A Modified "Talk Aloud Problem Solving" Intervention to Improve IEP Decision Making in Pre-Service Special Education Teachers

By

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DISSERTATION ABSTRACT

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Title: A Modified "Talk Aloud Problem Solving" Intervention to Improve IEP Decision Making in Pre-Service Special Education Teachers

In this randomized multiple baseline across participants single-case design study, pre-service special education teachers received a modified Talk Aloud Problem Solving (TAPS) intervention to improve their use of problem-solving verbal behavior and reasoning skills when making instructional decisions. Special education teacher candidates may have limited opportunities for meaningful practice with the problem-solving required to synthesize various information about student strengths, needs, and current performance into high-quality instructional decisions. This is evidenced in the field by IEP analyses that consistently demonstrate poor quality documents that lack evidence of strong instructional decisions. In this study, instructional decisions include a goal, an evidence-based instructional practice that will be used to reach that goal, and modifications or accommodations based on the student's needs that ensure access to the general curriculum. Dyads were trained using the TAPS curriculum to use effective problem solving and active listening language when presented with a student vignette. Visual analysis, Tau-U overlap analysis, and a between-case standardized mean difference effect size were calculated. Overall, the TAPS intervention improved the use of problem-solving language but an effect on decision-making quality could not be established. Implications and future research are discussed.

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CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

This chapter provides a review of the literature pertaining to (a) IEP quality, (b) special educator preparation in the area of IEP meeting collaboration, (c) special educator training in instructional decision making, and (d) Talk Aloud Problem Solving. The chapter concludes with the purpose statement and research questions for the single-case experimental design study.

Introduction

Special education teachers are responsible for making instructional decisions and programmatic decisions related to the education of individual students with disabilities. Individualized Education Programs (IEPs) are written statements for students with disabilities who require special education services to make progress in their education (IDEA, 2004). These legal documents are typically developed in schools by an IEP team, which is comprised of the student's parents or guardians, at least one regular education teacher, at least one special education teacher or provider, and a representative of the local education agency. Based upon the students' needs, other related service providers (e.g., behavior analysts, speech and language pathologists, occupational therapists, physical therapists) may be involved in the IEP development as well. The special educator is typically responsible for leading the IEP development and finalizing high quality, legally sound IEP documents for each child.

IEPs are comprehensive, formal documents that include: a statement describing the child's present level of academic and functional performance, statements of measurable annual goals designed to meet the needs that result from the child's disability and enable the child to be involved in and make progress in the general education curriculum, an explanation of the extent the child will not participate with nondisabled children in the regular class, statements of

necessary accommodations and modifications, and a description of the types, amounts, and locations of specially designed instruction and other services that will be provided to the student. IEPs include descriptive and quantitative information provided by all members of the IEP team.

The development of this complex document is typically guided by the special education teacher, who develops an agenda, leads the IEP meeting, collects necessary data, and finalizes the finished documents. A critical responsibility of the special educator is collaborating with the team members to make instructional decisions, including what goals the child will be working on, what instructional strategies will be used to accomplish those goals, and what modifications or accommodations will be necessary to ensure that the student also has access to grade level content. This is a process that requires the synthesis of information from several sources, knowledge of evidence-based instructional strategies, and problem solving skills to come to a final, high-quality decision that advances the education of the student (La Salle et al., 2013).

Unfortunately, previous research has indicated that IEPs are often of poor quality, particularly for students with more complex needs, where development of the IEP may require more collaboration and problem solving to develop (Al-Shammari & Hornby, 2020; Kurth et al., 2022; L. A. Ruble et al., 2010). Special educators often feel underprepared to lead this complex, paperwork-heavy decision-making process, with issues ranging from partnering with parents (Fowler et al., 2019; Murray et al., 2008) to isolation from colleagues preventing collaborative decision making (Billingsley et al., 2020; Mason-Williams et al., 2022). These issues can lead to ineffective instruction, low morale for special educators, and lack of collaboration to provide an inclusive education to each student. Interventions for pre-service teachers related to collaboration and IEP development are understudied. While it is known that there are high levels of variation in teacher preparation programs that impact teacher self-efficacy and effectiveness (Accardo et

al., 2020; Bishop, 2009; Brownell et al., 2010; Darling-Hammond et al., 2002), little empirical work has tested interventions with this population.

