Increasing implementation of effective teaching: A professional development model of least-to-most supports for special educators

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A dissertation
submitted in partial fulfillment of the
requirements for the degree of

DOCTOR OF PHILOSOPHY

University of Washington

2013

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Program Authorized to Offer Degree:

College of Education

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Abstract

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Professional development serves as means of transferring skills and knowledge to in-service educators (Reid, 2010) and of aiding practitioners in maintaining a current knowledge base (Grimes, Kurns, & Tilly, 2006; Jacobson, 1990). Much remains unanswered regarding how to enhance professional development and increase implementation of evidence-based practices in order to improve student outcomes (Guskey & Yoon, 2009; Odom, 2008). This study utilized a non-concurrent multi-element within a multiple-baseline across participants design to investigate the effects of a least-to-most system of supports for professional development to increase implementation of discrete trial training (DTT). Three special educators of young children with moderate to severe disabilities participated in the study. Results were varied across each participant but indicated a relationship between number of DTT components implemented, closed learn units, and behavior-specific praise and the professional development activities (i.e., online module, self-monitoring, coaching). In addition, teachers reported the activities were informative and valuable.

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ACKNOWLEDGEMENTS

I want to begin by acknowledging a few of those who inspire me to continue my work. To those children with special needs, especially Alyssa, Senia, Ty-Yanah, Cindy, Tariq, Andy, Jordan, Jefferson, Rodney, Christian, Zachary, Jonathan, Justin, Micah, Pierre, Ayanah, I want to thank you for inspiring me every day. I thought I was teaching you when, all along, you were the ones teaching me.

I owe my deepest gratitude to Dr. Carol Davis for her guidance and mentorship. She has served as a mentor and model for me as an advisor, a scholar, and a teacher. Her dedication to being a mentor, patience as I learned what it means to be a scholar, and encouragement throughout have been truly instrumental to my ability to reach this point. I will carry the lessons I have learned from Carol with me forever. Thank you for everything.

I would like to thank my committee members, Ilene Schwartz, Suzanne Kerns, Cap Peck, and Tracy Jiricowik. Their patience, persistence, knowledge, and guidance made this an incredible learning experience.

This dissertation would not have been possible without the exceptional teachers who participated in the study. These dedicated teachers took a tremendous amount of time to work towards their professional goals.

I also want to thank my research assistants, Kathleen and Doug, who worked tirelessly to code numerous hours of video and work with me on complex instructional behaviors.

Finally, but certainly not least, I am indebted to my parents, Kendra and Tom, for their love, support, encouragement, patience, and numerous dinners out. I could not have asked for better parents to provide me with a model of teaching and leadership that I will carry with me the rest of my life.

CHAPTER 1

INTRODUCTION

The "research-to-practice" gap, or "chasm" (Donovan & Cross, 2002), is a well-documented, persistent problem in education that has been discussed thoroughly across the past few decades (i.e., Carnine, 1997; Cook & Odom, 2013; Fuchs & Fuchs, 1998; Greenwood & Abbot, 2001; Gunter & Brady, 1987). Recently, Cook and Odom postulated this research-to-practice gap has been "present in special education as long as research and practice have co-existed" (2013, p. 136), an idea that is likely not far from the truth. While the research-to-practice gap is not unique to education, similar problems have been reported in the fields of prevention and health (Chamberlain, Brown, & Saldana, 2011; Glasgow, Lichtenstein, & Marcus, 2003; Hiss, 2004), child welfare (Aarons & Palinkas, 2007), and mental health services (Hoagwood, Burns, Kiser, Ringeisen, & Schoenwald, 2001), there is, nonetheless, urgency to solving the problem. With the standards and accountability movement and increased emphasis on the use of evidence-based practice (Buysse, Winton, & Rous, 2009), there is increased resolve to find ways to close the research-to-practice gap.

In recent years, the "research-to-practice" gap has been discussed through the framework of a problem of *implementation*. *Implementation science* has been described as "the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice" (Eccles & Mittman, 2006, p. 1). Implementation science, though currently the most frequently used term by education scholars, is also referred to as *knowledge transfer, translational research, diffusion, knowledge translation, knowledge utilization, uptake,* and *implementation research* (Straus, Tetroe, & Graham, 2009). Implementation science draws upon past research in the uptake of practices in various fields, and is most closely connected to

the second of two phases described in translational research literature (Cook & Odom, 2013). Translational research has been described as a two phase process where Phase 1 is applied research investigating evidence-based practice and Phase 2 is the adoption and sustained use of evidence-based practices identified in Phase 1 (Hiss, 2004). Unfortunately, research situated at the Phase 2 level has, historically, been more underfunded and messier to undertake than Phase 1 research (Cook & Odom, 2013). With the goal of implementation science being to "research and understand how innovations are adopted and maintained, so that implementation moves from 'letting it happen' to 'making it happen'" (Greenhalgh, Robert, MacFarlane, Bate, & Kyriakidou, 2004), it is clear that implementation science is seeking to find ways to meaningfully close the research-to-practice gap, rather than continuing to hope that practitioners will take up evidence-based practices.

Before discussing ways in which the research-to-practice gap might be "closed", it is important to discuss why research and practice need to come together, thereby closing the gap between research and practice. There are a few reasons that can be cited for the importance of closing the research-to-practice gap. Federal mandates such as No Child Left Behind (NCLB) and the Individuals with Disabilities Education Act (IDEA) both mandate the use of evidence-based practices in classrooms for children with and without disabilities. In addition, the use of evidence-based practices is tied to improvements in student outcomes (Cook, Tankersley, & Harjusola-Webb, 2008a) and thus is of primary importance to legislators who are working to increase accountability of schools. Finally, the field is seeking to improve practitioners' decision-making capabilities by providing research-based evidence for their instructional decisions (Cook, Tankersley, Cook, & Landrum, 2008b). Common among these reasons is the use of the term "evidence-based practice", with the push for increasing practitioner use of these practices. As

would be expected, any particular field is interested in the uptake of practices known to be effective or evidenced based. Therefore it is necessary also understand what is meant by evidenced based practice.

"Evidence-based practice" is described as being different from "best practice" or "research-based practice" (Cook & Cook, 2011). That is, there is a difference between "evidence-based practices" and those practices that are recommended by experts (Drake, Latimer, Leff, McHugo, & Burns, 2004). Essentially, those practices that rely on research only are very limited in scope and nature. Expert-opinion, however, relies on professionals combining research literature with clinical expertise. This expert-opinion allows for professionals to address issues that may not have specifically been addressed by research and allows them to be more flexible (Drake et al., 2004). For example, in special education, an educator may choose to use discrete trial training (DTT), which is an evidence-based practice for children diagnosed with autism spectrum disorders (ASD) (NAC, 2009; NPDC-ASD, 2013), with their own population of preschool children with disabilities other than ASD, such as Down Syndrome, intellectual disability, and other developmental disabilities. In this case, the expert (i.e., the educator) has decided to use existing research on a population similar to her students and has utilized her professional expertise to make instructional decisions (i.e., incorporating DTT). The Council for Exceptional Children (CEC) defines "evidence-based practice" as:

> [A] strategy or intervention designed for use by special educators and intended to support the education of individuals with exceptional learning needs. CEC includes in this definition specified configurations of individual strategies and interventions. Complex configurations of variables in which the efficacy of each

> of the variables has been studied separately are sometimes considered a practice (CEC, 2008, p. 4).

Others have stated that evidence-based practice is "professional wisdom supported by empirical research" (Whitehurst, 2002), "practice that is informed by credible research" (Cook et al., 2008b), and "instructional practices validated by scientifically-based research" (Smith, Schmidt, Edelen-Smith, & Cook, 2013, p. 147). Evidence-based practices are not intended to replace the expertise and wisdom of professionals but, rather, to enhance outcomes for students with disabilities (Cook et al., 2008a).

With the rise of accountability in education, it is clear that evidence-based practice is important throughout the field of education (Slavin, 2002). "The impetus for the current evidence-based movement in education is similar to that in medicine: A concern that effective educational practices, as proven by research, are not being used in schools" (Odom, Brantlinger, Gersten, Horner, Thompson, & Harris, 2005, p. 142). Indeed, evidence-based practice logic is that "identifying and using the most generally effective practices will increase consumer (e.g., student) outcomes" (Cook & Odom, 2013, p. 136). With educators being held accountable for student outcomes in increasingly high-stakes evaluations and strict policies (i.e., NCLB, IDEA), it is vital that educators be provided with effective methods for increasing and improving student outcomes. In addition, special educators and school districts are at risk of facing due process hearings and lawsuits if they cannot provide evidence that evidence-based practices have been utilized to educate students with disabilities (Yell & Drasgow, 2000). Educators must use the best available research evidence in combination with professional expertise and a valuing of family priorities.

There are, however, tensions between researchers and practitioners related to "evidence-based practice". While researchers continue to tout the importance of implementing evidence-based practice and federal mandates impose policies that require practitioner use of evidence-based practices, practitioners continue to rely heavily on practice-based evidence (Smith et al., 2013). Indeed, while evidence-based practices often "represent efficacious practices shown to work under ideal conditions, rather than effective practices that work in typical conditions" (Smith et al., 2013, p. 147), practice-based evidence focuses on extracting evidence from the typical experiences of practitioners (Barkham, Hardy, & Mellor-Clark, 2010; Simons, Kushner, Jones, & James, 2003). Several articles have shown the limited impact of evidence-based practice research on typical educational practice (*see* American Enterprise Institute for Public Policy Research, 2007; Cook & Smith, 2012; Epstein, 2010; Shriver, 2007; Vaughn, Klingner, & Hughes, 2000). In a recent special issue of *Exceptional Children*, Smith and colleagues discuss ways in which the tension between researchers and practitioners might be resolved by finding a way to balance rigorous research methodology (a priority for researchers) with relevance (a priority for practitioners) to daily instructional practice through developing communities of practice and utilizing educational design research. This represents a means of looking at the use of evidence-based practices not as an either/or (i.e., a practitioner is either using EBP or is not using EBP) but, rather, as a both/and (i.e., a practitioner is using both EBP and practice-based evidence) situation, thereby reducing the tension between researcher and practitioner.

Throughout the discussion on evidence-based practices, however, what is unclear is what is meant by "practice". While much work has gone into defining "evidence" (Odom et al., 2005; Gersten, Fuchs, Compton, Coyne, Greenwood, & Innocenti, 2005; CEC, 2008; NAC, 2009; NPDC-ASD, 2013; WWC, 2012), there is a lack of clarity in defining the "practice" in

"evidence-based practice". Organizations such as the National Professional Development Center on Autism Spectrum Disorders (NPDC-ASD), the National Autism Center's (NAC) National Standards Project, What Works Clearinghouse (WWC), and the CEC have defined "practice" when discussing the determination of evidence. However, with definitions such as a "strategy or intervention designed for use by special educators and intended to support the education of individuals with exceptional learning needs" (CEC, 2008, p. 4), it is not surprising that there is obscurity in interpreting what one means by "practice".

Context, it appears, is a key component of deciphering how an organization or individual is defining "practice". Indeed, there appear to be different "grain-sizes" that one might use in defining a practice. That is, in one definition, "practice" might refer to a discrete practice, such as the NPDC-ASD uses in its determination of evidence-based practices. The NPDC-ASD uses as their unit of analysis "focused intervention practices" which has been defined as "individual instructional practices or strategies that teachers and other practitioners use to promote specific outcomes", (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010, p. 276), such as goals that would appear on IEPs or outcomes on IFSPs. In this context, "practice" is defined narrowly and might be viewed as describing "small-grained" practices and include instructional strategies or practices such as discrete trial training (DTT), self-management, differential reinforcement, functional communication training, or Picture Exchange Communication System (PECS). Each of these practices, then, represents a discrete instructional strategy.

In contrast, the NAC defined "treatment", or practice", as "either intervention strategies (i.e., therapeutic techniques that may be used in isolation) or intervention classes (i.e., a combination of different intervention strategies that hold core characteristics in common)" (NAC, 2009, 27). In this context, "practice" is defined broadly and might be viewed as

describing “large-grained” practices. Indeed, these might be referred to as “comprehensive treatment models” (CTMs) (Odom et al., 2010, p. 276). Practices that fall under the NAC’s definition might include interventions such as antecedent-based packages, behavioral packages, joint-attention interventions, naturalistic teaching strategies, or comprehensive treatment packages for young children. Each of these may comprise several different discrete instructional strategies. For example, behavioral momentum, choice, prompting, environmental modification, seating, intertrial interval, adult presence, stimulus variation, priming, and time delay would all be included under the title of “antecedent packages” (NAC, 2009, p. 44). Rather than the definition of practice, then, relying upon discrete instructional strategies, the definition of practice becomes reliant upon the purposes, or intentions, of instructional strategies. The practice of using antecedent packages would then include all strategies that involve the modification of settings or events, prior to a behavior occurring, to increase the likelihood of a behavior occurring or to decrease the likelihood of problem behavior occurring (NAC, 2009).

Both of the preceding examples represent definitions of practice in special education-specific contexts. In general education, practice is, again, defined in terms of context. For some, “practice” may incorporate all an educator does during a school day, such as each curricula used, classroom management techniques, and other pedagogical strategies (i.e., Greenwood & Arreaga-Mayer, 1994). This definition of practice would represent a “large-grained” practice. However, there are instances where practice in general education is defined by specific strategies, such as the use of peer-mediated strategies in mathematics (i.e., Baker, Gersten, Dimino, & Griffiths, 2004).

Fixsen and colleagues (2013) have been one of the first to take a head-on approach to explicitly addressing the problem of defining a program or practice and have provided guidelines

to be used in defining a practice to provide transparency (Fixsen, Blase, Metz, & Van Dyke, 2013). At the core of the guidelines are the requirement that, "Programs that can become standard practice in education and other human service domains need to be clearly described so they can be taught, learned, and implemented with good outcomes" (Fixsen et al., 2013, p. 219). The implication is that problems of implementation will occur, or continue to occur, without clear definitions of practices.

For the purposes of this paper, which situates itself in the field of special education, the definition of "practice" will follow the NPDC-ASD definition of practice. Therefore, when the term "practice" is utilized, it will refer to an individual instructional practice used to foster specific outcomes for students.

Clearly, there is much to be considered before the research-to-practice gap can be closed, or even diminished. With the federal mandates requiring educator use of evidence-based practices, findings ways to support the implementation of evidence-based practices in typical classroom settings is a priority in implementation science. Indeed, researchers in special education need to "identify what is not known about making evidence-based practice implementation happen and conduct research to systematically fill those gaps in our knowledge base" (Cook & Odom, 2013, p. 140). Indeed, if we are to truly move from *hoping* practices will be implemented to *making* practices be implemented, we must move away from a "train and hope" (Stokes & Baer, 1977) ideology to a systematic means of supporting implementation of practices in everyday classrooms.

One means of supporting the implementation of evidence-based practices that is the relied-upon method of conveying information to practitioners is professional development (Kretlow, Cooke, & Wood, 2012). Although there are many promising aspects of various

professional development activities, there are still many questions left unanswered and professional development, alone, is most certainly not a "magic bullet" to closing the research-to-practice gap. Indeed, Fixsen and colleagues have stated, "Implementing evidence-based programs in typical practice settings is not for the faint of heart" (2013, p. 218). Defining the components that lead to successful implementation and creating change in organizations and systems is described as a "wicked problem", fraught with challenges, obstacles, and difficult terms and definitions (Fixsen et al., 2013). However, without consideration for how to best support the implementation of evidence-based practices, the practices and programs that are developed with the intention of improving student outcomes will not reach students. Many different supports have been developed with the express focus on increasing the use of practices effective for students. These supports, as a group, are termed professional development, which has been defined as a "term used in education to describe activities to enhance the knowledge and skills of those in the workforce" (Bruder, Morgo-Wilson, Stayton, & Dietrich, 2009, p. 14). Professional development activities include both group-focused supports, such as workshops and professional learning communities, and individualized supports, such as coaching and mentoring (Lieber, Butera, Hanson, Palmer, Horn, Czaja, Diamond, et al., 2009).

The following chapter will explore what is meant by "professional development", the components of effective professional development that have been derived from research, and those components relationship to various professional development activities. Current research in professional development and its influence on implementation efforts will also be discussed followed by a proposal for a model of professional development will be described.

CHAPTER 2

REVIEW OF THE LITERATURE

"Professional development is perhaps one of the most important bridges from research to classroom implementation" (Kretlow et al., 2012, p. 349). Indeed, the primary purpose of professional development is to get evidence-based practices into the hands of practitioners where such practices can improve student outcomes. Currently, US public schools spend approximately $20 billion annually on professional development activities (Zhou, 2010) for approximately 73% of educators across the US to participate in some form of professional development every year (Scotchmer, McGrath, & Coder, 2005). While the number of hours educators spend in professional development activities varies and is highly dependent upon content area focus, it is clear that a lot of time and money is being spent to provide educators with professional development opportunities. Professional development activities comprise a wide variety of activities and interventions, and consist of a variety of delivery methods, contact hours, providers, and content. In the following section, components of effective professional development (i.e., active learning, follow-up, time, content) will be described followed by descriptions of selected professional development activities and how each activity utilizes, or fails to utilize, components of effective professional development.

Components of Effective Professional Development

Following an extensive review conducted through IES that found only nine of more than 1300 studies on teacher professional development in three content areas (math, science, and reading and English/language arts) met the evidence standards of WWC (Yoon et al., 2007), Guskey and Yoon (2009) described what was learned about effective professional development, despite the rather small research base. In all nine studies that met the WWC criteria, Guskey et

al. (2009) identified common elements that might increase the effectiveness of professional development, including active learning experiences, time spent in professional development activities, follow-up, and content. Others have also examined what might comprise effective professional development and found similar factors (Abdal-Haqq, 1995; Birman, Desimone, Porter, & Garet, 2000; Garet, Porter, Desimone, Birman, & Yoon, 2001; Guskey, 2003; Joyce & Showers, 1980; Little, 1984). These factors, active-learning, time, follow-up, and content, will be explored in the following sections, followed by a discussion on components that may not be as important as once thought and other considerations for components of effective professional development.

Active learning. "Active learning" has been described as opportunities for teacher learners "to observe and be observed teaching; to plan classroom implementation, such as practicing in simulated conditions and developing lesson plans; to review student work; and to present, lead, and write" (Birman et al., 2000, p. 31). Active learning is characterized by teachers engaging in "meaningful discussion, planning, and practice" (Garet et al., 2001, p. 925). There are a variety of activities that comprise active learning: opportunities to practice new skills, to observe expert teachers, to plan how new teaching skills and methods will be used in the classroom, and to participate in discussions (Darling-Hammond, 1997; Garet et al., 2001). McCutchen and colleagues incorporated "active learning" into their 2 week institute on reading instruction by engaging educators in activities designed to increase their awareness of phonology (i.e., its development, common mistakes children make) and by spending time engaging educators in lesson plan development (McCutchen, Abbott, Green, Beretvas, Cox, Potter, Quiroga, & Gray, 2002). In addition, educators who had participated in the 2-week institute participated in follow-up discussions throughout the year, further increasing the active learning

component by including discussions with colleagues and researchers. Kretlow and colleagues incorporated that used descriptions of the rationale behind the use of each of the strategies, opportunities for teachers to identify where and when the use of the strategies would be appropriate in their instruction, and opportunities for teachers to practice using the strategies and receive feedback from the workshop trainer as the active learning components into a in-service (Kretlow et al., 2011). Jager and colleagues provided elementary school teachers with a training in which each session included a presentation on the theory behind the use of each strategy, demonstration and modeling of new skills, opportunities to practice and receive feedback from trainers and peers, and time for discussion with trainers and peers on implementing the strategies in their classrooms. Though active learning components were included in the in-service, training sessions were combined with individual coaching sessions that occurred between training sessions, making discrimination between the effects of the training and the effects of the coaching difficult to determine.

Time. Other than the recommendations that "sufficient" (Little, 1984; Guskey, 2003), "adequate" (Abdal-Haqq, 1995), "sustained" (NCLB, 2001), or "considerable" (Guskey & Yoon, 2009) time be spent in professional development activities, there is no "magic" number of hours that have been determined to be *the* most effective number of hours an educator should spend engaging in professional development activities. The Council for Exceptional Children (CEC) provides a recommendation that well-prepared special educators should spend an average of at least 36 contact hours per year engaged in professional development activities (CEC, 2004). Certification agencies might require a specific number of continuing education units (CEUs) be completed during a specific time frame, such as the Behavior Analyst Certification Board requirement that certified behavior analysts complete 36 hours of continuing education every 3

years. In the state of Washington, educators must complete 150 hours of continuing education every 5 years in order to maintain a standard teaching certificate (www.k12.wa.us/certification/teacher/ContinuingClockhours). However, the research literature shows a wide variety of contact hours and duration of professional development activities. Research has indicated that there is a wide variation in the number of hours participants are spending in professional development activities across the literature from 10 hours across 4 months to increase the use of explicit verbal explanations during reading instruction (Duffy, Roehler, Meloth, Vavrus, Book, Putnam, & Wesselman, 1986) to 100 hours over 4 weeks to increase teachers' utilization of the learning cycle in developing science curriculum (Marek & Methven, 1991), it is clear. Indeed, Mary Kennedy provided an analysis of professional development for educators and showed the amount of time educators spent in professional development did not correlate with changes in student outcomes (Kennedy, 1998). In the IES review, Yoon and colleagues determined that educators who spent more than 14 hours in professional development had the most positive and significant results (Yoon et al., 2007). There was not, however, a discussion on the duration, or over what period of time, these 14 hours should be distributed. It is clear that more study needs to be conducted to determine what, if any, number of hours comprise the most effective number of hours to be spent in professional development. It may be that there is not a definite number of hours that comprise effective professional development but, rather, a combination of previous experience, current classroom needs, prior professional development, and a number of contact hours.

Though determinations of the specific amount of time an educator should spend in professional development are unclear, it is clear other components are key to providing effective professional development as well. Indeed, it stands to reason, as Guskey and Yoon do, that more

time spent in an ineffective professional development does not yield better outcomes for students, “because doing ineffective things longer does not make them any better” (Guskey & Yoon, 2009, p. 497) or more effective.

Follow-up. Providing teachers with the opportunity to apply skills learned, or improved upon, in their own classrooms and receive feedback has been indicated as an effective component of professional development (i.e., Abdal-Haqq, 1995; Birman et al., 2000; Guskey, 2003; Guskey & Yoon, 2009; Joyce & Showers, 1980). The IES review found that only one study that met the WWC standard for evidence did not include follow-up as part of the professional development model (*see* Marek & Methven, 1991). Follow-up allows for the individualization of professional development activities and, therefore, meet the needs of educators in more specific ways (Guskey & Yoon, 2009). From an implementation perspective, follow-up provides an opportunity for the purveyor (or individual knowledgeable in the use of practices) and the implementer (in this case, the educator who has received training) to communicate about the use of learned skills or practices (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005, p. 14). Indeed, one core component of implementation is consultation and coaching, defined as an opportunity for implementers to learn skills on the job while engaging, planning, and working with a consultant or coach, which is designed to follow an initial training on the practice to be implemented (Fixsen et al., 2005). Types of follow-up, including coaching and self-management, will be discussed next.

Follow-up most frequently appears in the form of coaching. For example, Filcheck and colleagues used a professional development model that included a 1-hour didactic training session followed by multiple 30-minute coaching and feedback sessions conducted by the researcher (Filcheck et al., 2004). Kohler and colleagues investigated the effects of a professional

development model that included a 1-day in-service followed by multiple peer coaching sessions (Kohler et al., 1997). Kretlow and colleagues have conducted two studies that investigated the effects of an in-service plus coaching professional development model on kindergarten (Kretlow et al., 2011) and 1st grade (Kretlow et al., 2012) teachers' instructional behaviors related to math instruction.

Self-management is another form of follow-up that has shown to be effective for enhancing professional development. Self-management has been defined as "the behavior that a person emits to influence another behavior" and as the "personal application of behavior change tactics that produces a desired change in behavior" (Cooper, Heron, & Heward, 2007). Kazdin, who utilized the term "self-control", defined the self-management of behavior as "the application of behavioral principles to modify one's own behavior" (1975, p. 189). Skinner, who also utilized the term "self-control", conceptualized the self-management of behavior as "one response, the *controlling response*, affect[ing] variables in such a way as to change the probability of the other, the *controlled response*" (Skinner, 1953, p. 231, italicizes in original). For instance, an individual may utilize self-instruction by stating, "I first say 'hello', then I ask a question", to increase the probability of initiating a conversation with another individual. If the self-instruction on initiating conversations changes the probability of initiating conversations, then self-control has been demonstrated. Each definition of self-management highlights the key components of the self-management of behavior, that of self-management including two-responses in which one response influences another response and the involvement of the individual in influencing his/her own behavior. A variety of strategies fall under the broad term "self-management". These include self-instruction, goal setting, self-monitoring, self-evaluation, self-recording, and self-administered consequences. In the literature on the use of self-

management to increase educators' use of practices, self-monitoring is the most frequently utilized form of self-management. *Self-monitoring* is often described as including two strategies, *self-evaluation* and *self-recording*. Strategies for self-monitoring typically involve the individual observing his/her own behavior and recording whether or not s/he emitted the target behavior of the intervention (Rafferty, 2010). It can be argued that individuals may self-evaluate without self-recording; however, self-recording cannot occur without self-evaluation.

Browder and colleagues found that the use of self-monitoring following in-service and training on the use of a self-monitoring strategy, which involved completing a checklist after giving a lesson, increased special educators' adherence to lesson plans for middle school students with developmental disabilities (Browder, Trela, & Jimenez, 2007). In another study investigating the use of self-monitoring, which involved participants viewing videotapes of their instruction and recording the absence or presence of a behavior on a checklist, following staff training on the use of discrete trial training (DTT), Belifore and colleagues found teachers increased their accuracy in implementing DTT sessions with students with autism spectrum disorders (ASD) (Belifore, Fritts, & Herman, 2008).

Content. It has been stressed that relevance is of utmost concern to practitioners (Smith, Scmidt, Edelen-Smith, & Cook, 2013), as was discussed in Chapter 1. Research indicates that teachers are likely to be more satisfied when professional development is viewed as timely or relevant to their situation (Birman et al., 2000; Garet et al., 2001; Guskey & Yoon, 2009; Little, 1993; Shulman, 1986). Presentation of the theory behind the content can then be connected to daily practice in the classroom and provide a rationale for why a practitioner should learn and utilize skills in their classroom. Content knowledge has been interpreted in a variety of ways, including specific academic content (i.e., math, science, history, positive behavior supports)

(Cohen & Hill, 1998; Kennedy, 1998) as well as content on specific instructional practices (i.e., discrete trial training, self-management) (Joyce & Showers, 2002). Birman and colleagues have suggested that a strict emphasis on teaching techniques without a connection to content does not result in effective professional development (Birman et al., 2000). For special educators, who report feeling "left out" of relevant content (Boardman, Argüelles, Vaugh, Hughes, & Klinger, 2005; Peck, Hudson, Davis, Blum, Greenway, Hackett, Kidwell et al., in preparation), it is of particular importance that content provided in a workshop is based on research indicating its effectiveness with particular populations, a requirement of NCLB (2001).

