with ASD and DTT; an approach founded in ABA is discussed. The body of literature that supports the application of DTT as an evidence-based practice was also reviewed to determine its importance in the education of students with ASD.

Second, several aspects of the literature were reviewed with the goal of identifying empirically based professional development activities that could be incorporated into a MTSS. The interconnected and component parts of this framework - workshops, peer coaching with self-monitoring, and coaching with performance feedback are included in this section and the critical features of effective professional development that have been shown to impact teacher learning and competency are explored. Third, I explore a MTSS framework that structures professional development activities into a systematic service delivery framework.

Current Evidence Based Practices for Children with Autism

Applied Behavior Analysis. Scientifically based instruction has become synonymous with the terms quality research, quality evidence, and evidence-based practices, while the discussion around what constitutes best practice has accelerated (National Center for

Dissemination of Disability Research; NCDDR, 2005). This push to define a scientific-based practice in education has largely been due to policy that requires teachers' use teaching practices that have been proven to work (United States Department of Education; USDoE, 2002). Such policy, including No Child Left Behind (NCLB; 2002), and the Individuals with Disabilities Educational Improvement Act (IDEIA; 2004) promotes research that provides strong evidence of quality and as such has major funding and service implications for the educational field.

Many evidence-based interventions shown to effectively treat children with ASD are based upon the principles of ABA (National Autism Council [NAC], 2009; Odom et al., 2010). Applied behavior analysis is a discipline concerned with the application of behavioral science in real-world settings such as clinics, schools, and industry with the aim of improving socially important issues in real-world settings such as behavior problems and learning (Baer, Wolf, & Risley, 1968; Cooper, Heron, & Heward, 2007). It is the only treatment for children with ASD that has been endorsed by the United States Surgeon General (2000) and is viewed as the gold standard for treatment of children with ASD (Shook & Neisworth, 2005). In addition, several reviews of ABA-based procedures for the treatment of autism have concluded that ABA is the most optimal treatment (Barberesi, Katusic, & Voight, 2006) has the strongest empirical basis (Sturmeiy, 2002), is most efficacious (Lilienfeld, 2005), and shows the most substantial and sustained gains across multiple skills (Myers & Johnson, 2007). As such, ABA procedures should be a strong focus when educating students with ASD.

The Evidence-Base for ABA

Since 1968 when Baer, Wolf, and Risley produced the seminal paper titled "Some current dimensions of Applied Behavior Analysis" a growing body of literature has demonstrated the effective use of ABA-based programs to change behaviors of social significance. Multiple

studies with varying experimental designs have demonstrated a functional relationship between ABA-based interventions and changes in behavior. Topics of these studies have included communication training, social skills instruction, teaching adaptive skills, and treatment of challenging behaviors.

Dr. Ivar Lovaas (1987) was the first to comprehensively test promising behavioral treatments for young children with autism. Lovaas conducted a randomized control study to look at the effects of discrete trial training (DTT) on intellectual achievement in children with ASD. Lovaas' (1987) study assigned 19 children to either an intensive-treatment group or a minimal-treatment group. Children from the intensive group received 40 hours of one-on-one treatment a week over 2 years while children in the minimal group received 10 hours over the same period of time. The results of the study indicated that 47% of the children in the intensive treatment group showed significant gains in intellectual achievement compared to 2% of the minimal treatment group. This study changed the outlook of intervention for children with ASD from grim to optimistic and launched the current industry of home programming for children with ASD.

Several review papers and meta-analysis have summarized the published research on ABA-based interventions including reviews of comprehensive behavior intervention programs (Dawson & Burner, 2011; Eikeseth, Klintwall, Jahr, & Karlsson, 2012; Makrygianni & Reed, 2010; Peteres-Scheffer, Didden, Korzilius, & Sturmey, 2011; Reichow, 2011; Rogers & Vismara, 2008; Spreckley & Boyd, 2009), reviews of social skills training (Reichow & Volkmar, 2010), reducing problem behaviors in children with ASD (Didden, Duker, & Korzillius, 1997; Harvey, Boer, Meyer, & Evans, 2009; Heyvaert, Maes, Van den Noortgate, Kuppens, & Onghena, 2012; Ma, 2009), and treatment of elopement (Anderson, Law, Daniels, Rice,

Mandell,; Lang, Davis, O'Reilly, Machalicek, Rispoli, Sigafos et al., 2009).

Within the last 6 years two systematic evaluative reviews have been conducted on ABA-based interventions to determine if these treatments could be characterized as could be characterized as scientifically based research. The National Standards Project (NAC, 2009) developed a model to evaluate interventions for problems associated with ASD. In total 531 studies were systematically reviewed the results of which then determined which interventions could be categorized as an established treatment. The completion of this project resulted in a comprehensive guide of what educational and behavioral treatments target the core characteristics of ASD and offer recommendations for interventions that constitute evidence-based practices (NAC, 2009; p. 1). In total they identified 11 treatments that were established as scientifically based and effective for children with ASD, all of which were founded in ABA. Within these studies DTT was identified as an established treatment that met and an evidence-based practice for reducing problem behavior and teaching “functional alternative behaviors or skills through the application of basic principles of behavior change” (NAC, 2009; p. 45). In addition, DTT was identified as an evidence-based component of a comprehensive behavior treatment.

The National Professional Development Council on Autism Spectrum Disorders (NSPDC) split evidence-based practices into two main categories: Comprehensive Treatment Models (Odom, Boyd, Hall, & Hume, 2009; Smith, 2013) and Focused Intervention Practices (Odom, Boyd, Hall, & Hume, 2010; Smith 2013). Focused Intervention Practices are operationally defined, are designed to address specific learner outcomes, and stop once the individual goal is achieved (NSPDC, 2014). While Comprehensive Treatment Models target specific skills that impact global functioning, adaptive skills, academic skills, and social

functioning in children with autism and are provided for an extended period of time. They also target the core deficits of ASD (Wong, Odom, Hume, Cox, Fettig, Kucharczyk, et al., 2014).

Applied Behavior Analysis in Schools

Attempts have been made to transfer these ABA methodologies from research, center-based, and structured home-based settings into the public school system to meet the needs of these students. It appears that the impact of evidence-based practices on student learning is commensurate with their successful adoption by classroom teachers (Odom et al., 2010; The Evidence-Based Intervention Work Group, 2005), yet when such evidence-based strategies are implemented in the public school system, they vary widely in implementation, lack treatment integrity, and teachers are often resistant to adopting these practices (National Research Council, 2001). As Heward (2003) suggests,

An objective comparison between what research has discovered about effective instruction and the school day experienced by many students with disabilities reveals a large difference between what is known and what is practiced. (p.201)

Successful implementation of ABA methodologies requires teachers to implement with a level of fidelity necessary to achieve the intended results established through research, else intervention effects will likely to be diminished (Dusenbury, Brannigan, Falco, & Hansen, 2003). Yet, service systems constraints often determine which interventions should be used and as such ASD interventions should be individualized and contextualized to fit the resources available in our schools (Stahmer, Schreibman, & Cunningham, 2010).

While prominent researchers in the field of education acknowledge teacher quality as the “single most important influence on school success and students’ achievement, surpassing socioeconomic status, class size, family background, school context, and all other factors that

influence achievement” (Hollins & Guzman, 2005, p. 478), “there have been very few efforts put forth to examine how evidence-based interventions are implemented in the real world” (Stahmer et al., 2010). While it is of primary importance that teachers are comprehensively trained to implement evidence-based strategies shown to impact student outcomes (Iovannone, et al., 2003; NRC, 2001; Stichter, Crider, Moody, & Kay, 2007), research must also focus on closing the “science to service” gap and successfully developing systems that help teachers routinely implement EBP’s in their practice (Fixsen, Blase, Metz, & VanDyke, 2013). While many of the suggested guidelines to bridge this gap identify “what” teachers must learn, few address “how” teachers should learn these evidence-based practices that appear fundamental to the education of students with ASD beyond traditional teaching techniques. How teachers acquire specific content knowledge and skills appear fundamental to the education of students with ASD and must be central to any discussion on professional development.

Professional Development

There is much evidence that professional development enhances service delivery and has a significant impact on the education of all children (American Federation of Teachers, 2002; Odden, Archibald, Fermanich, & Gallagher, 2002). Indeed, research in special education comprehensively demonstrates that outcomes for children significantly improve when teachers acquire the necessary content knowledge skills, methods, and evidence based strategies that define their work (Howlin, Magiati, & Charman, 2009; Kraemer, Cook, Browning-Wright, Mayer, & Wallace, 2008; NRC, 2001; Simpson, 2003).

The No Child Left Behind Act (NCLB) describes high-quality professional development as activities that “improve and increase teachers’ knowledge of the academic subjects they teach”, are “sustained and intensive”, and has a direct effect on student outcomes (Desimone,

2009). To improve teacher quality for all students researchers must develop professional development that contain “methodologies that builds on the teachers’ own perceptions, their thinking and feeling about concrete teaching situations in which they were actively involved, their needs, and their concerns” (Korthagen and Wubbels, 2001; p.45). Typically these methodologies should be intensive, sustained, and embedded in practices that focus on what teachers teach. When they are, professional development is more likely to improve teacher knowledge and student achievement (Garet, Porter, Desimone, Birman, & Yoon, 2001; Guskey, 2003).

Professional Development Strategies

Workshops. The workshop or presentation is by far the most prevalent form of professional development utilized by school districts. This form of didactic instruction is an inexpensive and efficient way of providing training en-masse. The workshop is a means of imparting both content and pedagogical knowledge to multiple teachers at the same time. However, even with significant professional development opportunities, teachers still struggle to implement content or pedagogical knowledge learned from professional development workshops without significant follow-up (Yoon et al., 2007). Indeed, there is a growing consensus of opinion from researchers that systematic and ongoing professional development has a greater impact on teacher practice than the ‘single-shot’ workshop (Yoon et al., 2007). Yet, more often than not professional development workshops continue to be disjointed and do not provide the focused, sustained, and intensive training that is required to occasion change. When provided with this type of professional development opportunity, teachers rarely adopt the practices taught or when they do, they do so in ways that may undermine the original intent of the techniques (Ball & Cohen, 1999; Brophy, 1999; Joyce & Showers, 2002). Another feature of this this type

of PD is an absence of collaboration, few opportunities for understanding, and a failure to account for the teachers' current level of expertise (Joyce & Showers, 2002). The lack of coherence and consistency in such ongoing PD practices do not provide the transformative learning opportunities that teachers require to develop expertise. Subsequently, ongoing PD through these initiatives is rare and the predominant 'one-shot' lecture format alone has little impact on the ability of teachers to develop strong pedagogical practice (Petscher & Bailey, 2004).

The American Institutes for Research conducted a research synthesis that analyzed over 1,300 studies that addressed the impact of professional development on student outcomes (Yoon et al., 2007). Key findings from this study led Guskey & Yoon (2009) to present an alternate perspective on the use of workshops as a professional development strategy. They found that all studies that showed a positive relationship between professional development and positive student outcomes involved some form of workshop. They determined many PD workshops were often poorly organized, focused on unproven ideas, and were often wasteful. The exception to this assertion was if:

These workshops focused on the implementation of research-based instructional practices, involved active-learning experiences for participants, and provided teachers with opportunities to adapt the practices to their unique classroom situations (p. 496).

Peer mentoring. Whitaker (2003) reported that special educators received the most assistance from other special education teachers, than from their assigned mentor, determining that whether formalized or not teacher learner communities evolve naturally within school settings. This type of participation in collaborative communities influences the beliefs and practices of special educators in teaching students with ASD (Brownell, Ross, Colon, & Mc

Callum, 2003). Such collaborative learning approaches are under-utilized in the special education literature, severely handicapping a field wishing to transfer evidence-based practices into classrooms of students with ASD.

Collaborative practices will aid a rapid conventionalization of effective programs into the classrooms of other teachers of students with ASD as they share applied knowledge, which in turn adds value and increases the probability of adoption and sustainability (Durlak & DuPre, 2008). Cooperative learning groups have a positive impact on special education teachers and their students and are critical in the ultimate retention of teachers in the field of special education, setting a positive tone for future practice. In addition, collaborative initiatives help support teachers meet the challenges they face, improving professional and personal satisfaction (Whitaker, 2003).

Peer coaching has been identified as one strategy for addressing the retention of newly qualified teachers and may be closely linked to developing their professional and personal competence (Claycomb, 2000). “Mentors’ modeling and interactions with their mentees are vital for instilling the resilience necessary for teachers to meet the challenges they face” (He, 2009; p. 263). Mentoring services occur when staff experienced in the use of the evidence-based practices, methodology, or foundation subjects collaborates with and provides ongoing support and consultation to a less experienced peer. Mentors may perform a variety of functions that include modeling, rehearsal, problem framing, and the development of implementation checklists (Dempsey, Kelly, & Cartey, 2009; Strong, 2005).

Peer coaching is a process by which teachers are paired with a colleague learning the same strategy. Each member of the pair coaches the other, taking turns serving as a coach or inviting partner. The coach offers nonjudgmental comments and avoids providing suggestions to

assist the inviting partner in reflecting on her skills. A good coach serves as a guide introducing questions that allow the inviting partner to select and define a coaching target and data collection method during the pre-observation conference (NPDC, 2012). The coach's role is non-authoritarian and can include reflective questioning, self-monitoring, debriefing sessions, co-planning, videotape analysis, the use of fidelity checklists, and writing (He, 2009; Schwille, 2008). The coach's role has been shown to effect positive relational outcomes and treatment fidelity that may impact practice (Claycomb, 2000).

Evidence supporting peer coaching as an effective professional development strategy is limited and as yet, the mechanisms that drive peer coaching as a means to improve teacher quality have not been described in detail (Zwart, Wubbels, Bolhuis, & Bergen, 2007).

Griffin and colleagues (2003) reviewed several studies on peer mentoring, concluding, peer mentoring significantly improves the perception of self-confidence and collaboration for newly qualified special educators. The findings of this study also support the work of Whitaker (2003) who found that mentoring was significantly correlated with newly qualified teachers intentions to remain in special education. Similarly, Conderman and Stephens (2000) found that mentoring programs help develop strong and sustained relationships between mentor and mentee, particularly if assistance was tailored to individual teacher needs. Frey (2009) developed an online course to provide novice teachers with mentors, developed to implement skills related to individualized academic interventions for students with ASD. Mentors were required to provide weekly feedback to the teacher completing the project and were expected to ask questions to clarify decisions and activities of the teacher, offer suggestions and critical feedback, and in other ways act as this person's resource. Similar positive results on self-confidence and retention were found. Yet, none of these studies correlated mentoring with

improvement in content knowledge or pedagogical practice, and little evidence of the robustness of this practice (beyond perceptions of self-confidence) was found.

Self-monitoring. Self-monitoring has been defined as supervising one's own professional practice or systematically recording one's own behavior (Gravina, Austin, Schoedter, & Loewy, 2008). It is the process of analyzing one's own performance based on data to change or improve practices (Keller et al., 2005), and is an established practice that has been widely used to change a variety of student behaviors (Ganz, 2008; Webber, Scheuermann, & McCall, 1993; Sheffield & Waller, 2010), including increasing on task behavior (Harris et al., 2005), increasing social initiations (Strain, Kohler, Storey, & Danko, 1994) reducing disruptive behavior (e.g., Lam, Cole, Shapiro, & Bambara, 1994), and requesting help (Ganz & Sigafoos, 2005). While there are many iterations of procedures for implementing self-monitoring strategies, they typically teach learners to become cognizant of their own specific behaviors, observe and keep track of the occurrences of their behaviors, then select and provide self-reinforcement for improvements that meet their pre-determined criteria (Maag, Rankin, & Reid, 1995). Necessary features of a self-monitoring strategy are efficiency, appropriate to the target behavior, acceptable to the individual, minimally laborious or obtrusive, and relevant to the individual's needs and goals (Harris, Friedlander, Sadler, Frizzelle, & Graham, 2005).

Self-monitoring has recently emerged as a PD strategy including increasing teacher use of praise (Kalis, Vannest, & Parker, 2007; Keller, Brady, & Taylor, 2005; Sutherland & Wehby, 2001), and increasing teacher reinforcement of student responses for use of augmentative and alternative communication systems (Bingham, Spooner, & Browder, 2007). Self-monitoring studies have also been conducted to improve teacher procedural implementation of token economies (Petscher and Bailey, 2006; Plavnick, Ferreri, & Maupin, 2010), increase teacher adherence to lesson plans (Browder, Trela, & Jiminez, 2007), and increase the accuracy of

discrete trial teaching with children with ASD (Belfiore, Fritts, and Herman, 2008). Results of these studies indicate the use of teacher self-monitoring generally is superior to not using self-monitoring (Allinder, Bollins, Oats, & Gagnon, 2000) and using self-monitoring checklists show improvements in teacher behavior (Belfiore & Browder, 1992; Browder et al., 1986)

There is an emerging body of evidence that self-monitoring may produce changes in teacher behavior and may be a viable method to fade performance feedback support while still maintaining high levels of treatment fidelity thereby improving learner outcomes and teacher quality (Sanetti & Kratochwill, 2009; Petscher & Bailey, 2006).

Mentor coaching. Research in instructional coaching for special education provides strong evidence of its efficacy as a professional development technique (Greer, McCorkel, & Williams, 1989; Koegel, Russo, & Rincover, 1977; Petscher & Bailey, 2006; Sakaroff & Sturmey, 2004; Schwartz, Anderson, & Halle, 1989). Comprehensive reviews of coaching interventions determine that coaching significantly improves the degree to which learners' implement evidence-based practices with fidelity (e.g. direct instruction, teaching strategies, positive behavior supports). In addition, when learners are provided with initial professional development trainings, repeated observations, modeling, and performance feedback, greater gains in implementation fidelity are recorded (Kretlow & Bartholomew, 2010; Petscher & Bailey, 2006, Sanetti & Kratochwell, 2009). While coaching is described as a critical tool for professional development and teacher implementation of evidence-based practices, for it to be a successful professional development strategy school districts must commit to administrative investment and support, staff buy-in, staff time, and monetary resources (Fixsen & Blase, 2008; Knight, 2009). While coaching appears to be the singular most effective way of training teachers, if all teachers are to receive sufficient duration to make a difference it can be

prohibitively expensive and a drain on resources that render it inefficient. Often, there are insufficient resources to provide teachers with comprehensive instruction in behavioral treatment.

Joyce and Showers (2002) extrapolated from research and their own personal experience to highlight the necessity of a comprehensive and structured professional development program for educators. Teachers were given knowledge, provided with demonstrations, and then allowed opportunities to rehearse these skills. They reported that less than 5% of teachers were able to transfer these skills into practice. However, when a coaching component was added to this model the successful application of skills increased to 95%. Alvero, Bucklin, and Austin (2001) reviewed 63 applications of feedback in 43 studies and found that essential characteristics of maintaining improvements in staff performance occurred when a coaching and modeling approach combined with feedback was implemented. Kretlow and Bartholomew (2010) conducted a comprehensive review of coaching and determined that coaching significantly improved the degree to which teachers' implemented evidence-based practices with fidelity (e.g. direct instruction, teaching strategies, positive behavior supports). In addition, they found that when teachers were provided with initial professional development trainings, repeated observations, modeling, and performance feedback, greater gains in implementation were recorded. Scheeler, Congdon, & Stansbury (2010) implemented a coaching protocol that utilized peer feedback techniques using bug-in-the-ear (BIE) technology. Here, teachers coached one another through new, pre-determined instructional activities. Two significant findings emerged from this study; in addition to improvements in teacher competency, the coaches reported that they also learned from and were reinforced by giving feedback and observing behavioral changes in their co-teaching partners.

The instructional coaching research in special education provides strong evidence of its efficacy as a professional development technique. When combined with training, consultation, modeling, and targeted performance feedback it is robust (Greer, McCorkel, & Williams, 1989; Koegel, Russo, & Rincover, 1977; Petcher & Bailey, 2006; Sakaroff & Sturmeay, 2004; Schwartz, Anderson, & Halle, 1989).

Multi-Tiered Systems of Support: A Review of the Literature

A Multi Tiered System of Support (MTSS) is a framework for decision making that systematically determines the intensity of scientifically-based intervention required to progress learners toward their behavioral or academic goals (Sugai & Horner, 2009; Bradley, Danielson, & Doolittle, 2005). The goal of a MTSS is to catch students early and to provide appropriate levels of preventative intervention that facilitate learning and where necessary reverse or remediate academic and behavior problems (Batsche, Elliot, Graden, Grimes, Kovaleski, Prasse, et al., 2005). While historically a MTSS has been utilized as a means of identifying students with Learning Disabilities, more recently it has been conceptualized as a service delivery model (Murawski & Hughes, 2009; Fuchs, Mock, Morgan, & Young, 2003). Within a MTSS all students are exposed to Tier 1 interventions and their academic or behavioral progress is monitored to determine level of responsiveness. Students not responding appropriately to Tier 1 interventions are determined to be "at-risk" and receive Tier 2 interventions that incorporate evidence-based practices, more frequent progress monitoring, and more intense instruction (Anderson & Borgmeier, 2010). Students who are non-responders at Tier 2 move to Tier 3 intervention tier where they access highly individualized, more frequent, and more intensive supports (Ardoin, 2006; Christ & Poncy, 2005; Gresham, 2004).

Within the literature, MTSS is not presented as a specific set of strategies, rather it is

described as a problem-solving framework that can be applied to address the learning needs of whole groups, small groups, or individual students (Prasse, Breulin, Giroux, Hunt, Morrison, & Thier, 2012). While there are large variations within an MTSS continuum there is some consensus on common features of this framework (Hale, Alfonso, Berninger, Bracken, Christo, Clark, et al., 2010). Throughout the literature a MTSS framework provides all students with universal screening procedures to determine their learning needs. Frequent progress monitoring is combined with data based decision-making and problem solving protocols to determine if students are performing at or below expectations and hence require more or less intensive interventions. These interventions are provided on a continuum of scientific research-based services provided to all students, with structures and procedures to ensure implementation fidelity, including accurate and sustained implementation of the systems and practices (Ardoin, 2006; Christ & Poncy, 2005; Fairbanks, Sugai, Guardino, & Lathrop, 2007; Fuchs & Fuchs, 2006; Gresham, 2004). In addition, collecting data on student progress and using that data to inform instruction and intervention is an integral part of a MTSS (Fuchs, Fuchs, & Compton, 2010; Kovaleski, 2007; USDoe, 2009).