Literature Review

IEP Quality

IEPs are critical, legally binding documents that detail important aspects of the education of a student with a disability and educational needs. However, training methods for developing IEPs are understudied in the teacher preparation literature. There has been practitioner oriented work on involving parents, families, and students in the IEP process (Biegun et al., 2020; Lo, 2012; Reiman et al., 2010), and recommendations related to developing culturally and linguistically responsive IEPs (Barrio, 2021; Rossetti et al., 2017; Tran et al., 2018; Wolfe & Duran, 2014). M. Yell et al. (2013) provide recommendations for avoiding common procedural errors. Elder et al. (2018) provide practical recommendations for writing strengths-based IEPs for students with disabilities in inclusive settings, and Rowland et al. (2015) focus on specific high-quality IEP needs of students with complex communication needs. These papers are critical for practitioners to access and understand to follow expert recommendations for best practices and are filling gaps in knowledge and skills for educators in the field who are confronted with writing IEPs under a variety of circumstances that may be beyond their training. In a typical model of teacher preparation, special education teachers may have limited practice opportunities in IEP writing due to time and logistical constraints, further necessitating this type of guidance. Information about IEP writing and development may be taught throughout methods and practices coursework, and pre-service teachers may be required to practice authoring components of the IEP throughout their schooling. Ensuring that special educators can author IEPs that are in line

with both procedural and recommended content standards is critical, as IEP quality is related to better progress towards goals (L. Ruble & McGrew, 2013; M. L. Yell & Bateman, 2019).

Pre-service teachers are exposed to IEPs written by their cooperating teachers during student teaching placements. Students likely have obligations to observe IEP meetings but may be unable to substantially participate in IEP meetings themselves due to reasonable constraints, as the candidates are not licensed teachers yet. The critical issue with this observational experience as a primary learning tool for pre-service teachers is that research has shown that IEP documents are often of poor quality, particularly for students with more complex needs.

Kurth et al. (2019) examined Least Restrictive Environment (LRE) statements of students with extensive support needs. The LRE statement is an important part of the IEP in which IEP teams must justify the reason that students are being removed from placement in general education classes. In the 88 IEPs analyzed in this study using content analysis, it was found that only approximately half of the IEPs contained enough information to exactly determine what percentage of time the student was spending in general education. No LRE statements referred to supplementary aids and services that were attempted before removing the child from the general education environment, contradictory to the legal requirement in IDEA Section 612(a)(5). They also found that approximately half of the statements were not individualized or measurable; in 19 IEPs, there was no LRE statement at all. Seven IEPs used the exact same statement, copied and pasted, and five more simply said “yes,” or “no.” This information supports the hypothesis that special educators may not have received adequate training to write high-quality, legally defensible IEPs. Pre-service teachers who are learning from the models presented to them may inadvertently be taught to repeat poor practices.

Examining IEP quality from another angle, Kurth et al. (2022) sought to determine if exclusionary placements were indicative of lower IEP quality. While their multilevel regression analysis did not demonstrate differential IEP quality by placement categories, they unfortunately found instead that IEPs consistently failed to meet quality indicators across all four placement types. They note findings "consistent with reviews of IEPs for students with emotional behavioral disorders (e.g., Hott et al., 2021), attention-deficit/hyperactivity disorder (e.g., Spiel et al., 2014), and autism (e.g., L. A. Ruble et al., 2010), suggesting the development of low-quality IEPs is a problem that persists over time and across disability categories (e.g., La Salle et al., 2013)" (Kurth et al., 2022, p 253-254). The authors recommend investigating teacher preparation in relation to IEP development, as training is a critical but understudied area related to the issue of IEP quality.