Birman and colleagues (2000) stated "an activity is more likely to be effective in improving teachers' knowledge and skills if it forms a coherent part of a wider set of opportunities for teacher learning and development (p. 29). Coherence is a component that allows for continuity between professional development activities, rather than a random set of activities that provide no continuity to further develop educators' knowledge and skills (Garet et al., 2001). Coherence can also be thought of in relation to the connectedness between a professional development activity and how the activity supports collaboration and communication among educators (Garet et al., 2001).

Together, relevant content and coherence support educators' need for professional development that is timely and meets the "right now" needs of their classrooms. Relevant content gives educators the opportunity to develop knowledge and skills that can impact their practices immediately while coherence allows educators to develop those knowledge and skills at a meaningful level.

Location. There are few recommendations on where professional development activities should occur. Guskey points out that "The majority of lists stress that professional development

should be school- or site-based, even though significant research evidence suggests otherwise" (Guskey, 2003, p. 749). This is supported by evidence that shows that school- or site-based professional development may not provide enough emphasis on research-based instructional practices and may, instead, focus on trainings related or similar to practices already in place (Corcoran, Fuhrman, & Belcher, 2001). However, those who cite school- or site-based professional development as more effective also discuss the importance of access. Abdal-Haqq (1994) discusses the importance of professional development activities being accessible and inclusive by stating that professional development that cannot be accessed or is not inclusive or meaningful for all educators cannot be effective. There is a relationship between where the professional development occurs and coherence among professional development activities. However, location has been singled out as a component separate from coherence. Others state that, since professional development should be situated within the context of the priorities and initiatives of the school, school- or site-based activities would best situate the professional development within this context (Little, 1993). In a related discussion, Birman and colleagues emphasize the importance of collective participation and suggest that "participation of teachers from the same department, subject, or grade are more likely to afford opportunities for active learning and … to be coherent with teachers' other experiences" (Birman et al., 2000, p. 30). They further posit, "Collective participation also may contribute to a shared professional culture in which teachers in a school or teachers who teach the same grade or subject develop a common understanding of instructional goals, methods, problems and solutions" (Birman et al., 2000, p. 30). This would suggest that educators participate in professional development activities within their local context, whether that is district-based or site-based, in order to provide more coherent and relevant content in the professional development.

Despite the apparent theoretical support for school- or site-based professional development, there is a call for clearer and more detailed descriptions of the context within which professional development is situated (Guskey, 2003; Wayne et al., 2008). These descriptions would then lead to an ability to further investigate the effects of the location, or context, on the effectiveness of professional development activities.

Who. Though many believe that school- or site-based staff members should conduct training, Guskey and Yoon (2009) found that the most effective professional development activities (i.e., resulted in improvements in student outcomes) were conducted by outside experts, such as university faculty, research assistants, or curriculum development staff (p. 496). This conclusion is based on the IES review in which those studies found to have the most effective professional development were conducted by outside experts (Yoon et al., 2007). For example, McCutchen et al (2002), Jager et al (2002), Filcheck et al (2004), and Stitcher et al (2006) utilized trained researchers to conduct the in-service activities. In the studies conducted by Kretlow and colleagues (Kretlow et al., 2011; Kretlow et al., 2012), Kretlow acted as the in-service facilitator and coach. Guskey and Yoon caution that the conclusion that outside experts are needed for effective professional development may be a result of a lack of "strong, valid, and scientifically defensible evidence demonstrating that [train-the-trainer, peer coaching, and/or collaborative problem solving] are effective" (Guskey & Yoon, 2009, p. 496). There is, in fact, empirical evidence that does support the use of school-based personnel as the primary provider of professional development. For example, Peck et al (1989) utilized a school-based peer coach who had an existing relationship with each of the participants prior to the study. The results of the peer coaching demonstrated an increase in targeted behaviors for each teacher, such as prompting and delivery of consequences, as well as increases in the generalization of each

teacher behavior beyond the targeted class period. Kohler et al (1999) also utilized a peer coach who had experience as a peer coach and who had an existing relationship with each of the participants prior to the study. The results of their study demonstrated a functional relationship between coaching and increased teacher behaviors, such as prompts, questions, and facilitation of students' social interactions, as well as increased adaptation of instructional materials.

Clearly more research is needed to investigate the effects of multiple facilitators, from wider backgrounds (i.e., outside experts, school-based). Borko (2004) has described research in professional development as occurring in 3 phases, only the first of which has truly been investigated. Phase 1 involves research examining the relationship between a professional development program and educators, Phase 2 involves research investigating one professional development program with multiple facilitators at more than one site, the professional development program, and the teachers, and Phase 3 incorporates all elements of the system by investigating multiple professional development programs, multiple sites, multiple facilitators, and the teachers. If Borko's evaluation is correct, then the next step in determining components of effective professional development is an investigation into professional development programs with multiple facilitators.

In the following section professional development activities, including workshops, coaching, and web-based professional development, will be described and related to the components of effective professional development discussed and described in the previous section.

Professional Development Activities

Federal mandates (NCLB, IDEA) provide broad-termed guidelines for professional development activities. IDEA states that professional development activities must, "improve the

knowledge of special education and regular education teachers concerning… effective instructional strategies, methods, and skills… to improve teaching practices and student academic achievement" (IDEA, 2004, §654). NCLB, similarly, states professional development activities should, "advance teachers' understanding of effective instructional strategies that are… based on scientific research… [and are] used for improving student academic achievement or substantially increasing the knowledge and teaching skills of teachers" (NCLB, 2001, §9101, p. 1963). Despite the broad descriptions for professional development activities described by IDEA and NCLB, there is an emphasis on providing opportunities for teachers to 1) increase skills and 2) improve student outcomes.

In the following sections, three specific professional development activities, workshops, web-based professional development, and coaching will be described. These activities were chosen because of their relationship to the study conducted. The professional development activities will also be related back to the components of effective professional development discussed in the previous sections.

Workshops. One-day workshops have been, and continue to be, the method relied upon by school districts to transfer knowledge of evidence-based practices to educators working in the field (Guskey & Yoon, 2009; Odom, 2008). Unfortunately, evidence suggests this method, when used alone, is not translating research into practice quickly, effectively, or at all (Guskey & Yoon, 2009; Joyce & Showers, 2002; Odom, 2008). Clearly, it is expected that the skills and strategies educators learn in one-day workshops will generalize into classroom practice the very next day and, without opportunities to practice or receive feedback, this is an unreasonable expectation (Joyce & Showers, 2002). Indeed, these one-day workshops might be akin to the "train and hope" method of generalization discussed by Stokes and Baer (1977) as being highly

ineffective for teaching new skills. Odom (2008) has described the use of "one-shot workshops" as being an "expired" approach to sustaining changes in educators' practices in the classroom.

Despite these dire responses to the use of workshops as a sole means of providing professional development to in-service educators, workshops with specific components, such as active learning, relevant content, and coherence, have shown to be an effective element in providing professional development to educators (Guskey & Yoon, 2009). Guskey and Yoon state, "workshops are not the poster child of ineffective practice that they are often made out to be" (2009, p. 496). In fact, the IES review found that all nine of the studies meeting WWC standards for evidence did include a well-constructed workshop element in their professional development packages (Yoon et al., 2007). In a review of studies on coaching, Kretlow and Bartholomew (2010) found that 12 of the 13 studies included in their review utilized some form of an in-service workshop prior to beginning coaching procedures. Among these 12 studies, 2 investigated the effects of the in-service prior to beginning coaching (Kretlow et al., 2011; Kretlow et al., 2012). Others incorporated the in-service procedures prior to baseline (Filcheck et al., 2004; Kohler et al., 1997; Kohler et al., 1999; Stitcher et al., 2006) or incorporated in-services and coaching procedures together throughout the study (Jager et al., 2002; Morgan et al., 1994; Pierce & Miller, 1994). The studies that investigated the effects of the in-service prior to coaching found an increasing in instructional behaviors (specifically, delivery of instructional units) following the in-service and another increase following coaching sessions, concluding coaching provided an additive effect (Kretlow et al., 2011; Kretlow et al., 2012).

Workshops are well situated to provide opportunities for educators to increase their content knowledge and be presented with the theory and relevant evidence supporting the use of specific practices. This presentation of theory and relevant evidence supports providing

educators with answers to the question of why a practice should be implemented (Buysse, Winton, & Rous, 2009). There is evidence that workshops are able to increase educator knowledge (Joyce & Showers, 2002), though well-designed workshops are able to address 2 components of effective professional development – active learning and content – workshops alone are not able to address the follow-up component.

Web-based professional development. Increasingly popular, web-based professional development has become a source for educators seeking to enhance their knowledge and skills in practices. More recently, reports indicate that web-based professional development is used as frequently as workshops (Bruder et al., 2009). For the purposes of this paper, "web-based professional development" will be limited to online professional development intended to support current practitioners in their practices and will not include online for-credit courses offered through colleges or universities.

Web-based professional development allows for individuals to participate in professional development opportunities that might not be offered locally, such as those provided for educators in rural areas (Erickson, Noonan, & McCall, 2012), or that might be provided for specific populations, such as educators of at-risk preschool children (Kinzie, Whitaker, Neesen, Kelley, Matera, & Pianta, 2006) or children with communication needs (Brown & Woods, 2012). In addition, web-based professional development allows for practitioners to keep up-to-date with current best practices in their fields (Giguere, Formica, & Harding, 2004), such as evidence-based language and literacy instruction (Justice, Mashburn, Hamre, & Pianta, 2008), or to encourage a shift in beliefs about teaching, such as the use of technology in higher education (Rienties, Brouwer, & Lygo-Baker, 2013). Much is still unknown about what might comprise effective web-based professional development (Chen, Chen, & Tsai, 2009), however evidence

does suggest that web-based professional development is as effective as face-to-face workshops (Brown & Woods, 2012) and provides as many opportunities to collaborate with other educators (Park, Oliver, Johnson, Graham, & Oppong, 2007). Web-based, or online, professional development has been suggested as a form of "enhanced professional development" that allows educators to keep up-to-date on specific practices (Odom, 2008, p. 7).

Web-based professional development appears in a variety of formats and typically includes one or a combination of three elements: *information*, *interaction*, and *consultancy*. *Information* includes presentations of content, theory behind the use of a practice, rationale for using a practice, video clips of the practice in use, and tools, such as lesson plans, checklists, or data collection materials. *Interaction* includes quizzes on or responses related to content and discussions with peers. *Consultancy*, though related to interaction, involves a deeper level of interaction where participants upload videos of their own instruction and engage in discussions and receive feedback on their instruction from a consultant (i.e., outside expert) (Kinzie et al., 2006; Whitaker, Kinzie, Kraft-Sayre, Mashburn, & Pianta, 2007).

For professional development on practices associated with autism spectrum disorders (ASD), online professional development modules have been developed covering a broad spectrum of practices on the Autism Internet Modules (AIM) (www.autisminternetmodules.org). Categories of modules include "Infants and Toddlers with Autism," "Autism at Home," "Autism in the Classroom," "Autism in the Workplace," and "Autism in the Community". Modules on evidence-based practices include *Discrete Trial Training*, *Differential Reinforcement*, *Self-Management*, *Extinction*, *Functional Communication Training*, and *Time Delay*. Other modules include *Comprehensive Program Planning for Individuals with ASD*, *Sensory Differences*, *Speech Generating Devices (SGD)*, *Supporting Successful Completion of Homework*, *Preparing*

Individuals for Employment, and *The Employee with Autism*. Presently, 42 modules have been developed with 33 more in development. Modules include elements of information in the form of presentation of theory, content, and related research, video clips, and tools (i.e., data collection tools, implementation checklists) and interaction in the form of pre- and post-assessments. To date, there has not been a study investigating the effects of the AIMs on teacher instructional practices.

Several studies have investigated the effects of a web-based professional development that utilizes the elements of *information* and *interaction*. For example, Chen and colleagues developed and reported results from a hybrid (i.e., including both face-to-face and online interactions) online distance education professional development for early intervention service providers (including nurses, early childhood special educators, speech and language pathologists) who served children with multiple disabilities (Chen, Klein, & Minor, 2009). The hybrid course included a 5-hour initial face-to-face orientation, 13-weeks of online asynchronous (i.e., not occurring at the same time) discussions, online course modules on early intervention practices (i.e., working with families, home visits, early communication development), a midpoint videoconference, optional online synchronous (i.e., occurring at the same time) discussions, and a final 5-hour face-to-face debriefing (Chen et al., 2009). Measures included self-reported confidence ratings, a satisfaction survey, and an open-ended question survey. Results indicated an overall improvement in participants' perceptions of their knowledge regarding intervention practices, in-home service delivery, and interdisciplinary teaming. In addition, the online discussions appeared to provide an opportunity for participants to reflect on their own practices.

Yang and Liu (2004) reported a case study of the effects of an online workshop to create professional learning communities. In this study, both information, i.e., a workshop on

mathematics instruction, and interaction, i.e., online discussions, were evaluated for the effectiveness in increasing teacher knowledge and for creating a professional learning community for the participants. Their findings demonstrated that participants found the online workshop and community to be convenient and focused on their needs as educators. However, findings also demonstrated that participation was not high and did not appear to go beyond introductions and surface-level knowledge. Yang and Liu recommended that, though convenient, web-based professional development still needs to be sensitive to the time required to access the information and participate meaningfully (i.e., beyond introductions and surface-level knowledge). They also recommend the online environments of web-based professional development be developed to encourage more interaction among participants and/or moderators and encourage reflection rather than reactions to other participants.

A web-based professional development for early interventionists (i.e., early childhood special educators, occupational therapists) that included a self-paced curriculum was evaluated for its effectiveness on early interventionists' knowledge (Brown & Woods, 2012). The web-based professional development provided information on communication development and interventions for young children, and information on coaching caregivers on the use of interventions. The web-based professional development was designed to encourage active participation with voice-over presentations and video clips (i.e., information), and opportunities to respond to case studies by describing communication abilities, identifying target communication skills, and recognizing intervention strategies (i.e., interaction). Brown and Woods (2012) found changes in providers' instructional behaviors over the course of the web-based professional development through measures of case study application tests, skills surveys, within-course measures (i.e., responses to case studies), video measures of the participants

applying skills, and a satisfaction survey. Specifically, they found an increase in providers' use of descriptions, writing of intervention targets, and development of intervention strategies. This study represents the use of information through a web-based professional development course and interaction via responses to case studies embedded in the course.

One study has investigated the effects of all three elements – information, interaction, and consultancy. Kinzie and colleagues (2006) described a web-based professional development for teachers of at-risk preschool children in Virginia (Kinzie et al., 2006). In the *My Teaching Partner* (MTP), early childhood curricula is integrated in a format that meets the needs of educators of at-risk preschool children. The MTP includes *information* in the form of presentations on curricula, *interaction* through discussions with peers, and *consultancy* through the use of uploaded videos and video-conferencing with an outside expert. Whitaker and colleagues have examined the effects of different levels of support that might occur through MTP (Whitaker et al., 2007). In a study with early childhood educators, Whitaker and colleagues provided 3 levels of support through MTP. The first group received an iBook computer and information on accessing MTP; the second group received an iBook computer, information on accessing the "full-featured" MTP, and printed materials on using MTP; and the third group received everything the second group received plus a video-conferencing camera, access to bi-weekly discussions with a teaching consultant, and access to view and edit video clips of their instruction (Whitaker et al., 2007). Results showed, unsurprisingly, that the third group engaged longer and more frequently with MTP and had the greatest frequency of implementation of instructional practices highlighted in MTP.

Web-based professional development represents a method of professional development that is increasingly used to bring information to a wide group of individuals. Caution should be

taken, however, to determine the quality with which web-based professional development is designed. As research continues in the area of web-based professional development, clearer descriptions of well-designed web-based professional development should emerge. In the meantime, effective web-based professional development appears to provide opportunities for active learning through presentations of content, interactions with peers and/or moderators, and opportunities to practice applying skills in limited ways. Some may provide opportunities for follow-up through web-based consultancy (i.e., Whitaker et al., 2007). Information on amount of time is still pending. Indeed, time is a question that looms large in much of the professional development literature (i.e., how much time? over what period of time?) (Guskey & Yoon, 2009).

Coaching. A professional development activity that has been shown to demonstrate an increase in teacher use of practices is coaching (Joyce & Showers, 2002; Kretlow & Bartholomew, 2010). Coaching "allows professional development to address the individual teacher's needs related to his or implementation of new practices… (and) moves professional development beyond abstract theories and educational principles and addresses authentic everyday challenges faced by teachers" (Kretlow & Bartholomew, 2010, p. 282). Coaching is characterized by an expert (e.g., university faculty or supervisors, skilled peers, lead teacher) providing support to teachers following an initial training (Joyce & Showers, 1980; Joyce & Showers, 2002; Kretlow & Bartholomew, 2010). Coaching allows for the inclusion of active learning opportunities, relevant content, and follow-up for educators participating in professional development. Studies that include in-service training sessions that incorporate active learning components frequently incorporate other professional development activities, such as coaching, and tend to show that coaching allows for an additive effect (*see* Filcheck, McNeil, Greco, &

Bernard, 2004; Jager et al., 2002; Kohler, Crilley, Shearer, & Good, 1997; Kretlow, Cooke, & Wood, 2012; Kretlow et al., 2011; Stichter, Lewis, Richter, Johnson, & Bradley, 2006). It may be that coaching extends the active learning components beyond the in-service training by providing more opportunities to practice, receive feedback, and engage in discussions on the use of specific instructional practices.

Variations of coaching exist that vary the style of coaching (i.e., side-by-side, supervisory, peer) and the individual providing the coaching (i.e., peer, outside expert). These models include supervisory coaching, side-by-side coaching, and peer coaching.

Supervisory coaching. In a supervisory model, a coach observes a teacher using a new strategy, collects data on the teacher behavior, and then provides constructive, but non-evaluative, feedback (Kretlow & Bartholomew, 2010). Supervisory coaching has been utilized in a variety of studies, including studies investigating the effects on early childhood special educators use of strategies to increase their students' social competence (Fox, Hemmeter, Snyder, Binder, & Clarke, 2011), student literacy performance (Onchwari & Keengwe, 2008), general educators' instructional behaviors related to student IEP goals (Peck et al., 1989), kindergarten teachers' delivery of instructional units (Kretlow et al., 2011), and first grade teachers' delivery of instructional units (Kretlow et al., 2012). Typically, a supervisory model is not utilized with peer coaches but, rather, with an outside expert, as in the case of studies by Fox et al (2011), Jager et al (2002), Onchwari and Keengwe (2008), Kretlow et al (2011), and Kretlow et al (2012). In the studies conducted by Peck et al (1989) and Kohler et al (1999), however, the coach was a peer who worked in the same school as the participants and had existing relationships with the participants prior to the study.

Side-by-side coaching. In side-by-side coaching, a coach models a new strategy in a real classroom setting, the teacher (or "learner") is then encouraged to attempt the new strategy in the presence of the coach who intervenes when necessary and provides a rationale for using the strategy (Kretlow & Bartholomew, 2010). It is the in-vivo model and intervention in the moment as needed that characterizes side-by-side coaching. Side-by-side coaching may be provided by either peers or outside experts. In a study conducted by Filcheck and colleagues (2004), researchers acted as coaches in a side-by-side coaching model. Coaches modeled the use of a token system, observed teachers implementing the system, and provided immediate feedback on the teachers' use of the token system. The results of their study indicated an increase in teacher use of praise when coaching was implemented. In a study investigating the effects of supervisory and side-by-side coaching, Pierce and Miller (1994) found no significant differences between the two models, both models resulted in an increase in effective teaching behaviors and a decrease in ineffective teaching behaviors.

Peer coaching. A variation of side-by-side coaching that is appears in the literature is peer coaching. While more related to side-by-side coaching than supervisory coaching, though peer coaching can take either format, the difference in peer coaching is more than simply the individual providing the coaching. Peer coaching typically involves the use of peer educators, taking the roles of "coach" and "learner" in turn and assisting each other in their practice (Kohler et al., 1997), though peer coaching may also be in the form of a skilled peer collaborating with an educator to improve his/her instruction (Kohler et al., 1999). Indeed, peer coaching typically omits the verbal feedback component of coaching because the primary intent is for peer coaching to be a collaborative activity (Showers & Joyce, 1996). Peer coaching has been utilized to address changes in instructional strategies such as increasing the application of content learned

during in-service training (Matlock, Billingsley, Lynch, Haring, & Boer, 1991), acquiring direct instruction skills (Morgan, Menlove, Salzberg, & Hudson, 1994), making modifications or accommodations to instruction (Kohler et al., 1997), and increasing general educators use of student pair activities with included students with disabilities (Kohler et al., 1999). In Kohler and colleagues (1999) study, special educators served as peer coaches to general educators to increase the meaningful inclusion of students with disabilities. The coaching increased general educators' use of social talk towards and adaptations for students with disabilities in their classrooms. In another study investigating the effects of peer coaching on special educator and general educator co-teaching teams' use of the three-term contingency (i.e., antecedent, student response, consequence), Scheeler and colleagues found that teachers met criterion within 3 sessions and rated the experience as useful and one they would recommend to others (Scheeler, Congdon, & Stansbery, 2010).

A criticism of coaching has been, and continues to be, a wide variation in what is described as coaching (McCollum, Hemmeter, & Hsieh, 2013). Indeed, this is an extension of criticisms across all professional development activities and a call for more specificity in the training content and expected outcomes for all activities (Bruder, Morgo-Wilson, Stayton, & Dietrick, 2009). However, it is clear that coaching allows for the individualized professional development that has been shown to increase the effectiveness of professional development (Kennedy, 2010). Coaching allows for active learning components – with skills being modeled, discussed, practiced, and provided feedback, content relevance – where skills can be targeted that will immediately be relevant to educators, and follow-up – which provides educators with continued support as they implement practices in their classrooms.

Much remains unanswered regarding how to enhance professional development and increase implementation of evidence-based practices to improve student outcomes (Guskey & Yoon, 2009; Odom, 2008). Indeed, empirical evidence regarding factors that contribute to effective professional development that results in sustained use of evidence-based practices through teacher and student outcomes is lacking (Kretlow & Bartholomew, 2010; Odom, 2008; Yoon, Duncan, Lee, Scarloss, & Shapely, 2007). What is clear, however, is that there are components that comprise effective professional development – opportunities for active learning, sufficient time, and follow-up – and multiple methods for engaging these components – workshops, web-based professional development, coaching. Some have stated the importance of creating multicomponent professional development in order to better meet the needs of individual educators and, thereby, affect student outcomes (Bruder et al., 2009). Indeed, it appears that there is not a "one-size fits all" professional development and multiple methods of professional development need to be employed to address the needs of educators.

In the following section, professional development and implementation will be discussed. Specifically, professional development as a means of closing the research to practice gap and increasing implementation of evidence-based practices as well as the problems of implementation in current professional development practices will be discussed.

Professional Development and Implementation

Professional development is a means of providing support to close the research to practice gap so lamented in the field of special education (Odom, 2008). It is, however, important to recognize that it is a means only of *support* and is not a "magic" bullet for solving the problem of the research to practice gap. There are, indeed, problems of implementation within professional development. The literature on professional development has a need for more

specificity and rigorous research designs (Bruder et al., 2009; Lieber et al., 2009). Currently, policies mandate (i.e., NCLB, IDEA) professional development be implemented to support educator use of evidence-based practices. However, this is mandating a practice (e.g., professional development) with a policy. If we are to build policy from practice, as has been suggested by Honig (2006), then we must be clearer in our definitions of "practice". For the practice of professional development, we must agree upon a definition, what is and is not professional development, what it looks like, and what constitutes professional development.

Diffusion theory is used to situate a discussion on the relationship between professional development and the stages of implementation. Diffusion theory is useful in describing how organizations take up practices or make changes to current practice, which is at the core of implementation, where practices are being taken up and then put in place.

Diffusion theory. How organizations respond to new ideas in relation to their status as early or late adopters and the extent to which the idea is institutionalized is the core concern of diffusion theory (Tolbert & Zuker, 1983). Implementation science as been known under the name of *diffusion* (see Chapter 1 for discussion on historical context of implementation science) is linked to diffusion theory not only in name but in where implementation science draws its history of research (Cook & Odom, 2013). As will be described below, implementation begins with the adoption of practices or ideas, diffusion theory examines factors related to early and late adopters. Early adopters are characterized by their motivation to resolve a problem and improve efficiency (Tolbert & Zucker, 1983). An example in schools might be a principal in School A who decides to train all of her teachers in a particular practice (in this case, "practice" might be characterized as either "large-grained" or "small-grained"), before central administration makes the decision, because she sees her students struggling in a particular academic area and she has

the desire to improve teacher effectiveness in that area. This principal and school would then be classified as "early adopters" because of a demonstrated motivation to resolve a perceived problem and improve student outcomes. Late adopters are characterized by a need to be "legitimized" as an organization keeping up with others in their field (Tolbert & Zuker, 1983). For example, a principal at School B, near School A, may decide, after seeing the nearby School A's success in improving student outcomes through a change in practice, he wants to adopt a similar practice to School A to demonstrate his school is also seeking improved student outcomes. Late adopters still take up changes in practice, but do so after seeing the effects from early adopters.

Diffusion theory might also be situated in a context smaller than district-wide (as in the example). Instead, diffusion theory might be situated at the school-level. For example, consider Teacher A, who begins using an instructional practice because she sees her students struggling in reading. Next door, Teacher B is reluctant to change his practice, but after seeing Teacher A's success, might decide to also adopt the same instructional practice to improve his students' outcomes.

In the following sections, the stages of implementation will be discussed. While diffusion theory is quite relevant in the first stage of implementation, one might keep in mind how practices are taken up by individuals within an organization (i.e., teachers in a school) and how diffusion might occur at a the micro-level.

Implementation stages. To examine the relationship between professional development and implementation science, it is helpful to look at the stages of implementation as described by Fixsen and colleagues. Originally, in a monograph on implementation research, Fixsen and colleagues describe six stages of implementation that organizations follow when implementing

new practices (in this case, "practices" might be used in both the "large grain" or the "small grain" contexts) (Fixsen et al., 2005). Recently, Fixsen and colleagues revised the implementation stages down to four stages (Fixsen, Blase, Metz, & van Dyke, 2013). These stages include *exploration*, *installation*, *initial implementation*, and *full implementation* (Fixsen et al., 2013). Each stage is defined by the tasks that are necessary to meet the goal of sustained and effective use of a practice over time. The stages of implementation and their relationship to organizational contexts will be described below, followed by a discussion on the relationship between professional development and the stages of implementation, both in the context of the implementation of professional development activities and of how professional development can support implementation.

Exploration stage. Exploration is characterized by determining the strengths and needs of an organization (Fixsen et al., 2013). In this stage, the decision to take up a new practice is determined as well as what supports and resources are needed to fully implement the new practice. This stage also functions as a means of preparing for change at the individual level (Fixsen et al., 2013). "A key exploration stage outcome is buy-in and support from relevant stakeholders for the proposed new ways of work (e.g., evidence-based programs)" (Fixsen et al., 2013, p. 220). This stage, *exploration and adoption*, is the catalyst for the implementation of new practices.