On a practical level, a MTSS is designed to first prevent academic failure through screening and early intervention then where necessary identify students who are having academic or behavior problems when the problems first become apparent. Evidence-based practices are then applied to meet their educational needs (Yell, Shriener, & Katsiyannis, 2006; p. 13). Further, MTSS “promotes a careful consideration of an array of interventions that are organized to respond to the increasing support needs of students” (Sugai & Horner, 2009; p. 225).

The most commonly cited benefits of MTSS are a) the elimination of a ‘wait to fail’ model as close monitoring provides students with prompt help, and b) an increase in the number

of students who are successful in general education; as students whose achievement problems were due to a lack of prior instruction will be minimized (Klotz & Kanter, 2007; VanDerHeyden, et al., 2007).

The recent increase in popularity of MTSS frameworks is closely aligned with the reauthorization of the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) that emphasizes the importance of providing high quality, “scientifically based instruction” where schools are accountable for student progress. Scientific based instruction is often referred to as evidence-based practices (EBP’s) in the literature. State offices of public instruction responded to these laws by including language in their administrative codes that reflect these Federal mandates. Currently, Washington Administrative Code represents these Federal mandates by adopting the core features of MTSS in State Law including universal screening, scientifically-based research, a multi-tiered model, frequent monitoring, and decision making protocols to address the learning needs of students not responding to intervention (WAC 392-172A-03060, 2015).

There are multiple examples of MTSS as a means of identifying students with learning disabilities (Gresham, 2004; Gresham, 2005; Severson, Walker, Hope-Doolittle, Kratochwill, & Gresham, 2007; VanDerHeyden, et al., 2007) or behavior problems (Lassen, Steele, & Sailor, 2006; Sugai & Horner, 2002). There are also several examples of research that utilizes a MTSS framework as a service delivery model for teaching academics or social skills (Vaughn, Fletcher, Francis, Denton, Wanzek, Wexler, Cirinio, Barth, & Romain, 2008; Vaughn & Fletcher, 2010).

Multi-tier systems of support models have been directly linked to improved student outcomes, system changes, and are increasingly being applied to social behavior (e.g. Fairbanks et al., 2007; Gresham, 2004). While the interventions that make up a MTSS have

been studied extensively (e.g. mentor coaching) research on the MTSS process are limited (VanDerHeyden et al., 2007).

Burns, Appleton, and Stehouwer (2005) conducted a meta-analysis of 24 MTSS studies. Eleven of these studies looked at the effects of established MTSS models currently operating in schools, while 10 studies described MTSS models developed and implemented by researchers. The types of outcomes being studied were student outcomes (task completion, time on task, academic growth) and systemic outcomes (e.g. referrals to special education). Burns and colleagues concluded, “sites implementing MTSS had both improved systemic and student outcomes” further they determined “implementation of various MTSS models led to fewer students identified as learning disabled” (p. 389).

Hughes and Dexter (2011) conducted a systematic literature review to determine the effects of an MTSS on student learning outcomes. Eleven studies that met inclusion criteria and they conducted a descriptive analysis on each of the studies. Like Burns et al. (2005) the reviewers split studies into established models implemented by school personnel and researcher developed models. Student outcome measures included reading progress, math performance, office referrals for problem behaviors, time on task, and task completion. They presented 2 major findings that are relevant to the current study: 1) all MTSS studies documented improvements in student outcomes, 2) all MTSS studies described ongoing professional development, systems support, teacher buy-in and willingness to adapt their practice, and adequate meeting time as necessary factors for scalability and sustainability of MTSS. They concluded by characterizing the research supporting MTSS as “emerging” and urged further longitudinal research.

While MTSS are frequently applied to student academic and behavior skills, more recent studies have evaluated the effects of MTSS frameworks on teacher behavior. Myers, Simonsen, and Sugai (2011) evaluated the effects of a MTSS approach on teacher rates of specific, contingent praise; an evidence-based practice consistently shown to improve student behavior and enhance classroom management. Four teachers (all of who reported high levels of problem behaviors in their classrooms) in an urban middle school elected to receive training in School-Wide Positive Behavior Supports as a Tier 1 intervention. This included the use of specific praise and the need for a higher ratio of positive feedback than corrective feedback. After this initial training, the teachers were observed received brief consultation, weekly data on their ratios of positive to negative interactions with students, and weekly praise from the researcher. Two of these teachers met predetermined criteria at Tier 2, while the other 2 required a more intensive Tier 3 intervention. All teachers met criteria of a 4:1 ratio of positive interactions and 6 specific praise statements per observation by the end of the study. They concluded “an application of an RTI approach to teacher training and suggest that a relationship may exist between the level of teacher support and a change in teacher behavior” (p. 52).

Ross and Lignugaris-Craft (2015) also examined the utility of a MTSS framework for teacher preparation. They measured the impact of a MTSS on 3 key teacher skills: opportunities to respond, ratio of positive to negative student interactions, and student time on task. Each of these skills are founded in Positive Behavior Interventions and Supports (PBIS; Sugai & Horner, 1999; Walker, Stiller, Golly, Kavanagh, Severeson, & Feil, 1997) and are evidence-based indicators of effective teaching that support improved student

achievement (Haydon, Conroy, Scot, Sindelar, Barber, & Orlando, 2010; Moore-Partin, Robertson, Maggin, Oliver, & Wehby, 2010; Sutherland, Alder, & Gunter, 2003).

The results suggested that a MTSS approach for teacher preparation was a promising framework for preparing teachers to implement effective teaching practices within evidence-based systems of student support. All participants provided students with increased opportunities to respond, had a higher ratio of positive to negative student interactions, and increased student time on task. Participants also scored higher on district appraisals than other new teachers and some veteran teachers.

Underlying a MTSS framework is the reality that learning needs differ across populations and some learners may perform less well than their peers in specific areas or tasks (Prasse et al., 2012; Van DerHeyden et al., 2007). Learners do not all meet the same degree of academic competency and sometimes require additional supports for successful learning outcomes. Like students, many teachers need additional support to be successful in their practice (Myers et al., 2011), and minimizing teachers' achievement problems, by training them to adopt and maintain new practices through ongoing professional development seems to be a reasonable goal.

Theory of Change

The model in Figure 1 assumes that the effect of professional development on student learning is mediated by teacher knowledge and skills and the degree to which teachers' implement EBP's with fidelity (Cohen & Hill, 2000; Guskey & Spaks, 2004; Kennedy, 1998). In turn, a MTSS framework helps mediate teacher knowledge, skills, and implementation fidelity by providing teachers with more intensive tiers of support if they do not respond to lower tiers of intervention. The usability of the MTSS and its component PD strategies and the system supports available within the MTSS inspired framework support teacher learning and facilitate teacher

buy-in.

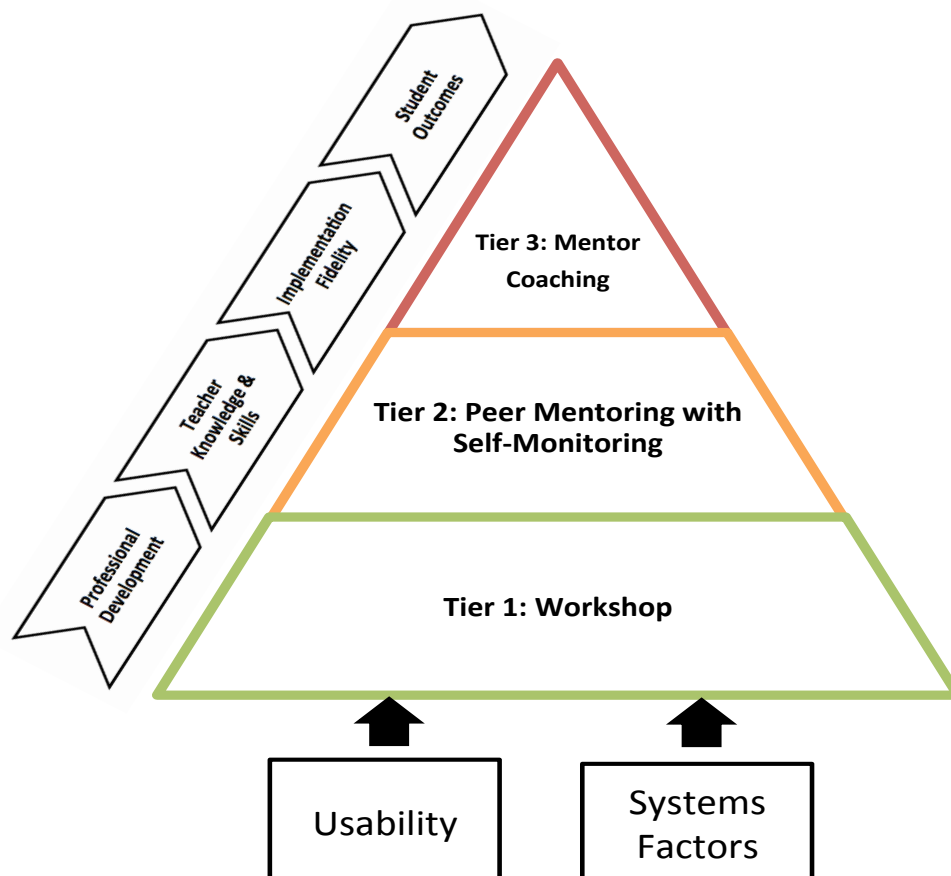


Figure 1. Theory of Change

Summary

There is an growing population of students with ASD entering our schools, and while there are several bodies of research that have documented empirically supported methodologies that meet the educational needs of these students (NAC, 2009; NPDC, 2014; NRC, 2001) it has been reported that special education teachers do not regularly utilize practices that have a proven track record of meeting the learning needs of students with ASD (Morrier, Heflin, & Hess, 2011; Odom, McLean, Johnson, & LaMontagne, 1995; Stichter, Crider, Moody, & Kay, 2007). One possible reason for this gap between research and practice is approaches to teacher education remain inadequate (Desimone, Porter, Garet, Yoon, & Birman, 2002; Penuel,

Fishman, Yamaguchi, & Gallagher, 2007) and it has been suggested that we have failed to provide a realistic framework of implementation that develop teachers' skills while meeting the contextual and logistical factors apparent in classrooms across the country (Odom, 2009; Stahmer et al., 2010). Yoon and colleagues (2007) reported on several crucial PD design factors that could help remedy this situation and contribute to more effective PD. Successful PD studies all incorporate a strong content focus, allow teachers time to deepen their understanding of EBP's and adopt new approaches to instruction, engage teachers in active-learning experiences while providing ongoing performance feedback and follow up. A MTSS may be an effective mechanism that addresses these crucial PD design factors by providing teachers with learning experiences and opportunities that allow them to develop and refine teaching techniques to the highest standards of fidelity within an efficient and effective framework of support (Odom, et al., 2010).

The current study will evaluate the relationship between teacher implementation fidelity of DTT (an EBP) and a MTSS inspired framework of PD. Incorporating evidence-based PD strategies into a continuum of increasing supports for teachers may be one way to streamline teacher PD into an efficient and effective framework (Myers et al., 2008).

CHAPTER TWO: METHOD

Participants

Before beginning the study, I obtained Human Subjects approval from the University. Approved recruitment and consent procedures were used to recruit 6 teachers from a local school district. All 6 teachers who agreed to participate in the study taught in pre-school special education self-contained classrooms. Participant demographic data can be found in Table 1.

Teacher A. Teacher A was a white male. He had a total of 5 children in his classroom and 1 para-educator. He selected 1 student to focus on teaching using a discrete trial training format. He had 7 years experience in teaching special education and had a Master's degree in curriculum and instruction. Teacher A requested not to take part in the peer-coaching and self-monitoring tier of the intervention.

Teacher B. Teacher B was a white male. He had a total of 11 children in his classroom and two para-educators. He selected 3 children to focus on teaching using a discrete trial training format. He had 2 years experience in teaching special education.

Teacher C. Teacher C was a white female. She had a total of 8 children in her classroom and 1 para-educator. She selected 3 children to focus on teaching using a discrete trial training format. She had 8 years experience in teaching special education.

Teacher D. Teacher D was a white female. She had a total of 5 children in her classroom and 2 para-educators. She selected 2 children to focus on teaching using a discrete trial training format. One of these children was a morning student in Teacher C's classroom, and both selected this student to focus on teaching using a discrete trial training format. This was not problematic as student outcomes were not measured and this provides a natural dyad for peer coaching. She had 4 years experience in teaching special education.

Teacher E. Teacher E was a white female. She had a total of 10 children in her classroom and 2 para-educators. She selected 3 children to focus on teaching using a discrete trial training format. She had 15 years experience in teaching special education and had a Master's degree in special education.

Teacher F. Teacher F was a white female. She had a total of 12 children in her classroom and 2 para-educators. She selected 2 children to focus on teaching using a discrete trial training format. She had 14 years experience in teaching special education and had a Master's degree in special education.

Table 1.

Participant demographics

Participant	Gender	Ethnicity	Years Teaching	Highest Qualification	# of Students in Class
Teacher A	Male	Caucasian	7	Master's	5
Teacher B	Male	Caucasian	2	Bachelors	11
Teacher C	Female	Caucasian	8	Bachelors	8
Teacher D	Female	Caucasian	4	Bachelors	5
Teacher E	Female	Caucasian	15	Master's	10
Teacher F	Female	Caucasian	14	Master's	12

Setting

This study was conducted at a public special education pre-school program located within an urban school district in Western Washington that offers pre-school programs to 236 students between the ages of three and five years old. The 2013-2014 demographic school district data is presented in Table 2. Participating teachers implemented DTT sessions with a total of 16

children all of whom had a diagnosis of ASD and had an Individual Education Plan (IEP) at the time of the study.

The school is designated as an Early Childhood Education Assistance Program (ECEAP) and all children receive special education services that met the local, state, and federal criteria for their respective disability area. The school includes a diverse group of students representing a range of cultures and ethnicities. Across the school approximately 70% of children are male and 30% are female. The diversity of the school is 42% Hispanic, 28% White, 12% Black/African American, 10% Asian/Pacific Islander, and 8% Asian. Over 70% of children come from families where English is not the primary language, and bi-lingual assistants support the children in their classrooms while interpreter services are available to the families in 18 different languages. Furthermore, 36.4% of students receive free or reduced-price meals.

Table 2.

School and district demographics by percentage

	School	School District
	2013-2014	2013-2014
Black/African American	12%	11.4%
American Indian/Alaskan Native	1.5%	1.1%
Asian	8%	14.4%
Hispanic	42%	37%
Pacific Islander	10%	18.7%
White	28.5%	24.1%
Multiracial	6%	7.6%
Special Education	100%	15.1%
Free/Reduced Lunch	36.4	69.4%
Total Enrollment	236	18,702

The pre-school has four early childhood classrooms for children with developmental delays and autism and three extended-day programs provide services for children with autism. All research activities took place within participants' classrooms (observations and coaching), offices at the school (peer coaching), or the library of the school (workshops).

Study Design

A concurrent multi-treatment, multiple-baseline design across teachers was used to evaluate the effects of a MTSS model and its components among teacher implementation of discrete trial training. Teacher implementation of DTT was evaluated at four phases, (i) baseline (no training), (ii) workshop, (iii) peer-coaching and self-monitoring, and (iv) mentor coaching. Teachers entered treatment at phase (iii) and (iv) in a multiple baseline staggered manner. Three teachers received all tiers of intervention (workshop, peer-coaching with self-monitoring, and mentor coaching), 1 teacher received 2 tiers of intervention (workshop and mentor coaching), while 2 teachers only received the workshop tier of intervention before meeting end-of-study performance criteria.

Instructional Content

The object of this study was to teach special educators to implement Discrete Trial Training (DTT) with fidelity. The DTT approach is a highly structured and systematic approach to teaching new skills to children with autism spectrum disorders (ASD). It is based in the science of behaviorism where specific learning principles are utilized to systematically teach skills or change behaviors that will improve children's quality of life.

Cue → *Prompt (if necessary)* → *Response* → *Consequence* → *Interval*

Figure 2. Discrete trial teaching general process

The DTT process involves breaking down activities into small (discrete) steps, and then carefully planning and implementing programs that teach the child to master each small step of this sequence (Koegel, Russo & Rincover, 1977; Severterson & Carr, 2012). Multiple trials are conducted to ensure students have many opportunities to practice the target skills. Within each trial of a DTT approach antecedents and consequences are manipulated to elicit the relevant target behavior or skill. Essentially, the teacher gives an instruction, if necessary a prompt, cue or model is provided to help the child respond correctly. Then, based upon the child's response and relative to a pre-determined criterion a consequence is provided. Finally, the teacher pauses before continuing to the next trial to let the child know they have finished the trial and access reinforcement (Smith, 2001). These general steps of a discrete trial are shown in Figure 2. During DTT, instructors use multiple evidence-based strategies including imitation, prompting, shaping, and reinforcement procedures to elicit specific responses from students. Over time, these prompts and cues are faded to promote independence (Donnellan et al., 1984; Ogletree & Oren, 2001).

Independent Variable

The independent variable is a MTSS inspired professional development framework that uses a systematic application of increasingly intensive professional development strategies; workshops, peer-coaching with self-monitoring, and mentor coaching. These different tiers of intervention are described in detail in the "Procedures" section below.

Dependent Variables

The primary dependent variable in this study was participants' performance on the implementation of the DTT procedure, while teaching one task per session, as measured by the Discrete Trials Teaching Evaluation Rubric (DTTER; Garland, Vasquez, & Pearl, 2012). The

secondary dependent variable was teacher perceptions of the MTSS inspired PD framework as measured by the Usage Rating Profile—Intervention Revised (URP-IR; Chafouleas, Briesch, Neugebauer, & Riley-Tillman, 2011) as described in the “Measurement Tools” section below.

Teacher Name:		Phase:									
COMPONENTS											
Management of Antecedents	Arrange Materials										
	Develop Rapport/Positive Mood										
	Introduce Task										
	Provide Opportunity for the Learner to Choose a Reinforcer										
Management of Sd's	Secure Learner's Attention										
	Present Correct Teaching Material										
	Present Correct Instruction										
Management of Correct Responses	<i>IF CORRECT</i>										
	Provide Specific Verbal Praise										
Management of Incorrect Responses	<i>IF INCORRECT</i>										
	Remove Materials & Look down (2 seconds)										
	Represent materials with a prompt										
	Represent instruction & prompt to ensure correct response										
Management of Inter-Trial Interval	Affirm Correct Response										
	Provide a Break between instructional trials										

Figure 3. Discrete Trial Training Evaluation Rubric (DTTER)

Measurement Tools

DTTER. The DTTER (Garland et al., 2012) was utilized to determine the percentage of steps of a DTT sequence teachers implemented correctly, the dependent variable in this study. The steps are categorized as, a) management of antecedents, b) management of discriminative stimuli, c) management of consequences for a correct response, d) management of consequences for an incorrect response, and e) management of the inter-trial interval. Each of these components is then sub-divided into 15 possible steps (See Appendix A for operational definitions of DTTER steps). During each discrete trial between 10 and 13 steps were implemented by the teacher depending upon child responses during the trial (See Figure 3 for

complete steps of DTTER). For example, if a child emitted a correct response the teacher was judged on 10 possible steps. In total, between 63 and 93 points were earned on the DTTER (see Table 3), dependent upon the ratio of correct and incorrect responses of the child. These points earned by the teachers were then converted to a scale of 100%. Participant responses were recorded by coding (+) for each step correctly demonstrated and (-) for each step incorrectly demonstrated. The measurement instrument was designed to collect data for a session over ten consecutive trials (Garland et al., 2009). Percentages of correct responses on applicable steps were calculated after each 10-trial session, on a point-by-point basis to determine teachers' proficiency level of DTT implementation.

During all phases, data were collected on the percentage of DTT instructional components implemented correctly as measured by the Discrete Trials Teaching Evaluation Rubric (DTTER; Garland et al., 2012) a tool that had been used in previous studies of DTT (see data collection measures).

Table 3.

Points earned in each category: Discrete Trials Teaching Evaluation Form

DTT Steps	Possible Points	Points Earned
Management of Antecedents (Steps 1-4)	4	
Management of Discriminative Stimuli (Steps 5-7)	30	
Management of Consequences -correct response (Step 8)	0 to 10	
Management of Consequences -incorrect response (Step 8-11)	0 to 30	
Management of Inter-Trial Interval (Steps 9-10 or Alt. 12-13).	19	
Totals (possible points)	63 to 83	

Surveys: Usage Rating Profile—Intervention Revised. Teachers were administered the URP-IR (Chafouleas et al., 2011) at the end of each tier of intervention to evaluate the social validity and usability of the specific professional development intervention (workshop, peer mentoring with self-monitoring, and mentor coaching). They were asked the extent to which they agreed to statements about specific PD interventions on a 6-point Likert type scale (1=strongly agree; 6=strongly agree). The survey contained a total of 26 questions that pertain to the acceptability of the intervention (9 questions), teacher understanding of the intervention (3 questions), feasibility of the intervention (6 questions), systems climate (5 questions), and systems support (3 questions). All URP-IR question items can be found in Appendix B. All six teachers completed the surveys after Tier 1 of the intervention, three teachers completed the survey after Tier 2 of the intervention, and four teachers completed the survey after Tier 3 of the intervention. Mean scores across five domains evaluated by the URP-IR are displayed in ???.

When specific interventions that the teacher needs to learn and implement hold high social validity they are more likely to be used and maintained over time (Guskey & Yoon, 2009; Schwartz & Baer, 1991; Wolf, 1978). The survey also contained items on systems support and systems climate to determine teacher perceptions of their schools readiness to implement a MTSS framework and the component interventions. These qualitative data would help determine the sustainability of the intervention (i.e., Will participants continue to use the PD strategies? Why or why not?). This could help determine what can be changed about the procedures to improve sustainability and inform future use of such a framework in research and practice.