Ruble et al. (2010), in looking at IEPs for young children with autism, measured IEPs against eight criteria based on IDEA requirements. In the 35 IEPs examined, 1.9% explicitly stated a method of goal measurement, 2.9% indicated specially designed instruction individualized to the goals or objectives, and 37.2% described student performance on goals in a way that linked it to the general curriculum or developmental curriculum. None of the IEPs explicitly stated all eight measured dimensions required per IDEA. Looking at a similar population, White (2014) found that parent complaints related to special education primarily focused on issues with the IEPs, with key issues including lack of clarity and problems with content and implementation.

In contrast, in one study, special and general education teachers across elementary, middle, and high school indicated that they perceive the IEP to be useful, and generally found the goals, objectives, and present levels of performance to be moderately helpful in instructional

planning (Rotter, 2014). In another survey study, most respondents indicated regularly (daily or weekly) consulting the IEP to guide instruction and modify curriculum (Fowler et al., 2019). It is concerning to consider that this important and regularly referenced instructional document, designed to communicate student's needs and educational program to all team members, is likely often lacking in quality. Referring to the IEP document often may be useful if the information contained within it is accurate, detailed, and aligns students' needs and goals in a way that makes an instructional approach clear. Unfortunately, as discussed, it is likely that educators are often referring to low-quality IEPs when making decisions for students.

Special Educator Preparation in IEP Meeting Collaboration

Development of an IEP does not happen in isolation. While a special educator is typically the expert in the actual form and is responsible for the finalized version of the IEP, the IEP is intended to be created by a team. At the IEP meeting, collaborative problem-solving decisions are meant to happen between all members of the team, with agreement reached on a plan to move forward. This is a social, dynamic process. Pre-service special educators may have minimal opportunities to lead and participate in this work before being asked to do it themselves once they are in their first positions.

Literature related to training and preparation in IEP meetings often focuses on ways to ensure and improve parent involvement, which is a well-documented area of need in the field, particularly related to the meaningful involvement of culturally and linguistically diverse parents (Lo, 2012; Murray et al., 2008; Reiman et al., 2010; Wolfe & Duran, 2014). In a recent non-exhaustive search, substantially less literature was found that related to training educators in facilitating the IEP meetings and handling the complex decision-making processes involved in IEP development (Quinn, 2023b).

In the qualitative domain, Mueller et al. (2019) used a simulated IEP meeting among pre-service special educators to examine the candidate's perceptions of the process. The researchers generated IEP situational vignettes that would require team problem solving and decision making and assigned the candidates into groups of four to five with assigned roles as IEP team members. Candidates were assessed on their confidence and preparedness related to various aspects of the IEP process. The candidates found this experience highly valuable and beneficial to their skills, some noting that it helped them feel ready to transition into the role of the special education teacher and even stating that they "*couldn't imagine going into teaching and not having had that experience before*" (Mueller et al., 2019, p. 217). The nature of this study sheds light on the need for more preparation activities and practice opportunities for candidates to do this work. Given the aims of the Mueller et al. (2019) study, it is not possible to discern if the skills practiced translate to the field or maintain in different decision-making scenarios.

It is evident from the amount of literature focusing on an improved IEP experience for parents that there are substantially negative perceptions of the meeting process from the parent side (Mueller & Vick, 2019). This may be an indicator that special educators are ill prepared to facilitate the collaboration with families that should happen at these meetings. There is a dearth of empirical work examining IEP meetings and facilitation strategies for team collaboration success. In a non-exhaustive search for literature related to training pre-service special educators to select instructional approaches in collaboration with an IEP team, no literature was found.