Installation stage. In this stage of implementation, tasks related to finding resources and getting staff ready for the uptake of a new practice or practices (i.e., installation) are completed (Fixsen et al., 2005). Program installation includes initial professional development on the practice, or practices, to be implemented (Fixsen et al., 2013). After a problem has been identified and chosen for adoption, there is a period of introducing the program or practice to

practictioners and providing relevant information. Active means, such as those found in professional development activities that include active learning, of introducing a practice program are more beneficial than passive (i.e., lectures that do not include opportunities for active learning), or "let it happen" (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004), methods (Fixsen et al., 2013). Without appropriate supports, such as sufficient staff and well-designed professional development, implementation will not happen (Aladjem & Borman, 2006; Vernez, Karam, Mariano, DeMartinin, Rand Education (Institute), & Rand Corporation, 2006). If practitioners are not given the proper professional development that includes opportunities for active learning, follow up, and sufficient time, it reasons that evidence-based practices intended to affect student outcomes will not reach the target population – students. Evidence-based practices, or programs, are not "plug and play", an organization cannot just insert the practice or program and expect it to "go" (Fixsen et al., 2013, p. 222). It is at this stage that well structured and "active" (Fixsen et al., 2013) professional development activities need to be planned and applied. The implementation of professional development activities is just as vital as the implementation of the new practice. This implementation of professional development activities continues into the next stage, initial implementation.

Initial implementation stage. Immediately following program installation is the initial implementation stage. It is at this point that it is critical to provide ongoing support (i.e., coaching) to practitioners attempting to utilize new skills even while the organization is learning how to adjust and support practitioners' use of the skills (Fixsen et al., 2013). Fixsen and colleagues have described this stage as the "most fragile stage where the awkwardness associated with trying new things and the difficulties associated with changing old ways of working are strong motivations for giving up and going back to education as usual" (Fixsen et al., 2013, p.

223). While each stage is important and the tasks vital, the initial implementation stage is key to moving through the implementation process. Without success in initial implementation, an organization (i.e., school) cannot expect practices to be sustained. Indeed, Fixsen and colleagues characterized the initial implementation stage as occurring "at a time when the program is struggling to begin and when confidence in the decision to adopt the program [or practice] is being tested" (Fixsen et al., 2005, p. 16). Further, it is clear that, without proper supports to implement practices or programs (i.e., follow-up), the implementation of new practices may end at this stage (Fixsen et al., 2013).

Full implementation stage. Previously described as *full operation*, *innovation*, and *sustainability* (Fixsen et al., 2005), the final stage of implementation is *full implementation*. In this stage, the "new practice" has become the standard practice in the organization (Fixsen et al., 2013). Systems are in place to provide continuity of outcomes across groups of students, practitioners, leaders, and staff each year, such as well-designed professional development that includes opportunities for new practitioners, leaders, and staff to gain the necessary knowledge about the practice as well as opportunities for all practitioners to continue to receive support (i.e., follow-up) on the use of the practice (Fixsen et al., 2013). Adjustments to the practice are made without compromising the fidelity of the evidence-based practice and take into consideration the needs of the community "in the context of a changing world" (Fixsen et al., 2005, p. 17). Indeed, professional development at this stage may focus not only on providing new staff, practitioners, and leaders with needed information, but also providing information on innovations made and continuing to provide follow-up support to those charged with implementing the practices.

Proposal for a Model of Professional Development

Effective professional development has been described in a variety of ways, as discussed above. However, there are common elements that can be gleaned from these descriptions in order to provide the elements of an effective professional development for educators. These elements include providing: a) small group, highly engaging, research-based training; b) opportunities for active learning, such as modeling and practicing in simulated conditions; and, c) coaching, consultation, and/or technical assistance that includes constructive feedback and provides ongoing support (Birman et al., 2000; Joyce & Showers, 2002; Kretlow & Bartholomew, 2010; Odom, 2008). These common elements have been combined in the model of professional development being proposed. Further, current research indicates that teachers are "more likely to adopt and sustain effective practices when supports include ongoing professional development, feedback on implementation of practice, collaborative support of others implementing the practice, and student outcome data to assess and demonstrate the impact of the practice." (Cook et al, 2008, p. 73). Creating sustainable change in educator instructional behavior requires more than a one-day professional development workshop.

Figure 1 provides a visual illustration of a cycle of professional development. Each component of the model is discussed below.

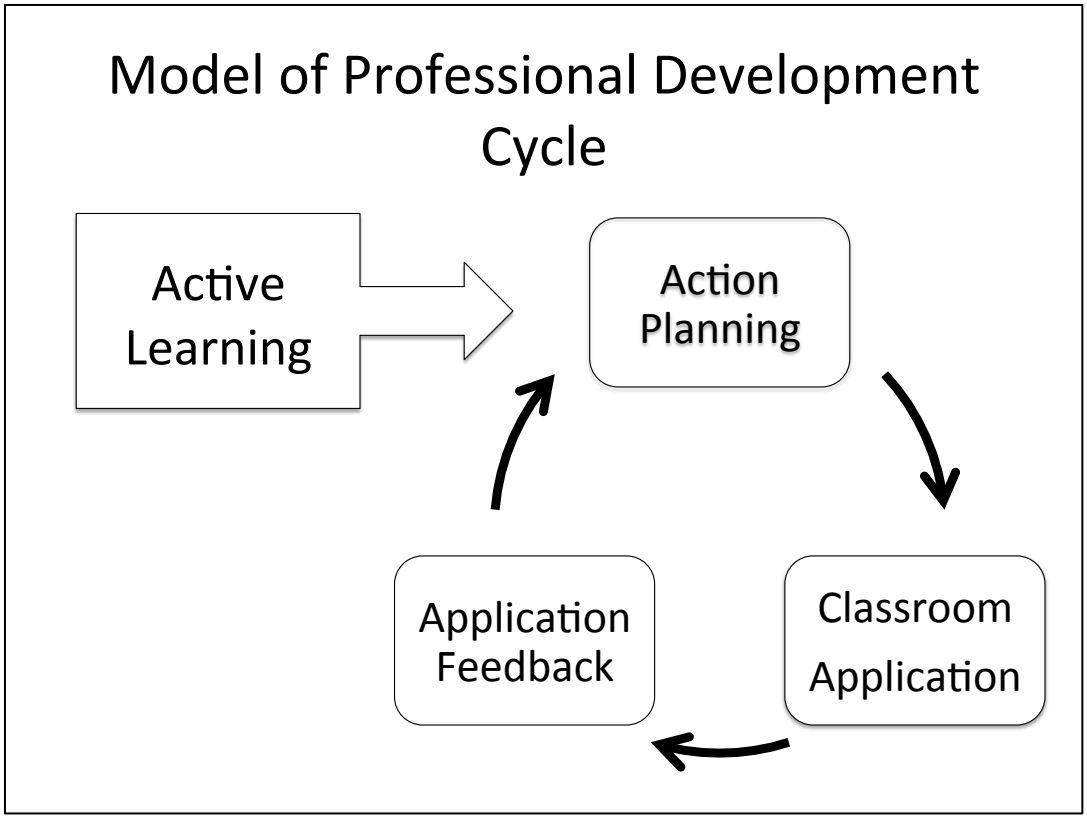


Figure 1 Model of Professional Development Cycle

Active learning. A workshop or web-based professional development with content based on current research begins the professional development cycle. Though workshops, particularly those of short-duration, have been described as ineffective (Joyce & Showers, 2002), professional developments that *do* improve educator use of practices always involve a workshop or institute (Guskey & Yoon, 2009). The key understanding is that the workshops involved in successful professional developments are based upon content that is research-based, relevant, and well organized and the workshop provides opportunities for active participation (Guskey & Yoon, 2009). In addition, well-designed workshops or web-based activities should include content that is relevant and coherent to the educator as well as active learning opportunities. "Active learning" has been described as opportunities for teacher learners "to observe and be observed teaching: to plan classroom implementation, such as practicing in simulated conditions

and developing lesson plans: to review student work; and to present, lead, and write" (Birman et al, 2000, p. 31). To incorporate active learning components, well-designed workshops or web-based professional development includes presentations on theory and the rationale behind the use of practices, opportunities to watch demonstrations or models of the practice in use, opportunities to engage in discussions or interactions with the material being presented, and opportunities to receive feedback (i.e., through practicing skills and receiving feedback or engaging with a web-based quiz to receive feedback on knowledge).

Action Planning. Action planning is characterized by determining either how implementation of new practices will occur or the effectiveness of the implementation. Following an active learning opportunity, action planning gives educators an opportunity to plan for the implementation of new practices. Following a debrief of enactment, action planning might include reflection on the practice just implemented and plans for its next implementation. Action planning might include setting a goal, planning a self-management strategy, and/or setting up a weekly check-in. That is, action planning might occur through individual reflection or discussion with a peer or coach.

Classroom application. The utilization of the new/modified skill/behavior/content/practice in the classroom with students characterizes classroom application. Application may include a coach or peer observation, or the skill/behavior/practice/content being video recorded and reviewed later by the educator, a peer, and/or a coach. The core feature of classroom application is the practice being used in a classroom with students.

Application feedback. Following the classroom application of the skill/behavior/practice, there is a debriefing of the application, or application feedback. Feedback

might include analyzing self-recorded data, completing a checklist to reflect on the implementation of the practice, checking in with a coach/trainer/co-teacher who did not observe the enactment, or a discussion with a coach/trainer/co-teacher who did observe the classroom application. The core feature of feedback is a reflection on the practice just used.

Action planning, classroom application, and application feedback are within a constant feedback loop because of their relationship. Once learning has occurred, planning must be made in order for practices to be implemented in a classroom. Once planning has occurred, application needs to occur, where the educator uses a practice in his/her classroom. After the practice has been implemented, an educator needs to make time to debrief from the application and reflect on how the implementation, including what went well and what might need to be improved upon.

This model of professional development was based on the literature reviewed and the components of effective professional development. It was used to develop the study described in the next chapter.

Purpose

Currently, much of the literature on professional development, including "enhanced professional development" strategies such as coaching, lacks a measure of student outcomes and, therefore, makes it difficult to interpret the effectiveness of professional development strategies. Without measures on teachers' use of new skills and strategies as well as a measure on student outcomes, it is difficult to explain what component of a professional development model was effective, or not effective. The purpose of this study is to utilize teacher and student outcome data to determine the effects of a model of professional development that provides a system of least to most intrusive forms of professional development. In addition, this study seeks to expand

the literature on professional development by focusing on early childhood special educators with students with moderate to severe disabilities in typical public school settings.

Research Questions

The study will be driven by three research questions:

RQ1: When given different levels of support following professional development activities, what is the effect on special educators' implementation of effective instructional practices?

RQ2: When given different levels of support following professional development activities, what is the effect on special educators' instructional behaviors?

RQ3: When special educators are given different levels of support following professional development activities, what are the effects on student outcomes?

RQ4: What are special educators' perceptions, feedback, views, and preferences related to the professional development model used in the study?

CHAPTER 3

METHOD

This chapter describes the process to answer the research questions. Ten major sections are addressed, including (a) participants, (b) setting, (c) experimental design, (d) materials, (e) procedures, (f) behavioral measures, (g) data collection, (h) interobserver agreement, (i) social validity, and (j) data analysis.

Participants

Two types of participants were included in this study: teachers and students. Three special educator-student dyads participated in the study. Special educators were included based on the following eligibility criteria:

1. Current employee of a public school and teach students with moderate to severe disabilities in a preschool, kindergarten, or elementary classrooms as either a classroom teacher or instructional aid;
2. Participants were familiar with discrete trial training (DTT) through university-based coursework, school district-based professional development, and/or on-the-job training;
3. Participants had taught or been an instructional aid for at least one year.

Participant 1: Tracy. Tracy was a special education instructional aid in a preschool extended day classroom for children diagnosed with an ASD. Tracy had been an aid in the classroom for 6 years (see Table 1). She had become an instructional aid after many years of volunteering in special education classrooms where her son, diagnosed with ASD, was a student. Her initial training in DTT occurred on-the-job from the classroom teacher. Tracy also reported

attending professional development activities, such as workshops, conferences, and professional learning communities, 3-4 times a year. During the past year, she reported attending an early childhood conference where she attended a variety of presentations, and attending workshops on discipline strategies (i.e., classroom management) and coping strategies (i.e., stages of change and how people go through those changes). Tracy worked with Mark (see Table 2) throughout the study procedures. Mark was a 5-year old boy diagnosed with an ASD. Tracy began working with Mark at the start of the study.

Participant 2: Ellie. Ellie was a special education classroom teacher in a preschool classroom for children with developmental disabilities. Ellie had been a certified teacher for 17 years and had been teaching in her current classroom for 12 years (see Table 1). Ellie reported that her initial training in DTT had occurred when she was an instructional aid, prior to becoming a certified teacher, but that the training was very minimal. Most recently, Ellie had received information on DTT from a co-teacher who taught in the classroom adjacent to her own. Ellie reported that she engaged in professional development activities approximately once a month. These activities included attending an early childhood education conference, professional learning communities within her school, and collaboration with peers (i.e., her co-teacher). During the study, Ellie worked in the same extended-day preschool classroom as Tracy. Ellie worked with Samir throughout the study procedures (see Table 2). Samir was a 3-year old boy diagnosed with an ASD. Ellie had worked with Samir for about 6 months, seeing him about once a week during a rotation with her co-teacher. Ellie had not been providing DTT instruction to Samir prior to the beginning of the study.

Participant 3: Sara. Sara was a special education teacher in a preschool classroom for children with developmental disabilities. Children in the classroom had moderate to severe

disabilities, with diagnoses such as autism spectrum disorders and Downs syndrome. Sara had taught in this classroom for 3 years (see Table 1). Sara received training on DTT from her school district's Autism Specialist. Sara reported that, typically, she attended professional development activities, such as workshops, conferences, and professional learning communities, 2-4 times per year. However, during the past year, Sara reported that she was attending professional development activities approximately 2 times per month. During the past year, she described attending workshops on evidence-based practices and positive behavior supports, an early childhood conference, and workshops on social thinking nurturing pathways, and Developmental, Individual difference, Relationship-based (DIR). Sara worked with Nick throughout the study procedures (see Table 2). Nick was a 3-year old boy diagnosed with an ASD. Sara had worked with Nick for about 5 months prior to the beginning of the study.

Name	Classroom Role	Age	Years Teaching	Highest Level of Education	Age Group
Tracy	Instructional aid	48	6 years	High school diploma	Preschool
Ellie	Teacher	51	17 years	Masters in Education	Preschool
Sara	Teacher	57	22 years	Masters in Education	Preschool

Table 1 Teacher participant information

Name	Age	Diagnosis	Home Language(s)	Special Educator	Time spent with Special Educator
Mark	4 years	ASD	English	Tracy	2 months
Samir	3 years	ASD	Kurdish*, Arabic, English	Ellie	6 months
Nick	3 years	ASD	English	Sara	5 months

*** indicates primary language spoken at home**

Table 2 Student participant information

Coach. A *coach* was utilized during the coaching phases. The coach was a doctoral candidate in the area of special education, was the primary researcher in the study, had taught

students with severe disabilities, and had supervised teacher candidates in a university affiliated Master's level teacher preparation program in severe and low-incidence disabilities. The coach had experience with students with severe disabilities through 3 years as a classroom teacher and 6 years as an instructional assistant in a preschool for children with disabilities. Prior to becoming a certified special educator, the coach had worked as a violin instructor, providing instruction for both individual and group music lessons for 6 years. As a classroom teacher, the coach had collaborated with and provided coaching for her peers on positive behavior supports, applied behavior analysis, and literacy/writing instruction for students with ASD.

Setting

The study procedures were conducted in early childhood classroom settings located in two suburban districts in the Pacific Northwest. Consent and assent for videotaping teachers and students in the classroom was obtained from teachers, parents, and students prior to beginning the study. The self-monitoring and coaching components of the research study were both implemented in the classroom setting. Tracy and Ellie were located in the same school in classrooms adjacent to each other. All study procedures for Tracy and Ellie occurred during an extended-day preschool for children diagnosed with an Autism Spectrum Disorder (ASD). The extended-day program included 7 children between the ages of 3 and 5 years old, a lead classroom teacher, 2 instructional aids (including Tracy), and a student teacher. Ellie was a co-teacher with the lead classroom teacher and typically taught in an adjacent classroom. During typical school hours (i.e., not extended-day), Ellie and the other classroom teacher utilized rotations between the two classrooms. For Tracy, all study procedures occurred in a small (2m by 2m) room located at the back of the classroom. This room had been organized for independent and 1:1 instruction, with workspaces for 3 students (i.e., 3 small tables, 2 chairs at

each table) arranged to provided limited distraction (i.e., tall shelves with instructional materials for each student organized on the shelves, 3-drawer plastic bins that contained independent work for each student. For Ellie, most study procedures (with the exception of 2 sessions) occurred in a portion of a large classroom (6m by 6m) typically used for group instruction and meals and included a long table with 8 chairs. This portion of the classroom had been sectioned off with a divider to limit distractions. Other areas of the classroom included a rotating play area (i.e., science-themed, kitchen play), group meeting area with a SmartBoard and large carpet with colored squares, reading area with bookshelves and a couch. All furniture was age-appropriate (i.e., chairs were sized for children ages 3-6 years old) and materials within easy access (i.e., low shelves) for young children.

Sara was located in a separate school district and all study procedures occurred during the afternoon preschool session for children with developmental disabilities. The afternoon preschool session typically had 8 children with developmental disabilities, including ASD, Down syndrome, and cerebral palsy. All study procedures occurred in a portion of a large classroom (6m by 6m) set up specifically for DTT with a small table and 2 chairs. This area was also observed to be used for other types of 1:1 instruction (i.e., completing assessments). Other areas of the classroom included a rotating play area (i.e., science-themed, kitchen play), group meeting area, reading area with bookshelves and a couch, small group instruction area with 2 small tables, and a sensory table with rotating activities (i.e., water play, sand play). All furniture was age-appropriate and most materials were within easy access for young children.

Experimental Design

The effects of self-monitoring and coaching on percentage of implementation components and percentage of completed learn units (LU) by special educators were assessed

using a single-subject, non-concurrent multi-element within a multiple-baseline design across participants. A multiple-baseline design calls for the sequential and staggered application of experimental conditions across legs (i.e., participants). Experimental control is demonstrated when and only when there is a change in both level and trend of dependent variables after the introduction of condition changes (Kazdin, 1982). Reflecting on the merits of the multiple baseline design, Kazdin (1982) stated, "behavior change agents can proceed gradually and only increase the scope of the treatment after having mastered the initial application" (p. 180). In addition, the use of the multi-element design allowed for multiple independent variables. In this study, the introduction of the independent variables was designed to increase in intensity by beginning with a less-intrusive online module, followed by a self-monitoring checklist, and, finally, a more-intrusive coaching intervention. Therefore, this design lent itself to gradually increasing the level of support participants received.

Materials

The study was implemented during routine classroom instruction. Discrete Trial Training (DTT) was identified as a specific instructional practice to target for each special educator because participants had just recently completed training (either initial training or "refresher" training) on using DTT. The materials for this study included an online professional development module for DTT and a self-management checklist related to DTT. The selected instructional practice, DTT, represents typical instructional practices in special education classrooms and a practice that is used with a variety of students in the classroom as well as being representative of evidence-based practices in the field of special education (NPDC-ASD, 2013).

Online Professional Development Materials. Participants were directed to the Autism Internet Modules (http://www.autisminternetmodules.org) for the online professional

development module on discrete trial training (Bogin, Sullivan, & Rogers, 2011). The online module consisted of:

1) pre-assessment to recall previous information;
2) an introduction to DTT;
3) information linking the use of DTT to CEC professional standards;
4) an overview of DTT, including its history;
5) a description of DTT;
6) a rationale for using DTT;
7) how DTT is implemented:
8) step-by-step instructions for implementing DTT;
9) next steps for the educator once DTT is being implemented;
10) case examples for 2 students (ages 18 and 7 years old);
11) the evidence-based for DTT
12) a summary of the information provided in the module;
13) a frequently asked questions page;
14) citations and references; and,
15) a post-assessment (Bogin et al., 2011).

In addition, the module included a resource section that provided the step-by-step instructions for implementing DTT, an implementation checklist, a glossary of terms used in the module, blank data sheets, discussion questions, and activities. In total, it is estimated the module could be completed in one and a half hours. Directions for the online module were made available to special educators immediately following baseline data collection. A copy of the directions given to participants can be found in Appendix A. As discussed in Chapter 2, the

AIM provides opportunities for active learning through the presentation of a rationale for using DTT and the evidence supporting the use of DTT, the use of voice-over presentations, video clips of DTT being implemented, access to tools (i.e., checklists, data collection materials), and pre/post assessments for learners to gauge their knowledge and understanding of the content.

Self-Monitoring Materials. Each special educator was asked to self-monitor his/her own instructional behavior related to DTT. Self-monitoring consisted of self-evaluating and self-recording either during the time of instruction or immediately following. This type of self-monitoring checklist was chosen based on the response effort required to complete the checklist (i.e., required approximately 45 seconds for participants to complete) and its incorporation of components from the DTT implementation checklist. Each participant was given a checklist consisting of 5 prompts related to the instructional practice, such as "Did I give my student a choice of reinforcers?" Tracy and Ellie received a self-monitoring checklist with the same 5 prompts while Sara's self-monitoring checklist had one prompt that was different. These prompts were based on discussions with each participant and data from baseline. Figure 2 displays the initial self-monitoring checklist provided to Tracy and Ellie. Figure 3 displays the initial self-monitoring checklist provided to Sara.

Following the coaching session, a revised self-monitoring checklist was given to each participant (see Figure 4 for Tracy and Ellie's and Figure 5 for Sara's revised self-monitoring checklists). The revised self-monitoring checklist provided a means for participants to rate their own behaviors in a more sensitive manner by providing a 1-5 Likert-rating scale rather than responding "yes", "sometimes", or "no" to the self-evaluation prompt questions. This change was incorporated based on feedback from participants who requested a more detailed rating section for the self-monitoring checklist. Specifically, one participant stated that it was difficult

to decide what might constitute a "sometimes" (i.e., 90% of the time, 40% of the time) versus a "yes" or "no". The change was discussed with each participant prior to implementing the new self-monitoring checklists, with each participant agreeing the change would provide more information for later reflection.

Date:

Did I….	**Yes**	**Sometimes**	**No**
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Provide a clear correction for any incorrect student responses?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Figure 2 Self-monitoring checklist for Tracy and Ellie

Date:

Did I….	**Yes**	**Sometimes**	**No**
Give my student a choice of reinforcers?			
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Figure 3 Self-monitoring checklist for Sara

Date:

Did I….	**Rating**				
Get my student's attention before giving the instruction?	**1**	**2**	**3**	**4**	**5**
Give a clear instruction for each trial?	**1**	**2**	**3**	**4**	**5**
Provide a clear correction for any incorrect student responses?	**1**	**2**	**3**	**4**	**5**
Give behavior-specific praise with the reinforcer?	**1**	**2**	**3**	**4**	**5**
Record data for each trial?	**1**	**2**	**3**	**4**	**5**

Notes:

Figure 4 Revised self-monitoring checklist for Tracy and Ellie

Date:

Did I….	Rating				
Give my student a choice of reinforcers?	1	2	3	4	5
Get my student's attention before giving the instruction?	1	2	3	4	5
Give a clear instruction for each trial?	1	2	3	4	5
Give behavior-specific praise with the reinforcer?	1	2	3	4	5
Record data for each trial?	1	2	3	4	5

Notes:

Figure 5 Revised self-monitoring checklist for Sara

Procedures

The study consisted of four experimental phases: a) baseline, b) online module, c) self-monitoring, and d) coaching. Prior to baseline, all participants had attended district workshops, received on-the-job training, and/or completed coursework related to DTT.

Baseline. Baseline procedures consisted of asking the teacher to set up instruction as she typically would when using DTT. That is, the sessions began after the teacher escorted the child to the small table and began instruction. No prompts or assistance was provided to the participants on how to set up instruction, gather the necessary materials, conducted a reinforcer assessment, begin the lesson, collect data, or provide reinforcement or corrective feedback. In addition, no information was given regarding the measures being taken, such as the implementation component checklist or learn units (LUs). The researcher discussed with each participant the time of day that would work best in their schedules for recording DTT. For Tracy and Ellie, it was determined that DTT would occur at the beginning of the day, within the first hour of students arriving for the extended-day preschool. For Sara, DTT occurred within the first hour and a half of the afternoon preschool session. In Sara's classroom, DTT occurred immediately following a group meeting that included singing, counting, and a read-aloud and co-occurred with a typical small group instruction period. Each participant was informed that 10-minutes of video recording would occur where the researcher would set-up a video recorder and

then walk away. The researcher and the participants determined the best area to set up the video recorder, though recorders were set-up within 4 feet of the instruction and were angled to include both the teacher and the student. For Tracy, the video recorder was set-up on top of a shelf slightly behind and to the left of where Tracy sat for conducting DTT. For Ellie, the video recorder was set-up at the end of the long table where she conducted DTT for Samir. For Sara, the video recorder was set-up on her desk, located next to where Sara provided DTT for Nick. In all videos, both teacher and student responses were visible.

Online module. Because all participants had received instruction on DTT at different times in proximity from the study, participants completed an online module (Autism Internet Modules, http://www.autisminternetmodules.org) related to DTT. Once baseline was stable, participants received information (see Appendix A) on completing the online module. The researcher brought a hardcopy of the information to the participant on the last day of baseline and spent approximately 5 minutes describing how to access the online module. Participants also received a copy of the instructions via an email sent the same day. The researcher requested that participants printed out and/or emailed their pre and post assessments, which were provided as PDFs on the AIM, as a means of verifying that participants had accessed the online module. The researcher requested that participants complete the module within 5 school days of receiving the information. Once the participant indicated that she had completed the module, video recording resumed. At the initial post-online module session, the researcher asked each participant how she liked the online module through informal discussion. This provided an informal means of determining how long it might have taken the participant to complete the module in relation to the time approximated on the AIM website and the level of each participants' interest in the module. All three participants indicated times within the hour and a half approximation and

indicated a desire to return to the AIM website to complete modules on other practices (i.e., naturalistic interventions). One participant also expressed enthusiasm for having the opportunity to receive continuing education units (CEUs) for completing the DTT module (that is, those who complete AIMs are able to request a certificate for CEUs for a minimal fee of $10).

Self-Monitoring. After completing the online module and demonstrating a steady or declining trend, participants were asked to self-monitor their instructional practice. The researcher described the use of the checklist, went over each of the prompts with each participant, and asked if the prompts were appropriate or needed to be changed. Changes were made to the prompts as needed. The researcher then provided a sheet with the checklist repeated 4 times (that is, on one sheet of paper, the checklist took up ¼ of the page and was therefore repeated 4 times so that 4 checklists appeared on one sheet of paper) Appendix B includes each self-monitoring checklist utilized during the study. Each participant was asked if she wanted the self-monitoring checklist emailed to her and, if requested, the self-monitoring checklist was also emailed to the participant. When the researcher introduced the self-monitoring checklist, after going over each prompt, the researcher also described how the checklist would be used by stating it could be kept with the student data and completed immediately following the end of the DTT session. The researcher also stated that it would be useful to look over the previous day's ratings prior to beginning the next DTT session and that notes might be taken in the "notes" section to help provide more information on what went well or what might go better at the next session. The researcher did not conduct accuracy checks or request that checklists be turned in at any point during the study procedures.