Acceptability. Treatment acceptability ratings demonstrate “whether treatment is appropriate for the problem, whether treatment is fair, reasonable, and intrusive, and whether

treatment meets with conventional notions about what treatment should be” (Kazdin, 1980; p. 259). It appears that teachers must first understand the purpose and utility of any evidence-based intervention before they make an informed choice of which interventions best meet their needs. Treatment acceptability is linked to social validity and measures the social significance of goals, social appropriateness of procedures, and social importance of effects on student outcomes (Wolf, 1978). Acceptability determines whether a teacher will use a particular intervention, hence determining its effectiveness (Witt & Elliot, 1985). As such, “Research knowledge must be ‘translated’ to teacher friendly instructional forms in order to be implemented in classrooms” (Abbot, Walton, Tapia, and Greenwood; 1999; p.339).

Feasibility. Feasibility refers to the time and effort required to successfully implement an intervention (Witt & Martens, 1983). The feasibility of an intervention includes the amount of time, personnel, and resources needed in order to implement the intervention (e.g., Gresham, 1989; Perepletchikova & Kazdin, 2005). If the intervention negatively impacts instruction, interrupts established routines, or is perceived to negatively impact student learning it is less likely to be viewed as feasible (Chafouleas, Briesch, Riley-Tillman, & McCoach, 2009).

Understanding. The complexity of an intervention and an individual’s understanding of what the treatment is and why it is being implemented are fundamental to its adoption (Modi & Quittner, 2006). Understanding refers to “an individual’s knowledge of what the intervention is, how to carry it out, and why it is being implemented” (Chafouleas, et al., 2009; p. 38). A teacher’s understanding of an intervention is a necessary precursor to intervention acceptability (Briesch, Chafouleas, Neugebauer, & Riley-Tillman, 2013).

System factors. The implementation fidelity of EBP’s can also be impacted by system factors, including system climate and system support. These system factors can positively or

negatively affect the teacher implementation and student outcomes (Briesch et al., 2013).

System climate. System climate refers to the compatibility of the intervention with the culture and priorities of local systems (Briesch et al., 2013; Broughton & Hester, 1993). It is an indicator of a school's readiness to implement a given intervention (Briesch et al, 2013).

Generally, these survey results are encouraging as research suggests that an intervention's fit within the school climate may substantially influence whether or not it is viewed positively and as an appropriate intervention strategy (Briesch et al., 2013).

System support. The systems supports items in the survey directly correspond with teachers' perspectives on the supports and resources they need to participate in the PD interventions. It includes the practical aspects of support including resources, time, and the need for ongoing consultation to support teacher learning and ensure implementation (Briesch et al., 2013).

Teachers were asked to complete URP-IR survey at the end of each tier of intervention. They used this tool to rate targeted instruction, peer coaching with self-monitoring, and mentor coaching acceptability and system factors. At the end of the study teachers were also asked to complete this questionnaire to provide information on teacher perceptions of the MTSS inspired framework of professional development.

Interviews. Brief teacher interviews were conducted to inform the quantitative findings and took place at the end of each tier of the study. Interviews were semi-structured, emphasizing the flexible use of questions and a mix of more or less structured interview questions (Merriam, 2009). Interviews also provided the scope to explore how teacher experiences, training, disposition, and classroom conditions facilitate or impede their implementation of DTT. An analysis of these interviews further informed data from the UPR-IR, allowing further exploration

of teacher perceptions of a MTSS and how teachers perceived that specific professional development activities impacted their practice. Specifically, teachers were asked to expand on the usability of a MTSS with specific questions geared toward the acceptability and feasibility of the intervention, whether they felt the school climate could support this type of professional development framework, and whether resources could be made available for support of an MTSS framework. Teachers were asked open-ended questions (ex. “How did you feel about participating in the study? “How do you feel about using initial instruction, peer-mentoring, coaching?”) to determine their level of satisfaction with the MTSS framework as an intervention and their ability to maintain implementation fidelity in DTT (See Appendix C for semistructured interview questions). Analyses of these interviews were conducted to identify categories that reflected the key themes from the data and inform the quantitative findings of the study.

Procedures

Phase 1: Baseline

During the first phase of this study, teachers were asked to implement an instructional session with a child using their current instructional methods. No changes were made to the instructional programs or classroom procedures. Teachers’ implementation of all DTT steps was observed across sessions (a session was the implementation of 10 consecutive trials of DTT across programs) during baseline data were collected through video recordings. Checklists on a teacher’s percentage of implementation of DTT were analyzed, and the median score of these data were calculated. An idiographic line was then drawn between median score after baseline and the end of intervention goal of 80% implementation of the dependent variable. During baseline, no training or feedback was provided.

Phase 2: Workshop

After the initial baseline sessions, a three-hour workshop on how to implement a DTT strategy was provided for the teachers. This professional development session was carefully designed and took into consideration the structural features (design of PD) and core features (substance of PD experiences) that reflected the characteristics of effective PD, including participation, content, active learning, and coherence (Birman, Desimone, Porter, & Garet, 2000; Garet et al., 2001).

Other teachers and para-professionals that were not part of the study chose to participate in the workshop because it aligned with their professional goals. Initial instruction was focused on content knowledge (Garet et al., 2001) that included the theoretical underpinnings and components of DTT, utilizing carefully selected activities and materials for teachers (Borko, 2004). Active teaching, rehearsal, feedback, and reflection were also incorporated into workshops, all features of high quality PD (Darling-Hammond & McLaughlin, 1995). The workshop provided opportunities for teachers to see the DTT strategies modeled, then task analyze this strategy into component skills. Teachers next rehearsed implementing these skills with other participants in the training environment, and received feedback from the instructor and peers on skill demonstrations. In addition, teachers were encouraged to identify potential contextual factors that acted as barriers to implementation and identify specific strategies for overcoming these barriers. Further, teachers were guided to recognize instances where they could use DTT and how the strategy might enhance the effectiveness of their programs (Dingle, Brownell, Leko, Boardman, & Haager, 2011). PowerPoint slides (See Appendix D) were designed and sequenced to clearly articulate content knowledge and pedagogical knowledge associated with DTT, adopting the characteristics of an effective PD (Birman et al., 2000).

After the workshop, data collection was continued as it was in baseline.

Phase 3: Peer-Mentoring with Self-Monitoring

The peer-mentoring with self-monitoring phase of intervention was introduced to teachers who did not meet 80% implementation criteria at phase 2 (as determined by the fidelity checklists). Peer-mentoring was packaged with self-monitoring to give teachers the opportunity to monitor their own practice and prompt them to engage in specific behaviors. It allows teachers to develop a shared understanding of practice and provides them with opportunities for rehearsal and discourse (Claycomb, 2000). The self-monitoring component involved teachers recording his/her own behavior during the first DTT trial of a session using an adapted DTTER (See Appendix E).

Peer-coaching opportunities were provided and participant dyads were asked to meet twice a week for 15-minutes to engage in informal conversations, and debriefing sessions where self-monitoring forms were reviewed and teachers engaged in analysis of one another's DTT sessions (He, 2009; Schwille, 2008). Peer-mentoring sessions included opportunities for reflective questioning, self-monitoring, debriefing, co-planning, videotape analysis, and the use of fidelity checklists (He, 2009). These fidelity checklists outlined the necessary steps of a peer-coaching session were utilized to ensure mentors implemented intervention components with fidelity. In this case, teachers were provided with a checklist of the 13 steps on the DTTER and asked to monitor their implementation of DTT during the first trial in a session. The data from teacher self-monitoring checklists were discussed during peer-mentoring meetings as a way of determining which specific steps teachers found challenging. From here, teachers and their mentors could review videos of each step, debrief, and rehearse these steps to improve implementation fidelity. If teachers met performance criterion, weekly implementation probes

were conducted to ensure maintenance.

Three teachers participated in the peer coaching and self-monitoring tier of intervention and data were collected for between 3 to 4 sessions per teacher as determined by the staggering effect of the multiple baseline design.

Phase 4: Coaching with Performance Feedback

Teachers who did not meet fidelity criteria at phase 3 received twice weekly, 30-minute coaching sessions with performance feedback. These coaching sessions included modeling of skills, rehearsal, prompting, and performance feedback. In addition, self-monitoring checklists were reviewed and analyzed. Coaching sessions were conducted twice a week for 30 minutes until teachers met 90% implementation criteria or the study ended. Fidelity checklists that outlined the necessary steps of a mentor coaching session were utilized to ensure the coach implemented intervention components with fidelity.

Four teachers participated in the mentor coaching tier of intervention and data were collected for between 3 to 9 sessions per teacher until criteria had been met or the study ended due to the end of the school year.

Progress Monitoring

Once teachers entered the study their implementation of critical components of DTT intervention were monitored. Progress monitoring was utilized to identify teachers at risk of poor learning outcomes. Specifically, it was used to assess individual teacher percentage performance in implementing DTT, while quantifying the teacher's responsiveness to instruction. In addition, progress monitoring was used to evaluate the effectiveness of instruction at each tier of support. Study staff met to address teachers' learning needs and teachers who did not meet competency in implementing critical components of DTT, as

measured by the DTTER (Garland et al., 2002) progressed to more intensive tiers of support. When teachers met 80% competency in implementing appropriate DTT instructional practices across 3 consecutive sessions intervention was stopped and they were placed on monthly probes. This criterion was determined by observational data collected by the researcher as measured by the DTTER.

Screening and outcome measures aimed to measure teacher implementation fidelity of DTT as presented by the DTTER. All measures were administered individually following the outlined procedures for each tier of intervention.

Materials

During the workshop teachers received a copy of an article to read that described DTT procedures (Texas Statewide Leadership for Autism, 2009), background research (Smith, 2001), and PowerPoint notes pages derived from the PowerPoint presentation. Teachers were also provided with a copy of the DTTER data collection tool with instructions (see Appendix F for instructions). During the PowerPoint teachers were shown two videos Discrete Trial Instruction: Part One and Discrete Trial Instruction: Part Two (Autism Training Solutions, 2014), which clearly represented and outlined the steps of the DTTER.

Before the peer-coaching and self-monitoring phase of intervention, each teacher was provided with self-monitoring data collection sheets, a brief summary of self-monitoring procedures, peer-coaching summary (Zwart et al., 2008), and peer-coaching fidelity checklists (See Appendix G).

Two Sony DSW830 20.1 MP digital cameras were used to capture DTT instructional periods for 2 to 4 days a week. The researcher or classroom teacher set up the classroom in an area where the implementation of a DTT session could be filmed.

Summary of Procedures

- 1) At each tier of training, teachers were asked to implement DTT to the best of their ability.
- 2) Assessment: After 3 sessions of ‘instruction as normal’ checklists on a teacher’s percentage of implementation of DTT were analyzed, and the median score of these data were calculated. A goal line was then drawn between median score after baseline and the end of intervention goal of 80% implementation of the dependent variable.
- 3) Progress Monitoring: Teachers who fell below the plotted slope on two-thirds of their scores were provided with Level 2 intervention – targeted instruction. Teachers who met their goal were monitored but not required to access more intense levels of instruction.
- 4) Multi-Level Intervention:
 - a. Targeted Instruction: Teachers were provided with targeted instruction, before being observed for 3-9 additional sessions (staggered for the purposes of a multiple baseline design). These scores were graphed and if the scores fell below the plot line the teachers were then moved to a tier 3 intervention; peer mentoring and self-monitoring.
 - b. Self-monitoring & peer mentoring: Teachers were provided with self-monitoring and peer-mentoring activities, they were then observed for an additional 3 or 4 sessions. If 1 out of 3 of their scores fell below the plot line teachers moved to coaching & performance feedback.
 - c. Coaching and Performance Feedback: Teachers were provided with coaching and performance feedback activities, until they student met 80% criteria of implementation fidelity or the duration of the study (end of the school year).

Data Analysis

Data analysis was an integral part of the MTSS as it determined teacher movement between tiers of intervention. After a predictable baseline pattern of data was documented for each individual participant, a dual-discrepancy model that used both idiographic data (i.e., slope) and nomothetic data (i.e., final outcomes) to determine how well a teacher responded to intervention was used (Christ & Hintze, 2007). These data were a primary source of information used in ongoing decision-making; determining which teachers required additional more intensive tiers of intervention and which had met criterion (Christ & Hintze, 2007).

A performance level of 80% implementation integrity was established as the benchmark for the dependent variable i.e. implementation of discrete trial training. The median of the teachers 3 baseline scores was plotted on a graph and a slope was drawn from this median score to a data point of 80% at between 6 and 24 observations, that represents the teachers' necessary learning rate to meet competency and was the criteria for determining teacher progress. Teachers with two-thirds of scores falling below the slope after 3 to 9 observations were provided with the next level of intervention (see Figure 4).

Calculating an effect size. The degree to which an independent variable (or in this case set of variables) influences changes in the dependent variable is referred to as the effect size (Cohen, 1988). Calculating and reporting the effect size promotes precision when discussing treatment effects, and offers a way to effectively communicate findings (Parker, Vannest, and Brown, 2009). One way of calculating effect size is to determine the extent to which longitudinal data are non-overlapping between phases of an intervention; an accepted indicator of the amount of performance change between phases of intervention and has long been an important part of single-case research (Horner et al., 2005; Parker & Vannest, 2009; Sidman,

1960).

For the purposes of this study, non-overlapping data metrics were used to calculate the effect sizes between baseline and the MTSS framework for individual teachers. In addition, where at least 3 data points were available at a specific tier of intervention (Horner et al., 2005; Kratochwill et al., 2010; Shadish, Sullivan, Hedges, & Rindskopf, 2010) effect sizes were calculated between each component PD strategy and the prior phase of treatment to determine the impact of each individual PD strategy within the MTSS. Specifically, a “Nonoverlap of All Pairs” (NAP; Parker & Vannest, 2009) metric was used to calculate the effect size of treatment on teacher implementation fidelity of DTT. NAP is appropriate for nearly all data types and distributions, has good power efficiency, and can be calculated by hand from small datasets (Wendt, 2009).

To calculate NAP, I first counted the total of paired comparisons (Pairs) across phases to calculate the number of points in baseline multiplied by the number of points in treatment. Next, I counted the number of data points that overlapped between phases and identified and pairs that were below the numbers in the previous phase (Neg) and overlapping data points with the same score (Ties). These (Neg, Ties) were subtracted from number of Pairs to get the number of Positive Ties (Pos.). Once the number of Pos. was obtained, NAP was calculated using the following formula:

$$\text{NAP} = \frac{\text{Pos.} + (.5 \times \text{number of ties})}{\text{Number of Pairs}}$$

(Alresheed, Hott, & Bano, 2013)

The NAP metric resulting from this equation determined the effect levels of the intervention:

weak effects: 0 to 65%; medium effects: 66% to 92%; large or strong effects: 93% to 100%.

Data based decision-making. The results of screening and progress monitoring facilitated a decision-making process. The data based decision-making process was used to determine appropriate instruction and teacher movement within this MTSS model. The principal investigator in collaboration with a research assistant conducted the data based decision-making process. Performance checklists were reviewed before data on teacher performance and competency in discrete trial training components were aggregated, analyzed, and graphed. Individual movement between levels was determined by these data.

Teachers were monitored at each level of instruction in order to determine rates of improvement in implementation of DTT procedures and identify those teachers who were not demonstrating adequate progress. In addition, progress-monitoring data allowed us to compare and contrast the effects different PD interventions had on teacher implementation. Progress monitoring quantified a teacher rate of improvement and responsiveness to instructional activities. This rate of improvement allowed us to determine if teachers were making adequate progress or if they need more intensive interventions.

Analysis of interview data. Semistructured individual interviews (Massey, 2010) were utilized as an attempt to corroborate findings from the URP-IR and explore the teachers' perceptions of a MTSS framework and its component PD strategies as a useable professional development strategy. Three interviews were conducted with Teacher A, one at the beginning of the study and one at the end of Tier 1 and Tier 3. Four interviews were conducted with Teacher B and Teacher D - one at the beginning of the study and one at the end of Tier 1, Tier 2, and Tier 3. The researcher was unable to schedule a convenient interview time with the other participants. On average, interviews lasted 18 minutes per participant meeting—a total of 186 minutes of recorded interview data. The initial interview focused on the participants' teaching

background and experience, history of professional development, their beliefs and values, and their teaching philosophy. Interviews were transcribed verbatim, described, analyzed, and interpreted (Wolcott, 1994).

Open coding was used for initial data analysis as this allowed the data to ‘talk for itself’ and entertain all analytic possibilities (Emerson, Fretz, & Shaw, 1995). As coding progressed I was able to identify categories that reflect the key themes from the data. Analytical files were used to organize interview transcripts. Data were chunked under a designated label, for example, Previous PD Experiences – TB_03_PPDE indicates the teacher initials, the interview number, and the specific theme interview data may represent. This method of organization was used to first analyze each participant as an individual case, before looking for themes, categories, or occurrences of concepts that permeate all cases. These were then clustered and partitioned, allowing contrasts and comparisons to be made between data sets. Coding remained close to the data as labels including acceptability, systems support, systems climate, feasibility, and understanding emerged from the data (Wolcott, 1994). Finally, data were organized into a table following specific themes, which allowed for comparisons between data sets.

Fidelity of Implementation

The researcher conducted the initial workshop training, trained staff to follow peer coaching and self-monitoring protocols, and assumed the role of mentor coaching for the course of the study. In addition, each tier of intervention followed a checklist that identified key steps and features of the intervention to ensure that the interventions were delivered consistently and with fidelity. The researcher completed a checklist for the workshop tier of intervention and mentor-coaching checklist after each coaching session. Fidelity checklists were explained and modeled to teachers and peer coaches respectively. Teachers who moved

into tier 2 interventions were asked to complete a checklist for the self-monitoring phase of intervention, while peer coaches were asked to complete a checklist after each peer coaching session. These fidelity checklists were collected at the end of each week and were aggregated. Any teacher or peer-coach who fell below 85% fidelity would be retrained; no retraining had to take place during the study.

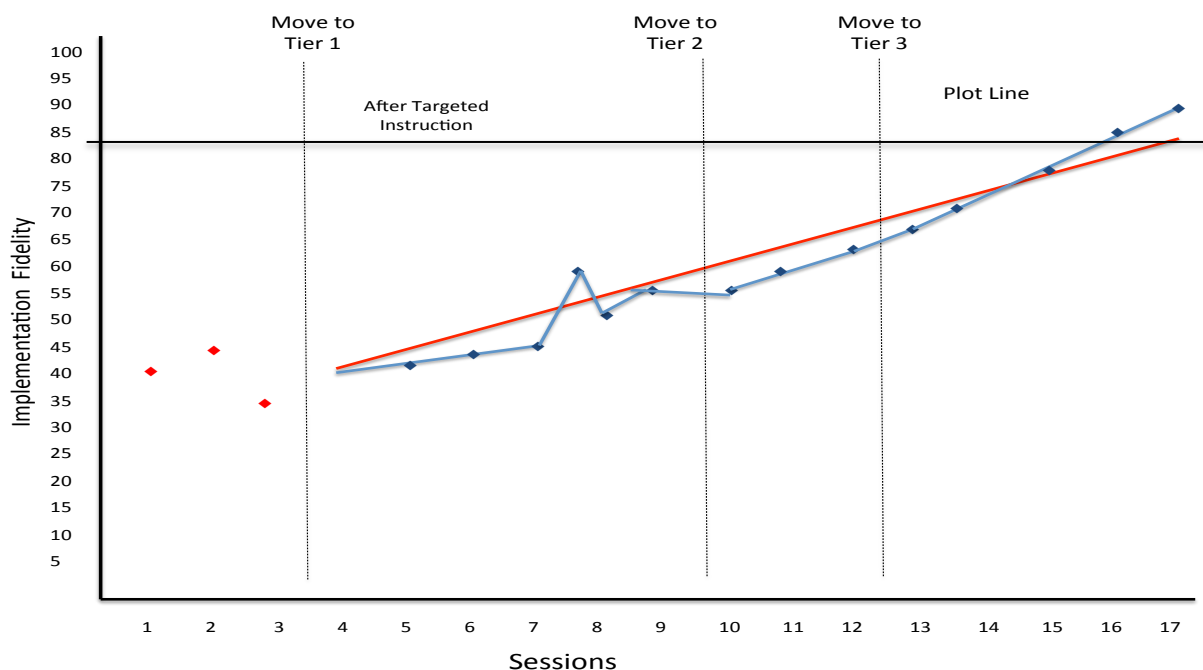


Figure 4. Sample graph indicating responsiveness to instructional activities

Inter-Observer Agreement

One hundred and twelve sessions of DTT were observed; 21 observations each for teachers A and B, 22 each for teachers C and D, and 13 each for teachers E and F. Of the 112 observations conducted for this study, 34 of them were done with two observers to establish inter-observer agreement (30% of observations). Checks were spread throughout the duration

of the study to prevent observer drift, and conducted with and between the two data collectors. We calculated inter-observer agreement by dividing the total number of intervals with agreement by the total number of intervals observed and obtaining a percentage.

Two data collectors were used for the study and inter-observer agreement was established for each data collector at the beginning of intervention then subsequently before each tier of intervention over the course of the study. In addition, inter-observer agreement observations were conducted on each teacher in the study. If inter-observer agreement fell below 85% the observer would be retrained; no retraining had to take place during the study.

CHAPTER THREE: RESULTS

The primary purpose of this study was to examine the effects of a multi-tiered system of support framework on teacher implementation of discrete trial training. Data were collected via video observations of teaching sessions. Teacher interviews and questionnaires were used to measure teacher perceptions of the Multi-Tiered System of Support (MTSS) inspired framework and its component professional development interventions.

This chapter addresses the results of the study in four main sections. The first section compares baseline data with a post-intervention probe to determine the cumulative effect of a MTSS on teacher adoption of DTT. The data collected at each phase of the intervention, determining the impact of individual professional development strategies on teacher implementation of DTT, is presented in the second section. Section three presents the results of the URP-IR teacher surveys, where teachers rated the usability of and systems support available for individual professional development interventions and the MTSS inspired framework as a whole. Excerpts from teacher interviews that focus upon teachers' prior professional development experiences, the type of professional development activities they would like to access is presented in section four.