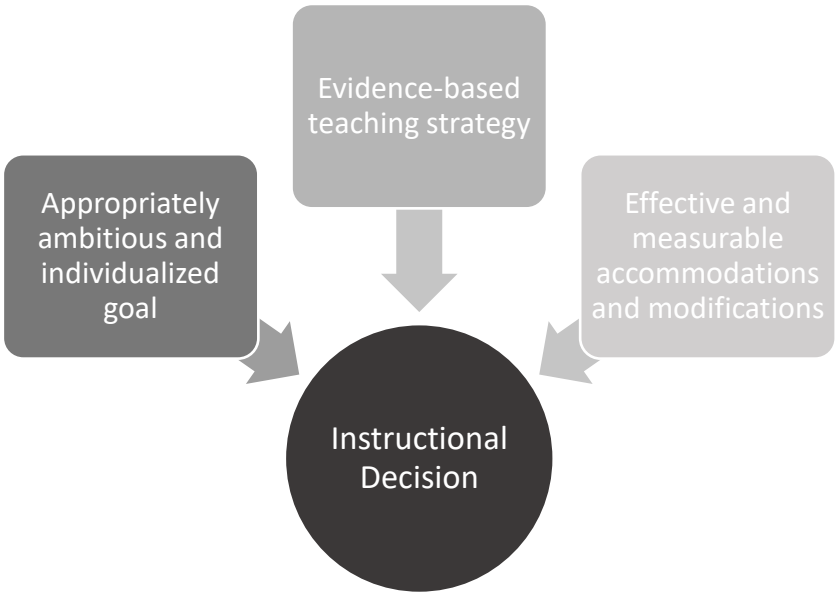
Special Educator Training in Instructional Decisions

Special educators are responsible for making high-quality instructional decisions, which in this study are defined as the combination of evidence-based teaching strategy towards an appropriately ambitious goal plus effective accommodations and modifications that ensure

student access to the general education curriculum. The specially designed, intensive instruction that pre-service special educators should employ the use of the best available evidence-based practices that have been identified in research to address the need of the student. Figure 1 details the conceptual relationship.

Figure 1

Components of Instructional Decisions



Making instructional decisions requires linking together information from multiple sources and selecting an appropriate path forward based on the gathered information. Research has historically demonstrated that these connections are often weak (Codding et al., 2005). Synthesizing the sheer amount of information into an IEP document has been documented as a particular challenge for pre-service special education teachers (Kamens, 2004), and the burden of the volume of paperwork required cannot be neglected when discussing this process (Mehrenberg, 2013). Some approaches to alleviate issues with the complexity in IEP decision

making have included the use of goal bank software that provides teachers with measurable annual goal language to modify and enter into IEPs (Kowalski et al., 2009). However, while using this type of resource may result in improvement of the technical writing of the goal, it can result in goals that are overly generic, not individualized to the student, and may not translate into good instructional choices to meet the selected goal (More & Hart Barnett, 2014). With the recent decision in the *Endrew F. v Douglas County School District* United States Supreme Court case, the issue of IEP goals being meaningful and appropriately ambitious has been brought to light as a critical decision point to ensure that all students with disabilities are making progress in their education (*Endrew F. v. Douglas County School District*, 2017; Turnbull et al., 2018; M. L. Yell & Bateman, 2019). Selecting goals using generic goal banks without meaningful underlying reasoning may result in inadequately ambitious learning targets or lack of alignment between student skills and instructional plan.

In addition to the legal requirements presented by IDEA regarding the content of the written goals present in IEPs, teachers and schools are expected to use evidence-based instructional practices to enact progress towards those goals (Cook & Cook, 2013). Preparation programs serve as the primary training opportunity for candidates to learn both how to implement these practices and how to determine when these practices are aligned with student needs. A commonly used framework for assessing pre-service educator's performance is the Council for Exceptional Children's Initial Preparation Standards. Under Standard 5: Instructional Planning and Strategies, standard 5.0 articulates this expectation of new teachers: "Beginning special education professionals select, adapt, and use a repertoire of evidence-based instructional strategies to advance learning of individuals with exceptionalities (Council for Exceptional Children, 2015, p. 2)." While this standard is clear and concise, the reality in the field is a

research-to-practice gap that results in teachers unaware of evidence-based practices or selecting non-evidence-based practices from other sources (Curcio et al., 2023).

Guckert et al. (2016) conducted interviews with 10 special educators and found that all teachers in their study believed that they were implementing evidence-based practices. However, teachers varied in terms of their awareness of evidence-based practices, demonstrating inconsistencies in knowing where evidence-based practices come from or whether or not their instructional choices are evidence-based. The authors of this study note that more investigation is needed into the fact that some teachers who are experienced and licensed as highly qualified are relatively unaware of evidence-based practice. The issue of disseminating and implementing evidence-based practice in special education has been ongoing over the past several decades as educational practice has changed (Cook & Odom, 2013; Odom et al., 2020). In efforts to bridge the research to practice gap, several organizations and agencies have focused on getting synthesized information about EBPs out to educators and other practitioners in the field.