Coaching. Following self-monitoring, participants received at least one session of coaching. The coaching phase was intended to support participants in need of more assistance or

those who wished to discuss further instructional practices (i.e., for Tracy, the use of token boards was discussed during coaching). For the coaching sessions, the coach and the participant determined when would be an appropriate time to conduct the coaching session, which either replaced the typical video recording time period (for Sara's first coaching session), immediately proceeded typical recording sessions (for Tracy's and Ellie's coaching session), or occurred immediately following a typical video recording session (for Sara's second coaching session). The coaching sessions were based on the feedback component of the professional development model described in Chapter 2. That is, elements of classroom application, application feedback, and action planning were incorporated into each coaching session. The coach followed a model in which a focus topic was identified, the coach provided basic information on the topic, the teacher was provided feedback, and then the teacher identified an action plan with the coach. Each coaching session was conducted in 15-20 minutes. Because of the individualization that coaching affords, coaching was tailored for each participant and reflected the individual needs of the participant. Coaching sessions for each participant will be described below.

Tracy. As the results will demonstrate, Tracy had high implementation. However, she was interested in strategies for keeping students on-task during DTT and providing students with more information on when instruction will end. Therefore, after discussion with the researcher, it was decided that Tracy wanted to be coached on using token systems. She was particularly interested in this strategy because of its potential for becoming a self-management strategy for the student. For the coaching session, the coach provided a simple token board (see Appendix C) placed in a plastic cover and 5 pennies. Prior to the coach arriving, Tracy located pictures of a variety of reinforcers for Mark (i.e., microphone, bubbles, slinky, cars, trains) that could be use with the token board. During the coaching session, the coach described the use of the token

system, how the student could be introduced to the token board, and how frequently Tracy might award pennies (i.e., it was decided that every 2-3 correct responses would result in a penny being placed on the board). The coach stressed to Tracy that use of the token board did not preclude providing behavior-specific praise and that BSP could still be provided even when a penny was not placed on the token board. The coach asked Tracy if she wanted the coach to demonstrate the use of the token board with Mark or if she wanted to have the coach watch and provide intervention if needed. Tracy decided to have the coach wait close by (within 3 feet) while she introduced the token board to Mark and began conducting the DTT with the token board. The coach did not need to intervene during the session. Following Tracy's first implementation of the token board, she and the coach debriefed her use of the token board. The coach provided positive comments (i.e., "well done implementing the token board" and "great job, just when I was going to intervene, you did exactly what I would have done") and asked Tracy how she felt about using the token board. Tracy was enthusiastic about its use and felt it had improved her session with Mark. The coaching session ended with Tracy and the coach planning how she would implement the token board in the next session (i.e., what she did well, what she might adjust in the next session).

Ellie. Though Ellie's implementation improved greatly following the online module and maintained during self-monitoring, as the results will show, Ellie requested coaching in order to better her DTT practice and to address some concerns she was having about her implementation. The coach began Ellie's coaching session by showing Ellie her data on praise statements. Praise statements were targeted in particular because of the change seen in her use of BSP following the online module and self-monitoring. The coach intended for Ellie to see this improvement, thinking it would encourage Ellie to continue using BSP. The coach and Ellie then discussed

ways to vary BSP, as one of Ellie's concerns was saying the same thing over and over again. In addition, the coach encouraged Ellie to increase her voice volume when delivering praise to the student. Ellie also asked about varying reinforcement and how to manage that feedback. The coach described varying reinforcement based on the student response (i.e., increasing the reinforcement when the student provided an independent correct response, still providing but lowering quality of reinforcement for prompted correct responses) and described examples within the context of her instruction. The coach then asked Ellie if she would like the coach to observe and intervene or to observe and then discussed following the DTT session. Ellie chose to have the coach observe and then discuss following the DTT session. After Ellie's DTT session, she and the coach debriefed on her use of praise statements and delivery of reinforcers by discussing what went well, what she might adjust for the next DTT session, and any questions she had. The coaching session ended with the coach providing positive feedback on Ellie's use of praise statements and encouraging her to continue delivering reinforcers differentially based on student response.

Sara. Two coaching sessions occurred for Sara. The first coaching session focused on several components of the DTT implementation checklist, including providing choices, gaining attention, giving a clear instruction, providing praise statements, and recording data. Because this coaching session occurred instead of a regular video recording session and, therefore, the coach would not observe a live DTT session on the day of coaching, the coach viewed videos of Sara's instruction and edited clips of Sara implementing or not implementing the specific components highlighted above into a short (3 min) video. The coaching session began with the coach discussing with Sara what would occur, that she would show Sara video of her instruction, they would discuss components that comprise effective DTT, and plan for future implementation.

While viewing the video, the coach paused the video and gave Sara the opportunity to ask questions and provide feedback on the clips chosen. Following the video, the coach asked Sara how she felt the DTT implementation was going for her and encouraged Sara to express her concerns. Sara and the coach discussed ways in which Sara could plan for implementing each component of DTT as well as how she might plan for Nick's programs (i.e., base instruction on IEP goals). Sara and the coach also discussed some barriers to implementation that Sara had been experiencing, such as a lack of materials and time. The coaching session ended with Sara and the coach planning future

Sara's second coaching session was implemented because data demonstrated a decline in implementation, as the results will show, and Sara requested another session to discuss her implementation of DTT. At the second coaching session, which was scheduled to occur following a typical video recording session, the coaching focused on programming (i.e., deciding what instruction should look like) and closing LUs. Sara had become frustrated with the programs she was using for Nick's DTT and requested feedback on how she should determine instructional programs. The coach provided feedback on choosing programs based on IEP goals, age-appropriateness, and readiness skills. For example, Sara had been using the same instructional program for X sessions and could see a decline in her implementation as well as an increase in frustration from Nick. Sara and the coach discussed changing the instructional program to better reflect age-appropriate expectations and goals. In addition, Sara and the coach discussed ways in which Sara might improve her LU closure. Specifically, the coach provided feedback to encourage Sara to be sure to gain the learner's attention and to encourage Sara to close the LU by providing reinforcement (i.e., a praise statement, giving access to a preferred toy) or by providing corrective feedback. The coaching session ended with the coach and Sara

planning Sara's next implementation of DTT, including instructional programs she might address.

Following the initial coaching session, the participant was given the modified self-monitoring checklist that included a Likert-rating scale (as described in Materials) and was encouraged to continue using the self-monitoring checklist.

Behavioral Measures

Three behavioral measures were collected for teacher participants including percentage of implementation, learn units, and praise statements. Student outcomes were also measured and are described in the context of learn units.

Percentage of Implementation. An implementation checklist was utilized to determine the fidelity with which DTT was implemented by each participant. Figure 6 displays the implementation checklist used during the study. This checklist was based on the work of the National Professional Development Center on Autism Spectrum Disorders (NPDC-ASD) and the implementation checklists found on the NPDC-ASD evidence-based practice brief for DTT (Bogin, Sullivan, Rogers, & Stabel, 2008). The implementation checklist consisted of a task analysis of the DTT procedure. This checklist was then modified for the purpose of this study by reducing the number of components, rewriting components to be more easily identifiable in a 10-minute video recording of DTT, and integrating a rating scale (i.e., 0, 1, 2) to rate the implementation of each component. All components of the implementation checklist were addressed through the online module participants engaged in following baseline data collection. For example, the online module included a video clip that provided a model for gaining the learner's attention, providing feedback (i.e., correction, reinforcer) following the learner

response, prompting for a correct learner response, giving behavior-specific praise, collecting data, and maintaining a short intertrial interval.

While viewing the recordings, the researcher and research assistant coded the presence or absence of components of the focus instructional practice with a 2, 1 or 0. A rating of 2 indicated the component was implemented in full, 1 indicated the component was implemented partially, and 0 indicated the component was missing. The full coding manual included specific examples of full, partial, or no implementation of each component (see Appendix D). For instance, for the component, "All materials ready (in close proximity, easy access during instruction, prepared for instruction to reduce wait time for student", examples of full implementation include: materials are prepared and ready to go for trials, materials are easily accessible to instructor and student and non-examples include teacher must shuffle through cards to find ones for instruction, materials are too far away, materials are not ready, materials are not accessible to student (i.e., too far away, out of sight-line). There were a total of 16 implementation components for DTT and a possible total of 32 (as shown in Figure 6). At the conclusion of the viewing, a percentage was calculated by adding the ratings, dividing by 32, and multiplying by 100.

Discrete Trial Training (DTT)
Implementation Checklist

Special Educator: _____ Date of Observation: _____

Observer: _____

	Discrete Trial Training (DTT) Implementation Checklist			
1	All materials ready	0	1	2
2	Instruction is provided in an appropriate area	0	1	2
3	Gain the learner's attention	0	1	2
4	Learner is positioned to maximize learning	0	1	2
5	Provide a clear stimulus or instruction	0	1	2
6	If learner responds appropriately: Reinforcer is delivered	0	1	2
7	If learner does not respond or responds incorrectly, one of the following occurs: a) Prompt is given so learner responds correctly and reinforcer is given, or b) Corrective feedback is given and trial is restarted	0	1	2
8	Prompts result in correct responding	0	1	2
9	Reinforcer is delivered with behavior-specific praise	0	1	2
10	Size of reinforcer is appropriate (not too big/small)	0	1	2
11	Reinforcement given contingently	0	1	2
12	Reinforcement given immediately (within 3 seconds) after response	0	1	2
13	Intertrial Interval of 3-5 seconds	0	1	2
14	Learner is provided information on length of instruction/when he/she will be finished	0	1	2
15	Instruction is provided in the same way for each trial	0		2
16	Evidence that data is systematically collected on the trials	0	1	2
	Total:			
	Percentage [(total/32)x100]**:**			

0 = not implemented
1 = implemented some of the time or partially
2 = implemented all the time

Figure 6 Implementation checklist

Learn Unit (LU). Learn Units have been described as the "strongest predictor of student learning" (Greer & McDonough, 1999, p. 10). LUs include both a measure of the teacher behavior and the student response, and provide a "moment-to-moment measure" (Greer & McDonough, 1999, p. 5). A coding form adapted from the *Teacher Performance Rate and Accuracy* scale (TPRA) (Ross, Singer-Dudek, & Greer, 2005) was used to code data. Data was

collected on three components of an LU (Greer, 2002; Goodman, Brady, Duffy, Scott; & Pollard, 2008):

1. Instructor antecedent,
2. Student responses, and
3. Instructor consequence (either reinforcement or correction).

A LU delivered by the special educator was considered closed if all three components were present and correct. If any of the LU components were missing or incorrect, an open LU was scored.

For this study, the following descriptions served as operational definitions of antecedent, response, and consequence.

The *instructor antecedent* was defined as: a) verbal (i.e., instructor says, "What is this?"); b) nonverbal (i.e., instructor holds one finger); or c) gestural (i.e., instructor points to a cup). To be scored as correct (i.e., +), antecedents needed to be clear, provided after student attention had been gained, and delivered one at a time. Only LUs related to instructional programs were scored. That is, instructor antecedents for behaviors unrelated to the instructional program (i.e., sitting down, hands in lap, putting materials away) were not scored unless those behaviors were the focus of the instructional program. Examples of instructions included verbal instructions (i.e., "What is this?", "Match", "Show me how") and gestural instructions (i.e., pointing to where a student needs to write, pointing to an object and expecting the student to identify the object).

The *student response* was the behavior that immediately follows the instructor antecedent and was emitted by the student. Student responses were defined as a verbal, nonverbal, or gestural response to the question/mand delivered by the teacher. These responses were scored as correct (i.e., the answer to the mand was correct), incorrect (i.e., the answer to the mand was

incorrect) or no-response (i.e., the teacher did not gain the student's attention and the student did not provide a response). In addition, student responses were coded as prompted or independent. A prompted student response was a response that received some form of prompt from the teacher, such as a verbal, physical, or gestural prompt. Independent student responses were scored when the student responded without a prompt from the teacher. Additionally, a student "no response" was recorded when the student did not provide either an independent or prompted response.

Instructor consequence was defined as a verbal (e.g., yes, that is a cup; no, this is the red car) or gestural (e.g., sign language, thumbs up, high-five, pat on the back) instructor response to a student response. Instructor consequence were coded as correct (e.g., +) if the instructor provided reinforcement after a correct student response or gave a correction for an incorrect student response.

A *closed* LU was scored if the instructor antecedent and consequence were scored as correct and there was a student response. An *open* LU was scored if the instructor antecedent and/or consequence were scored as incorrect (e.g., -). Table 3 displays examples of closed LUs.

Teacher Antecedent	Student Response	Teacher Consequence
Teacher gains student's attention, gives student a red object, and says, "Match with red"	Student independently places red object into red container	Teacher says, "Good job! You matched the red toy with the red container"
Teacher gains student's attention, points to a picture of a train, and says, "What is this?"	Student responds, "Apple"	Teacher says, "No, this is a train. Say 'train'"

Table 3 Examples of closed LUs

Praise Statements. Two types of praise statements were coded: behavior-specific praise and general praise.

Behavior Specific Praise (BSP). BSP was operationally defined as positive comments about an academic or social behavior that describes the behavior and affirms a student's response or actions. Examples of BSP included pointing to a student's work paired with a verbal affirmation that had a concrete detail or description of the learner response (e.g., "good job putting the colors together"), and repetition of answers paired with a praise statement (e.g., "you're right, the answer is 5"). BSP included nonverbal praise such as a thumbs up, a pat on the back, or a high-five if it was paired with a visual such as pointing at the correct answer. Praise statements that are not "behavior-specific" (e.g., "Yes," "That's right," "Good job," and "You've got it!") were not be counted as BSP unless they were paired with a description of the behavior being praised. BSP instances were counted as recordings were viewed.

General Praise (GP) Statements. In addition to counting BSP per session, general praise statements were counted. Examples of general praise included verbal (e.g., "good job", "yay") and non-verbal (e.g., giving a high-five, giving a thumbs up).

Data Collection

Data collection began after obtaining written consent from special educators and parents of student participants, and assenting students in the classrooms to allow videotaping. Video recorders were utilized in all classrooms. A Zoom Q2HD™ handy video recorder was used to record special educators as they delivered DTT. Video cameras were attached to tripods and were equipped with a directional microphone to enhance sound quality. Video cameras were situated no further than 4-feet away from where instruction was occurring. Special educators were video recorded during the same time 10-minute period each day (i.e., in the morning, in the afternoon). As recordings were completed and collected, the researcher and research assistant

viewed video recordings and used a coding form and implementation checklist to collect data (see Appendix A). Length of lessons ranged from 6 to 10 minutes.

LUs were coded via an event system. That is, an LU was coded when an instruction began. BSP and GP were coded with the LU. "Time" was coded to facilitate the calculation of interobserver agreement. Time was based on the recording indicator and was recorded within 2 sec of the beginning of instruction. Table 4 provides an example of a portion of the coding form used to collect event data for LUs, praise statements, and student data.

Time	I	R	C	BSP	GP		C	O

Time was the time on the recording when the instruction began; I = instructor antecedent; R = student response; C = instructor consequence; BSP = behavior-specific praise; GP = general praise; C = closed LU; O = open LU

Table 4 Example of a portion of the coding form used to code LUs, praise statements, and student data

Interobserver Agreement

For at least 30% of all data-collection sessions that involve direct observation of teacher-student interactions, a second observer conducted independent observations of the same teacher-student interactions. Two observers, one a masters-level graduate student with extensive training and experience in applied behavior analysis and one a doctoral-level graduate student with extensive instructional experience, were trained to code instructional videos. Both observers were kept blind to all study procedures. Training began with each observer and the primary researcher meeting to go over the coding manual (Appendix E), the coding form, the implementation checklist, and accessing videos via a secure university-based website. Training

occurred separately for each observer. After the tools (i.e., coding manual, coding form, checklist) were introduced, the researcher and trainer simultaneously coded up to 5 minutes of a 10-minute video and then compared codings. Discrepancies were located in the video and discussed until an agreement was met. After the first training session, the researcher requested that each observer code up to 3 videos prior to a second training session. At the second training session, codings between the researcher and the observer were compared, discrepancies identified, located in the videos, and discussed until an agreement was met. Following the second training, observers coded videos and met with researcher on an as-needed basis. Periodic meetings (i.e., every other week) occurred where the observer and researcher met to review and discuss the data they recorded. These meetings addressed the extent to which both observations reliably coded the same behaviors, or interobserver agreement (IOA) across the two observers (e.g., Cooper, Heron, & Heward, 2007; Suen & Ary, 1989). At least one data point from each phase was coded for reliability.

Social Validity

Subjective evaluation occurred to determine whether the focus of the study and the instructional changes that took place as a result met the values of the teachers who participated in the study (Kazdin, 1982). Social validity was assessed using teacher surveys (see Appendix F for the social validity survey). This survey was developed to examine issues related to participant experiences with the professional development study and each professional development activity and comfort with being videotaped. In addition, the survey was developed to examine components the participants found the most and least useful as well as participant views on effectiveness and efficiency. It was important to know which professional development activities were viewed by participants as useful and whether they noticed changes in their own

instructional behaviors and student learning. In addition, teachers' perspectives on effectiveness and efficiency could guide future professional development activities.

Data Analysis

Raw data for LUs and implementation components was converted into a percentage for each participant. Instructional sessions did not contain the same number of instructional opportunities (i.e., LUs) per session. Therefore, LUs were converted to a closed LU percentage by dividing the total number of closed LUs by the total number of LUs (closed LUs + open LUs) and multiplying by 100. For the implementation components, a percentage was calculated by adding a total rating and dividing by 32 (see figure 1 for implementation checklist). A higher score reflects higher rates of correct implementation of DTT. In addition to instructor-related behaviors, student behavior was analyzed as percentage of independent correct responses, independent incorrect responses, prompted correct responses, prompted incorrect responses, and no responses per session. Percentages of student independent correct and incorrect, prompted correct and incorrect, and no-responses were calculated by dividing independent corrects by total LUs and multiplying by 100, dividing independent incorrects by total LUs and multiplying by 100, dividing prompted corrects by total LUs and multiplying by 100, dividing prompted incorrects by total LUs and multiplying by 100, and dividing no-responses by total LUs and multiplying by 100.

Data was analyzed through visual inspection, where data patterns were examined to determine intervention effect. Visual inspection refers to "reaching a judgment about the reliability or consistency of intervention effects by visually examining the graphed data" (Kazdin, 1982, p. 232). Specifically, characteristics of the data that reflect magnitude of the changes across phases and the rate of these changes were used.

CHAPTER 4

RESULTS

The results of the effects of a least-to-most model of professional development on special educators' instructional behaviors related to and implementation of discrete trail training (DTT) are presented in this chapter. This chapter comprises six sections. The first section contains the results of interobserver agreement for all participants. The second section contains the results of the effect of intervention on implementation components. The third section contains the results of the effect of intervention on learn units (LU). The fourth section contains the results of the effect of the intervention on praise statements. The fifth section contains the results of the effect of the intervention on student data. The sixth section reports the results of the social validity surveys from each participant.

Interobserver Agreement

Interobserver agreement (IOA) was calculated for instructional behaviors, implementation components, and student responses. IOA for each will be reported below. Interobserver agreement was calculated for at least 33% of all observations for each participant and included at least one data point from each phase. Table 5 displays a summary of the mean percent of interobserver agreement for each teacher participant.

Instructional behaviors. Interobserver agreement for instructional behaviors was calculated on a point-by-point basis. That is, the observers had to agree on each component of the Learn Unit (i.e., teacher instruction, student response, teacher consequence) and the type of praise (i.e., general praise, behavior-specific praise) in order for an agreement to be counted for instructional behavior. The percentage of agreement for instructional behaviors averaged 86% for Tracy, 81% for Ellie, and 77% for Sara.

Implementation components. For implementation components, IOA was calculated on a component-by-component basis. That is, observers had to agree on the rating (i.e., 0, 1, 2) for each component on the checklist. The percentage of agreement for implementation checklist components averaged 91% for Tracy, 81% for Ellie, and 77% for Sara.

Student responses. In addition, IOA was calculated for the student response component (i.e., independent correct, independent incorrect, prompted correct, prompted incorrect, no response). The percentage of agreement for student responses averaged 97% for Mark (range, 85-100%), 90% for Samir (range, 83-100%), and 81% for Nick (range, 70-91%).

Participant	Instructional Behavior IOA	Range	Implementation Checklist IOA	Range	Percentage of Observations with IOA
Tracy	81%	75-95%	91%	85-95%	37%
Ellie	81%	75-88%	81%	70-90%	56%
Sara	77%	75-94%	77%	70-85%	33%

Table 5 Mean Percent of Interobserver Agreement for Participants

Intervention Results for Implementation Components

Results for each participant will be discussed below. Figure 7 displays the percentage of discrete trial training (DTT) implementation components for each participant across phases.

Tracy. During baseline, Tracy's mean percentage of DTT implementation components was 81%, with a flat trend (range 72% to 91%). Following the online professional development module, Tracy's DTT implementation increased slightly and was less variable with a mean of 84%, with a slight increasing trend. When Tracy began self-monitoring, her DTT implementation increased again (M = 91%) with a slightly increasing trend. After Tracy received a coaching session, her mean implementation increased slightly (M = 93%) and demonstrated a slight increasing trend. DTT Implementation remained high throughout all phases, with only 2 data points falling below 80% implementation (Sessions 1 and 4). Overall, there was 50% nonoverlapping data across all intervention phases (online module, self-monitoring, and

coaching) with baseline. Specifically, there was 0% nonoverlapping data between baseline and the online module, 67% nonoverlapping data between baseline and self-monitoring, and 67% nonoverlapping data between baseline and coaching.

Ellie. Ellie's percentage of DTT implementation during baseline was variable (*M* = 57%, range 50% to 76%), with an increasing trend across 5 data points. Ellie's percentage of DTT implementation immediately increased after the online module to a mean of 78%, with a flat trend. When Ellie began self-monitoring, there was a slight increase in DTT implementation to a mean of 80% with a flat trend (range, 78% to 81%). After Ellie received coaching, her DTT implementation increased to a mean of 89%. For Ellie, there was 100% nonoverlapping data across all intervention phases (online module, self-monitoring, and coaching) with baseline.

Sara. Sara's baseline percentage of DTT implementation components was steady (*M* = 53%, range 50% to 56%), with a flat trend. Sara's percentage of DTT implementation increased slightly following the online module. The mean percentage of DTT implementation following the completion of the online module was slightly above baseline at a mean of 54% with a decreasing trend. After beginning the self-monitoring phase, Sara's DTT implementation again showed an increase at first, but then demonstrated a decreasing trend. The mean percentage of DTT implementation during the self-monitoring phase was below baseline and online module phases at 49%. Following the first coaching session, Sara's percentage of DTT implementation immediately increased and was followed by a very distinct decreasing trend. The mean percentage of DTT implementation following the first coaching session was above baseline, online module, and self-monitoring phases (*M* = 59%, range 50%-75%). After a second coaching session, Sara's DTT implementation again increased (*M* = 63%), with an increasing trend. Data across all sessions was variable yet remained between 41% (lowest DTT implementation

percentage, Session 13) and 75% (highest DTT implementation percentage, Session 16). There was 36% nonoverlapping data across all intervention phases (online module, self-monitoring, coaching sessions) with baseline. Specifically, there was 33% nonoverlapping data between baseline and online module, 20% nonoverlapping data between baseline and self-monitoring, 50% nonoverlapping between baseline and both coaching phases.

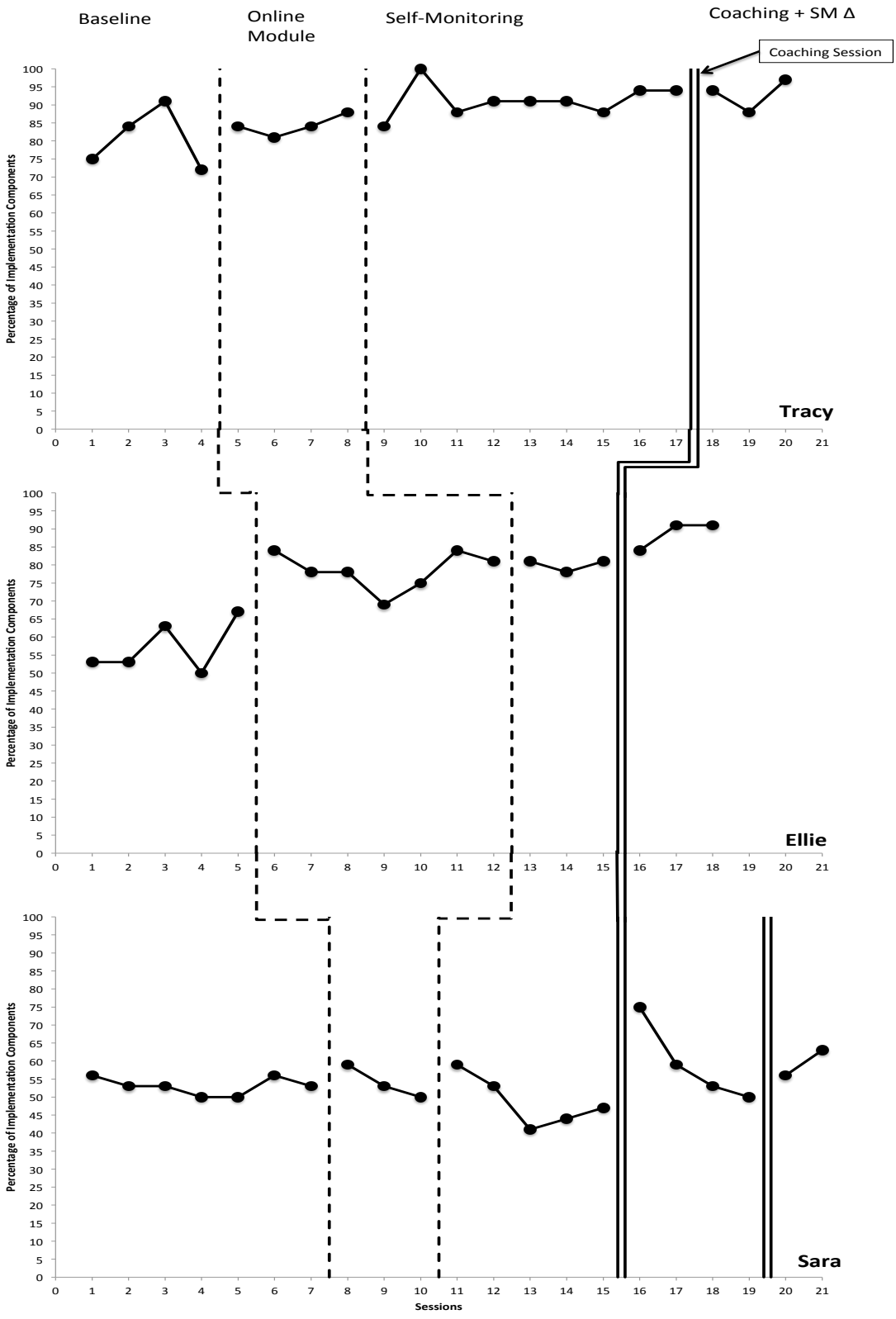


Figure 7 Implementation Components

Intervention Results for Learn Units

Figure 8 displays the percentage of closed learn units (LU) for each participant across phases. Table 6 displays a summary of the means for closed LUs for each participant across phases.

Tracy. During baseline, Tracy's percentage of closed LUs was variable due to a low initial data point and ranged from 37% to 93% (*M* = 73%), with a sharp increasing trend. Following the online professional development module, Tracy's percentage of closed LUs increased slightly (*M* = 76%, range 61% to 91%) and was variable with a sharp increasing trend. When Tracy began self-monitoring, there was an increase in her percentage of closed LUs with slightly less variability (*M* = 93%, range 81% to 100%) and slight increasing trend. After Tracy received coaching, her mean increased to 98%. For Tracy, there was 38% nonoverlapping data across all intervention phases with baseline. Specifically, there was 0% nonoverlapping data between baseline and the online professional development module, 44% nonoverlapping data between baseline and self-monitoring, and 67% nonoverlapping data between baseline and coaching.