Intervention Results for MTSS Inspired Framework and Component PD Strategies

All teachers' scores were plotted on a graph, and a slope was drawn from the mean baseline to the performance criteria of 80% at the 24-session point on the graph. This slope line represented the teachers' necessary learning rate (NLR) to meet competency and was the criterion for determining teacher progress. If teachers fell below a NLR for 3 consecutive trials, they were given a more intensive level of intervention (See Figure 5 for graphs).

Data from the DTTER demonstrate that all 6 teachers made gains on the dependent

variable as result of one of more types of professional development (See Table 4). The effect size of the MTSS and component interventions on teacher implementation of DTT were triangulated using the NAP, a nonparametric technique of showing the entire score distribution and the percentage of data improving across phases (Parker, Vannest, & Davis, 2011). Effect sizes are shown in Table 5 and data for individual teachers are described below.

Teacher A

Teacher A's percentage implementation of DTT ranged between 15% and 24% ($M = 20.67\%$) at baseline. Because these scores fell below a performance criterion of 80% he required further intervention and was assigned to the workshop phase of intervention. After the workshop, Teacher A showed a slight increase in his implementation of DTT, with a mean of 25.67 (range 17% to 33%). Visual analysis indicated some variability in his level of implementation of DTT, with a slight upward trend, indicating teacher A should move to the Tier 2 component of intervention. However, he chose not to participate in the peer mentoring intervention, hence he moved immediately to the mentor coaching (Tier 3) level of intervention.

After 9 sessions of mentor coaching, his implementation fidelity was variable ($M=49\%$, range 34% to 72%). Following the first 3 sessions in this phase his percentage implementation fell well below the NLR to a mean of 37.67%. Further coaching proved beneficial, increasing his implementation fidelity to between 56% and 72%, significantly increasing his implementation fidelity from baseline. A follow-up probe indicates that Teacher A maintained implementation fidelity at 56%.

Visual analysis of Teacher A's data during mentor coaching shows a visible increasing trend in Teacher A's implementation fidelity. Increases in implementation fidelity occurred

slowly, at a steady rate, but were not significant when applying the immediacy of effect criterion. Teacher A moved from low levels of implementation (during baseline and Tier 1) to moderate levels during mentor coaching. There was some variability in Teacher A's implementation of DTT during mentor coaching, but the last three data points maintain implementation fidelity within a range of 56% to 58%. At the end of the study, a follow-up probe indicated that his implementation fidelity of DTT increased to 56%, well below the 80% treatment fidelity required to impact student learning.

Results indicate MTSS system on Teacher A's implementation of DTT increased implementation fidelity from a mean of 20.67% at baseline to 56% at the end of the study. A NAP index was applied to calculate percentage of data that improved across phases (Parkey & Vannest, 2009). This NAP indicated the workshop had a moderate effect on teacher A's implementation of DTT (85%), mentor coaching had a strong effect on DTT adoption (100%), and the MTSS had a strong effect on Teacher A's adoption of DTT (100%).

Teacher B

Teacher B participated in all components of the MTSS. Teacher B's implementation of DTT ranged between 13% and 17% ($M = 14.33\%$) at baseline. This level of implementation did not meet the benchmark of 80% implementation fidelity so he was assigned to the workshop tier of intervention. At this tier, DTT implementation increased to a mean of 20.83% (range 17% to 24%), still well below NLR. Visual analysis indicated that during the workshop phase of intervention, Teacher B had some variability in his level of implementation of DTT, with a slight upward. These data indicated that Teacher B should advance to peer-mentoring with self-monitoring (Tier 2).

During peer-mentoring with self-monitoring, an immediacy of effect was demonstrated in Teacher B's data. DTT adoption changed from a mean of 20.67% for the last three data points in Tier 1 to a mean of 46.67% in the first three data points at Tier 2 (Kratochwill et al., 2010). While Teacher B's levels of implementation fidelity increased from low to moderate and a significant increase in percentage implementation was demonstrated, he did not meet a NLR, and moved on to mentor coaching.

Teacher B was provided with 5 sessions of mentor coaching. Again, an immediacy of effect was shown within his data. Implementation fidelity of DTT changed from a mean of 48% for the last three data points in Tier 2 to a mean of 86.67% in the first three data points at Tier 3. After the first mentor-coaching session, Teacher B improved his implementation fidelity to 90%, above the idiographic slope line and meeting the end-of-study benchmark for competency. Teacher B maintained this level of implementation fidelity for the next three observations. However, after the last session of mentor coaching, his DTT adoption fell to 79%, below the 80% benchmark for competency cutoff. A follow-up probe indicated that Teacher B maintained implementation fidelity at 85% once mentor coaching had ended.

The application of an MTSS system on this teacher's implementation fidelity of DTT increased from a mean of 14.33% at baseline to 88.6% at the end of the study. A NAP index was applied to calculate the percentage of data that improved across phases (Parkey & Vannest, 2009), indicating all phases of intervention had a strong effect on teacher B's implementation fidelity of DTT (workshop =97%; peer mentoring = 100%; mentor-coaching= 100%; MTSS = 99%), indicating a smooth adoption process across tiers.

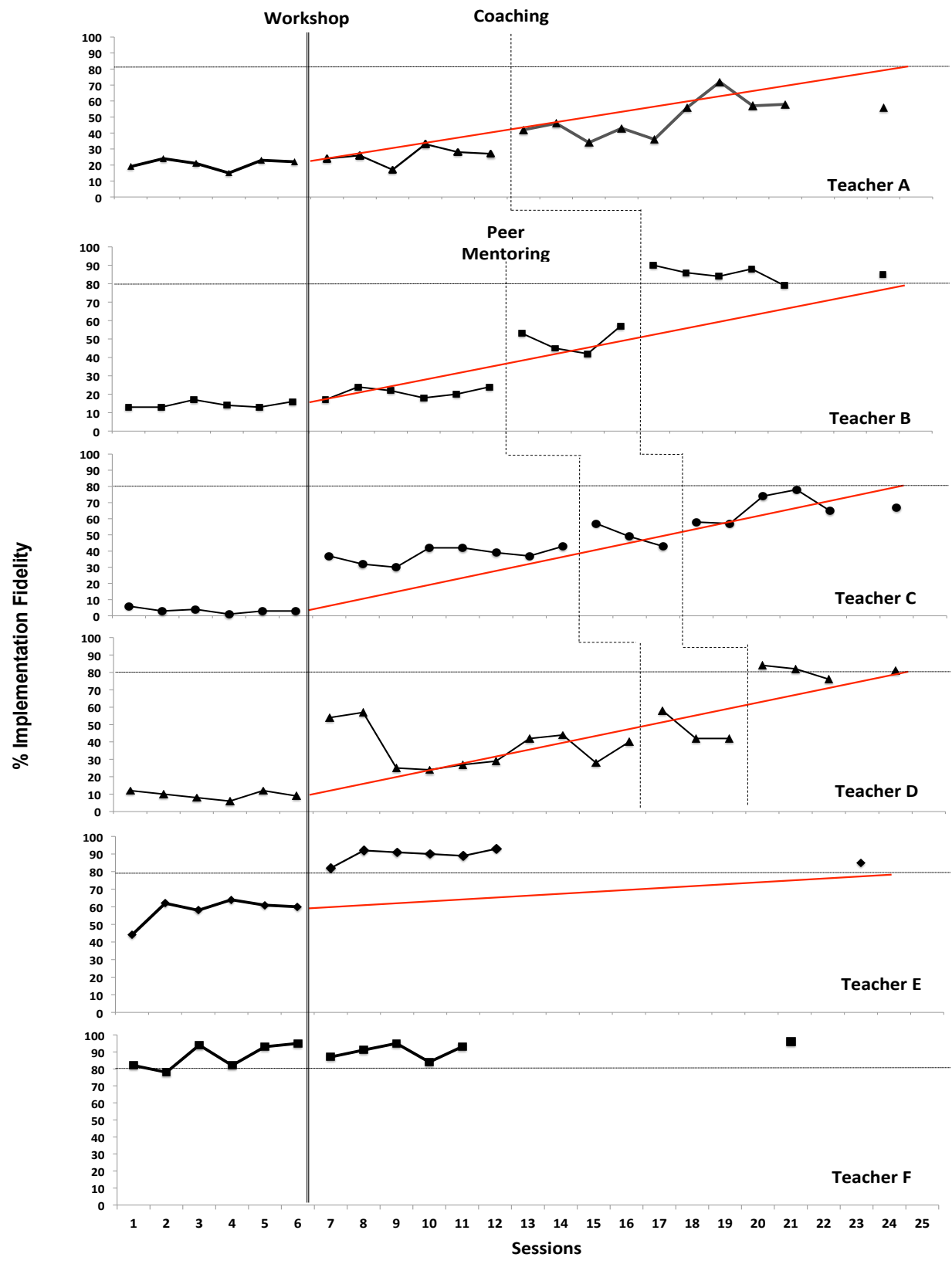


Figure 1. Percentage of correct implementation of DTT across MTSS sessions

Teacher C

Teacher C participated in all components of the MTSS. Teacher C's data indicate her implementation of DTT at baseline ranged between 1% and 6% ($M = 3.33\%$) across 6 sessions. This level of implementation fell well below the benchmark of 80% implementation fidelity; hence she was assigned to the workshop phase of intervention.

During the workshop phase of intervention her implementation was variable, but increased from low to moderate levels with a mean of 37.75% (range 30% to 42%). This demonstrated an immediacy of effect (Kratochwill et al., 2010). At this stage Teacher C met NLR, however, as she had performed at such a low level during baseline and only a slight increasing trend emerged during Tier 1, it was decided that she would access an additional tier of intervention to ensure progress continued.

Teacher C engaged in three sessions of peer mentoring with self-monitoring. During this tier no immediacy of effect was demonstrated, although implementation fidelity increased from a mean of 39.67% for the last three data points in Tier 1 to a mean of 49.67% for the first three data points at Tier 2. Data at this tier showed a decreasing trend and NLR was not met, indicating a need for mentor coaching.

After 5 sessions of mentor coaching Teacher C improved her implementation fidelity to $M=66.4\%$ (range 57% to 78%). Visual analysis of Teacher C's data during mentor coaching shows a visible increasing trend in implementation fidelity. A follow-up probe indicated that Teacher C maintained implementation fidelity at 67% once mentor coaching had ended, below study criteria for competency but a significant increase from 3.33% at baseline.

Teacher C's adoption of DTT occurred at a steady rate with little variability and an increasing trend across all tiers of intervention. The application of an MTSS system on

Teacher C's implementation fidelity of DTT increased from a mean of 3.33% at baseline to 67% at the end of the study. A NAP index was applied to calculate the percentage of data that improved across phases (Parkey & Vannest, 2009). Results of the NAP indicated the workshop (100%), peer-mentoring (98%), mentor-coaching (97%), and the MTSS (100%) all had a strong effect on Teacher C's adoption of DTT (1.0).

Table 4.

Teacher percentage implementation fidelity of DTT

Participant		Baseline M (SD)	Tier 1 M (SD)	Tier 2 M (SD)	Tier 3 M (SD)	Post-Intervention Probe
Teacher A	M (SD)	20.67 (3.27)	25.83 (5.27)	---	49.33 (12.3)	56
Teacher B	M (SD)	14.33 (1.75)	20.83 (3.0)	42.95 (6.95)	85.4 (4.22)	85
Teacher C	M (SD)	3.33 (1.63)	37.75 (4.77)	49.67 (7.02)	66.4 (9.4)	67
Teacher D	M (SD)	9.5 (2.35)	37 (12.16)	47.33 (9.24)	80.67 (4.16)	81
Teacher E	M (SD)	58.17 (7.22)	89.5 (3.94)	---	---	85
Teacher F	M (SD)	87.33 (7.47)	90.83 (4.49)	---	---	96

Teacher D

Teacher D participated in all components of the MTSS. Teacher D's implementation of DTT ranged between 6% and 12% (M = 9.5%) baseline, falling well below the benchmark of 80% implementation fidelity. Visual analysis indicated that following the workshop phase of intervention Teacher D's implementation of DTT was variable (M=37%, range 27% to

57%). An immediate effect was demonstrated from baseline to Tier 1. If implementation fidelity had remained at this level after the workshop, she would have met the NLR and been placed on maintenance. However, a sharp decrease in implementation fidelity at Session 9 to 25% implementation fidelity placed her below a NLR. Her performance leveled out over the next seven sessions, although there continued to be moderate levels of variability in the data (range 24 to 44). Teacher D did not maintain this performance level, so progressed to the next and more intensive tier of intervention.

Teacher D engaged in three sessions of peer mentoring with self-monitoring. During this Tier, no immediacy of effect was demonstrated, although implementation fidelity increased slightly from a mean of 37% to a mean of 47.33%. At Session 17 Teacher D was progressing at a NLR, with implementation fidelity at 58%. However, she did not achieve three consecutive scores at a NLR so advanced to mentor coaching.

After mentor-coaching Teacher D's implementation fidelity of DTT increased from a mean of 47% for the last three data points of Tier 2 to a mean of 81% for the first three data points of Tier 3, demonstrating an immediacy of effect. Data points during Sessions 20, 21, and 22 met a NLR at 84%, 82%, and 76%. However, her implementation fidelity dropped below the end of study benchmark criteria during Session 22. It must be noted that Teacher D only received 3 sessions of mentor coaching, not the anticipated 5 to 10 sessions, because she was unavailable for observations for a 3-week period and the school year had come to an end.

A follow-up probe indicated that Teacher D maintained implementation fidelity at 81% once mentor coaching had ended, meeting study criteria for competency and a significant increase from a baseline mean of 9.5%.

In general, the application of an MTSS system on this teacher's implementation fidelity

of DTT increased from a mean of 9.5% at baseline to 81% at the end of the study. The application of a NAP index (Parkey & Vannest, 2009), indicated the workshop (100%), mentor-coaching (100%), and the MTSS (100%) had a strong effect on teacher B's implementation fidelity of DTT. Peer mentoring had a medium effect at 77%.

Table 5.

“Non-overlap of all pairs”: Location of the entire score distribution

Participant	Effect of Workshop	Effect of Peer-Mentoring	Effect of Mentor-Coaching	Effect of MTSS
Teacher A	85%*	--	100%**	94%**
Teacher B	99%**	100%**	100%**	99%**
Teacher C	100%**	98%**	97%**	100%**
Teacher D	100%**	77%*	100%**	100%**
Teacher E	100%**	--	--	100%**
Teacher F	6%	--	--	67%*

Effect size: Weak effects: 0-65%; medium effects: 66-92%; large or strong effects**: 93-100%.*

Teacher E

Teacher E participated in the workshop component of the MTSS, before meeting necessary criteria (above her plotted line) to achieve competency of implementation fidelity. Indeed, the teacher met end-of-study criteria for implementation fidelity with percentage scores of 82%, 92%, and 91% after Tier 1 intervention had been implemented.

Teacher E's DTT adoption ranged between 44% and 64% ($M = 58.17$) at baseline. This level of implementation fell below the benchmark of 80% implementation fidelity; hence she was assigned to the workshop tier of intervention. Her data at this tier showed a level

increase from moderate to high in her implementation of DTT, with a mean of 89.5%. Visual analysis demonstrated an immediacy of effect and Teacher E met end-of-study benchmark criteria. As Teacher E had met both criteria of the dual discrepancy model, she was placed on maintenance in the study with a follow-up probe scheduled at Week 23.

A follow-up probe indicated that Teacher E maintained implementation fidelity at 85% once mentor coaching had ended, a significant increase from baseline at 58.17%. While this increase demonstrated a significant response to intervention, the baseline was already high, and when interviewed Teacher E indicated that she had previously been taught to implement teaching sessions using “DTT-like strategies” potentially skewing results. However, when a NAP index was applied to calculate percentage of data that improved from baseline to the post intervention (Parkey & Vannest, 2009), it was found that a MTSS had a strong effect on her adoption of DTT (100%).

Teacher F

Teacher F’s implementation of DTT ranged between 78% and 95% ($M = 87.33$) at baseline. The last four baseline data points exceeded the end-of-study benchmark of 80% implementation fidelity, allowing Teacher F to move to maintenance within the study. Teacher F requested access to the workshop (Tier 1) intervention and further observations. She was observed across six DTT sessions after the workshop phase of the intervention (Tier 1) had been implemented. Her data at this tier remained high and stable ($M = 90.83$), with a range between 84% and 95%), and she continued to meet end-of-study benchmark criteria.

A follow-up probe indicated that Teacher F maintained implementation fidelity at 96%, a slight increase from baseline at 87.33%. A NAP index was applied to calculate percentage of

data that improved from baseline to the post intervention (Parkey & Vannest, 2009), indicating the MTSS had a medium effect on her adoption of DTT (67%).

Summary

Comparison of the mean DTT adoption in baseline to that of adoption after the application of an MTSS inspired framework shows a strong improvement in fidelity of implementation for all participants. The overall mean accuracy for Teachers A through D improved from 11.96% in baseline (range from 3.33% to 20.67%) to 72.75% (range of 56% to 81%) after an MTSS framework of professional development had been implemented. Teacher A had the smallest increase at 23.5% increase, while teacher D had the largest percentage increase of 71.5%. While Teacher E's implementation fidelity did not meet the end-of-study benchmark during baseline, her percentage implementation of DTT was high with a mean of 58.17 (range 44 to 64). After the workshop, her mean of six sessions increased to 89.5% with a range between 82% and 93%. Teacher E maintained implementation fidelity of 85% during a follow-up probe, demonstrating a 31.33% increase from baseline to the end of the study after an MTSS framework of professional development had been implemented. Teacher F met the end-of-study benchmark (80%) at baseline with 87.33%, but after the workshop, which she voluntarily attended, her final probe had increased to 96%. The workshop potentially had a positive impact on her practice.

An analysis of change across similar conditions indicates that, across participants, baseline levels were maintained until an MTSS was introduced, and the level and trend in each of the participants' data improved immediately after the introduction of the MTSS inspired framework and component professional development interventions. A positive change in trend direction was noted across all six participants when moving from baseline to follow-up probe. As the major variable that changed between conditions was the addition of an MTSS framework

and its component professional development strategies, we can say with relative confidence that change was directly relative to the implementation of an MTSS inspired framework.

Data from the NAP test of score distribution indicate that while a MTSS had a large effect on teachers' DTT instruction, the individual professional development strategies (workshops, peer-mentoring with self-management, and mentor coaching) that comprise the MTSS had varying degrees of impact on teacher implementation of DTT.

Implementation Fidelity: An Analysis of Treatment Steps

Teacher correct implementation of individual steps within the five categories of the DTTER was reviewed throughout the study to guide the instructional focus of peer-mentors and mentor coaches. In addition, these analyses provided information on which steps teachers found most difficult to implement. The results of these analyses are presented below (See Table 6 for teacher implementation fidelity for each DTTER category).

Teacher A

During baseline, Teacher A managed antecedents appropriately 21% of the time, managed SDs appropriately for 33% of steps within trials, and appropriately managed consequences for correct responses for 17% of steps within trials. He scored 0% on management of consequences for incorrect responses, but appropriately managed inter-trial intervals for 11% of steps. During a post-intervention probe, he managed antecedents appropriately for 50% of trials, managed SDs appropriately for 70% of trials, managed consequences for correct responses appropriately for 40% of trials, managed consequences for incorrect responses appropriately 67% of trials, and managed inter-trial intervals appropriately for 63% of trials.

Teacher B

During baseline, Teacher B managed antecedents appropriately 12% of the time,

managed SDs appropriately for 33% of steps within trials, and appropriately managed consequences for correct responses for 17% of steps within trials. He scored 0% on management of consequences for correct responses, management of consequences for incorrect responses, and management of inter-trial intervals. During a post-intervention probe, he managed antecedents appropriately for 75% of trials, managed SDs appropriately for 67% of trials, managed consequences for correct responses appropriately for 86% of trials, managed consequences for incorrect responses appropriately 33% of trials, and managed inter-trial intervals appropriately for 68% of trials.

Teacher C

During baseline, Teacher C managed antecedents appropriately for 13% of trials, managed SDs appropriately for 0.6% of trials, and appropriately managed consequences for correct responses for 17% of trials. She scored 0% on management of consequences for incorrect responses and management of inter-trial intervals. At the end of the study, she managed antecedents appropriately for 100% of trials, managed SDs appropriately for 93% of trials, managed consequences for correct responses appropriately for 86% of trials, managed consequences for incorrect responses appropriately 94% of trials, and managed inter-trial intervals appropriately for 42% of trials.

Teacher D

During baseline, Teacher D managed antecedents appropriately for 42% of trials, managed SDs appropriately for 17% of trials, and appropriately managed consequences for correct responses for 0% of trials. She also scored 0% on management of consequences for incorrect responses and management of inter-trial intervals. At the end of the study, she managed antecedents appropriately for 100% of trials, managed SDs appropriately for 83% of

trials, managed consequences for correct responses appropriately for 86% of trials, managed consequences for incorrect responses appropriately 81% of trials, and managed inter-trial intervals appropriately for 53% of trials.

Table 6.

Treatment Fidelity: Pre & Post % of DTT steps implemented correctly in 5 categories of DTTER.

Participant	Phase of Study	Teacher A	Teacher B	Teacher C	Teacher D	Teacher E	Teacher F	Mean Fidelity
Management of Antecedents	Baseline	21%	12%	13%	42%	75%	100%	43.83%
	Follow Up	50%	75%	100%	100%	100%	100%	87.5%
Management of Discriminative Stimulus	Baseline	33%	33%	0.6%	17%	39%	96%	24.71%
	Follow Up	70%	67%	93%	83%	83%	100%	82.67%
Management of Consequences (Correct Rx)	Baseline	17%	0%	17%	0%	72%	92%	33%
	Follow Up	40%	86%	86%	86%	78%	100%	79.33%
Management of Consequences (Incorrect Rx)	Baseline	0%	0%	0%	0%	74%	71%	24.17%
	Follow Up	67%	33%	94%	81%	67%	92%	72.33%
Management of Inter-trial Intervals	Baseline	11%	0%	0%	0%	58%	72%	23.5%
	Follow Up	63%	68%	42%	53%	100%	89%	69.83%

Teacher E

During baseline, Teacher E managed antecedents appropriately for 75% of trials and managed SDs appropriately for 39% of trials. In addition, she managed consequences for correct responses for 72% of trials, appropriately managed consequences for incorrect responses for 74% of trials, and managed inter-trial intervals for 58% of trials. At the end of the study, these

numbers increased as she managed antecedents appropriately for 100% of trials, managed SDs appropriately for 83% of trials, managed consequences for correct responses appropriately for 78% of trials, and managed inter-trial intervals appropriately for 100% of trials. Her implementation fidelity for management of consequences for incorrect responses decreased from 74% at baseline to 67% during the follow-up probe.