Evidence-based practice dissemination is the mission of the What Works Clearinghouse, which synthesizes research to develop clear, concise practice guides and reviews of individual instructional programs for evidence of effectiveness (U.S. Department of Education, 2023). Despite the availability of this resource and other dissemination efforts by practitioner-oriented organizations, (e.g., Council for Exceptional Children), use of non-evidence based practice and fad practices are still widely spread via resource sharing websites like TeachersPayTeachers.com (Aguilar et al., 2022; Shelton et al., 2022). Analyses of these resources demonstrate lack of alignment to Common Core State Standards, often missing learning standards and objectives, and in a more specific study of U.S. History resources in particular contained potentially harmful information in 30% of the sample (Harris et al., 2023).

Empirical work has focused on training in-service teachers in the use of evidence-based practice and high-quality instruction. Alexander et al. (2015) reviewed 23 studies that involved experiments designed to increase teacher's use of evidence-based practices for students with autism. Only two studies met WWC quality indicators, and it was found that most studies focused on individually training teachers in the use of behavioral interventions to improve student communication. Only five of the studies addressed training teachers in academic instruction methods, despite there being substantial research on practices to support the academic learning of students with autism (Bailey & Arciuli, 2020; Gevarter et al., 2016; Steinbrenner et al., 2020; Taylor et al., 2020). Once again, a limitation of this body of work is that teachers are trained in the implementation of the EBP, but not the nuances of the selection process.

Another review of the literature examined a commonly used training strategy, performance feedback, on pre-service teacher use of EBPs (Schles & Robertson, 2019). Only five studies met inclusion criteria, all of which included a specific targeted EBP. All the studies used single-case methodology, and each established a functional relation between performance feedback and the use of EBPs. Work like this supports the idea that uptake of EBPs is possible using good training practices. However, these studies do not address training the teachers in identifying the need for and selecting the appropriate EBP based on student need. This could limit the utility of knowing how to implement one EBP, which may not generalize to other students or contexts.

Leko et al. (2019) provides practical guidance for teachers related to selecting evidence-based practices based on their students' needs, strength of evidence, cost, and contextual fit. They discuss additional resources for EBPs for specific disability types including learning disabilities, emotional and behavior disorders, and autism spectrum disorder, and indicate other

places to find syntheses of EBPs for practitioners such as the Autism Focused Intervention Resources and Modules, National Professional Development Center on ASD, National Center on Intensive Intervention, and Substance Abuse and Mental Health Services Administration, the IRIS Center, Florida Center for Reading Research, and the Center on Positive Behavioral Interventions and Supports, among others. These resources are incredibly useful, but they are expansive. A new educator who is not well versed in considering all the student variables, logistics, and input from other providers in the IEP process may not be able to effectively sort through and access all of these options efficiently.

In addition to selecting and implementing evidence-based practices in intensive intervention, IDEA concurrently stipulates that all students should have access to the general education environment and curriculum. Supplementary services and supports, including accommodations and modifications, are also documented in the IEP and are frequently the avenue by which students with higher support needs access grade level content. A related Council for Exceptional Children standard under Standard 3: Curricular Content Knowledge, is 3.3: "Beginning special education professionals modify general and specialized curricula to make them accessible to individuals with exceptionalities." Coupling the evidence-based instruction with appropriate accommodations and modifications is a decision that must be based in data, held in balance, and often involves collaboration across school environments (e.g., special education, general education, specials classes, etc.).

When it comes to accommodations and modifications to support access to the general education curriculum, in complement to intensive instruction, more research is needed. Some work has evaluated the efficacy of specific accommodations with certain populations, such as the systematic review by Lovett & Nelson (2021), which found that across 68 relevant articles,

findings indicated that highly common accommodations for students with ADHD (such as extended time) failed to show evidence of specific benefits. IEP analyses discussed in a previous section of this literature review found that supplementary aids and supports, which include accommodations and modifications to support access, were one of the lowest quality sections in student IEPs (Kurth et al., 2022). They recommend guidance and training to support teachers to write specific, anti-ableist accommodations and modifications that embody high expectations and access.