Ellie. Ellie's percentage of closed LUs during baseline ranged from 8% to 24% (*M* = 18%), with a slight decreasing trend. Immediately following the online professional development, Ellie's percentage of closed LUs increased substantially to a mean of 73% with a slight decreasing trend. When Ellie began self-monitoring, there was a decrease in her percentage of closed LUs (*M* = 64%, range 56% to 74%), with a decreasing trend. Ellie's percentage of closed LUs following the coaching session increased substantially (*M* = 84%),with a flat trend. There was 100% nonoverlapping data across all intervention phases with baseline.

Sara. Sara's percentage of closed LUs ranged from 16% to 39% (*M* = 22%) with an increasing trend during baseline. Following the online professional development, Sara's percentage of closed LUs initially increased followed by a sharp decreasing trend. When Sara began self-monitoring, there was an initial increase in her percentage of closed LUs followed by a sharp decreasing trend with an overall mean of 18%. There was an immediate substantial increase in her percentage of closed LUs following the first coaching session (Session 16, 57%) followed by variability with a decreasing trend (range 20% to 69%). Overall, there was a mean of 42% across the data points following the first coaching session. Following the second coaching session, there was another immediate and substantial increase in Sara's percentage of closed LUs (Session 20, 53%) followed by an increasing trend (*M* = 63%, range 53% to 73%). There was 43% nonoverlapping data across all intervention phases with baseline. Specifically, there was 33% nonoverlapping data between baseline and the online professional development module, 20% nonoverlapping data between baseline and self-monitoring, 50% nonoverlapping data between baseline and the first coaching session, and 100% nonoverlapping data between baseline and the second coaching session.

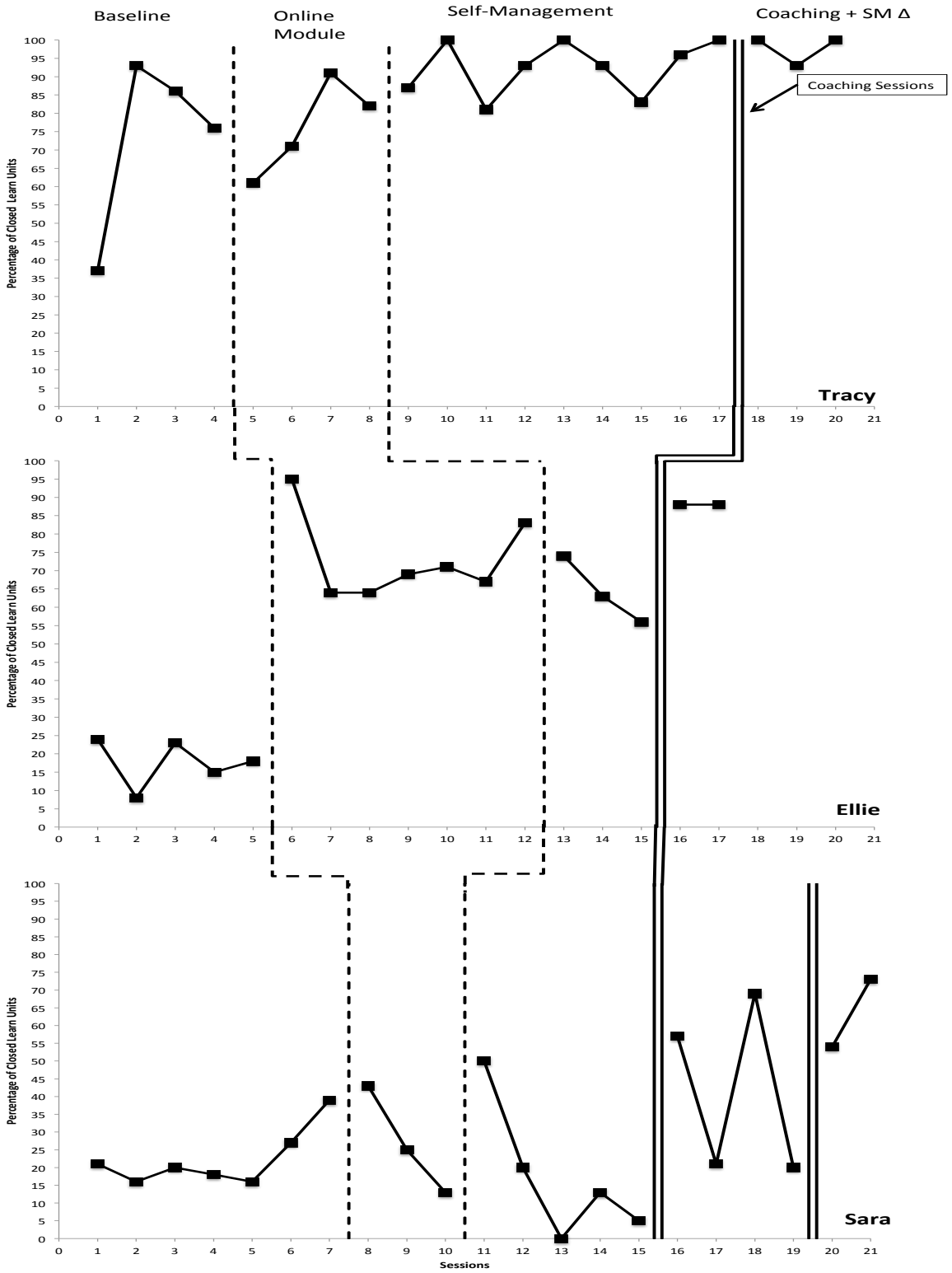


Figure 8 Closed Learn Units

Participant	Baseline	Online Module	Self-Monitoring	Coaching 1	Coaching 2
Tracy					
Closed LU	**73%**	**76%**	**93%**	**98%**	N/A
Range	37-93%	61-91%	81-100%	93-100%	
Ellie					
Closed LU	**18%**	**73%**	**64%**	**84%**	N/A
Range	8-24%	64-95%	56-74%	77-88%	
Sara					
Closed LU	**22%**	**27%**	**18%**	**42%**	**63%**
Range	16-39%	13-43%	0-50%	20-69%	53-73%

Table 6 Means for Closed Learn Units

Intervention Results for Praise Statements

Figure 9 displays the praise statements by behavior-specific praise (BSP) and general praise (GP) for each participant across phases. Black areas indicate BSP while gray areas indicate GP. Table 7 displays a summary of the BSP mean per session, GP mean per session, and mean total of praise statements per session for each participant across phases.

Tracy. Tracy's average BSP during baseline was high (*M* = 17, range 7 to 27) with an increasing trend across the phase. Her GP statements during baseline was low (*M* = 1, range 0 to 3), indicating that when Tracy made praise statements, those praise statements were largely behavior-specific. Her total (BSP and GP) average praise statements made during baseline showed an increasing trend (*M* = 18, range 7 to 30). Following the online professional development module, Tracy's average BSP increased (*M* = 22, range 11 to 28). Tracy's GP statements following the online professional development increased slightly (*M* = 4, range 1 to 8). Her total (BSP and GP) average praise statements made increased following the online professional development (*M* = 26, range 19 to 30) and showed an increasing trend. When Tracy began self-monitoring, her average BSP per session remained high (*M* = 19, range 14 to 24). Her GP statements decreased slightly (*M* = 2, range 1 to 8). Tracy's overall mean total of praise

statements decreased slightly during self-monitoring (*M* = 22, range 16 to 26). After Tracy received coaching, her BSP remained high with a mean of 19. Her GP increased slightly to a mean of 6. Tracy's overall mean total praise following coaching was consistent with previous phases (*M* = 26, range 24-28). There was 6% nonoverlapping data for BSP across intervention phases with baseline due to already high occurrences of BSP during baseline.

Ellie. During baseline, Ellie's average BSP per session (*M* = 1, range 0 to 3) and GP per session (*M* = 4, range 1 to 7) were low. Ellie's mean total praise statements was low (*M* = 5, range 2 to 10) during baseline. Following the online professional development module, Ellie's average BSP per session (*M* = 11, range 8 to 13) and GP per session (*M* = 9, range 2 to 20) both increased substantially. Her mean total praise statements increased overall following the online professional development (*M* = 21, range 14 to 28). When Ellie began self-monitoring, her average BSP per session increased again (*M* = 15, range 8 to 18) while her GP per session decreased (*M* = 3, range 0 to 8). Ellie's overall mean total praise statements decreased slightly when she began self-monitoring (*M* = 18, range 16 to 19). Following a coaching session, Ellie's average BSP per session was 17 while her average GP per session was 4. Her overall mean total praise statements increased following the coaching session (*M* = 21, range 16 to 24). There was 100% nonoverlapping data for BSP across intervention phases with baseline.

Sara. During baseline, Sara's average BSP per session was low (*M* = 1, range 0 to 6), with an increasing trend. Sara's average GP per session was stable (*M* = 10, range 7 to 12) and accounted for the majority of her praise statements. Sara's mean total praise statements during baseline was variable (*M* = 11, range 7 to 18). Sara's mean BSP per session increased slightly following the online module, but remained low (*M* = 2, range 1 to 3) with a decreasing trend. Her mean GP per session decreased slightly (*M* = 6, range 2 to 11), with a decreasing trend. Sara's

overall mean total praise statements decreased slightly (*M* = 8, range 3 to 14). When Sara began self-monitoring, her mean BSP per session again decreased (*M* = <1, range 0 to 1) and her mean GP per session also decreased to a level similar to her BSP level (*M* = 1, range 0 to 2). Sara's overall mean total praise statements decreased significantly (*M* = 1, range 0 to 2). After the first coaching session, Sara's mean BSP per session increased slightly (*M* = 2, range 1 to 3). Her mean GP per session also increased (*M* = 6, range 2 to 11). Sara's overall mean total praise statements increased following the first coaching session (*M* = 8, range 7 to 13). After the second coaching session, Sara's mean BSP and GP per session increased substantially and were at nearly equal levels (BSP – *M* = 10, range 8 to 12, GP – *M* = 10, range 8 to 11). Her overall mean total praise statements increased significantly following the second coaching session (*M* = 20, range 19 to 20). There was 14% nonoverlapping data for BSP across intervention phases with baseline, with both nonoverlapping data points occurring after the second coaching session.

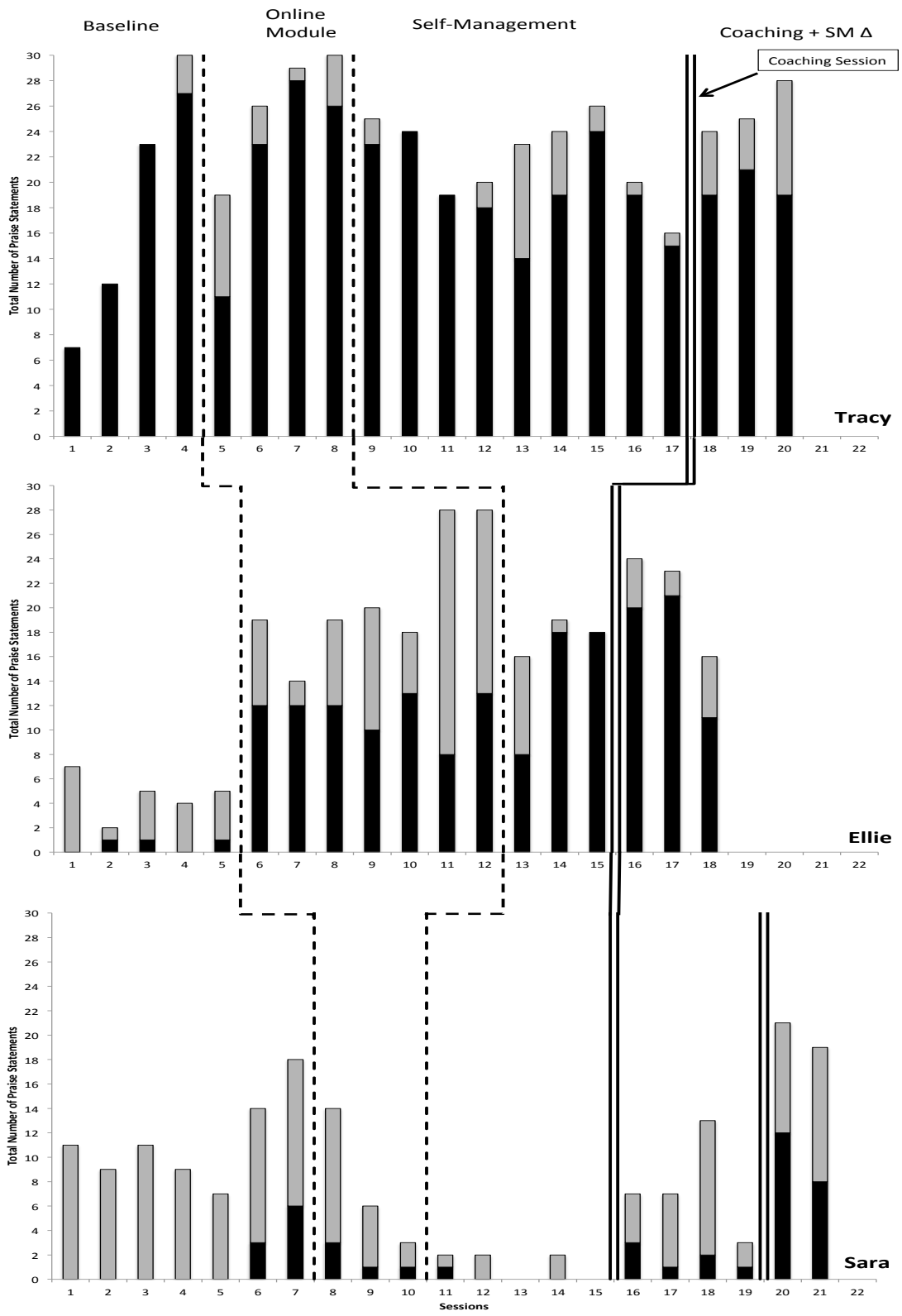


Figure 9 Praise Statements: Black indicates BSP, Gray indicates GP

Participant	Baseline	Online Module	Self-Monitoring	Coaching 1	Coaching 2
Tracy					
BSP Mean Per Session	**17**	**22**	**19**	**20**	N/A
Range	7-27	11-28	14-24	19-21	
GP Mean Per Session	**1**	**4**	**2**	**6**	N/A
Range	0-3	1-8	1-8	4-9	
Mean Total Per Session	**18**	**26**	**22**	**26**	N/A
Range	7-30	19-30	16-26	24-28	
Ellie					
BSP Mean Per Session	**1**	**11**	**15**	**17**	N/A
Range	0-1	8-13	8-18	11-21	
GP Mean Per Session	**4**	**9**	**3**	**3**	N/A
Range	1-7	2-20	0-8	2-5	
Mean Total Per Session	**5**	**21**	**18**	**21**	N/A
Range	2-10	14-28	16-19	16-24	
Sara					
BSP Mean Per Session	**1**	**2**	**>1**	**2**	**10**
Range	0-6	1-3	0-1	1-3	8-12
GP Mean Per Session	**10**	**6**	**1**	**6**	**10**
Range	7-12	2-11	0-2	2-11	8-11
Mean Total Per Session	**11**	**8**	**1**	**8**	**20**
Range	7-18	3-14	0-2	7-13	19-20

Table 7 BSP Mean Per Session, GP Mean Per Session, and Mean Total Praise Statements Per Session

Intervention Results for Student Data

Results of the student data will be presented for each student-teacher dyad in this section. Table 8 displays a summary of the means for independent and prompted correct, independent and prompted incorrect, and no responses for each student participant across phases.

Student (Teacher)	Baseline	Online Module	Self-Monitoring	Coaching 1	Coaching 2
Mark (Tracy)					
Independent Correct	68%	90%	88%	91%	N/A
Prompted Correct	11%	3%	2%	5%	
Independent Incorrect	18%	7%	10%	4%	
Prompted Incorrect	3%	0%	0%	0%	
No Response	0%	0%	0%	0%	

Samir (Ellie)					
Independent Correct	12%	54%	26%	45%	N/A
Prompted Correct	63%	35%	56%	44%	
Independent Incorrect	1%	4%	11%	9%	
Prompted Incorrect	8%	1%	4%	0%	
No Response	17%	6%	6%	4%	
Nick (Sara)					
Independent Correct	61%	35%	22%	12%	57%
Prompted Correct	23%	28%	7%	30%	21%
Independent Incorrect	7%	14%	21%	22%	16%
Prompted Incorrect	5%	19%	48%	45%	0%
No Response	4%	4%	3%	3%	4%

Table 8 Means for Independent and Prompted Correct, Independent and Prompted Incorrect, and No Responses

Tracy and Mark. Figure 10 displays percentage of student responses across phases for Mark, the student Tracy worked with during the study procedures. A summary of Mark's responses is displayed in Table 8.

Baseline. During baseline, Mark's independent correct was variable due to a low initial data point (M = 68%, range 22% to 90%), with an increasing trend. Mark's prompted correct responses were low, with the exception of the initial data point, which may be reflective of beginning a new instructional program, (M = 11%, range 0% to 30%). Mark's independent incorrect responses were low (M = 18%, range 5% to 37%), with a decreasing trend. Mark's prompted incorrect responses occurred only in the initial data point (M = 3%, range 0% to 11%).

Online professional development. Following the online professional development, Mark's independent correct responses increased significantly (M = 90%, range 82% to 100%). His prompted correct responses decreased (M = 3%, range 0% to 12%), which is reflective of his receiving fewer prompts. Mark's independent incorrect responses decreased (M = 7%, range 0% to 12%).

Self-monitoring. When Tracy began self-monitoring, Mark's independent correct responses decreased slightly but remained steady (M = 88%, range 74% to 96%). He received

fewer prompts and, therefore, his prompted correct responses decreased (*M* = 2%, range 0% to 9%). Mark's independent incorrect responses increased slightly (*M* = 10%, range 4% to 21%).

Coaching. After Tracy received coaching, Mark's independent correct responses increased to a mean of 91%, consistent with past performance. His independent incorrect responses decreased, consistent with an increase in independent correct responding.

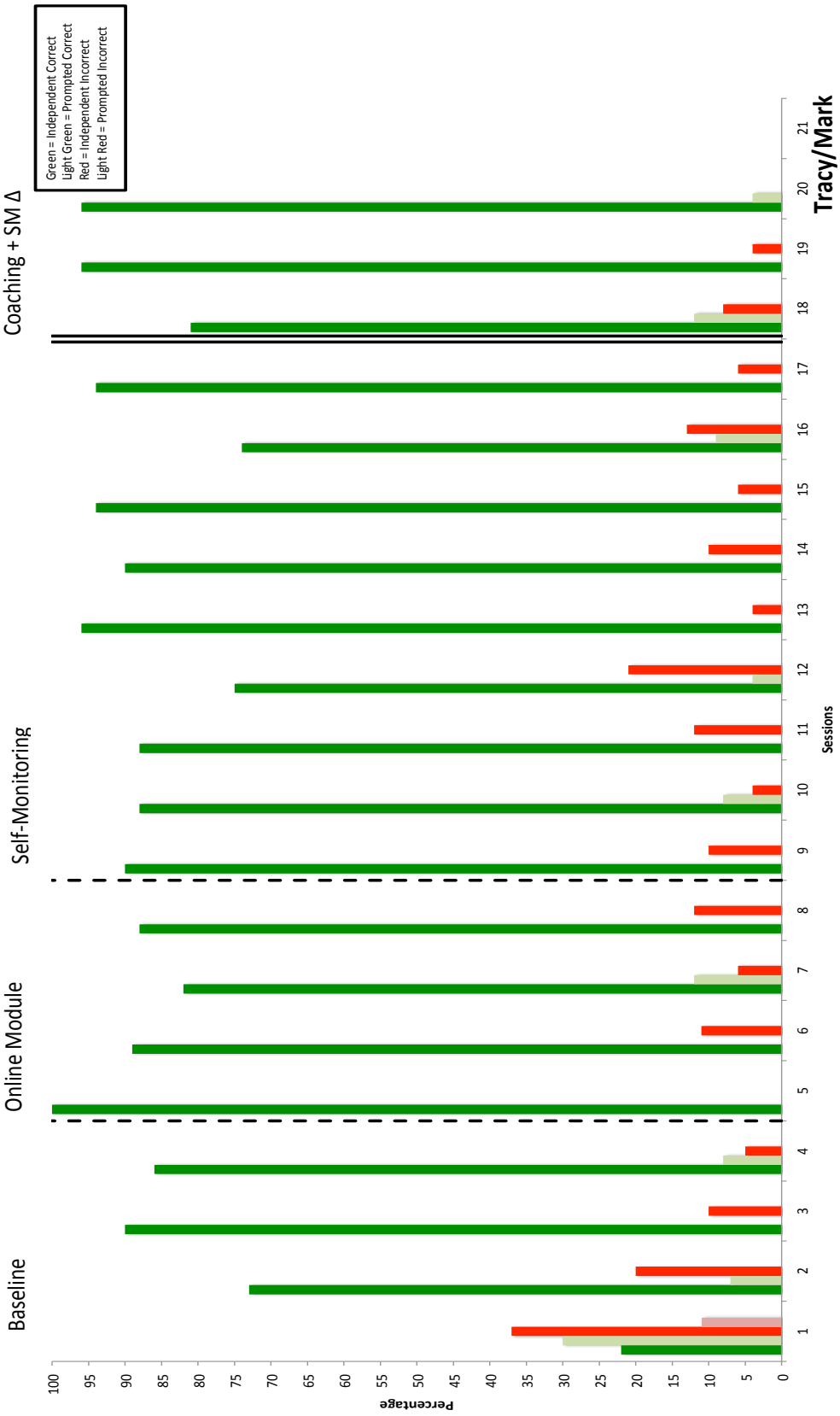


Figure 10 Student Responses for Tracy and Mark

Ellie and Samir. Figure 11 displays percentage of student responses across phases for Samir, the student Ellie worked with during study procedures. A summary of Samir's responses is displayed in Table 8.

Baseline. During baseline, Samir's independent correct responses were low (*M* = 12%, range 4% to 15%). His prompted correct responses were high (*M* = 63%, range 54% to 67%). Samir's prompted incorrect responses were low and only occurred in the final session in baseline (session 5, 4%). Instructions from Ellie resulted in no responses for Samir 17% of instructional time (range 14% to 21%).

Online professional development module. Following the online professional development module, Samir's independent correct responses increased substantially (*M* = 54%, range 27% to 100%), though remained variable due to a high initial data point (session 6, 100%). Samir's prompted correct responses decreased slightly (*M* = 35%, range 0% to 56%). His independent incorrect responses increased slightly (*M* = 4%, range 0% to 11%). For two data sessions, Samir received prompts that resulted in incorrect responses (session 7 and session 9). Instructions from Ellie resulted in no responses from Samir 6% of instructional time (range 0% to 16%), a decrease from baseline levels.

Self-monitoring. When Ellie began self-monitoring, Samir's independent correct responses initially increased (Session 13, 61%) but then showed a decreasing trend (*M* = 26%, range 7% to 61%). Samir received more prompts that resulted in correct responses (*M* = 56%, range 22% to 78%). Samir provided incorrect responses an average of 11% of the time (*M* = 11%, range 4% to 19%). For two data sessions during self-monitoring, Ellie provided instructions that resulted in no responses from Samir resulting in an average of 6% of the total instructions (range 0% to 13%).

Coaching. Following the coaching session, Samir's independent correct responding increased to a mean of 45%(range, 38% to 56%), which was similar to his prompted correct responding (*M* = 44%). Following coaching, Ellie did not provide any prompts that resulted in incorrect responding.

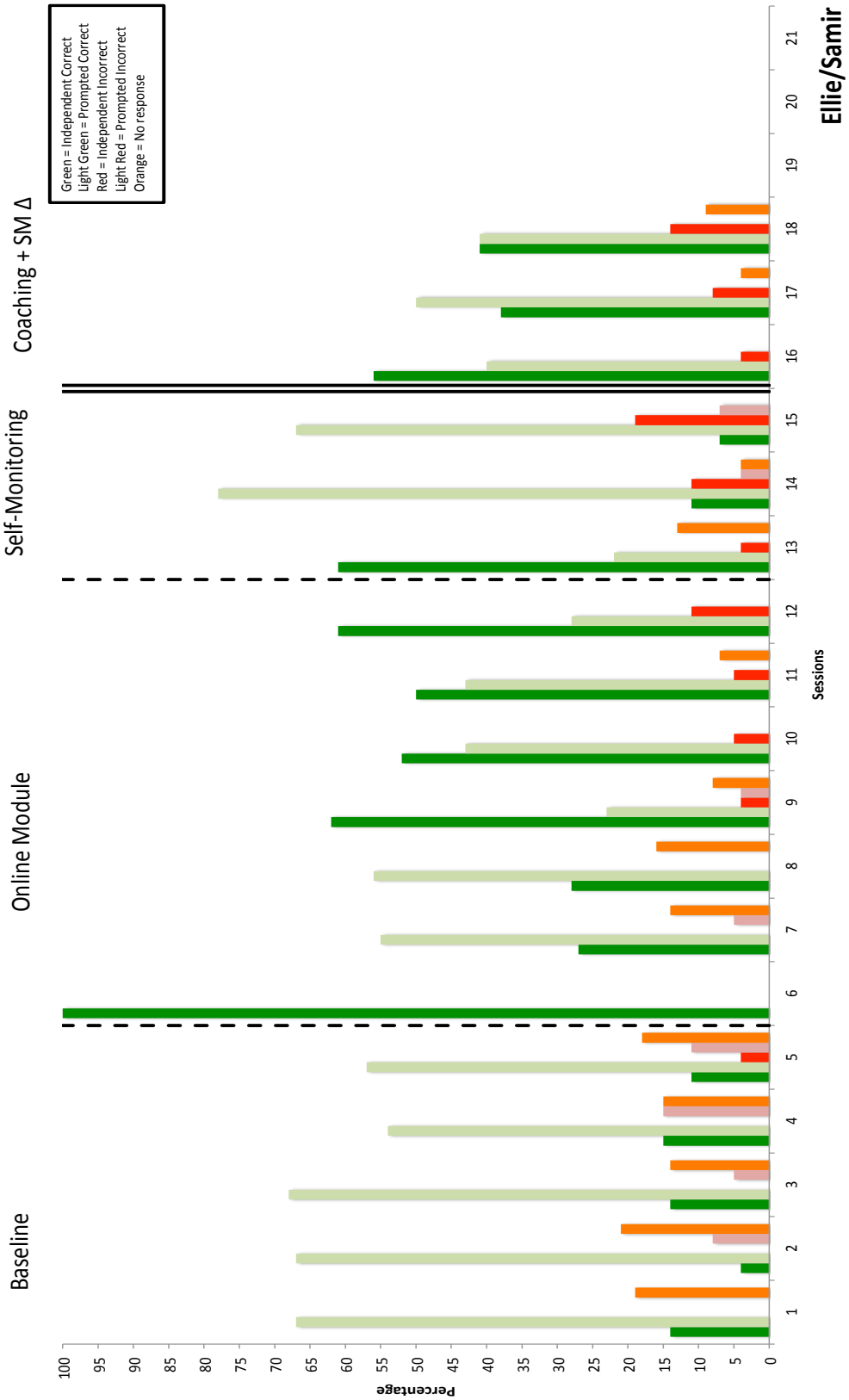


Figure 11 Student Responses for Ellie and Samir

Sara and Nick. Figure 12 displays percentage of student responses across phases for Nick, the student Sara worked with during study procedures. Table 8 displays a summary of the information provided below.