Teacher F

During baseline, Teacher F managed antecedents appropriately for 100% of trials and managed SDs appropriately for 96% of trials. In addition, she managed consequences for correct responses for 92% of trials. He had most difficulty in managing consequences for incorrect responses (71% of trials), and managed inter-trial intervals for 72% of trials. At the end of the study, she maintained antecedent management at 100%, increased the management of SDs and consequences for correct responses to 100%, an increased her management of consequences for incorrect responses to 92%. Her management of inter-trial intervals also increased to 89%.

Summary

Comparison of the pre & post percentage of DTT steps implemented correctly in 5 categories of DTTER mean DTT show improvement in fidelity of implementation for all participants. The overall mean accuracy of teacher scores was reviewed to determine if teachers had more difficulty with a specific category of steps in the DTTER. In general, scores fell within a 18% range (69.83% to 87.5%) between the 5 categories, with variability in individual teacher scores impacting the overall mean.

Intervention Results: Teacher Perceptions of Intervention

Teachers completed the Usage Rating Profile—Intervention Revised (URP-IR; Chafouleas, et al, 2011) at the end of each tier of intervention. This survey was used to evaluate

the usability of and systems support available for the specific professional development intervention (workshop, peer mentoring with self-monitoring, and mentor coaching). All 6 teachers completed the surveys after Tier 1 of the intervention, 3 teachers completed the survey after Tier 2 of the intervention, and 4 teachers completed the survey after Tier 3 of the intervention. Mean scores across five domains evaluated by the URP-IR are displayed in Table 7. Finally, at the end of the study the URP-IR was administered to all six teachers to evaluate the usability of MTSS as a framework of professional development.

Workshops: URP-IR results

The results of the survey indicate all 6 teachers strongly agreed, with little variability, that workshops were an acceptable PD strategy $M=5.25$ ($SD=0.74$). In addition, all strongly agreed with the intervention's feasibility ($M = 5.97$, 0.17) and strongly agreed with items that pertained to their understanding of the intervention ($M = 5.5$, $SD = 0.74$). All teachers strongly agreed ($M=6$, $SD=0$) that workshops were consistent with the mission of their school, would be agreeable to administrators, were well matched to their job expectations, and were conducive to participation in respect to their job responsibilities. Teachers slightly agreed with items pertaining to the systems support required to implement the intervention ($M = 4.1$, $SD = 1.39$). Indicating that teachers feel confident in implementing this intervention independently without additional support.

Peer Mentoring With Self-Monitoring: URP-IR Results

The 3 teachers who advanced to the peer mentoring with self-monitoring component of the intervention were requested to complete the URP-IR on this professional development strategy. All three teachers rated this intervention positively on all five domains. Teachers moderately to strongly agreed with items pertaining to the acceptability of the intervention ($M =$

5.6, $SD = 0.64$), and strongly agreed that the intervention was feasible ($M = 5.8, 0.38$), and strongly agreed that they understood the intervention ($M = 5.1, SD = 1$). Teacher responses to systems climate for peer-mentoring with self-monitoring were neutral ($M=3.9, SD=2.14$). However, of the 5 core items in systems climate, all teachers strongly disagreed with the statement “Peer-mentoring with self-monitoring is consistent with the way PD is currently done at my school”. If this question were excluded, then the mean changes to $M=4.99$ indicating a strong agreement with that school climate is conducive to utilizing peer-mentoring with self-monitoring as a PD strategy.

While peer-mentoring with self-monitoring was rated as a moderately agreeable PD strategy, variability between teacher responses was greater. Specifically, Teacher B had concerns over the amount of data collection required for this phase of intervention and have particular reservations around managing student data while self-monitoring her own performance. While teachers reported favorably on peer-mentoring with self-monitoring Teacher B felt that she would need additional instruction in this strategy to maximize her effectiveness as both a peer-mentor and mentee.

Mentor Coaching: URP-IR Results

All four respondents who advanced to the mentor-coaching component of the MTSS rated mentor coaching positively on four of five domains. Teachers strongly agreed with items pertaining to the acceptability of the intervention ($M = 5.6, SD = 0.64$), strongly agreed with feasibility ($M = 5.8, 0.38$), strongly agreed that intervention aligned with the systems climate at their school ($M = 5, S = 1.72$), and strongly agreed with items that pertained to their understanding of the intervention ($M = 5.1, SD = 1$). Teachers slightly agreed with items related to the systems support required to implement the intervention ($M = 4, SD = 1.27$). However, in

this case, scores closer to 1.0 are desirable because the results indicate that some teachers felt that they would need additional resources to carry out this intervention, such as consultative support and/or someone to assist with preparation of materials. Others felt confident in their ability to carry out the intervention with the resources they already had.

Table 7.

Teacher Perception of Professional Development Strategies as Measured by the URP-IR

		Survey Respondents (N = 6)			
		Workshops	Peer-Mentor with Self- Monitor	Mentor- Coaching	MTSS
Factors (N = 5)					
Acceptability	M	5.25	4.57	5.63	5.33
	(SD)	(0.74)	(1.77)	(0.39)	(0.67)
Understanding	M	5.53	4.56	5.05	4.72
	(SD)	(0.74)	(0.73)	(1.14)	(0.89)
Feasibility	M	5.97	4.72	5.83	5.28
	(SD)	(0.17)	(1.86)	(0.38)	(0.78)
System Climate	M	6	3.9	5.03	5.17
	(SD)	(0)	(2.14)	(1.75)	(1.32)
System Support	M	4.06	4.11	2	4.39
	(SD)	(1.39)	(1.27)	(2.26)	(0.78)

MTSS: URP-IR Results

Overall, all six respondents rated the MTSS framework positively on all five domains (See Appendix H for individual teacher URP-IR ratings). Teachers highly rated items pertaining to the acceptability of the intervention (M = 5.3, SD = 0.67) and their perceptions about the intervention's feasibility (M = 5.3, 0.78), and they strongly agreed that intervention aligned with the systems climate at their school (M = 5.2, S = 1.34). Teachers moderately agreed with items that pertained to their understanding of the intervention (M = 4.72, SD = 0.89).

Systems support was the category that teachers agreed with least across interventions. Teachers appeared ready to put in the additional work and time to meet their professional learning needs, but had some doubts that the district would provide them with the minimum resources to be successful. Teachers tended to moderately to strongly agree with items pertaining to the systems support required to implement the intervention ($M = 4.4$, $SD = 0.78$).

Teachers moderately agreed that the district had the capacity to support a MTSS framework of PD although most doubted that they would be provided with the dosage and expertise to fully benefit from this framework of PD.

Summary

The results of the survey indicate all 6 teachers strongly agreed, with little variability, that workshops were an acceptable PD strategy. Similarly, all 6 teachers registered strong agreement, with little variability, that mentor-coaching was an acceptable PD strategy, while peer-mentoring with self-monitoring was rated slightly lower with moderate agreement that it was an acceptable PD strategy. While teachers moderately agreed that the necessary supports would be provided to implement workshops and peer-coaching, all but one teacher felt that mentor-coaching would not have the necessary systems support to make it a viable option for PD. For example, some felt that the additional resources to carry out this intervention, such as consultative support and time for them to engage in these practices would not be provided by the school or school district. However, all felt confident in their ability to effectively participate in peer-coaching with the current resources.

Finally, teachers strongly agreed that the MTSS framework as a whole was an acceptable framework for PD. All teachers reported strong agreement that they were knowledgeable about PD strategy procedures and understood the mechanisms that promoted positive change in their

practice. Teacher's felt they had the greatest understanding of workshops and mentor-coaching, while they had a moderate understanding of peer-mentoring with self monitoring. In general, teachers felt they had a strong grasp of how PD strategies worked, and understood the procedures of the intervention.

Intervention Results for Teacher Interviews

Initial Interviews

Before the beginning of the study teachers participated in a brief interview to determine their previous exposure to DTT, their prior professional development experiences, and the type of professional development activities they would like to access. All teachers initially reported that they had not been exposed to DTT and previous PD experiences had been limited to workshops, minimal coaching, and self-directed learning experiences. All teachers reported that they sought out opportunities, to learn and improve their practice, but were restricted to in-house trainings due to financial and time restrictions. Teacher E and Teacher F described how past trainings helped their practice but were frustrated with the lack of PD opportunities available to them. The other teachers expressed their desire to have more PD but when asked were only able to identify 1-2 day workshops or presentations as PD strategies. Teachers A, E, & F articulated that they engaged in self-directed learning opportunities including reading books and articles on educational topics and learning from other teachers. While these activities may increase teacher knowledge and are grounded in the literature on professional development activities (Garet et al, 2001; Guskey & Yoon, 2008), none of the teachers categorized these informal learning opportunities as professional development.

Teachers A, B, and D were interviewed prior to participating in the MTSS and focused upon the participants' background and experiences of professional development. The following

themes emerged: a) Prior professional development experiences across teachers were limited and often were restricted to a lecture format; b) Teachers wanted additional ongoing professional development experiences; and c) Teachers did not know what professional development would look like outside of lectures and outside consultancy.

During the semi-structured interviews, all three teachers discussed their initial teacher training, and while they enjoyed the experience, they did not feel it fully prepared them for their professional life. As illustrated by Teacher B's response, "It isn't remotely related to what I do now." All three teachers discussed their prior professional development experiences and believed them to limit their professional growth, as articulated by Teacher C:

I really want to learn more. I want to know what to do with these kids. It's so frustrating at times that I question if I'm helping at all. It's so frustrating. I just wish I had more opportunities like this one.

The professional development experiences that teachers talked about were limited to a one-day lecture, or a 90-minute discussion on district professional development days. Teacher A felt that these were inadequate considering the complexity of his classroom:

I have some kids who can't talk, some who just scream all day, and some who can't even sit. Then some guy tells me that I should be using a three-to-one ratio of whatever. How will this help?

Teacher A also voiced concerns over the expertise of other teachers of students with special needs and the lack of accountability within districts in ensuring high-quality programs for students with ASD.

Teacher B and Teacher D articulated that they drew on multiple sources to learn more about their work, friends from college, researchers who had historically supported their practice,

and “any readings I can get my hands on.” Descriptions of phone calls to professional contacts, formal training, “hitting the books,” and talking to colleagues were all high on the list when looking for practices that would meet their professional development needs. Teacher B described how he learned from colleagues: “I bounce ideas off of them, especially if I can come with ideas of what I’d like to see, and then they can help tease out ideas about what it could look like in our room.”

More formal professional development opportunities seemed less accessible. As teacher D articulated, “Going to conferences has happened maybe twice, but it’s been really great. I walk away really motivated to try new things, and to do things better.” It appeared that the teachers in this study were active in their ongoing professional development and, in spite of limited formal learning opportunities, teachers continued to seek out, develop, and implement technologies that impacted their practice.

When asked to describe the types of professional development they would like to engage in, teachers identified lectures, workshops, and ongoing coaching/consultancy. Teachers were realistic about the accessibility of these PDs: “I’m not saying I want to go every week, but getting out and learning about what’s going on and what’s working for other teachers, that’s all. Maybe only two or three times a year ... even that would be nice” (Teacher B). Teachers’ attitude toward outside consultancy was less positive: “It seems like a waste of money. Some guy comes in and tells me what I’m doing wrong, leaves, [and] then I don’t see him again for 6 months” (Teacher D). All teachers relayed similar experiences with outside consultants.

Teacher B elaborated, saying:

They only come in when parents go to due process. They tell us what to do, but half the time, I don't know what they mean. An hour, that's how long my last one came, and he gave me 20 things to work on ... what does he know?

The coaching and consultancy models that teachers had previously experienced did not appear to contain the necessary elements of successful coaching protocols presented in the literature (repeated observations, modeling, and performance feedback; Kretlow & Bartholomew, 2010; Petcher & Bailey, 2006; Sanetti & Kratochwell, 2009). In addition, the main facilitators for PD workshops were district personnel who provided multiple PD's on a wide variety of topics. This is contrary to research that suggests that positive outcomes are more likely when researchers with an in-depth understanding of specific EBP's should present interventions directly to teachers (Guskey & Yoon, 2008; Desimone et al., 2002).

In general, all teachers interviewed sought opportunities to learn and develop their expertise. However, it became apparent that financial limitations and a lack of relevant training opportunities proved a major barrier to their professional development.

PD Strategy Interviews

Professional development strategy interviews delved deeper into teacher perceptions of specific professional development strategies.

Workshop. When asked about the workshop, all 3 teachers felt it was an efficient and effective PD strategy. When asked, Teacher A reported, "I like workshops. I like anything that doesn't disrupt my teaching" expanding to say that other more intensive PD activities had previously disrupted his classroom to the detriment of his students. Teacher D reported that the workshop had given her teaching "more focus" and claimed that it had already positively impacted student learning. Teacher B enjoyed the training and thought it was an easy way for

school districts to provide teachers with ongoing learning experiences. He also complimented the design of the workshop; “most professional development days involve someone talking at us for a few hours. I like the way you gave us opportunities to practice the skills. It’s just good teaching”. However, Teacher B was not convinced that DTT was an effective intervention for students commenting, “It’s hard to teach not because it’s complicated but because it’s very repetitive and there are lots of things to manage”.

Interviews with Teachers A, B, and D at the end of Tier 1 supported the results of the URP-IR. They strongly agreed that workshops were a usable professional development strategy. Specifically, the teachers felt strongly that the school had the capacity and access to resources to implement workshops without additional support on a regular basis, as illustrated by Teacher B’s statement, “I don’t understand why we don’t have things like this more often. You know, something that targets useful teaching strategies.”

Peer Mentoring with Self-Monitoring. Peer mentoring with self-monitoring was the subject of the third interview that was conducted with Teacher B and Teacher D (Teacher A did not access this tier of intervention). This interview had two purposes: (a) to identify whether each teacher engaged in peer-mentoring sessions with fidelity and completed self-monitoring checklists, and (b) to corroborate quantitative findings and explore the teacher’s perceptions of peer mentoring with self-monitoring as a useable professional development strategy.

All teachers engaged in peer mentoring with self-monitoring appropriately. They engaged in informal conversations surrounding the steps to implement DTT successfully and reviewed self-monitoring checklists. Both teachers felt peer-mentoring with self-monitoring was beneficial to their practice. They particularly enjoyed “bouncing ideas” off one another and learning from one another. The teachers indicated that they primarily discussed managing the

discriminative stimuli and managing consequences for incorrect behaviors and engaged in modeling and rehearsal during these sessions; this is reflected in Teacher D's statement, "First we'd talk about it, then I'd ask her to show me, then I'd try and she'd tell me what was going on. It was a good learning experience." During debriefing sessions, self-monitoring forms were also reviewed, and teachers analyzed the correct and incorrect steps of each other's DTT sessions.

Teacher B met with Teacher F twice a week for 15 min to review the self-monitoring forms and engaged in analysis of one another's DTT sessions. Teacher B was impressed with Teacher F's knowledge and has since asked for her advise on several other students.

Both teachers' felt that self-monitoring was difficult to manage and was the least useful of all PD strategies. Teacher B said, "I'm trying to manage my instructional materials, collect data, and then monitor my own behavior. I see the usefulness but its not logistically possible." Teacher D felt stated, "It's just too much. We are trying to learn all of these new things and then you give us one more thing to do." However, teacher D did acknowledge it was a useful point of reference for the peer-mentoring sessions.

The qualitative results from semistructured teacher interviews supported the results of the URP-IR. Teachers B and D found it useful to get another person's perspective on this process and saw peer mentoring with self-monitoring as an acceptable and feasible intervention that they understood. They also believed that "most teachers" at the school were open to this type of professional development and that implementation would require very few additional resources, supporting the systems climate and systems support results on the URP-IR.

Mentor-Coaching. The final interview focused on teacher perceptions of mentor-coaching as a specific professional development. Interviews with Teachers A, B, and D at the end of Tier 3 supported the results of the URP-IR. They strongly agreed that mentor coaching

was a usable professional development strategy, and they clearly understood how ongoing coaching could affect their practice. They felt that the school administrator and other staff would support this form of professional development but had doubts that the school district would provide them with the necessary funding for ongoing support. As Teacher D articulated,

It's a shame, coaching really works well for me. Bouncing ideas off someone who really knows their stuff, you can't not learn. I understand that money is tight, but I wish the district would realize how much coaching helps us do our jobs more effectively.

In general, teacher interviews supported the results of the URP-IR survey across interventions. However, Teacher F discussed the feasibility of a MTSS without the support of the lead researcher and expressed concern that the district did not have the expertise to facilitate such a PD process. The issue of utilizing a natural implementer is discussed in the limitations section of this paper.

CHAPTER FOUR: DISCUSSION

The purpose of the current study was to apply a MTSS inspired framework to teacher training. Specifically to demonstrate the usefulness of using increasing instruction of differing levels of intensity to increase the fidelity of teachers' implementation of DTT in preschool classrooms. Results were varied across each participant, with all participants responding differently at each tier of intervention, but also indicated a positive relationship between teacher percentage implementation of DTT and a MTSS inspired framework of PD. Further, teachers reported that a MTSS inspired framework of PD and its component PD strategies were usable and could be supported in their current setting.

Based upon MTSS logic, it was anticipated that progressively more intensive tiers of professional development strategies would positively impact teacher implementation of DTT. This framework provides a criterion for decision making where additional tiers of intervention are systematically provided when an initial or ongoing need for support is identified (Barnett et al., 2004; VanDerHeyden et al., 2007). In this study, teachers who were not competent in implementing DTT would be provided with a PD workshop at Tier1, peer-mentoring with self-monitoring at Tier 2, and mentor coaching at Tier 3 as progressively more intense intervention strategies that help teachers adopt DTT.

Pre-Intervention Experiences and Attitudes

During pre-intervention interviews teachers' descriptions of professional development were bounded by a workshop or presentation format and were typically provided by district staff. The literature suggests researchers with an in-depth understanding of the intervention typically facilitate improvements in teacher practice, and positive outcomes are more likely when researchers present interventions directly to teachers then help them with implementation

(Guskey & Yoon, 2008; Desimone et al., 2001). Hence, it cannot be assumed that participants' previous exposure to PD activities provided by natural implementers in school districts had a significant positive impact on their practice.

A discussion of the effects of the MTSS framework on teacher implementation of DTT and the impact of each of these PD activities will follow.

The Effects of an MTSS on Teachers' Implementation of DTT

The effects of the MTSS framework on teachers' implementation of DTT demonstrated that this was effective strategy for professional development. The mean pre-intervention DTT implementation percentage across all 6 participants was 32.22% (SD = 33.211), whereas, after the intervention, DTT implementation was 78.33% (SD = 14.390). The difference in DTT implementation before and after the intervention, including where teachers' implementation fidelity data were distributed is illustrated in Figure 5, and demonstrated that the MTSS framework had a large impact on teacher implementation of DTT.

Successful MTSS frameworks share several common features: they provide universal screening measures, frequent progress monitoring (which informs data-based decision making), multiple tiers of support, and comprise evidence-based practices at each tier of intervention (Fuchs & Fuchs, 2006; Gresham, 2004). The MTSS inspired framework in this study met these criteria and consisted of a variety of PD activities: workshops, peer-mentoring with self-monitoring, and mentor coaching; all had significant bodies of literature supporting their effectiveness.

Visual inspection of the data and results of the NAP (Parker & Vannest, 2009) indicate that while all teachers made strong gains from baseline to post-intervention probe after the application of a MTSS there was a varied impact across participants. In addition, teacher

response to intervention varied across PD strategies. Teacher A's percentage implementation of DTT increased by 35% from baseline, teacher B's increased by 71%, teacher C by 64%, teacher D by 70%, and teacher E by 27% (See Table 4). Percentage of nonoverlap of all pairs (Parker & Vannest, 2009) for Teacher's A, B, C, D, and E, indicate that a MTSS had a strong effect on their implementation of DTT. Teacher F had already met competency levels at baseline and showed a 9% increase in implementation fidelity at follow-up, which explains a moderate rather than strong effect of the MTSS on her implementation of DTT.

The variability in responding between participants highlights the unique learning needs of individual teachers and supports the necessity for individualization of PD training activities. All teachers were asked to implement DTT under contextually similar circumstances (same school, similar students, similar teaching goals), hence it seems likely that individual teacher responses to different tiers of intervention and the social validity of the PD strategies account for the discrepancies between the rate of adoption of DTT. Consequently, aligning strategies within an MTSS framework to individual teachers preferred learning styles, and tailoring PD activities shown to be effective for individual teachers may positively impact teacher learning. To illustrate, in this study Teacher C and D responded equally to each tier of intervention. Visual analyses indicate that for these teachers the effects of the MTSS framework provided an incremental, smooth, and predictable advance across tiers. Whereas, Teachers A and B seemed to respond more favorably to mentor coaching and peer mentoring respectively, with an immediacy of effect occurring after the implementation of these PD activities. The consistent and systematic application of an MTSS framework would allow us to identify specific PD strategies that match individual teacher-learning needs. Hypothetically, it may become apparent that Teacher A does not respond to anything other than mentor-coaching while other teachers

may respond to more efficient and effective workshop models of PD. In practice, the iterative nature of the MTSS framework allowed us to make objective decisions to move teachers between tiers. The design of this study enabled a transition to occur rapidly when teacher data indicated the need for more intensive support.

Of the 6 teachers in the study, 4 achieved 80% implementation criteria. Of these teachers only two teachers (B & D) met performance criteria at follow-up after accessing all tiers of intervention. However, all participants made significant gains throughout the course of the study. The results of this study suggest that ongoing PD support has an effect on teacher adoption of DTT and while some teachers require more intensive support than others, a MTSS inspired framework has the capacity for individualization that may better meet the needs of a wider scope of teachers than traditional PD's. Indeed, it is possible that, had the intervention not been customized based on the changing needs of the teachers the DTT adoption percentages would not have increased to such high levels. These results suggest that the same dosage, type, and/or intensity of professional development may need to be individualized and adjusted across teachers.