Baseline. Nick's independent correct responses were high and variable (*M* = 61%, range 22% to 92%) with a decreasing trend. His prompted correct responses were low (*M* = 23%, range 5% to 56%) with an increasing trend. Nick's independent incorrect responses were low (*M* = 7%, range 0% to 15%) with an increasing trend. Nick received prompts that resulted in incorrect responses an average of 8% of instructions (range 0% to 22%). On the average, 4% of instructions provided by Sara resulted in no response from Nick (range 0% to 22%).

Online professional development module. Following the online professional development module, Nick's independent correct responses decreased significantly (*M* = 35%, range 10% to 50%) with a decreasing trend. Nick received prompts that resulted in correct responding an average of 28% of instructional time (range 13% to 36%) with a decreasing trend. His independent incorrect responses increased slightly (*M* = 14%, range 7% to 25%) with an increasing trend. Nick received prompts that resulted in incorrect responses an average of 19% of instructional time (range 7% to 25%), an increase from baseline levels, with an increasing trend. On the average, 4% of instructions provided resulted in no response from Nick, a level equal to baseline levels (range 0% to 11%).

Self-monitoring. Nick's percentage of independent correct responses decreased (*M* = 22%, range 0% to 50%) when Sara began self-monitoring. His prompted correct responses also decreased (*M* = 7%, range 0% to 20%). Nick's percentage of independent incorrect responses was variable and increased (*M* = 21%, range 0% to 50%). Most significantly, Nick received prompts that resulted in incorrect responses an average of 48% of instructions (range 0% to

100%), with a spike at session 13 (100%) followed by a decreasing trend. No responses decreased to an average of 3% of instructions (range 0% to 10%).

Coaching 1. After one coaching session, Nick's percentage of independent correct responses was variable (*M* = 12%, range 0% to 42%) with a decreasing trend. His percentage of prompted correct responses increased (*M* = 30%, range 20% to 38%). Nick's independent incorrect responses were variable (*M* = 22%, range 3% to 26%). Again, Nick received prompts that resulted in incorrect responses an average of 45% of instructions (range 8% to 67%), similar to the self-monitoring phase. Percentage of no responses from Nick remained low (*M* = 3%, range 0% to 7%).

Coaching 2. After a second coaching session, Nick's percentage of independent correct responses increased substantially (*M* = 57%, range 50% to 63%) with an increasing trend. His percentage of prompted correct responses decreased (*M* = 21%, range 10% to 32%) with a decreasing trend. Nick's percentage of independent incorrect responses decreased (*M* = 16%, range 13% to 18%). Significantly, in this phase, Nick did not receive prompts that resulted in incorrect responses. His percentage of no responses was 7% and occurred in one data session (session 21).

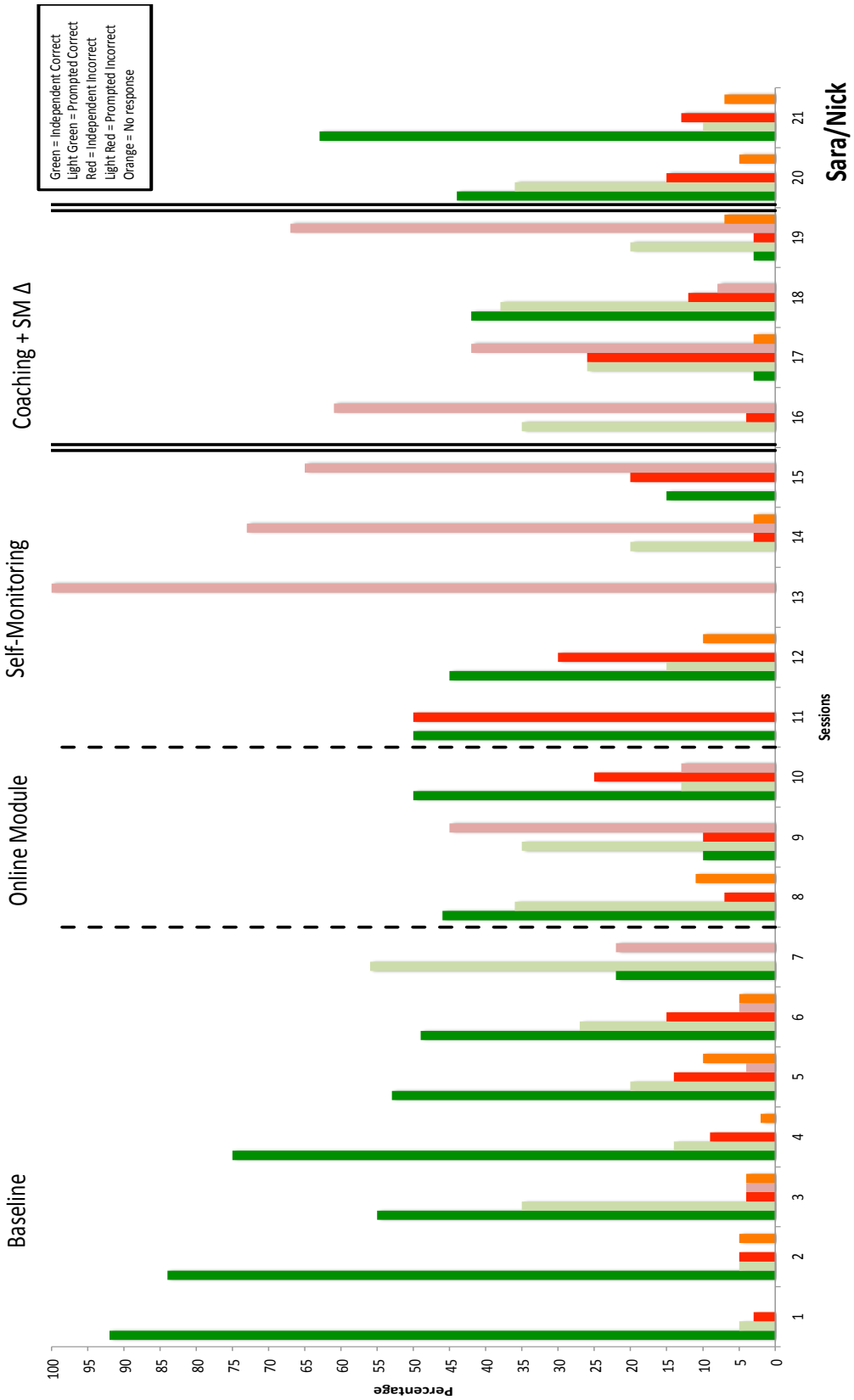


Figure 12 Student Responses for Sara and Nick

Social Validity

After the completion of all study procedures, each participant was asked to complete a survey (see Appendix F for social validity survey) assessing their experiences with and opinion of the intervention. Two of the three participants completed the social validity survey. Participants reported that their overall experience was "very good" (see Table 9). One participant commented that, "Although it seemed like it went on forever, it was also at the end of the year, when we are the busiest, wrapping things up for the year." For comfort level with being video recorded on a frequent basis, one participant commented, "I must admit, I was very nervous being video taped at the beginning since I have never been video taped before. By the end of the filming I didn't even realize or worry that I was being watched. This was a very big step for me!". Another participant stated, "After the first couple of days, I didn't even think about it. I liked the video feedback in the end, so any early anxiety was worth it." In response to being asked about the online module, one participant indicated that she was looking forward to having time to look at the other modules. Comments related to being asked what the most useful component of their experience in the professional development study highlighted that error correction (Participant 1) and being held accountable (Participant 2) were factors that impacted their experience. For components they found least useful, one participant indicated that all components were useful (Participant 1) while another indicated that the self-monitoring checklists were the least useful component for her (Participant 2). Participants were also asked to rate changes they may have seen in their own instruction. Participant 1 indicated she saw a little change in her own instruction. Participant 2 indicated she saw somewhat of a change in her instruction and commented, "Closing the loop… making sure that all components were there and not just part or some of the discrete trial training." In response to being asked about changes they

may have seen in their students' learning, one participant indicated she a little change (Participant 1) while another indicated she saw a lot of change (Participant 2), though she also commented, "I think he was getting tired of working with me. The trials were either too easy or too hard, the other children were busy doing interesting things, and I didn't make it enthusiastic enough with some wild and fancy reinforcers."

Question	Participant 1	Participant 2
How would you rate your overall experience participating in the professional development study?	Very good	Very good
How would you rate your comfort with being videotaped while providing instruction?	Very good	Good
How would you rate your experience with the online professional development module – Autism Internet Modules?	Very good	Good
How would you rate your experience with the self-monitoring checklist?	Good	Good
How would you rate your experience with coaching?	Very good	(No response)
What component or components did you find to be the MOST useful?	"Error corrections. I had an understanding of what DTT is, but the module really cleared some things up for me. I think that all instructors learning to work with DTT should watch the module. I felt it was so helpful!"	"The accountability part, knowing that I was going to be video-taped/observed, so I should have my act together. The video feedback was the best."
What component or components did you find to be the LEAST useful?	"NONE, it was all useful!"	"The checklist."
To what extent, if at all, did you notice a change in your own instructional practice and use of discrete trial training during the course of the study?	A little	Somewhat

To what extent, if at all, did you notice a change in your students' learning during the course of the study, specifically related to instruction you provided during discrete trial training sessions?	A little	A lot

Table 9 Social Validity Survey Results

CHAPTER 5

DISCUSSION

The purpose of this study was to utilize teacher and student outcome data to determine the effects of a model of professional development that provided a system of least to most intrusive forms of professional development. This system included first introducing an online module, considered a less intensive form professional development, followed by the use of a self-monitoring checklist, and, finally, by introducing coaching sessions, considered a more intensive form of professional development. In addition, this study sought to expand the literature by focusing on the professional development needs of early childhood special educators of students with moderate to severe disabilities in typical public school settings. Results were varied across each participant but indicated a relationship between number of DTT components implemented, closed LUs, and BSP and the professional development activities (i.e., online module, self-monitoring, coaching). In addition, teachers reported the activities were informative and valuable.

This chapter has been organized in seven sections to discuss the results of each professional development activity (i.e., online module, self-monitoring, coaching), student performance, and teacher measures, and to provide discussion on the issues around implementation science, limitations, and implications for practice. The chapter concludes with an overall summary of the discussion.

Professional Development Activities

Attempting to study the problem of implementation, the intervention package was developed using a variety of PD activities that are typically used in public schools: online

module, self-monitoring, and coaching. A discussion on each activity and the combination of activities will follow.

Online module. The online module consisted of an AIM on DTT, which incorporated active learning and interaction, two components of effective professional development. Following the online professional development, two participants, Ellie and Sara, increased their implementation of DTT and percentage of closed LUs. Ellie's implementation of DTT increased immediately following the online module and maintained implementation levels higher than her baseline across the sessions following the online module (i.e., 100% nonoverlapping data). Ellie's percentage of closed LUs also increased immediately, and dramatically, following the online module. In addition, Ellie's total praise statements increased dramatically following the online module and maintained levels higher than baseline. For Sara, an increase, though slight, occurred for both implementation of DTT and percentage of closed LUs following the online module. However, because there was an increasing trend in the data points leading toward the online module, it is difficult to draw conclusions about the effects of the online module on Sara's implementation and closed LUs. In addition, following the initial session after implementing the online module, there is a decline in her implementation and closed LUs. For Tracy, the online module had less of an impact on her implementation and percentage of closed LUs. This may be because, with the exception of the initial data point that may have been influenced by Tracy's lack of experience and initial discomfort with being video recorded, her implementation and closed LUs were already at high levels. Indeed, it may be that the slight increase in her implementation was due to a ceiling effect. Tracy did report anecdotally that she enjoyed

the online module and was looking forward to returning to the site to explore other modules.

The online module was intended to provide background information and models on using DTT in a classroom. Because of the varied training each participant had in DTT, it is possible this module was redundant to some and would not meet the needs of each educator. For instance, Sara had already participated in a district-based workshop on DTT that had incorporated active learning, including a presentation on content, relevant research, and opportunities to practice and receive feedback. For Sara, the online module may have been too similar to her past experiences and provided no further support in her implementation of DTT. The other participants, however, reported positive feedback on the module. It may be that these participants had not recently participated in a workshop on DTT and, therefore, the online module better served its purpose as an informative tool, or a booster for previous learning. For Ellie, who had not had training on DTT within the past several years but was exposed to DTT through her co-teacher, the online module may have better served as an active learning process. Indeed, Ellie reported after completing the module having a "light bulb coming on" after completing the module (she also described this as a "duh" moment) and she felt as though she had had a "refresher" on DTT. Ellie further reported that she had known all the skills she needed to implement DTT but the online module had allowed her to refocus on her areas of weakness in implementing DTT, which she identified as giving praise that was specific, and recognize what she was doing well. Tracy also reported the online module "filled in" some of the information she had not known about DTT, mostly the evidence behind the use of DTT, and refreshed her memory on error correction in the DTT context.

Because of the varied experience and training in DTT each participant had prior to the study, it is difficult to draw conclusions about the function of the online module on participant implementation, percentage of closed LUs, and praise statements. In addition, though participants were asked to submit pre and post assessment results, it was not possible to measure each participant's engagement with the module (i.e., time spent, number of sections completed). Results do demonstrate that the online module had a dramatic effect on the implementation and closed LU percentage for one participant, Ellie. Results are less clear for Tracy and Sara. Future research should considered participant background and determine the effectiveness of online modules based on previous experience with a variety of practices.

Self-monitoring. The self-monitoring activity was intended to provide an enhancement to the online module by including a follow-up component. Self-monitoring allows for individuals to monitor their own behavior and serve as a reminder to engage in certain behaviors. For example, in the study, the self-monitoring checklist was derived from the DTT implementation checklist and was intended to serve as a reminder to engage in behaviors associated with DTT, such as gaining the learner's attention, providing a clear instruction, and recording data.

Results on the effectiveness of self-monitoring varied across participants and across measurements (i.e., implementation components, percentage of closed LUs, praise statements). For Tracy, self-monitoring reduced some of the variability seen in the closed LU percentages during baseline and the online module as well as stabilized Tracy's DTT implementation. Self-monitoring did not have an affect on Tracy's praise statements and, in fact, appeared to decrease her total praise statements. However, her ratio of BSP remained

high. For Ellie, self-monitoring maintained her DTT implementation though had an effect that decreased her closed LUs. This is likely a result of the self-monitoring providing reminders for specific components of the implementation checklist but not specifically addressing closing LUs. Ellie's total praise statements also decreased during the self-monitoring phase, however, her ratio of BSP remained high. Initially, Sara's DTT implementation and percentage of closed LUs increased when self-monitoring was introduced. However, the increase was followed by an immediate decrease in closed LUs and a gradual decrease in DTT implementation.

Participant self-monitoring was not closely monitored by accuracy checks or by pre-determined check-ins. A lack of these types of checks may have reduced the fidelity with which this phase was implemented, causing a reduced effect on the self-monitoring phase in this study. However, the addition of fidelity checks would have increased the intensity of the self-monitoring phase. In addition, the self-monitoring checklist was changed after the coaching session as a result of participant feedback. This feedback may indicate that participants found the initial self-monitoring checklist to be unhelpful and were then less inclined to utilize the checklist. In commenting on behavior change, Skinner has stated that you cannot make someone do something he/she does not want to do (Skinner, 1953). For self-monitoring to be effective, an individual must desire a change in behavior. This study did not begin with a needs assessment and may, therefore, have lacked buy-in, despite the voluntary nature of the study (that is, all participants volunteered to participate in the study). Indeed, Fixsen and colleagues have stated that buy-in may, in fact, occur *after* implementation (Fixsen et al., 2013). If this is the case, then self-monitoring may have been positioned too early in the sequence of activities and may be more effective as a

maintenance component following more intensive forms of professional development. These conclusions are not supported by the results because a withdrawal of self-monitoring was not implemented, but may be addressed in future research. In addition, the self-monitoring checklist was modified following the coaching session, further impacting conclusions that can be drawn regarding the effects of the self-monitoring checklist.

Coaching. Following the online module and self-monitoring phases, coaching was introduced as a more intensive form of follow-up. The coaching phase was characterized by individualized coaching sessions for each participant, designed to address specific needs. Results demonstrate that coaching was effective for Ellie and Sara. For Ellie, conclusions are limited because of the limited number of sessions after coaching, however, the data immediately following coaching demonstrate an increase in closed LUs and a small increase with an increasing trend for DTT implementation. For Sara, who experienced two coaching sessions, the results demonstrate coaching had more effect on her DTT implementation and closed LUs than other phases. After the first coaching session, though there is variability in the data, there is a clear immediate effect on both her DTT implementation and closed LUs. After a decreasing trend in implementation components, Sara requested another coaching session where she requested more specific information on ways to impact her instruction. Following this second coaching, an increasing trend can be seen in both her closed LUs and DTT implementation. While this second coaching session was conducted similarly to the first and focused on similar topics (i.e., closing LUs, providing BSP), it also addressed decision-making on programming, which was not discussed in the first coaching session. That is, between the first and second coaching session, Sara began working on a different instructional program with Nick and noted that

the programming was not working well but did not change the programming until after the second coaching session. The guidance Sara received on instructional programming during this coaching session may have addressed concerns she had from the very beginning the study. Indeed, this effect highlights the need for professional development to include needs assessments to determine educator expectations and areas of need prior to beginning activities.

This study does demonstrate that even those who appear least in need may benefit from coaching. Because of Tracy's already high implementation and percentage of closed LUs, coaching did not have a significant impact on her instructional practice. However, Tracy had requested assistance with implementing another practice, a token system, in addition to DTT because of the impact it could have on her student's performance. This highlights the individualization of coaching and the need all educators may be experiencing – the need for assistance in other practices even if they show competency in implementing practices that are the focus of a professional development activity (or activities). Certainly, the addition of coaching for Tracy met her needs and her students by being "connected to and derived from [her] work with [her] student" (Darling-Hammond, 1995, p. 598).

Combination of activities. The results of the various professional development activities utilized in this study highlights the unique needs of individual teachers, even teachers who are providing instruction in similar settings, with similar students. These findings reiterate that a "one-size fits-all" professional development model may not be the most efficient or effective. Some educators may need more support and others less. Because of the additive effect of the research design, it is also possible that this effect is reflected in the data. That is, the effects seen in coaching for Sara and Ellie would not have

occurred had coaching not been proceeded by the online module and the self-monitoring. The implementation of the components was based on a progressive model, similar to the positive behavior supports framework (Car, Horner, Turnbull, Marquis, McLaughlin, McAtee et al., 1999) or response to intervention framework (National Center on Response to Intervention, 2013). Indeed, the elements of the study were designed to increase in intensity, with the assumption that a web-based professional development (i.e., online module) would be less intrusive than self-monitoring and self-monitoring would be less intrusive than coaching. As the various activities increased in intensity, one would "move up" the intensity of PD (see Figure 13) to receive more individualized supports. Indeed, this model of providing professional development may provide districts and administrators with a basis for planning professional development based on needs of individual educators. Educators who require a more intensive form of professional development in order to improve implementation of evidence-based practices may be provided opportunities to engage in self-monitoring strategies and/or professional learning communities designed to provide engagement and follow-up opportunities. If this strategy failed to increase implementation, coaching might be provided to improve educator implementation. Future research might explore feasible means for districts and administrators to determine levels of individualized professional development educators in their schools.

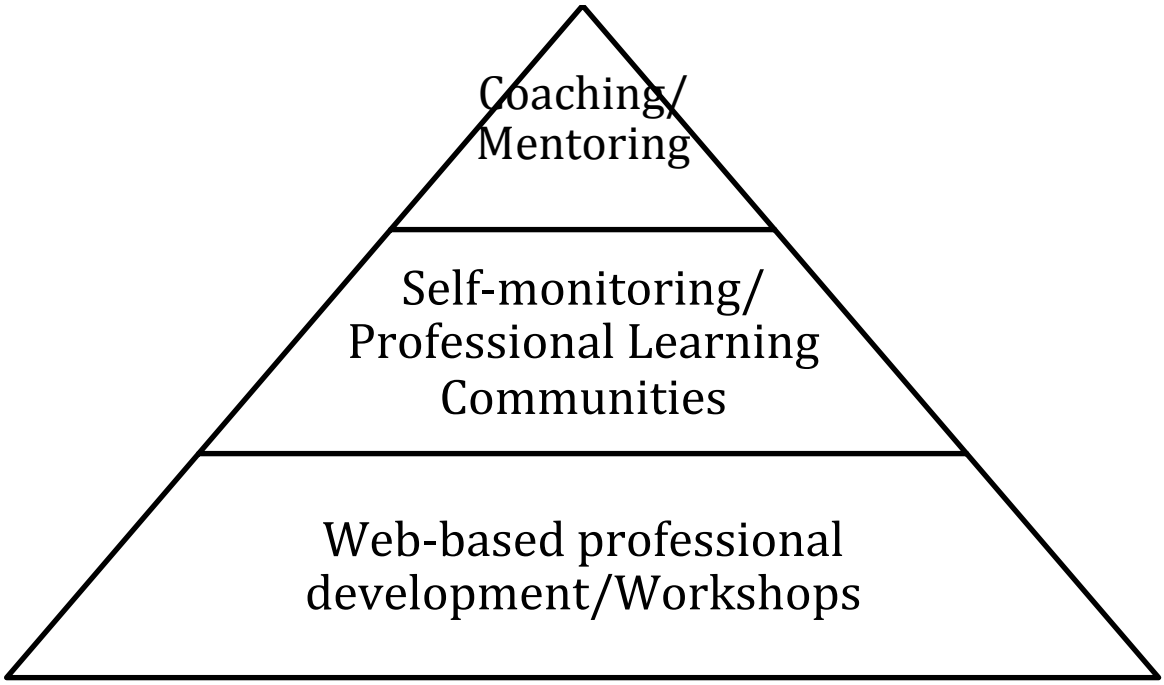
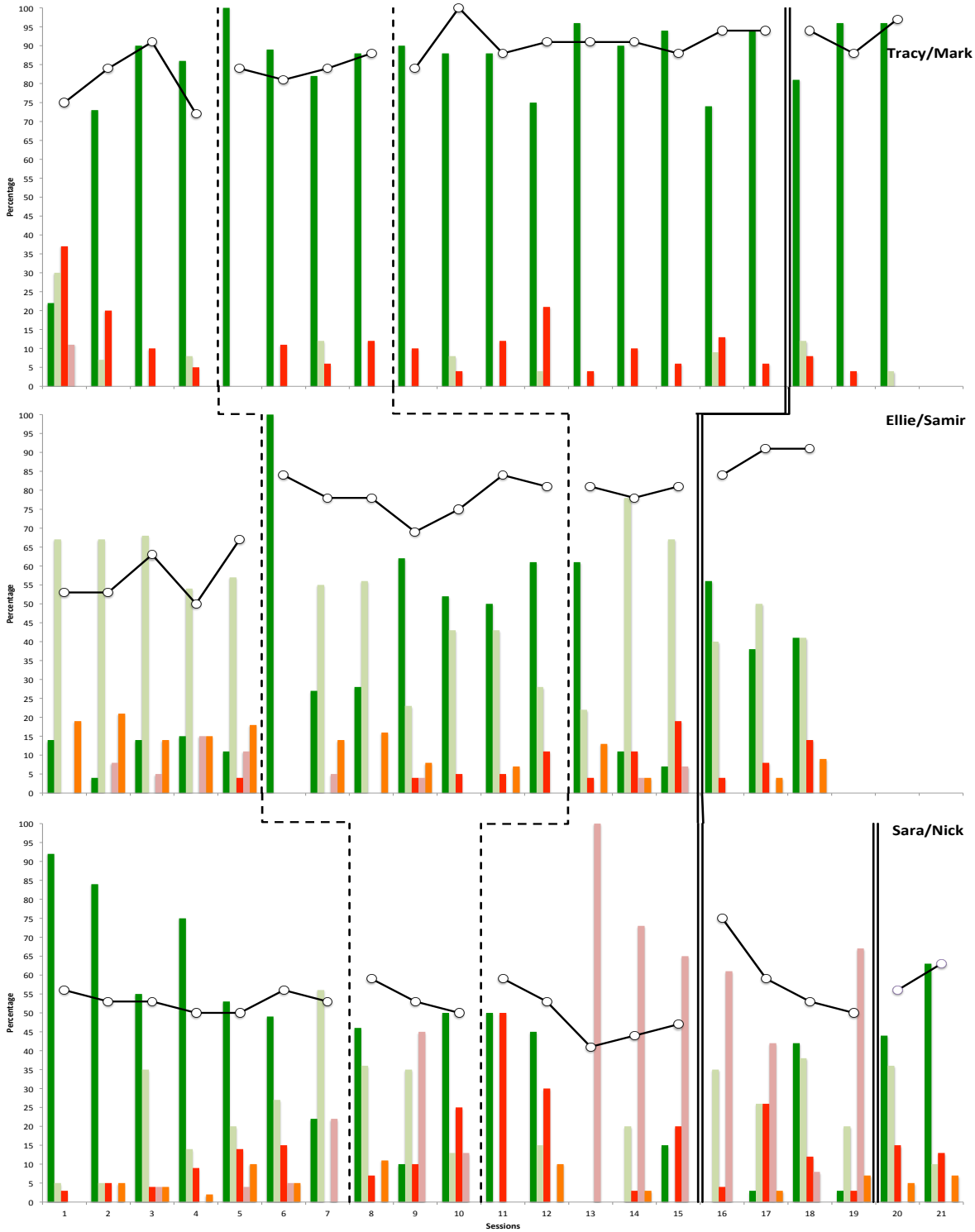


Figure 13 Individualization of professional development

Student Performance

Though there are limits to the conclusions on causality that can be drawn between teacher performance and student performance, a discussion on student performance is warranted and expands the literature on professional development by being a study that includes student performance data. In this study, it is interesting to note the apparent relationship between student performance and teacher implementation, closed LUs, and praise statements. In Figure 14, teacher implementation is overlaid with student performance. In this figure, we can see that there is a relationship between student performance and the percentage of DTT implementation from the teacher. In particular, the graph with Sara and Nick's data demonstrates this relationship clearly. In looking at session 13, one can see that Sara's low implementation correlates with Nick's high percentage of prompted incorrect data. In addition, session 6 for Ellie and Samir shows Ellie's high implementation correlates with Samir's high percentage of independent correct

data. Again, causality may be limited, particularly because the intervention was intended to target teacher performance not student performance, but, if the ultimate goal for professional development is to impact student outcomes by increasing teacher implementation of evidence-based practices, then this study may provide a first glimpse into possible methods of correlating teacher performance following professional development with student performance.



Open circles indicate teacher implementation components; Dark green – student independent correct; Light green – student prompted correct; Dark red – student independent incorrect; Light red – student prompted incorrect; Orange – student no response

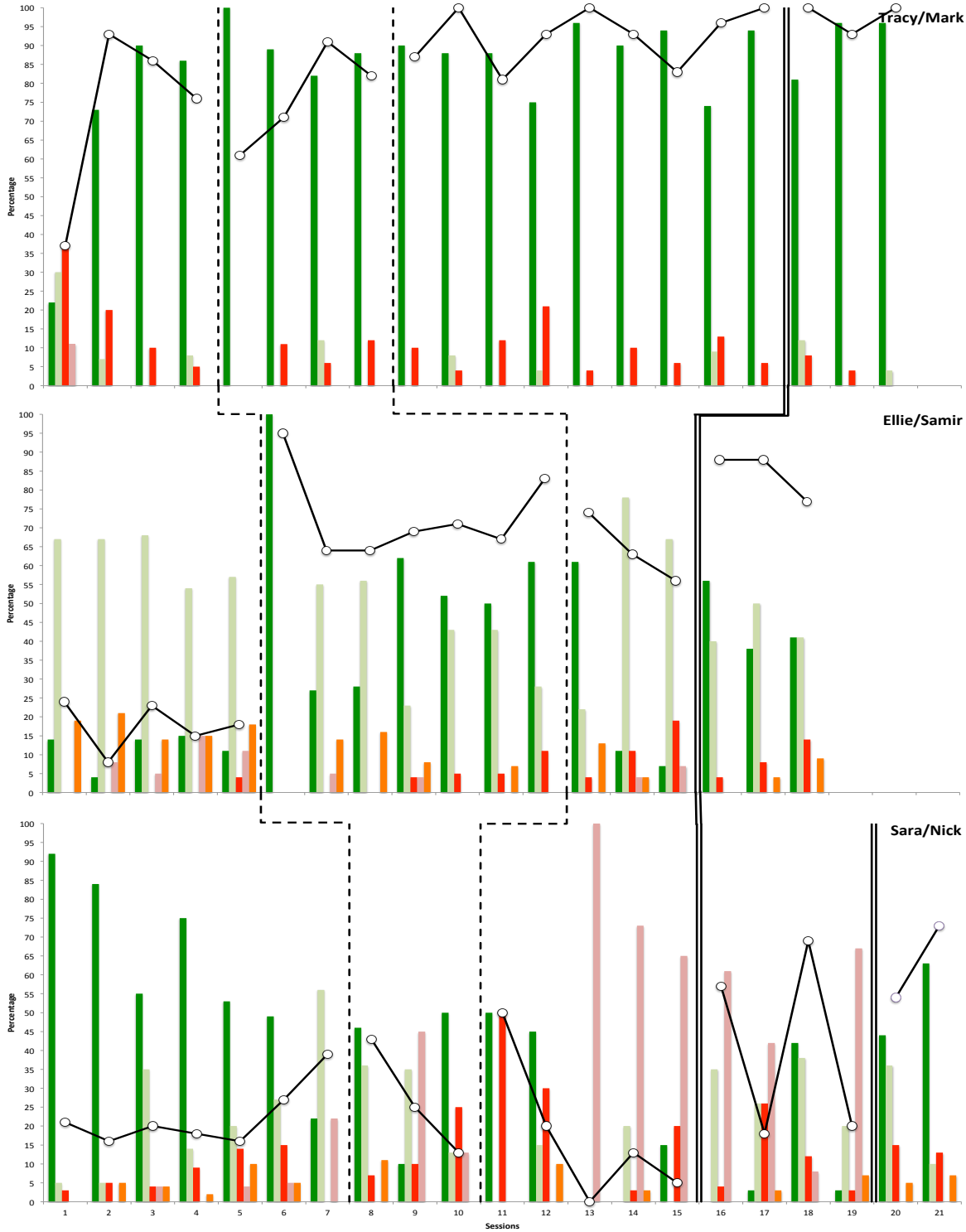
Figure 14 Student Data and Implementation Components – Open circles indicate teacher implementation components

Measures

Multiple measures were used in this study to investigate the effects of professional development activities on teacher implementation of DTT. These measures included percentage of implementation components, learn units (LUs), and praise statements. Each measure will be discussed in the following sections.

Implementation components. Lesson components or implementation components have previously been used to study fidelity of lesson delivery (Capizzi, Wehby, & Sandmel., 2010), therefore this study expands the use of implementation components to investigate fidelity of implementation and measure effects of an intervention on teacher performance. However, the implementation checklist utilized in this study has not been utilized in other studies and is therefore limited in validity. Future research should expand on the use of implementation checklists to measure the effects of professional development activities on teacher implementation of practices.

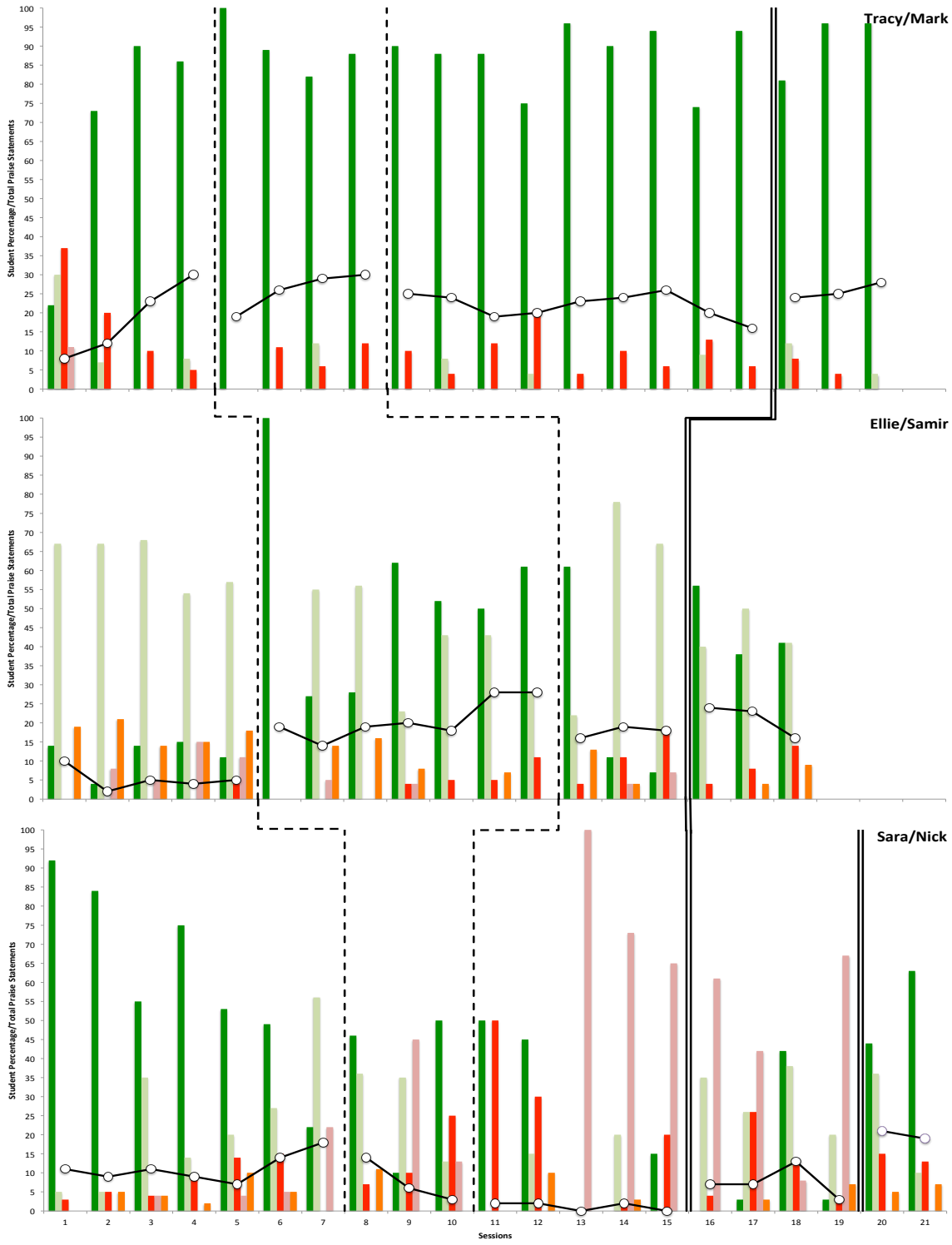
Learn units. LUs have been described as the "strongest predictor of student learning" (Greer & McDonough, 1999, p. 10). Indeed, data from this study does indicate that teacher percentage of closed LUs correlate with improved (i.e., independent correct) student performance (see Figure 15). However, it may be that more information is needed in order to make determinations about the correlation between teacher closed LUs and student performance. For instance, knowledge of the stage of learning (i.e., acquisition, fluency, maintenance) the student is currently in would assist in determining effectiveness of instruction being provided and expectations for student performance (i.e., in acquisition, one would expect more frequent prompts from the teacher).



Open circles indicate teacher closed LUs; Dark green – student independent correct; Light green – student prompted correct; Dark red – student independent incorrect; Light red – student prompted incorrect; Orange – student no response

Figure 15 Student Data and Closed LUs

Praise statements. In addition to measures on teacher implementation of DTT components and closed LUs, measures of their use of behavior-specific (BSP) and general praise (GP) statements were taken. The results were expressed as a total with a ratio between BSP and GP. Results for Tracy demonstrated that she already had high BSP use. For Ellie, after the online module, her total use of praise statements increased significantly. In addition, her ratio of BSP increased dramatically, indicating the online module and, again, the coaching session had an effect on her use of BSP. Sara's use of praise decreased over the online module and self-monitoring phases. For two sessions (sessions 13 and 15), Sara displayed zero praise statements. After coaching, however, Sara increased her use of praise statements. After the second coaching, specifically, Sara's BSP use increased significantly. In addition, there appears to be a relationship between total praise use and student performance data (see Figure 16), though conclusions may be limited. For example, Sara's total praise for sessions 13 and 15 were zero, which correlates with a high percentage of prompted incorrects for Nick. However, it cannot be determined if this effect on Nick's performance was related to low praise, low implementation, or near zero closed LUs.



Open circles indicate teacher total praise statements; Dark green – student independent correct; Light green – student prompted correct; Dark red – student independent incorrect; Light red – student prompted incorrect; Orange – student no response

Figure 16 Student Data and Total Praise Statements

Issues around Implementation Science

The link between being presented with a practice to be used in the classroom and the actual use of the practice everyday is an issue for implementation. The oft-cited "research-to-practice gap" has plagued the field of education for decades and continues to lead to the use of ineffective practices in classrooms today (Greenwood & Abbott, 2001). There is a clear need for supports that can increase the sustainability of instructional practices learned in a professional development as those practices are moved into everyday classroom use (Gersten, Chard, & Baker, 2000). Rather than continuing the professional development practice of transmitting knowledge to practitioners and "hoping for the best", implementation science allows for the examination of specific components that can be used to enhance professional development and, thereby, improve implementation outcomes. As Odom has stated, "The tie that binds [evidence-based practices] to positive outcomes for children… is implementation in classrooms" (2008, p. 7). Professional development without measures on implementation cannot, and will not, lead to improvements in student outcomes.

This study provided an investigation into the effect of different professional development activities on the implementation of a specific practice, discrete trial training. In this way, professional development was linked directly to its impact on classroom practice. This study adds to literature on professional development that has begun to link the professional development activities to observable changes in classroom practices (i.e., Kohler et al., 1999; Kretlow et al., 2012; McCutchen et al., 2002; Morgan et al., 1994; Peck et al., 1989; Scheeler et al., 2010; van Vonderen et al., 2010), moving beyond self-report measures.

Limitations

Several limitations in this study are important to discuss. First, each teacher began the study with varied training and experience with DTT. Sara had experienced a district-based workshop on DTT facilitated by a doctoral-level consultant as well as training from a district-based autism specialist. However, Sara reported that she had not incorporated DTT into her daily routine prior to beginning study procedures. Tracy had been trained by the lead classroom teacher on the implementation of DTT and was used to using DTT on a daily basis, though for the study she had chosen to work with a student she was unfamiliar with. In addition, Tracy demonstrated high implementation across the study, with the exception of two low data points (session 1 and session 5). Ellie had received information on DTT through previous coursework and from her co-teacher (the lead teacher in Tracy's classroom). However, she reported that she had not been implementing DTT in her classroom and was "rusty" in its use. The participants in this study do represent the range of professional development experiences and needs experienced by educators. This dilemma, finding meaningful and relevant professional development for teachers with varied experiences, is an everyday challenged faced by those in charge of planning professional development in school districts.

Second, the coach and the researcher were the same individual, likely a factor affecting both the coaching phases and the interactions between the participants and the researcher. Additionally, the researcher/coach likely spent much more time examining (i.e., watching and coding videos) than a typical coach would. The coach as researcher, however, is not foreign to the literature on coaching. As mentioned in Chapter 2, in studies by Kretlow and colleagues (Kretlow et al., 2011; Kretlow et al., 2012), Kretlow acts as

researcher and coach, and in other studies (i.e., Browder et al., 2007; Duffy et al., 1986; Filcheck et al., 2004; Fox et al., 2011; Goodman et al., 2008; Jager et al., 2002) researchers have served as coaches.

Third, the study procedures occurred in the final 3 months of the school year, when teachers may have less interest in professional development. Indeed, setting events, including time of year, were unaccounted for in the study. For both teachers and students, setting events may have an influence on behavior during instruction. For teachers, other responsibilities, having new students join the class, and personal events may influence instructional behaviors. For students, difficulty in transitioning from one activity to another, not having enough sleep the night before, and not eating breakfast/lunch may influence responses during instruction.

Finally, it is important to remember that the study procedures allowed for only a snapshot of each teacher's instructional practices. That is, each teacher utilized practices beyond DTT in their every day instruction and this study is a representation only of their skills in implementing DTT during one 10-minute instructional portion of their daily routine.

Implications for Practice

Results from this study combined with the body of literature on professional development demonstrated the positive effects of an increasing levels of support professional development for two participants. These results combined with the recommendations of the review of professional development by Yoon et al. (2007) and the NCLB (2001) requirements for high-quality professional development suggest that when

designing professional development, a multi-level training model that includes opportunities to engage in active learning and follow-up should be included.

Teachers with prior experience using DTT may benefit more from individualized professional development. In this study, the teacher who had most recently participated in a workshop on DTT showed the greatest improvement in DTT implementation, closed LUs, and use of praise statements after coaching (see Figures 14, 15, & 16). Although these results are not causal in nature, they suggest that more intensive professional development may be helpful in getting teachers to implement components of DTT if prior professional development activities have not already increased implementation.

Summary

In summary, this study demonstrated the effects of a multi-element professional development to increase special educator implementation of an evidence-based practice (i.e., DTT). The online module may be one way of giving critical information to teachers in a way that is feasible, cost-effective, accessible, and appealing to educators. Results from this study may offer insight into one way of close the research-to-practice gap using professional development.

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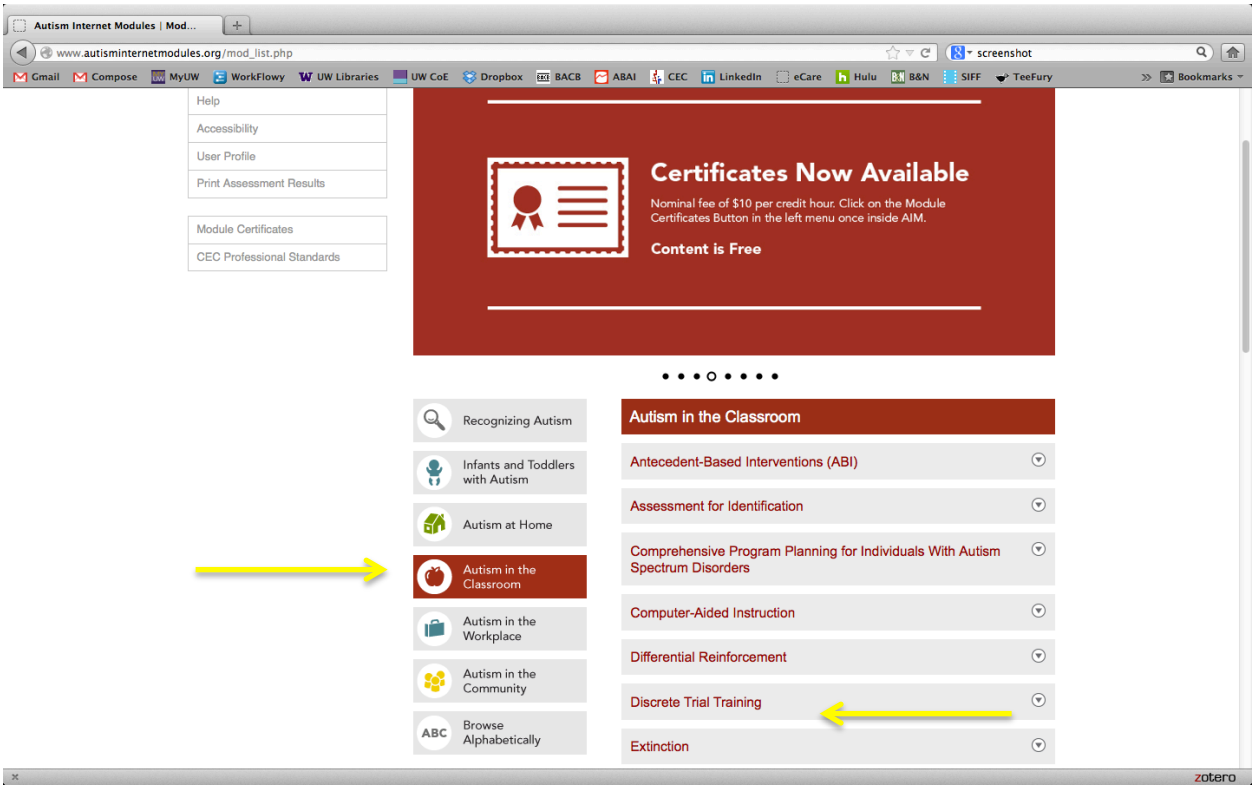
Appendix A: Directions for Online Module

Online Professional Development Module

For the online professional development, you will access the Autism Internet Modules (AIM). The link to AIM is provided here: http://www.autisminternetmodules.org/

You will need to create a login to use the modules. It is **free** and the login allows you to save your pre/post assessments and print them out at a later time.

The Autism Internet Modules provides a wide-variety of modules related to autism; we will focus on the "Discrete Trial Training" module found under "Autism in the Classroom".



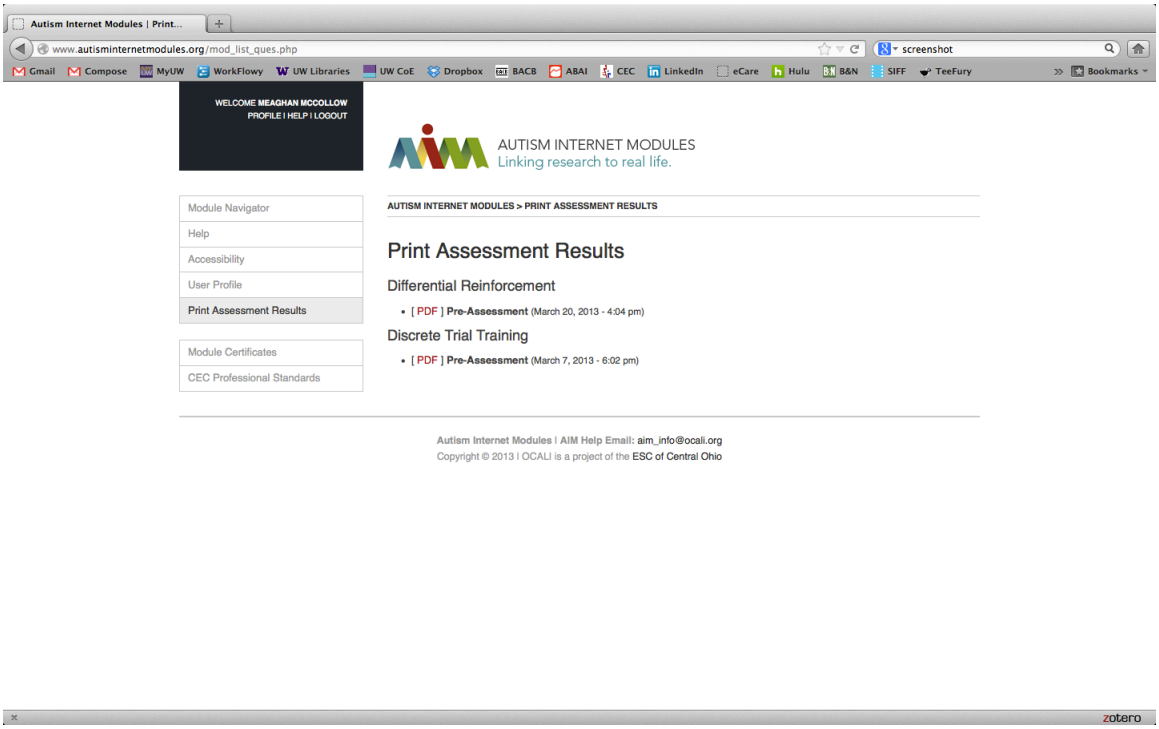
Software Requirements

You must have access to a computer with an up-to-date browser (i.e., Firefox, Internet Explorer, Google Chrome, Safari, etc.) and an Internet connection. Downloading resources requires Adobe Reader. The website provides a link to download Adobe Reader for your specific computer.

Completing the Module

You can complete the module at your own pace, reading and watching videos when it is most convenient for you. I would ask that it not be longer than 5 days after you have received this information in order to keep on schedule with the study.

Pre- and Post-Assessments are completed as part of the module and then saved in your account as PDFs. Once you have completed an assessment, you can find it under your "Profile" and "Print Assessment Results". Assessments can be downloaded as PDFs and then sent to me via email.



Please send me your completed Pre- and Post-Assessments once you are finished with the module.

We will then resume recording DTT in your classroom for a few days before beginning the self-monitoring.

If you have any questions, please let me know:

Phone: 206[redacted]
Email: meaghm@uw.edu

Thank you! ☺

Appendix B: Self-Monitoring Checklists

Tracy's and Ellie's Self-Monitoring Checklist

Date:

Did I….	**Yes**	**Sometimes**	**No**
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Provide a clear correction for any incorrect student responses?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Date:

Did I….	**Yes**	**Sometimes**	**No**
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Provide a clear correction for any incorrect student responses?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Date:

Did I….	**Yes**	**Sometimes**	**No**
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Provide a clear correction for any incorrect student responses?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Date:

Did I….	**Yes**	**Sometimes**	**No**
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Provide a clear correction for any incorrect student responses?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Sara's Self-Monitoring Checklist

Date:

Did I….	**Yes**	**Sometimes**	**No**
Give my student a choice of reinforcers?			
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Date:

Did I….	**Yes**	**Sometimes**	**No**
Give my student a choice of reinforcers?			
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Date:

Did I….	**Yes**	**Sometimes**	**No**
Give my student a choice of reinforcers?			
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Date:

Did I….	**Yes**	**Sometimes**	**No**
Give my student a choice of reinforcers?			
Get my student's attention before giving the instruction?			
Give a clear instruction for each trial?			
Give behavior-specific praise with the reinforcer?			
Record data for each trial?			

Notes to myself:

Tracy's and Ellie's Revised Self-Monitoring Checklist

Date:

Did I….	**Rating**				
Get my student's attention before giving the instruction?	**1**	**2**	**3**	**4**	**5**
Give a clear instruction for each trial?	**1**	**2**	**3**	**4**	**5**
Provide a clear correction for any incorrect student responses?	**1**	**2**	**3**	**4**	**5**
Give behavior-specific praise with the reinforcer?	**1**	**2**	**3**	**4**	**5**
Record data for each trial?	**1**	**2**	**3**	**4**	**5**

Notes:

Date:

Did I….	**Rating**				
Get my student's attention before giving the instruction?	**1**	**2**	**3**	**4**	**5**
Give a clear instruction for each trial?	**1**	**2**	**3**	**4**	**5**
Provide a clear correction for any incorrect student responses?	**1**	**2**	**3**	**4**	**5**
Give behavior-specific praise with the reinforcer?	**1**	**2**	**3**	**4**	**5**
Record data for each trial?	**1**	**2**	**3**	**4**	**5**

Notes:

Date:

Did I….	**Rating**				
Get my student's attention before giving the instruction?	**1**	**2**	**3**	**4**	**5**
Give a clear instruction for each trial?	**1**	**2**	**3**	**4**	**5**
Provide a clear correction for any incorrect student responses?	**1**	**2**	**3**	**4**	**5**
Give behavior-specific praise with the reinforcer?	**1**	**2**	**3**	**4**	**5**
Record data for each trial?	**1**	**2**	**3**	**4**	**5**

Notes:

Date:

Did I….	**Rating**				
Get my student's attention before giving the instruction?	**1**	**2**	**3**	**4**	**5**
Give a clear instruction for each trial?	**1**	**2**	**3**	**4**	**5**
Provide a clear correction for any incorrect student responses?	**1**	**2**	**3**	**4**	**5**
Give behavior-specific praise with the reinforcer?	**1**	**2**	**3**	**4**	**5**
Record data for each trial?	**1**	**2**	**3**	**4**	**5**

Notes:

Sara's Revised Self-Monitoring Checklist

Date:

Did I….	**Rating**				
Give my student a choice of reinforcers?	**1**	**2**	**3**	**4**	**5**
Get my student's attention before giving the instruction?	**1**	**2**	**3**	**4**	**5**
Give a clear instruction for each trial?	**1**	**2**	**3**	**4**	**5**
Give behavior-specific praise with the reinforcer?	**1**	**2**	**3**	**4**	**5**
Record data for each trial?	**1**	**2**	**3**	**4**	**5**

Notes:

Date:

Did I….	**Rating**				
Give my student a choice of reinforcers?	**1**	**2**	**3**	**4**	**5**
Get my student's attention before giving the instruction?	**1**	**2**	**3**	**4**	**5**
Give a clear instruction for each trial?	**1**	**2**	**3**	**4**	**5**
Give behavior-specific praise with the reinforcer?	**1**	**2**	**3**	**4**	**5**
Record data for each trial?	**1**	**2**	**3**	**4**	**5**

Notes:

Date:

Did I….	**Rating**				
Give my student a choice of reinforcers?	**1**	**2**	**3**	**4**	**5**
Get my student's attention before giving the instruction?	**1**	**2**	**3**	**4**	**5**
Give a clear instruction for each trial?	**1**	**2**	**3**	**4**	**5**
Give behavior-specific praise with the reinforcer?	**1**	**2**	**3**	**4**	**5**
Record data for each trial?	**1**	**2**	**3**	**4**	**5**