The Effects of Individual Interventions on Teachers' Implementation of DTT Workshops

Significant variations between teachers existed at the workshop phase of intervention. Visual analyses indicate that Teachers A and B did not have a sizable response to the workshop tier of intervention; implementation fidelity rose by 5% and 7% respectively during post workshop observations. While these data remained stable with low variability, this slight upward trend does not indicate any effect of the workshop on their implementation of DTT. When interviewed at the end of this tier, Teacher A and B both indicated that they felt they understood DTT and it was an acceptable and feasible intervention, yet neither were able to

implement with fidelity. An analysis of treatment steps of the 10 to 13 steps of the DTTER, also showed that Teachers A and B were not able to implement any step of DTT consistently across trials. While both teachers managed the discriminative stimulus with most consistency at 33%, data do not suggest that either teacher had become fluent in any step of DTT after workshop. It appears that a workshop format was ineffective for Teacher A and B, with no indication that they adopted any step of the DTT protocol.

However, Teacher C, D, and E all showed larger effect sizes after the workshop with 34%, 38%, and 28% increase in implementation fidelity respectively. This immediacy of effect is a key indicator that the intervention impacted the dependent variable. Teachers C and D data indicated decreasing trends in implementation fidelity at baseline, yet saw a jump immediately after implementation, further supporting the impact of the workshop on their implementation of DTT. While the implementation data of Teacher C and E remained stable after workshops, with little variability and a slight upward trend, Teacher D's data dropped by 25% after 2 post workshop observations. Yoon et al. (2007) identify follow-up training as a necessary component of sustainable PD, and this sudden drop in Teacher D's implementation fidelity may be indicative of a lack of ongoing instruction provided during Tier 1. Once Teacher D's data stabilized we do see a slight upward trend in implementation with low variability, but she did not return to levels seen immediately after workshop until the application of the peer mentoring with self-monitoring phase of intervention.

After the workshop Teacher E and F approached the researcher and indicated that they had been previously been exposed to DTT. They did not indicate this before the study, as they did not know this intervention as DTT. Both recognized the specific steps of the intervention and while Teacher E had utilized the practice a few years ago in a previous teaching position,

Teacher F articulated that it was a practice she currently utilized. Both teachers requested to continue in the study. This prior exposure is demonstrated in the results, where both score significantly higher in implementation fidelity than their colleagues. However, after the workshop, improvements in both teachers implementation of DTT occurred, indicating that even those teachers who appear competent in a practice can benefit from workshops.

These results at this tier of intervention again suggest that the same level and type of professional development may not be appropriate for all teachers, and the individualization of PD activities may increase the likelihood that they engage in practices targeted in PD.

Peer-Mentoring with Self-Monitoring

Results of the effectiveness of peer-monitoring with self-monitoring varied between participants. Teacher B demonstrated a 22% gain in implementation fidelity during peer-mentoring (from M=21% to M=43%), while teachers C and D's implementation increased from M=38% to M=50% and M=37% to M=47% respectively. While visual analyses indicate that peer-mentoring had the smallest impact on teacher DTT adoption, it also was the briefest of the interventions at 3 or 4 sessions. However, even with this short duration of intervention positive change occurred. After an initial increase, all teachers had a slight downward trend in implementation fidelity during peer-mentoring but due to the brevity of this tier of intervention, we cannot assume that this trend would not have continued had Tier 2 been implemented across additional sessions. Teachers informally reported that these session helped clarify and expand their knowledge of DTT and "getting to see what they did was particularly helpful".

Mentor-Coaching

Teachers who did not respond to appropriate levels of implementation at Tier 2 were provided with mentor-coaching as a Tier 3 intervention. These coaching sessions included

modeling of skills, rehearsal, prompting, and performance feedback, and allowed the teacher to engage in dialogue with the lead researcher about DTT. Teachers A, B, C, and D all accessed the mentor coaching tier of intervention with some variability in results.

Teacher A progressed to mentor-coaching immediately after the workshop phase of intervention and accessed 9 coaching sessions. After an initial increase in implementation fidelity (from $M=27\%$ to $M=42\%$) during the first 2 coaching sessions, the teacher made no significant gains and fell below the idiographic line over the next 4 sessions. After 6 coaching sessions Teacher A made a gain in implementation fidelity moving from 36% to 56% and achieved a final probe result of 56%. However, Teacher A was unable to demonstrate the necessary levels of treatment fidelity to occasion positive outcomes (80%) even if we apply McCurdy and Watson's (1999) assertion that interventions may have positive behavior changes when the integrity is 60%–65%. Teacher A received the highest dosage of mentor-coaching (9 sessions) and it would be difficult to argue that a longer duration of the same type of mentor-coaching may have a positive effect. Indeed, following MTSS logic, when the participant falls under the idiographic line over 3 consecutive sessions, an additional more intense tier of intervention should have been applied to help the learner meet standards. The impact of longer or more frequent coaching sessions would have been utilized, but the teacher was not responsive to this addition and this would have required additional Human Subjects approval.

Teacher B responded well to coaching and we can see an immediacy of effect from Tier 2 to Tier 3 ($M=43\%$ to $M=85\%$). These data had little variability but maintained a slight downward trend. However, during mentor-coaching and follow-up probe, Teacher B met the performance criteria of over 80%. Similar to Teacher B, Teacher D's data indicate an immediacy of effect. After the first mentor coaching session teacher D's implementation fidelity

increased from M=42% to M=84%, and even though the next 3 data points had a slight downward trend, performance was maintained around 80%, with a follow-up probe of 81%.

After Teacher C moved on to the mentor-coaching phase of intervention, she experienced a 16% increase in treatment fidelity (M=50% to M=66%). Teacher C's adoption of DTT seemed smooth and commensurate across all tiers of intervention, moving from a medium level at Tier 1, to medium/high level at tier 2 to high level at tier 3. Adoption during the mentor-coaching phase had low variability with a slight upward trend. During follow-up Teacher C's implementation fidelity dropped to 67%. With this level of adoption it is doubtful that any positive student outcomes could be attributed to the DTT intervention.

These results at this tier of intervention suggest that coaching can significantly impact teacher implementation of DTT and is an effective professional development strategy. However, while all 4 teachers' responses to coaching are promising, it is possible that they (like Teachers E and F) had been previously exposed to DTT and coaching triggered the skills and knowledge they already possessed. Alternatively, the other tiers of intervention may have had a collateral effect on teacher implementation of DTT, and the effects of coaching may not have been seen had a workshop and peer mentoring with self-monitoring not preceded them.

Summary of Effective PD Strategies

While many studies use self-reports and surveys to assess the quality of the PD (Burns & Ysseldyke, 2009; Gagnon & Maccin, 2007; Greenwood & Abbott, 2001), I used direct behavior measurements to assess teacher implementation of DTT as this a more sensitive and objective way to evaluate teacher implementation than rating scales or surveys (Yoon et al., 2007). Of the 6 teachers in the study, 1 achieved performance criteria at baseline, 1 achieved performance criteria after receiving the Tier 1 intervention, while the 4 other teachers required the most

intensive supports (Tier 3) to advance their implementation fidelity. Teacher A or C never achieved the expected 80% treatment fidelity criteria after accessing all tiers of intervention. Due to time limitations Teacher C only accessed 3 mentor-coaching sessions, and it is possible that a continuance of mentor coaching sessions would have resulted in more positive outcomes. Visual analyses indicate that mentor coaching had the most significant overall effect on teacher implementation of DTT across the 4 teachers who accessed this tier of intervention. Workshops had a significant impact on Teachers, C, D, and E, while peer mentoring had the greatest effect on Teacher B. It is not surprising that results of the mentor-coaching tier demonstrate a larger effect than other PD strategies, as this is the most intense tier of intervention. It has been described as the singular most effective way of training teachers (Petcher & Bailey, 2006). It must be noted that before intervention all 6 teachers indicated that workshops and mentor-coaching were the only forms of PD that they had experienced, and this familiarity may be indicative of teacher agreement. Mentor-coaching is also less accessible and more expensive than other forms of PD, with few teachers regularly accessing coaching for extended periods (Guskey & Yoon, 2008). Addressing teacher training needs by first applying less-intrusive and more efficient PD strategies, then applying mentor-coaching within the context of an MTSS framework while supporting those teachers who do not meet expectations, may be one way of minimizing school district costs while providing teachers with regular professional development strategies that impact student learning (Myers et al., 2011).

Teacher Perceptions of an MTSS as a Framework for PD

All participants completed the URP-IR (Chafouleas et al., 2011) to provide information on the social validity of the MTSS framework and the component interventions. Semistructured interviews were also conducted to qualify the survey findings and gather qualitative data on the

social validity of the MTSS and component interventions. With such a small sample size, responses on the various survey instruments were analyzed qualitatively to evaluate trends across participants and presented in a histogram.

The URP-IR results suggest the teachers thought the MTSS framework and its component PD strategies was an effective professional development model that they felt was both usable and feasible. Teachers appeared to strongly support a MTSS framework of professional development, though most had some doubts that the school district would provide the system supports necessary for them to consistently access a similar PD framework. However, given that an MTSS design limits the necessity for the most intensive and expensive types of PD strategies e.g. mentor-coaching, to teachers who have not responded to more efficient PD strategies, school districts may be more amenable to this form of PD. These preliminary results indicate that teacher perceptions of MTSS and its component strategies were positive and are strongly encouraging for further investigations.

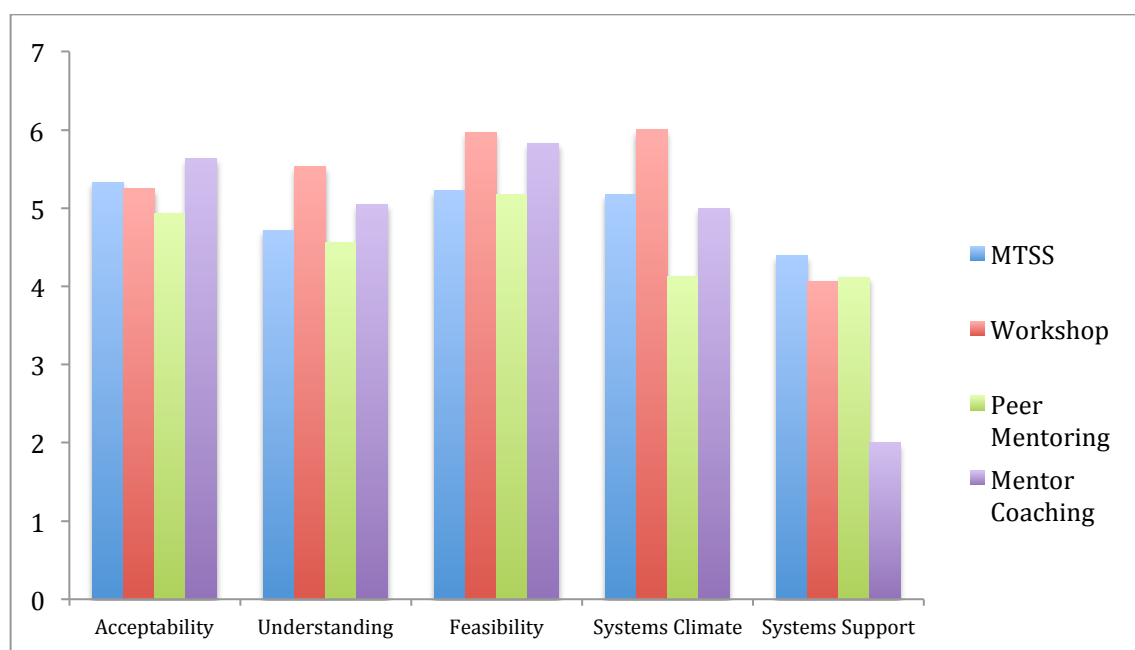


Figure 6. Teacher rankings of MTSS (and component PD strategies) by categories

Limitations of the Study

The study had numerous limitations, which are important to discuss. First, the sample of the study ($n = 6$) was far too small to yield generalizability and participants were clustered in the same school. The study would be more impactful if it had taken place in multiple settings with a larger sample of teachers. In addition, all observations and interventions were implemented in a school setting, and as such certain environmental variables could not be controlled (e.g. absences, interruptions, pullout services).

Second, after baseline indicated Teacher E and Teacher F implemented DTT with high fidelity, after the workshop phase of intervention, both disclosed they had previously learned a similar intervention to DTT packaged under a different name. This prior exposure to DTT may have skewed group results. Indeed, both Teacher E and Teacher F, both of who had previously been trained in DTT showed significantly higher levels of implementation fidelity than other participants at baseline and follow-up. It also cannot be ruled out that other teachers had also previously experienced DTT and the results were reflective of them recalling earlier instruction. In hindsight, PD in other EBP's may have better served Teacher E and Teacher F's learning needs, highlighting the dilemma facing school districts. Even if we have a systematic PD training framework how so we determine content areas that meet the varied needs of teachers?

Third, it is possible that the post-intervention of DTT will drop off considerably if data were gathered after a sufficient period of time. This lack of maintenance data on teacher implementation fidelity means that no conclusions can be made about how well teacher's implementation would be maintained in the future. In other words, without a slightly longer longitudinal window, it is difficult to determine whether teachers will return to their baseline percentages.

Fourth, the study came to its natural conclusion at the end of the school year; at this point only 3 of the 6 teachers had met study criteria for proficiency in DTT implementation. This can be illustrated by Teacher D who had accessed 3 mentor-coaching sessions and had a decreasing trend in her data, yet was unable to engage in further mentor-coaching sessions. It is possible that further mentor-coaching would have resulted in higher levels of implementation of DTT by the teachers. It is also important to remember that teachers were observed utilizing DTT during very small windows throughout the study. A session observation lasted for 10-minutes, yet teachers were providing students with instruction for 4 to 6 hours each day, not necessarily representative of their ability to implement DTT or other EBP's.

Fifth, peer-mentoring was combined with self-monitoring at the Tier 2 phase of intervention were applied as an intervention package. While this phase of intervention had a positive effect on some teachers' implementation of DTT, it is impossible to determine that extent that each of these interventions effected teacher implementation fidelity. In addition, peer-mentoring with self-monitoring was the briefest phase of intervention and teachers may have not required a third tier of intervention had they been able to continue accessing this tier.

Sixth, the quantity and scope of qualitative data collected for the study was limited. The extent of qualitative data collection was limited to 2 brief interviews held with 3 teachers and no qualitative data were collected through observations or artifact analysis. This limited qualitative analysis prevented rich inferences from being drawn.

Finally, the district staff that would typically implement PD sessions may have different results because of their different relationship with the school or teachers. Concurrently, as many of these natural implementers are required to present on multiple subjects their focus and understanding of one specific EBP is likely more limited than researchers in the field.

Implications for Practice

Despite these limitations, this study advances the research in the following ways. The current study provides preliminary evidence on the effectiveness of a MTSS inspired framework designed to support teacher implementation of DTT. The intervention was mediated by emerging and established PD strategies identified in the research literature that promote teacher learning and hence their implementation of DTT. It is feasible that as more efficient and effective PD strategies emerge from the literature these could be incorporated into a MTSS and utilized at the appropriate tier depending upon their complexity.

An implication for practice arising out of the data gathered and analyzed for this study is that a MTSS inspired framework can be utilized as a means of increasing DTT adoption among teachers. It can be facilitated through workshops, peer-mentoring with self-monitoring, and mentor coaching. While mentor-coaching was ranked more highly by participants in this study, workshops and peer-mentoring with self-monitoring were also acceptable to teachers. All tiers of intervention were shown to have an effect on teacher implementation of DTT.

The primary implication from practice supported by the results of this study is highlighted by the variations that exist between teacher adoptions of DTT, and their varied responses to different PD interventions. There is a clear need for PD that provides sustainable evidence-based practices that are rapidly transferred from a PD format into everyday classroom use (Gersten, Chard, & Baker, 2000). The results of this study suggest a MTSS framework applied to teacher PD may have the potential to fill this need and in doing so yield better results than single shot approaches. As educational mandates are requiring schools to adopt scientifically-based practices, rather than relying on self-reports, surveys, or administrator evaluations to determine the effectiveness of PD on teacher practices, the use of a MTSS

framework that monitors teacher progress and is responsive to teachers' individual instructional needs that includes more frequent performance feedback may lend itself to more effective teachers.

Directions for Future Research

Based on the identified limitation of a small sample size, future researchers ought to consider replicating this study with a larger number of participants. In addition, future studies should also extend the follow-up period in order to determine whether DTT adoption is maintained over longer periods of time. Results of the NAP metric applied to the results of this study showed a strong effect from baseline to intervention completion across teachers. However, if follow up data had been conducted over a longer period (for example, 6, 9, or 12 months after the intervention) might detect a significant drop in DTT adoption percentage. Hence, future researchers might consider studies of longer duration in order to measure the time-dependence of the intervention's effect. If the effect is observed to fade relatively quickly, then it can be concluded that the intervention was unsuccessful in maintaining teachers' implementation behaviors. If it were found that teacher implementation behaviors were not maintained, follow-up studies could be conducted to learn why this was the case.

Finally, future research should also consider applying a MTSS as a PD strategy for teaching teachers to implement other EBP's with fidelity. The NPDC identified twenty-seven practices that met the criteria for being evidence based, including DTT, extinction, modeling, and naturalistic interventions. There is strong evidence that when applied to a variety of academic and behaviors problems a MTSS framework has a positive impact on student learning outcomes. It is feasible that a MTSS inspired framework could be applied as a PD framework to teach many other relevant EBP's to special educators. Examining the application of a MTSS

framework with different dependent variables may demonstrate the efficacy and durability of this PD framework.

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Appendix A: Operational Definitions of DTTER Steps

MANAGEMENT OF ANTECEDENTS	
1. Arranges necessary materials	Selects teaching materials that are appropriate to lesson (e.g. pictures, data sheets, pens/pencils, tangible reinforcers) and places them within easy reach for instructional session. Must do this before inviting student to the table. Requests learner to table for learning opportunity.
2. Develop Rapport/Positive Mood	Smiles, makes a friendly inquiry, or makes a positive comment to the learner. Examples might be "You look ready to go today!" or "It's great to see you again!" Directions for the task or reinforcer selection are not acceptable for this component. Must be done before task is introduced.
3. Introduce the task.	Explains to the learner what he will be learning in the session. Tells learner that when he completes the task, he will be rewarded with the selected reinforcer for 10 minutes of free time. May do after component 4
4. Provide opportunity for the learner to choose a reinforcer.	Holds up two items, one in each hand, one to the right and one to the left at almost arm's length, and at shoulder height, and asks learner to point to the item that he would like to earn for completing the task. May do before component 3.

MANAGEMENT OF SD's	
5. Secure learner's attention.	Ensures that learner is attending to the instruction. This can be done by requesting the learner to "look at me". Does not go to component 6 until learner is oriented towards the task and looking directly at the instructor.
6. Present the correct materials.	Presents items to learner by placing in front of learner or holding up in the air. Placement should be varied at least once for every three consecutive trials. Must be placed correctly when delivering instruction
7. Present the correct instruction.	Delivers concise instruction once, with clear articulation, using minimal words or gestures (no more than 6 words). Examples might be "Show me Don 't Walk." or "Point to Don 't Walk." Waits 2-3 seconds for a response. Must consistently use the same direction for all 10 trials. May be delivered simultaneously with presenting materials.

MEASUREMENT OF CONSEQUENCES FOR A CORRECT RESPONSES	
8. Provide specific verbal praise Name Action Praise (in any order)	Delivers immediate positive feedback to learner within 2 seconds. Praise should be enthusiastic in tone. Must be behavior specific praise. Generic praise like “Good job” or “That’s Right” is not acceptable.
9. Remove Materials	Removes materials from the learner’s view placing under table or face down on table.

MEASUREMENT OF CONSEQUENCES FOR AN INCORRECT RESPONSE	
10. Remove Materials	Calmly & Quietly removes materials from the learner’s view placing under table or face down on table. Looks down without talking or otherwise interacting with the learner for 2-3 seconds after removing materials.
11. Re-Present Materials with a Prompt	Presents only correct item and says “This is…” while pointing to the item with free hand as a model prompt.
12. Re-Presents Correct Instruction	Delivers concise instruction once, with clear articulation using minimal words or gestures. Waits 2-3 seconds for a response. Consistently uses same direction for all 10 trials.
13. Affirms Correct Response	Delivers immediate positive feedback to learner within 2 seconds. Feedback is delivered in a neutral tone. Must be behavior specific praise. There should be a clear difference between this feedback and the verbal praise provided for an unprompted correct response.

MANAGEMENT OF INTER-TRIAL INTERVAL	
14. Provide a break between instructional trials.	Removes materials by placing under table or places material face down on the table. Does not interact with the learner for 3-5 seconds after materials have been removed.
15. Records Data	Correctly records learner response onto data sheet as either a Correct (+) or Prompted (-) response. Must do this during the inter-trial interval. Cannot go back and fill in for previous trial.