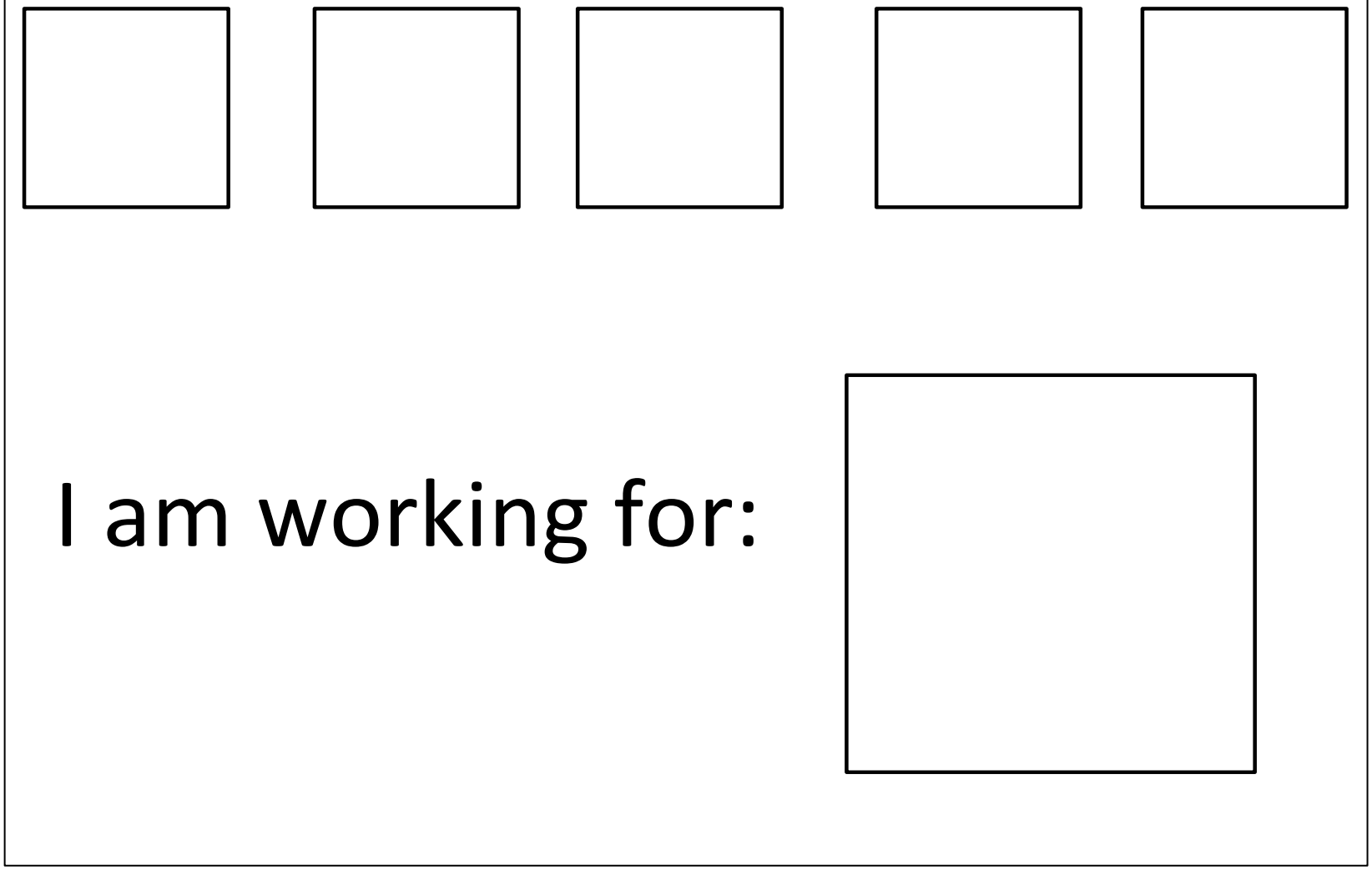
Notes:

Date:

Did I….	**Rating**				
Give my student a choice of reinforcers?	**1**	**2**	**3**	**4**	**5**
Get my student's attention before giving the instruction?	**1**	**2**	**3**	**4**	**5**
Give a clear instruction for each trial?	**1**	**2**	**3**	**4**	**5**
Give behavior-specific praise with the reinforcer?	**1**	**2**	**3**	**4**	**5**
Record data for each trial?	**1**	**2**	**3**	**4**	**5**

Notes:

Appendix C: Token Board



Appendix D: Implementation Checklist

Special Educator: _____ Date of Observation: _____

Observer: _____

	Discrete Trial Training (DTT) Implementation Checklist			
1	All materials ready	0	1	2
2	Instruction is provided in an appropriate area	0	1	2
3	Gain the learner's attention	0	1	2
4	Learner is positioned to maximize learning	0	1	2
5	Provide a clear stimulus or instruction	0	1	2
6	If learner responds appropriately: Reinforcer is delivered	0	1	2
7	If learner does not respond or responds incorrectly, one of the following occurs: a) Prompt is given so learner responds correctly and reinforcer is given, or b) Corrective feedback is given and trial is restarted	0	1	2
8	Prompts result in correct responding	0	1	2
9	Reinforcer is delivered with behavior-specific praise	0	1	2
10	Size of reinforcer is appropriate (not too big/small)	0	1	2
11	Reinforcement given contingently	0	1	2
12	Reinforcement given immediately (within 3 seconds) after response	0	1	2
13	Intertrial Interval of 3-5 seconds	0	1	2
14	Learner is provided information on length of instruction/when he/she will be finished	0	1	2
15	Instruction is provided in the same way for each trial	0		2
16	Evidence that data is systematically collected on the trials	0	1	2
	Total:			
	Percentage [(total/32)x100**]:**			

0 = not implemented
1 = implemented some of the time or partially
2 = implemented all the time

Appendix E: Coding Manual

Coding Manual

Instructional Behavior Coding

Percentage

- I will be calculating percentage of closed/open learn units, percentage of behavior-specifc and general praise, and percentage of implementation components
- To calculate percentage of CLOSED LEARN UNITS:
  - Total Closed Learn Units DIVIDED BY Total Teacher Instruction X 100
- To calculate percentage of OPEN LEARN UNITS:
  - Total Open Learn Units DIVIDED BY Total Teacher Instruction X 100
- To calculate percentage of PRAISE STATEMENTS:
  - Behavior-Specific:
    - Total Behavior-Specific DIVIDED BY Total number of praise statements X 100
  - General Praise
    - Total General Praise DIVIDED BY Total number of praise statements X 100
- To calculate percentage of IMPLEMENTATION COMPONENTS
  - Follow directions on Implementation Checklist coding form

Discrete Trial Training Coding Form

Teacher Instruction

- ***Correct***
  - Clear instruction provided by teacher
  - Could be verbal or gestural but the instruction must be clear for the student
  - Related to instruction or instructional behavior
    - Verbal examples include:
      - "What is this?"
      - "Match"
      - "Show me how"
      - "Put the X in the Y"
      - "Give me X"
    - Gestural examples include:
      - Pointing to where a student needs to write
      - Pointing to an object and expecting student to identify object
- ***Error***
  - Unclear instruction
  - For example:
    - Student is not ready

        - Student is not looking at teacher
        - Redelivery of instruction before student has responded
            - This does not include prompts that might be given
            - This does include repetition of the same instruction (repetition of the same instruction counts as the beginning of another instruction)
        - Teacher places objects in front of student without a clear direction
- **Ignore nonacademic directions** not related to curriculum (unless the goal of the instruction is to respond to directions)
    - For example:
        - "Look at me"
        - "Ready hands"
        - "Sit down"
        - Requests to get materials out

Student Response

- ***Correct***
    - Student responds correctly to teacher instruction
- ***Incorrect***
    - Student response is an incorrect answer to question/mand
    - Incorrect answers or responses might include:
        - Matching colors/letters/words/pictures incorrectly
        - Responding incorrectly to a question asked
    - Includes responses unrelated to the teacher instruction
        - For example:
            - Asking, "Break, please"
            - Playing with an object close by
            - Holding materials (i.e., card to match, pencil) but not providing a response
- ***No response***
    - Student does not provide a response
    - Student engages in another behavior, i.e., falling out of chair, getting up from seat
    - This may occur when teacher repeats an instruction before a student responds

Note regarding student responses:
A student response that did not result from a teacher instruction is not to be recorded. This would indicate that the teacher has not established stimulus control over the student response and, therefore, is not considered a discrete trial.

Teacher Consequence

- ***Reinforcement***
    - Verbal praise and/or tangible/edible given <u>following</u> correct student response
    - Examples:
        - High-five

        - Access to a toy
        - Edible – fruit snack, M&M, pretzel, etc
- ***Correction***
    - Specific correction given following incorrect student response that directs student to correct response; can be verbal or gestural
    - Examples:
        - When student is given direction to point to green and student points to red, teacher may respond "this is green" and point to green
        - When student is given direction to match the trucks and student puts a truck with an apple, teacher may respond "this is a truck" and match the pictures
- ***Error***
    - Reinforcement not given for correct student response
    - Correction not given for incorrect student response
        - Includes redelivering instruction without providing student with corrective feedback
    - IN GENERAL, for any consequence, it must be AUDIBLE to the student
        - If the consequence is difficult for you to hear, it is likely unheard by the student and should be counted as an "error"
    - Nonspecific correction procedure used after incorrect student response
        - Examples:
            - "Try again"
            - "That's not right"

Some Coding rules:

- If a teacher provides a non-specific correction (i.e., "Try again) and **5 seconds or more** pass before a specific correction procedure, the Teacher Consequence should be coded as an "error" and the next instruction begins a new trial
    - For example:
        - Teacher: "Match"
        - Student places card on a non-matching card
        - Teacher: "Try again" [7 seconds pass] "This is an X, <u>match X</u>"
    - Code as:
        - Teacher Instruction: +
        - Student Response: -
        - Teacher Consequence: -
        - Teacher Instruction: + ("…match X")

Teacher Praise

- Record instances of teacher praise
    - Praise may be delivered AS the reinforcer or WITH the reinforcer
    - Praise may also be delivered with a correction, for example:
        - "Good try, this is green"
    - Two types of praise may be used: behavior-specific and general

    - Praise statements need to be audible to the student – if it is difficult for you to hear the praise statement, it is likely the praise statement was not heard by the student
- ***Behavior-specific praise***
    - Following student correct response, teacher gives praise that includes description of the behavior
    - Examples:
        - "Nice job pointing to red"
        - "Good work matching the trucks"
        - "You wrote an 'M', nice work"
- ***General praise***
    - Praise given by teacher that does not refer to the student's behavior
    - Examples:
        - "Thank you"
        - "Good job"
        - "Nice work"
        - "yay"
- Non-praise examples include:
    - "Okay"

Open/Closed Learn Unit

- After coding the video, you will check for closed and open learn units
- A Learn Unit consists of:
    - Teacher instruction
    - Student Response
    - Teacher Consequence
- A Learn Unit is **CLOSED** if:
    - All 3 components are present AND
    - Teacher Consequence is either REINFORCEMENT or CORRECTION
- A Learn Unit is **OPEN** if:
    - Teacher instruction was coded as an ERROR; OR
    - Teacher consequence was coded as an ERROR

Implementation Checklists

Discrete Trial Training (DTT) Checklist

- *All materials ready (in close proximity, easy access during instruction, prepared for instruction to reduce wait time for student)*
    - This component is looking for the preparedness of the teacher to provide instruction. This includes having materials close at hand and ready for the DTT to begin.
    - Examples:
        - Materials are prepared and ready to go for trials
        - Materials are easily accessible to instructor and student
    - Non-examples:
        - Teacher must shuffle through cards to find ones for instruction
        - Materials are too far away
        - Materials are not ready
        - Materials are not accessible to student – too far away, out of sight-line

- *Instruction is provided in an appropriate area – away from distractions, seating arrangement fits student, student is able to access materials*
    - This component is looking for the instruction to be occurring in an appropriate space – one that provides little or no distraction for the student and the teacher. This also includes how the student and teacher are positioned.
    - Examples:
        - Instruction is occurring in an area that is receiving little or no "traffic" (such as other students or staff walking by, other students sitting close-by)
        - Student is seated at a desk that is the appropriate size
        - Teacher is seated in an appropriate position for providing instruction
    - Non-examples:
        - Student is seated at a desk that is too small or too big
        - Student is seated too far away from desk, if desk is needed for instruction
        - Teacher is seated so that he/she cannot provide appropriate prompts or corrections

- *Gain the learner's attention*
    - Examples:
        - Teacher provides a direction such as, "Look at the card", to prepare student for start of instruction
        - Teacher provides a brief description of instruction that is about to occur
            - For example: "We are going to count now"
        - Teacher provides a gesture, such as tapping on the table, to gain student's attention

- *Provide a clear stimulus or instruction*
    - This component is looking for clarity in the teacher instruction

- *If learner responds appropriately: Reinforcer is delivered*
    - Reinforcer might be an edible, tangible, or praise

- *If learner does not respond or responds incorrectly, on of the following occurs: Prompt is given so learner responds correctly and reinforcer is given, or Corrective feedback is given and trial is restarted*
    - Does the teacher provide a prompt that allows the student to respond correctly?
    - Does the teacher provide feedback that specifically corrects the student response?

- *All prompts result in correct responding*
    - When the teacher delivers a prompt (occurs BEFORE the student response), does it result in a correct student response?

- *Reinforcer is delivered with behavior-specific praise*
    - Does the teacher provide praise that specifically identifies the student behavior?

- *Size of reinforcer is appropriate (not too big/small)*
    - Is the size of the reinforcer appropriate for the behavior?
    - Examples of too big:
        - Student receives a whole cookie, a whole chip
        - Student receives a 5 minute break after completing 3 trials
        - Student receives access to a toy for 5 minutes after completing 4 trials
    - Examples of too small:
        - Student receives praise in the form of "Yay" after 7 correct responses
    - Examples of "just right":
        - Access to preferred toy for 1-2 minutes after 2+ trials
        - Behavior-specific praise after a correct response
        - High-five + BSP after a correct response

- *Reinforcement given contingently*
    - When reinforcement is given, is it given after a correct response? Is it given only after a correct response?
    - Are there instances when reinforcement is given non-contingently? (i.e., goldfish given without being contingent on a specific behavior)

- *Reinforcement given immediately (within 3 seconds) after response*

- *Intertrial Interval of 3-5 seconds*

    - This component is looking at within tasks, i.e., if the teacher has the student engage in more than one task, do not look at between task trials for responding to this component
    - This component is addressing pacing of the instruction

- *Instruction is provided in the same way for each trial*
    - This component is dichotomous – either a "0" or "2" will be scored for this component
        - Either instruction is provided in the same way or it is not
    - Is the teacher consistent across all trials?
    - Is there any ambiguity across similar tasks?

- *Evidence that data is systematically collected on the trials*
    - Is a data sheet visible?
    - Does the teacher use the data sheet frequently to record data?
    - Just having a data sheet visible does not mean there is evidence that data is being systematically collected, there must also be evidence that the teacher is using the data sheet to record trials frequently
    - If data is collected only sporadically or infrequently – partially implemented

Appendix F: Social Validity Survey

1. How would you rate your overall experience participating in the professional development study?
    a. Very poor
    b. Poor
    c. Fair
    d. Good
    e. Very good

Comments:

2. How would you rate your comfort with being videotaped while providing instruction?
    a. Very poor
    b. Poor
    c. Fair
    d. Good
    e. Very good

Comments:

3. How would you rate your experience with the online professional development module – Autism Internet Modules?
    a. Very poor
    b. Poor
    c. Fair
    d. Good
    e. Very good

Comments:

4. How would you rate your experience with the self-monitoring checklist?
    a. N/A
    b. Very poor
    c. Poor
    d. Fair
    e. Good
    f. Very good

Comments:

5. If you experienced the coaching component, how would you rate your experience with coaching?
    a. N/A
    b. Very poor
    c. Poor
    d. Fair
    e. Good
    f. Very good

Comments:

6. What component or components did you find to be the MOST useful?

Comments:

7. What component or components did you find to be the LEAST useful?

Comments:

8. To what extent did you notice a change in your own instructional practice and use of discrete trial training during the course of the study?
    a. Not at all
    b. Very little
    c. A little
    d. Somewhat
    e. A lot

Comments:

9. To what extent did you notice a change in your student's learning during the course of the study, specifically related to instruction you provided during discrete trail training sessions?
    a. Not at all
    b. Very little
    c. A little
    d. Somewhat
    e. A lot

Comments:

10. Any additional comments you would like to provide regarding the professional development activities and/or your experiences during the study?

CURRICULUM VITA

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EDUCATION

Doctor of Philosophy **2013**
Special Education
University of Washington

Master of Science in Teaching **2008**
Students with Disabilities/Childhood Education
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Bachelor of Music **2004**
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Northern Arizona University

EMPLOYMENT EXPERIENCE (selected)

Research Assistant, University of Washington 2011-Current
Doctoral Leadership (OSEP funded grant)

Behavioral and Educational Consultant 2011-2012
Haring Center for Applied Research & Training in Education

Research Assistant, University of Washington 2010-2011
Supervise M.Ed. and teacher certification students

Research Assistant, University of Washington 2009-2010
Elementary DATA Project (OSEP funded grant)

Selector, New York City Teaching Fellows 2008-2009
Interviewer for the New York City Teaching Fellows Program

Special Education Teacher 2006-2009
New York City Public School District
Teach and implement programs for students with ASD

Violin/Viola Instructor 2004-2006
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Fayetteville Symphony Orchestra, Fayetteville, NC

Violin Instructor 2001-2004
Northern Arizona University Preparatory School

PEER-REVIEWED PUBLICATIONS

McCollow, M., Davis, C. A., & Copland, M. (2013). Creating success for students with Autism Spectrum Disorders and their teachers: Building district-based support teams. *Journal for Cases in Educational Leadership, 16*(1), 12-19. DOI: 10.1177/1555458913478426

West, E., McCollow, M., Umbarger, G., Kidwell, J., & Cote, D. (accepted, pending revisions). Evidence based practices for students with intellectual disability and autism spectrum disorders. *Education and Training in Autism and Developmental Disabilities.*

Greenway, R. M., McCollow, M., Hudson, R. F., Peck, C., & Davis, C. A. (accepted, pending revisions). Autonomy and accountability: Teacher perspectives on evidence-based practice and decision-making for students with intellectual and developmental disabilities. *Education and Training in Autism and Developmental Disabilities.*

REFEREED CONFERENCE PAPERS & PRESENTATIONS

Shurr, J., Jasper, A., & McCollow, M. (submitted for April 2014). "Evidence-based practices for culturally and linguistically diverse students with severe disabilities in review". Paper to be presented at the Council for Exceptional Children annual conference, Philadelphia, PA.

Greenway, R., & McCollow, M. (submitted for April 2014). "Autonomy and accountability: Teacher perspectives on evidence-based practice and decision-making for students with intellectual and developmental disabilities". Paper to be presented at the Council for Exceptional Children annual conference, Philadelphia, PA.

Travers, J., McCollow, M., Kemper, T., & Cote, D. (submitted for April 2014). "Participant characteristics of empirical investigations of functional communication training: Practitioner considerations for implementation". Paper to be presented at the Council for Exceptional Children annual conference, Philadelphia, PA.

McCollow, M., & Davis, C. A. (submitted for January 2014). "Increasing implementation of effective teaching: A professional development model of least-to-most supports for special educators". Paper to be presented at the DADD annual conference, Clearwater, FL.

Shurr, J., Perner, D., Jasper, A., & McCollow, M. (accepted for December 2013). "Professionals united: A review of current multidisciplinary research in severe disabilities". Poster to be presented at the TASH annual conference, Chicago, IL.

McCollow, M., & Shurr, J. (submitted for November 2013). "Bullying and youth with disabilities: Contributing factors, personal experiences, and implications moving forward". Poster submitted to be presented at the Human Rights, Literature, the Arts, and Social Sciences International Conferences, Mt. Pleasant, MI.

McCollow, M., Davis, C.A., Levy, E., & Sainato, D. (accepted for October 2013). "Utilizing antecedent strategies in early childhood settings". Poster submitted to be presented at the annual Division for Early Childhood conference, San Francisco, CA.

McCollow, M., Blum, G., Hackett, J., Patish, Y., & Pierce, J. (May 2013). "Conceptualizing the Dilemmas of Implementation Through a Socio-Cultural Lens: A Qualitative Study Examining Tools, People, and Organizations." Poster to be presented at the Seattle Implementation Research Conference, Seattle, WA.

McCollow, M., Davis, C.A., Pierce, J., & Patish, Y. (April 2013). "Sustaining implementation of evidence-based practices through coaching." Paper presented at the Council for Exceptional Children annual convention, San Antonio, TX.

McCollow, M., & Liberty, L. (April 2013). "Professional Judgment: Its impact on the implementation of evidence-based practices." Paper presented at the Council for Exceptional Children annual convention, San Antonio, TX.

Hudson, R.F., Blum, G.I., Greenway, R.M., Hackett, J., Kidwell, J., Liberty, L., McCollow, M., Pierce, J., Schulze, M., Smith, M., Peck, C., & Davis, C.A. (April 2013). "Practitioner Perspectives on Evidence-Based Practices: Dilemmas of Policy and Practice". Paper presented at the Council for Exceptional Children annual convention, San Antonio, TX.

West, E., Stodden, B., Cook, B., Umbarger, G., Cote, D., McCollow, M., & Kidwell, J. (January 2013). "Evidence-based practices for students with intellectual disability and autism spectrum disorders". Paper presented at the Council for Exceptional Children – Division on Autism and Developmental Disabilities annual conference, Kona, HI.

McCollow, M., & Davis, C.A. (January 2013). "Addressing the problems of practice in social skills instruction for students with ASD". Paper presented at the Council for Exceptional Children – Division on Autism and Developmental Disabilities annual conference, Kona, HI.

McCollow, M., & Davis, C.A. (May 2012). "The effects of a self-evaluation and self-recording package to increase use of social skills in children with ASD". Paper presented at the Applied Behavior Analysis International Conference, Seattle, WA.

McCollow, M. & Davis, C.A. (April 2012). "The effects of a self-management package to increase the use of social skills in children with ASD". Paper presented at the Council for Exceptional Children annual convention, Denver, CO.

Spaulding, S. A., Davis, C. A., McCollow, M., & Kidwell, J. (April 2012). "Building capacity to provide function-based supports for students with problem behavior". Paper presented at the Council for Exceptional Children annual convention, Denver, CO.

Davis, C.A., & McCollow, M. (February/March 2012). "Using implementation teams to support students with autism in schools". Paper presented at NorthWest PBIS Conference, Portland, OR.

Davis, C.A., McCollow, M., & McLaughlin, A. (January 2012). "Supporting young students with stereotypic behavior." Paper presented at the Council of Exceptional Children – Division on Autism and Developmental Disabilities conference, Miami, FL.

Davis, C.A. & McCollow, M. (January 2012). "The effects of a self-evaluation and self-recording package to increase use of social skills in children with ASD." Poster presented at the Council of Exceptional Children – Division on Autism and Developmental Disabilities conference, Miami, FL.

McCollow, M. & Davis, C.A. (November 2011). "The effects of a self-evaluation and self-recording package to increase use of social skills in children with ASD." Paper presented at the Applied Behavior Analysis International Conference, Granada, Spain.

McCollow, M. & Davis, C.A. (April 2011). "Social skills for middle school girls with ASD and Asperger's". Poster presented at Council for Exceptional Children national conference, National Harbor, MD.

Davis, C.A., & McCollow, M. (March 2011). "Combining self-monitoring and social skills instruction to increase generalization for students with ASD". Paper presented at Association for Positive Behavior Supports conference, Denver, CO.

McCollow, M. & Davis, C.A. (March 2011). "Social validation of social Skills for adolescent girls with autism spectrum disorder". Paper presented at Association for Positive Behavior Supports conference, Denver, CO.

INVITED PAPERS & PRESENTATIONS

Stodden, B., West, E., Umbarger, G., Cote, D., McCollow, M., & Kidwell, J. (April 2013). "Evidence-based practices for students with intellectual disability and autism spectrum disorders". Paper to be presented at the Council for Exceptional Children annual convention, San Antonio, TX.

Davis, C.A. & McCollow, M. (August 2010). "Positive Behavior Supports". Presentation at Summer Academy for Severe Disabilities, Renton, WA.

WORKS-IN-PROGRESS

McCollow, M. *Increasing implementation of effective teaching: A professional development model of least-to-most supports for special educators.* Manuscript in preparation.

McCollow, M., Levy, E., Davis, C. A., & Sainato, D. (submitted for review). Using self-monitoring, activity schedules, and correspondence training to increase independence while decreasing challenging behavior in young children*. Young Exceptional Children Monograph #15*.

McCollow, M., & Davis, C.A. *The effects of a self-management package on the stereotypic behaviors of young children with disabilities.* IRB approval completed; data collection pending.

Peck, C., Hudson, R., Davis, C.A., Blum, G., Greenway, R., Hackett, J., Kidwell, J., McCollow, M., Patish, Y., Pierce, J., Schulze, M., & Smith, M. *Evidence-based decision-making in special education.* Manuscript in preparation.

TEACHING

GRADUATE COURSES: UNIVERSITY OF WASHINGTON, SEATTLE

EDSPE 501 Seminar for Creating Instructional Leaders
EDSPE 507 Instruction for Students with Moderate to Severe Disabilities
EDSPE 525 Educating Students with Autism and Severe Behavior Disorders
EDSPE 527 Applied Behavior Analysis for Teachers

GUEST LECTURES: UNIVERSITY OF WASHINGTON, SEATTLE

EDSPE 414 Introduction to Early Childhood Special Education
- Literacy in early childhood
- Independence

EDSPE 506 Classroom Management of the Physical Problems of Individuals with Severe or Profound Disabilities
- Functional Communication Training

EDSPE 518 Doctoral Seminar Series
- Practitioner's Views on Evidence-Based Practices

REVIEWING ACTIVITIES

AGENCIES

- Office of Head Start, Grants Review, 2012
- National Professional Development Center, *Evidence-Based Practices in ASD*, 2012

PROFESSIONAL ORGANIZATIONS

- *Division for Early Childhood*, Conference Proposal Reviewer, 2013

JOURNALS/MONOGRAPHS

- *Young Exceptional Children Monograph #15,* 2013, Reviewer
- *Young Exceptional Children*, 2012-2013, Student Editorial Review Board
- *Focus on Autism and Other Developmental Disabilities*, 2011, Guest Reviewer

PROFESSIONAL SERVICE

UNIVERSITY

- 2012-2013 Committee member, Search committee for Assistant/Associate Professor of Instructional Excellence – Special Education, University of Washington, College of Education
- 2012-2013 Senator, *Graduate and Professional Student Senate*, Special Education representative
- 2010-2012 Mentor, University of Washington College of Education Peer-to-Peer Mentor Program

NATIONAL

- 2012 - current Committee member, Diversity Committee for the Division on Autism and Developmental Disabilities (DADD), a division of the Council for Exceptional Children
- 2012 - current Committee member, Critical Issues Committee for DADD

COMMUNITY

- 2008-2009 Mentor teacher for Writer's Workshop
- 2008 Cooperating teacher for a New York City Teaching Fellow
- 2007-2009 Schoolwide Positive Behavior Supports Team Member

FELLOWSHIPS, AWARDS, & SCHOLARSHIPS

2012-2013 Haring Family Fellowship- $8000 fellowship award for dissertation research
2012-2013 Doi Dissertation Award- $1000 grant award
2011 Hayden Scholarship Fund- $4900 scholarship award
2006-2008 New York City Teaching Fellow
2002 Frier Foundation Scholarship
2000-2002 Northern Arizona University Centennial Scholarship
2000 John C. Lincoln Hospital scholarship, given to a college-bound volunteer for service at JCL
2000-2004 Northern Arizona University Music Performance Full-Tuition Scholarship

CERTIFICATIONS

- Board Certified Behavior Analyst – 1-11-9340 expires 09/2013
- New York State Public School Teacher Certificate in Students with Disabilities (Grades 1-6)

- New York State Public School Teacher Certificate in Childhood Education (Grades 1-6)
- Washington State Substitute Teacher Certificate

PROFESSIONAL AFFLIATIONS

Council for Exceptional Children
    Division on Autism and Developmental Disabilities
    Division for Early Childhood
    Teacher Education Division
    Division for Research
Association for Behavior Analysis International
Association for Positive Behavior Supports