Appendix B: Usage Rating Profile—Intervention Revised Questions

Usage Rating Profile-Intervention Revised (URP-IR)						
	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1. This intervention is an effective choice for addressing a variety of problems.	1	2	3	4	5	6
2. I would need additional resources to carry out this intervention.	1	2	3	4	5	6
3. I would be able to allocate my time to implement this intervention.	1	2	3	4	5	6
4. I understand how to use this intervention.	1	2	3	4	5	6
5. A positive home-school relationship is needed to implement this intervention.	1	2	3	4	5	6
6. I am knowledgeable about the intervention procedures.	1	2	3	4	5	6
7. The intervention is a fair way to handle the child's behavior problem.	1	2	3	4	5	6
8. The total time required to implement the intervention procedures would be manageable.	1	2	3	4	5	6
9. I would not be interested in implementing this intervention.	1	2	3	4	5	6
10. My administrator would be supportive of my use of this intervention.	1	2	3	4	5	6
11. I would have positive attitudes about implementing this intervention.	1	2	3	4	5	6
12. This intervention is a good way to handle the child's behavior problem.	1	2	3	4	5	6
13. Preparation of materials needed for this intervention would be minimal.	1	2	3	4	5	6
14. Use of this intervention would be consistent with the mission of my school.	1	2	3	4	5	6

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
15. Parental collaboration is required in order to use this intervention.	1	2	3	4	5	6
16. Implementation of this intervention is well matched to what is expected in my job.	1	2	3	4	5	6
17. Material resources needed for this intervention are reasonable.	1	2	3	4	5	6
18. I would implement this intervention with a good deal of enthusiasm.	1	2	3	4	5	6
19. This intervention is too complex to carry out accurately.	1	2	3	4	5	6
20. These intervention procedures are consistent with the way things are done in my system.	1	2	3	4	5	6
21. This intervention would not be disruptive to other students.	1	2	3	4	5	6
22. I would be committed to carrying out this intervention.	1	2	3	4	5	6
23. The intervention procedures easily fit in with my current practices.	1	2	3	4	5	6
24. I would need consultative support to implement this intervention.	1	2	3	4	5	6
25. I understand the procedures of this intervention.	1	2	3	4	5	6
26. My work environment is conducive to implementation of an intervention like this one.	1	2	3	4	5	6
27. The amount of time required for record keeping would be reasonable.	1	2	3	4	5	6
28. Regular home-school communication is needed to implement intervention procedures.	1	2	3	4	5	6
29. I would require additional professional development in order to implement this intervention.	1	2	3	4	5	6

URP-IR SCORING GUIDE**Factor I: ACCEPTABILITY**

Items % 1, 7, 9*, 11, 12, 18, 21, 22, 23

Factor II: UNDERSTANDING

Items – 4, 6, 25

Factor III: HOME SCHOOL COLLABORATION

Items – 5, 15, 28

Factor IV: FEASIBILITY

Items – 3, 8, 13, 17, 19*, 27

Factor V: SYSTEM CLIMATE

Items – 10, 14, 16, 20, 26

Factor VI: SYSTEM SUPPORT

Items – 2, 24, 29

* REVERSE CODE THESE ITEMS WHEN SCORING

Citation for the measure:

Chafouleas, S.M., Briesch, A.M., Neugebauer, S. R., & Riley%Tillman, T. C. (2011). *Usage Rating Profile – Intervention (Revised)*. Storrs, CT: University of Connecticut.

Appendix C: Semistructured Interview Questions

Initial Interview Questions

1. Tell me about your work.
2. How many years have you been teaching, including this year?
3. How many children are currently in your classroom?
4. What are their disabilities?
5. Tell me about your teaching background e.g. where you went to college, your qualifications, etc.
6. Tell me what you know about Discrete Trial Teaching?
7. Have you received training in DTT before?
8. Tell me about your professional development experiences since becoming a teacher.
9. Describe the different professional development you have experienced or heard about.
10. Which type of PD do you feel best meets your learning needs?
11. Tell me how (if at all) these PD experiences impact your practice.
12. What kinds of conversations do you have with other teachers at your school about professional development?
13. Describe the ideal professional development you would want to attend to learn more about teaching students with ASD?

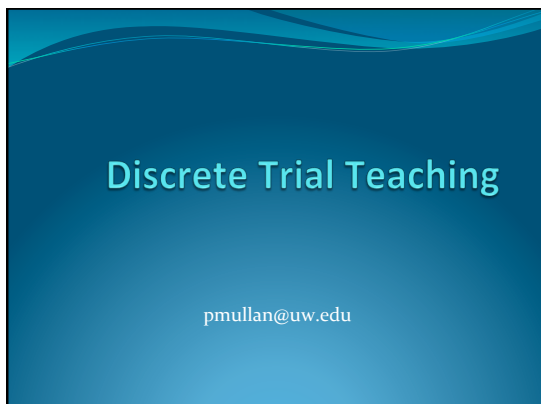
Interview Questions (after each Tier of PD)

1. Think back to the beginning of this professional development process and your expectations of it. How has it compared to your expectations? Provide examples, if possible.
2. How has participation in this (workshop/peer-mentoring/mentor coaching/MTSS) changed your beliefs about PD?
3. Has this training affected your practice as a teacher? If so, how?
 - a. What aspects of the training have you enjoyed/not enjoyed
 - b. Specify what has been particularly helpful
4. Tell me your understanding of (workshop/peer-mentoring/mentor coaching/MTSS) as a PD strategy?
5. Has this training supported or enhanced your student learning? If so, how?
6. What, if anything, could have been improved?
7. Describe how, if at all, your practice has changed over the duration of this (workshop/peer-mentoring/mentor coaching/MTSS)?
8. Describe how, if at all, the strategies you learned from this professional development process have generalized into other aspects of you work?
 - Could you provide me with some examples?
9. How does (workshop/peer-mentoring/mentor coaching/MTSS) align with your school culture and climate?
10. How do you think your school district will be able to incorporate (workshop/peer-mentoring/mentor coaching/MTSS) into their PD offerings?
11. Is there anything about their practice that I didn't think to ask, that you think is important to me to understand?

Final Interview Question

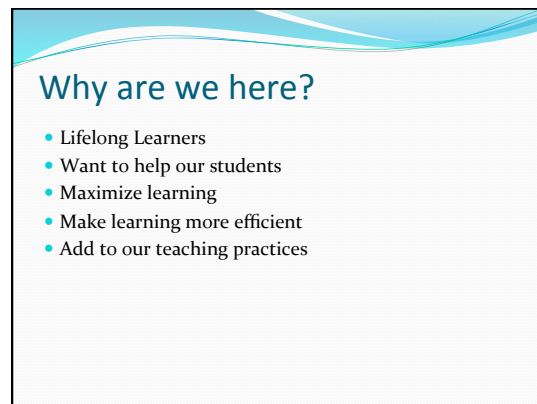
1. A variety of instructional methods were implemented during the training: Initial instruction, peer-mentoring, self-monitoring, coaching.
 - Can you tell me more about which contributed most to your learning?
 - Could you provide me with some examples of how they impacted your practice?
 - How do you feel about (workshops, peer-mentoring, coaching) as PD strategies?

Appendix D: Powerpoint Presentation Outline



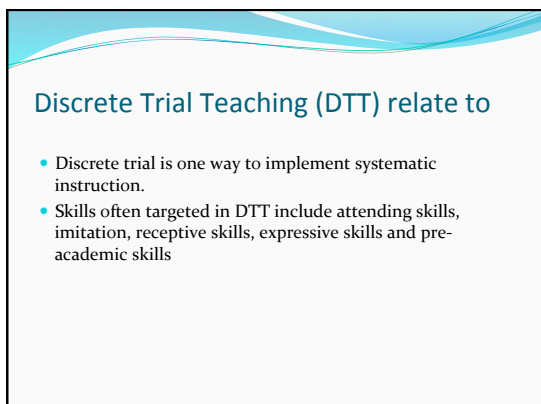
Discrete Trial Teaching

pmullan@uw.edu



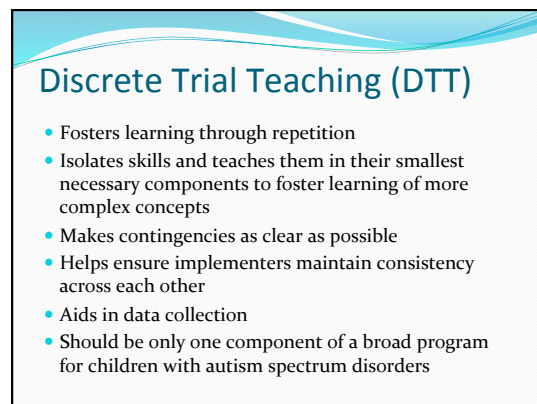
Why are we here?

- Lifelong Learners
- Want to help our students
- Maximize learning
- Make learning more efficient
- Add to our teaching practices



Discrete Trial Teaching (DTT) relate to

- Discrete trial is one way to implement systematic instruction.
- Skills often targeted in DTT include attending skills, imitation, receptive skills, expressive skills and pre-academic skills



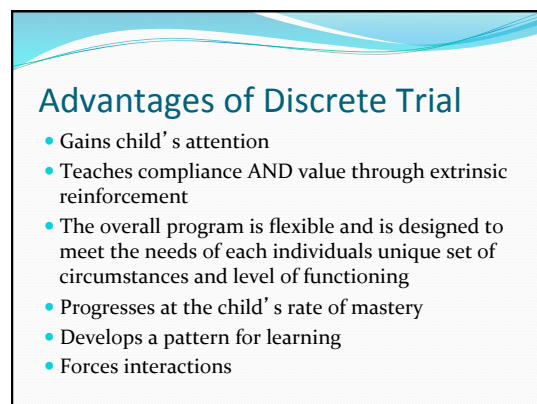
Discrete Trial Teaching (DTT)

- Fosters learning through repetition
- Isolates skills and teaches them in their smallest necessary components to foster learning of more complex concepts
- Makes contingencies as clear as possible
- Helps ensure implementers maintain consistency across each other
- Aids in data collection
- Should be only one component of a broad program for children with autism spectrum disorders



Advantages of Discrete Trial

- Teaches "Learning how to Learn"
 - Joint attention
 - Imitation
 - Behavior
 - Communication
 - Social interaction



Advantages of Discrete Trial

- Gains child's attention
- Teaches compliance AND value through extrinsic reinforcement
- The overall program is flexible and is designed to meet the needs of each individuals unique set of circumstances and level of functioning
- Progresses at the child's rate of mastery
- Develops a pattern for learning
- Forces interactions

Advantages of Discrete Trial, cont.

- Teaches a wide variety of skills and concepts
- Skills are observable and measurable
- Incorporates all domains of functioning – everything builds upon each other

When Implementing DTT

- Work area is typically free of distractions (other materials, reinforcers, etc.)
- Begin session by finding a motivating reinforcer – preference assessments.

Components of a Discrete Trial

- 1) Management of Antecedents
- 2) Managements of Discriminative Stimulus (SD)
- 3) Management of Consequences for a Correct Response
- 4) Management of Consequences for an incorrect Response
- 5) Management of Inter-Trial Response

The trial itself is DISCRETE with a clear beginning and end, which is why it is called a DISCRETE TRIAL (we are also teaching discrete skills).

Management of Antecedents

1. Arrange necessary materials
2. Develop Rapport/Positive Mood
3. Introduce the task.
4. Provide opportunity for the learner to choose a reinforcer

Management of Sd

- Definition of a Discriminative Stimulus: The **instruction** or anything that evokes a response

Rules:

1. Get child's attention FIRST
2. Present Correct Materials
3. Present Correct Instruction
 - a. Louder than typical speech
 - b. Clear and concise language
 - c. Only say directive once before getting a response

Discrete Trial: Consequence

- Consequence is what happens after the response
- Must **immediately** follow the response
 - The more immediate the consequence, the better connection the child will make between the Sd and the response

Discrete Trial: Correct Response

Definition: What the child does immediately after the Sd

Correct Response: Responds correctly to the Sd (make sure everyone is accepting the same response)

1. Provide Behavior Specific Praise Must be behavior specific praise – Name, action, praise e.g. Jared, you pointed to red, high five.
2. Remove Materials before next trial

Discrete Trial: Incorrect Response

Definition: What the child does immediately after the Sd

Incorrect Response: Responds incorrectly to the Sd.

1. Remove materials calmly and quickly
2. Re-present Materials with a prompt
3. Represent discriminative stimulus
4. Affirm correct response – in a neutral tone

Management of Inter-Trial intervals

- An interval is placed in between trials to ensure the student is aware the trial is complete.
- The adult does not interact with the child for 3-5 seconds after materials have been removed.
- During this time we record child's response onto data sheet as either a Correct (+) or Prompted (-) response.

Example of a Discrete Trial

- Review the data collection tool as Michelle and I run a trial.
- Check off each step we take on the Data collection tool.

Did we follow each step?

Your turn

- Split into pairs at one of the tables.
- Review the student goal and reinforcers
- Now conduct a discrete trial as we give you feedback.

CONGRATULATIONS! You've just run a discrete trial!

Let's see some experts implement

- <https://www.youtube.com/watch?v=7pN6ydLE4EQ>
- Use the data collection tool to rate their implementation fidelity.
- What did you see?

Additional Practice

- Look at the body parts program
 - This time run a discrete trial 10 times in a row following the DTT instructions.

Why does DTT work

- Antecedent
- Behavior
- Consequence

Antecedent

- The antecedent is the first part of the discrete trial and it "sets up the response". In our original example, the antecedent was the teacher saying "point to red" as well as the colored cards.
- So without this antecedent the child would not have been able to provide the correct response of pointing to the red card and this is why the antecedent "sets up the response".

Antecedent Stimulus

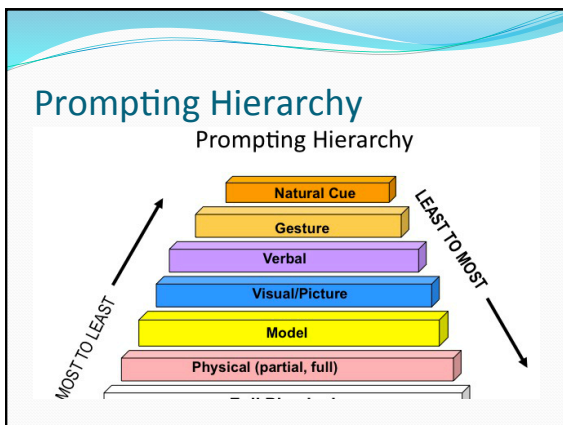
- The cue that you give a child to perform the **target behavior**.
- The stimulus related to the direction, instruction, or command to cue a response is called a **discriminative stimulus** or the **Sd**.
- The child learns a specific response is required through previous teaching trials, and has been **prompted** and reinforced for responding in a specific way many times before.

Prompts

- Prompts are supplemental teaching aids that come before the behavior.
- For a full gestural prompt, after the teacher says "point to red" s/he would then immediately point to the red card himself, effectively giving Jane the answer. Only if Jane then responded correctly by pointing to the red card would reinforcement be delivered.
- After this prompt has been used a number of times and Jane is responding correctly at a certain frequency (a set criteria) it might then be "faded" out

Prompting*

- Prompt can be full or partial
- Only provide as much assistance as is required to ensure a correct response
- Fade prompts with in a single time delay
- Most to least intrusive*
 - Physical(full)
 - Model(partial)
 - Gesture(partial)
 - Verbal(partial)
 - Within Stimulus



Behavior

- The behavior, sometimes called the response comes after both the antecedent and the prompts. When the discrete-trial procedure is written out, the behavior is defined clearly such as “Jane will point to the correct coloured card” and not something more general such as “Jane will answer correctly”.
- This clear definition ensures that anyone teaching the child will know precisely what **response** is to be reinforced.

Behavior or Response

There are three kinds of responses a child can have:

1. A correct response,
2. An incorrect response, or
3. No response at all.

Consequence

- Correct responses receive positive reinforcement which may be in the form of verbal praise and/or through a token economy or delivery of tangible reinforcers like candy.
- The type and amount of reinforcement must also be defined and adhered to as it can be an integral part of the success of educational programs (Cooper, et al, 2007; Miltenberger, 2008).

What is Reinforcement?

- Reinforcement is something added (In Jane’s case candy) to increase the future rate of a behavior
- Reinforcement is the building block and foundation of an effective ABA program.
 - Use continuous reinforcement for new skills
 - Use intermittent reinforcement to maintain behaviors over time

Using Reinforcement Effectively

- Be sure what you are using as a reinforcer is truly reinforcing to the child
- Value of reinforcement vs. effort/difficulty of task
- Contingent
- Always keep interactive and include social praise (this is where you should use the child’s name)
- Vary reinforcement

Using Reinforcement Effectively (Cont.)

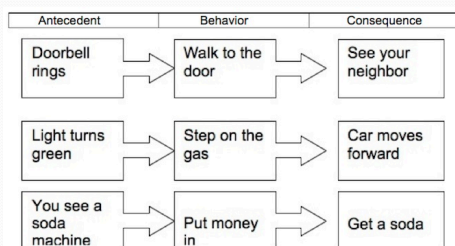
- Pairing
- Think out of the box
- Incorporate sensory activities
- Watch for satiation
- Keep things new and exciting
- Strategies: preference assessment, observation, interview, switch out toys in boxes

Recap Components of DTT

- The discrete trial is comprised of three core parts; these core parts are often referred to as **ABC**, which stands for
 1. **antecedent**,
 2. **behavior** and
 3. **consequence**

Three-Term Contingency

- If you change one part of the contingency the other two are affected.



Antecedents that consistently lead to specific behaviors are called discriminative stimuli

Antecedent Behavior Consequence

You see red tail lights go on in front of you. S^D

You apply the brakes on your car.

You avoid an accident.

Antecedents that consistently lead to specific behaviors are called discriminative stimuli

Antecedent Behavior Consequence

You see a sign that says "Sale." S^D

You enter store and make a purchase.

You extend your budgeted money.

Antecedents that do not lead to specific behaviors are called Stimulus deltas

Antecedent Behavior Consequence

Student is shown a nickel. S^Δ

Student say "dime" or "ten cents"

Your correct, "this is a nickel" or this coin is worth 5 cents."

Discrete Trial: Pause

- Between trials take a **brief** pause - 1-3 seconds long
- Helps the child see that it is the end of one opportunity for reinforcement and we are about to begin another opportunity to receive reinforcement
- Long enough to make this connection, but not long enough to allow time to engage in other behaviors
- Gives instructors time to mix up or reset the field for the next trial and time to take data

Quick Quiz

- What are the 5 steps in DTT
- 1.
 - 2.
 - 3.
 - 4.
 - 5.

Questions

- Describe a skill or behavior that could be taught using discrete trial training. What steps need to take place before implementing this strategy?
- What types of skills are most appropriate for using discrete trial training?
- What needs to take place before starting the discrete trial training?
- What is the best way to determine what reinforcers will be most appropriate for an individual learner?

Incorrect Responses in DTT

What if They Go to Make a Mistake?

- Always block when possible. Sometimes we're not fast enough and that's okay.
- AVOID hand over hand guidance to the correct answer
- AVOID allowing the student to make the wrong answer by BLOCKING errors
- If the student moves towards the incorrect target, block by putting the students hand back in lap.

ERROR CORRECTION WITH A CORRECT RESPONSE ON INDEPENDENT PROBE

- Step 1.** Error is blocked. Record error.
- Step 2.** Remove materials and turn away for 2 seconds
- Step 3.** Re-present the Sd with an immediate prompt (0-second delay)
- The prompt should be intrusive enough to produce a correct response.*
- Step 4.** Provide reinforcement (praise only)
- Step 5.** Re-present the directive a second time, giving the learner and "independent opportunity" with a 5-second wait (e.g. no prompt). If correct, record only the first error.

How Do We Reduce Errors?

- When teaching a new skill, the learner is given the most experience necessary to ensure that he or she responds correctly and the response can be reinforced
- If an error occurs, an error correction procedure is implemented, reducing the likelihood of another error will occur

Data Collection

- Correctly records learner response onto data sheet as either a Correct (+) or Prompted (-) response. Must do this during the inter-trial interval. Cannot go back and fill in for previous trial.

Rationale for Data Collection

1. Verify student progress.
2. Verify mastery of IEP goals
3. Assist in curriculum/IEP decisions
4. Assist in behavior intervention decisions.
5. Verify need for service delivery/changes in placement.
6. Good feedback for parents and students.
7. Accountability requirements – District, state, federal

Data Collection

- Target multiple items at a time within each program
- Each block contains 10 trials. Implementers typically complete at least 1 block per target per hour.
- All 3 current items will be placed in “field” at once and can be placed in any position.

Activity

- Split into threes.
- Use the data collection sheet to step out and run a program on matching objects/pictures.
 - Trainer
 - Trainee
 - Data Collector

ERROR CORRECTION WITH ERROR ON INDEPENDENT PROBE*

- Step 1.** Error is blocked. Record as Error.
- Step 2.** Remove materials and turn away for 2 seconds
- Step 3.** Re-present the Sd with an immediate prompt (0-second delay)
The prompt should be intrusive enough to produce a correct response.
- Step 4.** Provide reinforcement (praise only)
- Step 5.** Re-present the directive a second time, giving the learner and “independent opportunity” at 5-second wait (e.g. no prompt)
- Step 6.** If student goes to make an error, BLOCK. Remove materials and turn away for 2 seconds
- Step 7.** Re-present the Sd with an immediate prompt (0-second delay). End on prompted response.
The prompt should be intrusive enough to produce a correct response.
- Step 8.** Provide reinforcement (praise only)
- Step 9.** Record second Error. Mark out the remaining trials in the block for this target. Regress a time-delay in the next block.

Practice

- In pairs practice
 1. Errorless learning
 2. Blocking
 3. Prompting

Reinforcement During the Prompted Response

Differential Reinforcement

- Slightly more exciting and motivating, but not as strong as when the child is independent
- May be more reinforcing if it is something the child is just beginning to learn. Will be very neutral if this is something the child has shown many times in the past that they can do.

Common Beginning Programs

- Receptive Object Labels
- Expressive Object Labels
- Gross Motor Imitation with Objects
- Gross Motor Imitation with Body
- Blocks
- Matching Objects and Pictures
- Following Instructions

Other Essential Programs

- Expressive and receptive language (manding)
- Identify by feature, function, and class
- Categories
- Pronouns
- General knowledge
- Negation
- Questions
- Pronouns
- Memory
- Pragmatic language
- Academics and concepts
- Functional and prevocational
- Applied reading and math

Questions

Appendix E: Teacher Self-Monitoring DTTER form

Date:

BEFORE BEGINNING THE TRIAL, I...	YES	NO
1. Arranged necessary materials		
2. Developed Rapport/Had a positive affect		
3. Introduced the task.		
4. Provided an opportunity for the child to choose a reinforcer.		
WHEN STARTING THE TRIAL, I...		
5. Secured child's attention		
6. Presented the correct materials		
7. Presented the correct instruction		
IF THE STUDENT RESPONDED CORRECTLY I....		
1. Provided specific verbal praise		
2. Removed Materials		
IF THE STUDENT RESPONDED INCORRECTLY I....		
1. Removed Materials		
2. Re-Presented Materials with a Prompt		
3. Re-Presented Instruction		
4. Affirmed a Correct Response		
AFTER THE TRIAL I...		
1. Provided student with a break		
2. Recorded the data		

Appendix F: DTTER Data Collection Tool with Instructions

Teacher Name:		PHASE:									
		COMPONENTS									
Management of Antecedents	Arrange Materials										
	Develop Rapport/Positive Mood										
	Introduce Task										
	Provide Opportunity for the Learner to Choose a Reinforcer										
Management of Sd's	Secure Learner's Attention										
	Present Correct Teaching Material										
	Present Correct Instruction										
Management of Correct Responses	<i>IF CORRECT</i>										
	Provide Specific Verbal Praise										
Management of Incorrect Responses	<i>IF INCORRECT</i>										
	Remove Materials & Look down (2 seconds)										
	Represent materials with a prompt										
	Represent instruction & prompt to ensure correct response										
Management of Inter-Trial Interval	Affirm Correct Response										
	Provide a Break between instructional trials										
Data Collection	Records Data										

DTTER STEP	INSTRUCTION
Arranges necessary materials	Before bringing student to table, select teaching materials that are appropriate to lesson (e.g. pictures, data sheets, pens/pencils, tangible reinforcers) and place them in easy reach for your session.
Develop Rapport/ Positive Mood	Before introducing the task, smile, make a friendly inquiry, or make a positive comment to the child.
Introduce the task	Explain to the child what he will be learning in the session. Tell child that when he completes the task, he will be rewarded with... (the selected reinforcer).
Child chooses a reinforcer	Holds up two items and ask child to point to the item that he would like to earn for completing the task
Secure learner's attention	Ensures that child is attending to the instruction. This can be done by requesting the child to "look at me".
Present the correct materials	Place materials in front of child. Vary placement at least once for every three consecutive trials.
Present the correct instruction	Delivers concise instruction once, with clear articulation, using minimal words or gestures. Use consistently across trials.
Provide specific verbal praise	If student gives a correct response, deliver immediate positive feedback to child within 2 seconds. Praise should be enthusiastic in tone. Must be behavior specific praise – Name, action, praise e.g. Jared, you pointed to red, high five. Then:
Remove Materials	Remove Materials from the child's view before reintroducing for next trial.
Remove Materials	If child gives an incorrect response, Calmly & Quietly removes materials from their view placing under table or face down on table. Look down without talking or otherwise interacting with child for 2-3 seconds. Then:
Re-Present Materials with a Prompt	Delivers concise instruction once, with clear articulation using minimal words or gestures. Waits 2-3 seconds for a response.
Re-Presents Correct Instruction	Redeliver concise instruction once, with clear articulation using minimal words or gestures. Waits 2-3 seconds for a response.
Affirm correct response	Deliver immediate positive feedback to learner within 2 seconds in a neutral tone.
Provide a break between instructional trials.	Remove materials and do not interact with the child for 3-5 seconds after materials have been removed.
Record Data	During the inter-trial interval, record child's response onto data sheet as either a Correct (+) or Prompted (-) response.

Appendix G: Peer Coaching Fidelity Checklist

Mentor Name: _____
Teacher Name: _____

PEER MENTORING PROCESS CHECKLIST (pg. 1)

Remember your goal in the peer mentoring sessions should be to help your colleague self-reflect on their implementation of DTT. They should be encouraged to generate the principles, describe the significance, highlight what was effective and ineffective on self-monitoring sheets and videos, and demonstrate how to implement DTT in the classroom through role-play. Teachers are far more likely to put into practiced what they talk about than what they hear about. Your role is to clarify information when there are misperceptions or misunderstandings, to offer suggestions when needed and to support, encourage and motivate teachers to make progress toward their goals.

SET UP	Yes	No	N/A
Did the you (the peer coach):			
1. Have everything ready for the meeting with the teacher.			
2. Set a clear agenda for the meeting in collaboration with teacher?			
3. In advance ask teacher to provide self-monitoring sheets?			
4. Identify teacher's goals for meeting and set realistic priorities?			

SELF-MONITORING SHEETS	Yes	No	N/A
Did you (the peer coach):			
1. Review self-monitoring sheets with the teacher and provide feedback?			
2. Ask teacher to share their insights after reviewing Self-monitoring sheets?			
3. When reviewing self-monitoring sheets together reflect on the DTT implementation and identify potential implementation challenges ad solutions?			
4. Asks open ended questions to promote discussion about DTT process and steps from DTTER?			
5. Highlight the key DTT steps teacher is having problems implementing?			
6. Summarize and restate important points?			

PEER MENTORING PROCESS CHECKLIST (pg. 2)

WATCH VIDEOS OF TEACHER IMPLEMENTATION OF DTT TOGETHER AND PROVIDE FEEDBACK	Yes		No		N/A
Did you (the peer coach):					
1. Review teacher videos of DTT implementation?					
2. Ask teacher to share their insights after watching video?					
3. When watching the videos together reflect on the DTT implementation shown on the video identify potential implementation challenges and solutions?					
4. Asks open ended questions to promote discussion about DTT process and steps from DTTER?					
5. Highlight the key DTT steps teacher is having problems implementing?					
6. Move onto the next video after key points have been discussed?					
7. Summarize and restate important points?					

ROLE PLAY AND PRACTICE	Yes		No		N/A
Did you (the Peer Coach):					
1. Ensure that the skill to be practiced had been covered in the discussion prior to asking teacher to role play (ensures likelihood of success).					
2. Do a spontaneous role play practice that is derived from the videos and allows teachers to practice new skills.					
3. Provide enough scaffolding so that teachers are successful?					
4. Highlight the key DTT steps teacher is having problems implementing?					
5. Debrief with teacher afterwards to help them reflect on what they learned?					

Appendix H: Individual Teacher URP-IR Ratings

USER RATING PROFILE INTERVENTION REVISED & Ammended - TEACHER SCORES (TARGETED INSTRUCTION)

Item Number	ITEM	P1,	P2,	P3,	P4,	P5,	P6,
1,	Targeted Instruction is an effective choice for addressing a variety of my professional development needs	4,	4,	5,	4,	4,	4,
7	Targeted Instruction is a fair way to handle professional development	5,	5,	6,	5,	5,	5,
9*	I would not be interested in taking part in Targeted Instruction as a type of professional development	6,	6,	6,	6,	6,	6,
1,1,	I would have positive attitudes about taking part in this type of professional development	6,	6,	6,	6,	6,	6,
1,2,	Targeted Instruction is a good way to handle my professional learning	4,	4,	5,	4,	5,	6,
1,8	I would take part in this type of professional development with a good deal of enthusiasm.	5,	5,	5,	5,	6,	6,
2,1,	Targeted Instruction would not be disruptive to my other job requirements.	5,	6,	6,	6,	6,	6,
2,2,	I would be committed to engaging in this type of professional development	6,	6,	5,	6,	5,	6,
2,3,	The Targeted Instruction process easily fit in with my current job responsibilities.	6,	6,	6,	6,	6,	6,
4,	I understand how this Targeted Instruction works	6,	6,	6,	6,	6,	6,
6,	I am knowledgeable about the Targeted Instruction procedures	6,	6,	6,	6,	6,	6,
2,5,	I understand the procedures of this Targeted Instruction	6,	6,	6,	6,	5,	6,
3,	I would be able to allocate my time to take part in this type of professional development	6,	6,	6,	6,	6,	6,
8	The total time required to take part in the Targeted Instruction procedures would be manageable.	6,	6,	6,	5,	6,	6,
1,3,	Preparation of materials needed for this Targeted Instruction would be minimal	6,	6,	6,	6,	6,	6,
1,7	Material resources needed for the Targeted Instruction are reasonable.	6,	6,	6,	6,	6,	6,
1,9*	This type of professional development is too complex to carry out accurately.	6,	6,	6,	6,	6,	6,
2,7	The amount of time required for record keeping would be reasonable.	6,	6,	6,	6,	6,	6,
1,0	My administrator would be supportive of my participation in Targeted Instruction	6,	6,	6,	6,	6,	6,
1,4,	My participation in Targeted Instruction would be consistent with the mission of my school.	6,	6,	6,	6,	6,	6,
1,6,	Participation in Targeted Instruction is well matched to what is expected in my job.	6,	6,	6,	6,	6,	6,
2,0	Targeted Instruction procedures are consistent with the way professional development is done in my school	6,	6,	6,	6,	6,	6,
2,6,	My work environment is conducive to participation in Targeted Instruction	6,	6,	6,	6,	6,	6,
2,	I would need additional resources to participate in Targeted Instruction	1,	2,	1,	1,	1,	1,
2,4,	I would need consultative support to participate in Targeted Instruction	1,	2,	2,	1,	1,	1,
2,9	I would require additional professional development in order to implement what i have learned	5,	5,	3,	4,	2,	1,

SER RATING PROFILE INTERVENTION REVISED & Ammended - TEACHER SCORES (PEER COACHING

Item Number	ITEM	And	Anya	Sue
1,	Peer Coaching & Self-Monitoring is an effective choice for addressing a variety of my professional development needs	3,	5,	3,
7	Peer Coaching & Self-Monitoring is a fair way to handle professional development	4,	5,	5,
9*	I would not be interested in taking part in Peer Coaching & Self-Monitoring as a type of professional development	6,	6,	6,
1,1,	I would have positive attitudes about taking part in this type of professional development	4,	6,	5,
1,2,	Peer Coaching & Self-Monitoring is a good way to handle my professional learning	3,	6,	6,
1,8	I would take part in this type of professional development with a good deal of enthusiasm.	4,	6,	6,
2,1,	Peer Coaching & Self-Monitoring would not be disruptive to my other job requirements.	4,	4,	5,
2,2,	I would be committed to engaging in this type of professional development	4,	6,	6,
2,3,	The Peer Coaching & Self-Monitoring process easily fit in with my current job responsibilities.	3,	6,	6,
4,	I understand how this Peer Coaching & Self-Monitoring works	5,	6,	4,
6,	I am knowledgeable about the Peer Coaching & Self-Monitoring procedures	4,	4,	5,
2,5,	I understand the procedures of this Peer Coaching & Self-Monitoring procedures	4,	5,	4,
3,	I would be able to allocate my time to take part in this type of professional development	6,	6,	5,
8	The total time required to take part in the Peer Coaching & Self-Monitoring procedures would be manageable.	6,	6,	5,
1,3,	Preparation of materials needed for this Peer Coaching & Self-Monitoring would be minimal	6,	5,	6,
1,7	Material resources needed for the Peer Coaching & Self-Monitoring are reasonable.	4,	6,	6,
1,9*	This type of professional development is too complex to carry out accurately.	3,	4,	5,
2,7	The amount of time required for record keeping would be reasonable.	4,	4,	6,
1,0	My administrator would be supportive of my participation in Peer Coaching & Self-Monitoring	4,	6,	6,
1,4,	My participation in Peer Coaching & Self-Monitoring would be consistent with the mission of my school.	6,	6,	6,
1,6,	Participation in Peer Coaching & Self-Monitoring is well matched to what is expected in my job.	3,	6,	6,
2,0	Peer Coaching & Self-Monitoring procedures are consistent with the way professional development is done in my school	1,	1,	1,
2,6,	My work environment is conducive to participation in Peer Coaching & Self-Monitoring	2,	4,	4,
2,	I would need additional resources to participate in Peer Coaching & Self-Monitoring	2,	5,	2,
2,4,	I would need consultative support to participate in Peer Coaching & Self-Monitoring	2,	2,	1,
2,9	I would require additional professional development in order to implement what i have learned	1,	1,	1,

USER RATING PROFILE INTERVENTION REVISED & Ammended - TEACHER SCORES (MENTOR COACHING)

Item Number	ITEM	P1,	P2,	P3,	P4,
1,	Mentor Coaching is an effective choice for addressing a variety of my professional development needs	6,	4,	5,	5,
7	Mentor Coaching is a fair way to handle professional development	6,	4,	6,	5,
9*	I would not be interested in taking part in Mentor Coaching as a type of professional development	6,	6,	6,	6,
1,1,	I would have positive attitudes about taking part in this type of professional development	6,	6,	6,	6,
1,2,	Mentor Coaching is a good way to handle my professional learning	6,	6,	6,	6,
1,8	I would take part in this type of professional development with a good deal of enthusiasm.	6,	5,	5,	6,
2,1,	Mentor Coaching would not be disruptive to my other job requirements.	6,	4,	5,	5,
2,2,	I would be committed to engaging in this type of professional development	6,	6,	6,	6,
2,3,	The Mentor Coaching process easily fit in with my current job responsibilities.	6,	6,	6,	6,
4,	I understand how this Mentor Coaching works	6,	6,	5,	6,
6,	I am knowledgeable about the Mentor Coaching procedures	4,	3,	4,	4,
2,5,	I understand the procedures of Mentor Coaching	6,	4,	6,	6,
3,	I would be able to allocate my time to take part in this type of professional development	6,	6,	6,	6,
8	The total time required to take part in the Mentor Coaching procedures would be manageable.	6,	5,	5,	5,
1,3,	Preparation of materials needed for this Mentor Coaching would be minimal	6,	6,	6,	6,
1,7	Material resources needed for the Mentor Coaching are reasonable.	6,	6,	6,	6,
1,9*	This type of professional development is too complex to carry out accurately.	6,	6,	6,	6,
2,7	The amount of time required for record keeping would be reasonable.	6,	6,	6,	5,
1,0	My administrator would be supportive of my participation in Mentor Coaching	6,	6,	6,	6,
1,4,	My participation in Mentor Coaching would be consistent with the mission of my school.	6,	6,	6,	6,
1,6,	Participation in Mentor Coaching is well matched to what is expected in my job.	6,	6,	6,	6,
2,0	Mentor Coaching procedures are consistent with the way professional development is done in my school	2,	2,	1,	2,
2,6,	My work environment is conducive to participation in Mentor Coaching	6,	5,	5,	5,
2,	I would need additional resources to participate in Mentor Coaching	5,	5,	5,	5,
2,4,	I would need consultative support to participate in Mentor Coaching	6,	6,	6,	6,
2,9	I would require additional professional development in order to implement what i have learned	1,	1,	1,	1,

USER RATING PROFILE INTERVENTION REVISED & Ammended - TEACHER SCORES (MTSS SYSTEM)

Item Number	ITEM	P1	P2	P3	P4	P5	P6
1	This MTSS is an effective choice for addressing a variety of my professional development needs	5	4	5	5	4	5
7	The MTSS is a fair way to handle professional development	5	4	6	5	5	6
9*	I would not be interested in taking part in this type of professional development	6	5	5	6	5	6
11	I would have positive attitudes about taking part in this type of professional development	5	6	5	5	4	5
12	This MTSS is a good way to handle my professional learning	5	6	6	6	5	6
18	I would take part in this type of professional development with a good deal of enthusiasm.	5	5	5	6	5	6
21	This MTSS would not be disruptive to my other job requirements.	4	4	5	5	6	6
22	I would be committed to engaging in this type of professional development	6	6	5	6	6	6
23	The MTSS process easily fit in with my current job responsibilities.	6	6	5	6	6	6
4	I understand how this MTSS works	4	4	5	4	6	6
6	I am knowledgeable about the MTSS procedures	4	3	5	5	5	6
25	I understand the procedures of this MTSS	4	4	5	4	5	6
3	I would be able to allocate my time to take part in this type of professional development	6	6	5	5	5	6
8	The total time required to take part in the MTSS procedures would be manageable.	6	5	5	5	6	6
13	Preparation of materials needed for this MTSS would be minimal	6	4	5	6	5	6
17	Material resources needed for the MTSS are reasonable.	6	4	5	6	5	6
19	This type of professional development is too complex to carry out accurately.	4	5	5	5	6	6
27	The amount of time required for record keeping would be reasonable.	3	4	5	5	6	6
10	My administrator would be supportive of my participation in this intervention	6	6	6	6	6	6
14	My participation in this intervention would be consistent with the mission of my school.	6	6	6	6	6	6
16	Participation in this intervention is well matched to what is expected in my job.	6	6	6	6	6	6
20	These intervention procedures are consistent with the way professional development is done in my school	3	3	4	2	3	2
26	My work environment is conducive to participation in an intervention like this one.	4	4	5	5	6	6
2	I would need additional resources to participate in this intervention	3	2	3	2	1	1
24	I would need consultative support to participate in this intervention.	3	2	2	1	1	1
29	I would require additional professional development in order to implement what i have learned	2	1	1	1	1	1

CURRICULUM VITAE

PAUL J. MULLAN

EDUCATION:

PhD	June 2015	University of Washington, Seattle
M.A.	June 2009	California State University, Los Angeles, in Autism
A.C.E.	July 1996	University of Birmingham, UK, in Autism
B.Ed. (Hons.)	July 1991	University of Birmingham, UK, in Severe Learning Disabilities

CERTIFICATION:

- California State Teacher Certification in Mod./Severe Disabilities
- Washington State Teacher Certification in Special Education
- United Kingdom Teacher Certification in Special Education
- Board Certified Behavior Analyst
- Credentialed Counselor (WA State) – Exam results pending

PROFESSIONAL EXPERIENCE:

Sept. 2011 – Present	Clinical Director, CBPI, LLC (a Behavioral Health Agency)
Sept. 2011-July 2013	BCBA Supervisor & Practicum Coordinator, University of Washington
Sept. 2009-2011	Graduate Research Assistant, Experimental Education Unit, University of Washington
Sept. 2009-Present	Independent Consultant, Highline School District, Burien, WA
July 2007 - 2009	Autism & Behavior Specialist, LAUSD, Los Angeles
July 2003 - 2007	Special Educator, Monlux Elementary School, Los Angeles
Oct.1999 - 2000	Special Educator & Teacher Support, HSD, Burien, WA
Sept. 1997 - 1999	Consultant & Teacher, Dasman Model School, Kuwait

Jan 1994 - 1997 Team Leader & Special Educator, Bridge Autism Provision,
Hatton School, London, UK

Jan 1991 - 1994 Special Educator, Beckton School, London, UK

TEACHING EXPERIENCE:

TEDUC 549 (Summer 2011, 2012, 2013, & 2014) – Teaching Students with Special Needs. University of Washington, Tacoma.

SPED 474 (Summer 2012) – Teaching Students with Complex Special Needs. Western Washington University, Bremerton Campus.

EDSPE 500c (Winter & Spring, 2011) – BCBA Practicum Seminar

SPED 474 (Summer 2011 & 2012) – Teaching Students with Complex Special Needs. Western Washington University, Bremerton Campus.

TEDUC 533 (Summer 2011) – Classroom Management in Secondary Schools. University of Washington, Tacoma.

PRESENTATIONS:

Mullan P. & Kidwell, J.F. (September 2011 to present) Professional Learning Communities for teachers of students in self-contained programs.

Mullan P. (2012, April) We know what teachers of students with ASD don't do, so what is it that they actually do? Council for Exceptional Children, Denver.

Mullan P. J. & Kidwell J. F. (2011, May). Scaling the Pyramid: Development of Tertiary Support Teams in Schools with Successful School-Wide Implementation. 2nd Annual Washington PBIS Conference

Mullan P. J. & Kidwell J. F. (2011, March). Scaling the Pyramid: Development of Tertiary Support Teams in Schools with Successful School-Wide Implementation. 9th Annual NorthWest PBIS Conference

Mullan P. J. (2010, February). Implementation of PECS with Fidelity: The Effects of a Self-Study Training Package for Parents. California Association for Behavior Analysis, Irvine, CA.

Mullan, P. J. & Nguyen, A. (2009, June). Issues and Interventions in Supporting Students with Autism and Asperger Syndrome. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2009, May). Social Skills Intervention. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2009, May). Skillstreaming in the Classroom. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2009, May). Issues and Interventions in Supporting Students with Autism and Asperger Syndrome. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2009, May). Supporting Parents in the Use of PECS. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. & Nguyen, A. (2009, May). Functional Behavior Assessment. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2009, April). What is PECS? Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2009, April). Person Centered Planning, Secondary Education, and ASD. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2009, March). Organizational Strategies for Students with High Functioning Autism. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. & Nguyen, A. (2009, March). Behavior Intervention Case Manager Training. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. & Nguyen, A. (2009, March). Preventing Problem Behaviors. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. & Nguyen, A. (2009, February). CHAMP's: Classroom management to Support Student behavior. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2009, January). Positive Behavior Supports. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2008, December). Using Data to make Decisions. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. & Nguyen, A. (2008, November). Suspension Alternative: A Systematic Team Approach. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. & Nguyen, A. (2008, November). An Introduction to Functional Behavior Assessment. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2008, October). Quality Indicators: Programs for Students with ASD. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2008, September). Interventions for Increasing the Academic Engagement of Students with ASD. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2008, June). Interventions for Increasing the Academic Engagement of Students with ASD. LAUSD, Beaudry Building, Los Angeles, CA.

Mullan, P. J. (2008, May). Including Students with ASD. LAUSD, Beaudry Building, Los Angeles, CA.

Mullan, P. J. (2008, May). Transition Planning for Students with ASD. LAUSD, Beaudry Building, Los Angeles, CA.

Mullan, P. J. (2008, March). Understanding Autism. LAUSD, Beaudry Building, Los Angeles, CA.

Mullan, P. J. & Nguyen, A. (2008, March). Behavior Intervention Case Manager Training. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2008, March). Preventing Problem Behaviors. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. & Nguyen, A. (2008, February). Functional Behavior Assessment. Support Unit Central West, Los Angeles, CA.

Mullan, P. J. (2008, January). Positive Behavior Supports for Students with ASD. Support Unit Central West, Los Angeles, CA.

WORKSHOPS:

Mullan, P. J. (2008, June - August). Parent Workshops: Applied Behavior Analysis in the Home. Pomona Regional Center, Pomona, CA.

Mullan, P. J. (2007, October - December). Differentiating Instruction for Students with ASD in the General Education Classroom. California State University, Los Angeles, CA.

Mullan, P. J. (2002, June - July). Summer Workshop: Teaching Children with Autism. Highline School District, WA.

Mullan, P. J. (1999, January - June). Parent Workshops: Helping your Child with Autism Learn; communication, behavior, and social skills. Kuwaiti Autism Society, Kuwait.