The dearth of research in this area means that there are not the same clearinghouses, websites, and resource banks related to effective accommodations and modifications as there are for evidence-based instructional practice. Promising but understudied frameworks such as Universal Design for Learning are becoming more popular for providing clearer guidance related to ensuring that all students, including those with more complex support needs or other disabilities, can meaningfully engage in grade level work (Coyne et al., 2017; Lowrey et al., 2017; Rao et al., 2020; Root et al., 2022). Ensuring that teachers have a foundational understanding of using accommodations and modifications as means to reduce barriers for student access is critical to a more effective and inclusive school experience for students with disabilities.

Newly licensed special education teachers need effective strategies for fluently and flexibly developing ambitious IEP goals that are measurable and linked to grade level standards related to the goal, and selecting aligned accommodations and modifications. However, developing these skills independently and in isolation is unlikely to produce the collaborative leadership skills that an IEP meeting requires of a special educator. There is a need for relatively brief curriculums that pre-service programs can embed into coursework that supports the

development of a flexible but simple behavioral problem solving repertoire (as problem solver and active listener). This training should be able to provide the teacher candidate with sufficient exemplars across disability classification and diagnoses, as well as provide practice opportunities with expert feedback to build fluency and confidence in decision making skills related to the IEP. Finally, this training should be carried out in simulated contexts that closely approximate interprofessional collaborative problem solving, as the logistical barriers for students to get repeated practice in authentic IEP meeting settings is challenging during training. To date, there are no such programs readily available to deploy in special education pre-service programs. However, in applied behavior analysis, there is a potentially promising intervention: Talk Aloud Problem Solving. The content of this curriculum is broadly focused on improving problem solving behavior through explicitly teaching specific listener and problem solving behavior that facilitates collaborative problem solving. Learners practice these new verbal behavior skills with a partner to observe models and receive immediate feedback, and eventually transition from public vocal verbal behavior to private vocal verbal behavior that the learner carries with them to novel, untaught situations.

Talk Aloud Problem Solving

To understand Talk Aloud Problem Solving, one must start with Think Aloud Pair Problem Solving, a procedure developed to encourage students to solve problems or questions by talking aloud, allowing the identification of gaps in reasoning, collaboration with others to ask questions or offer suggestions, and allow instructors to understand the thought process of their students and thereby encourage meta-cognition (Lochhead & Whimbey, 1987). At Morningside Academy in Seattle, WA, educators have incorporated behavioral approaches to develop the Talk Aloud Problem Solving (TAPS) curriculum based on the Think Aloud Pair Problem Solving

procedures (Johnson & Twyman, n.d.; J. Robbins, 2014; J. K. Robbins, 2011). Morningside has utilized TAPS curriculum with precision teaching approaches to obtain powerful results with their students, going so far as to guarantee tuition reimbursement to students who don't gain at least two years of progress in the domain they are farthest behind in within one year in their programs (Weisenburgh-Snyder et al., 2015). Robbins (2011) describes problem solving, reasoning, and analytical thinking as teachable repertoires, with the TAPS curriculum making internal verbal problem-solving behavior external, allowing it to be shaped, developed, and reinforced by teachers. She discusses the definition of problem-solving presented by Skinner (1969), in which the first stage of problem solving is the situation for which a response has not been previously reinforced or is not available to the individual, and second, the behavior that brings about the change is the problem solving. The TAPS curriculum builds on this concept by centering private verbal behavior that guides an individual through a problem solving sequence (Berk, 1994). Internal verbal behavior functions to guide and prompt us through the problem-solving process, and Robbins asserts that in situations with less well-defined parameters and outcomes, a further layer of questioning is needed to generate analytical thinking. An example presented in this paper is one of a student who needs to study for a test. The student needs to ask themselves, "*What do I study and how do I know what is important*?" Using this internal verbal behavior is a stimulus for discerning the important information, a skill relevant to many problem-solving situations.

The track record of Morningside Academy and their use of this program suggests that TAPS may contribute to its effectiveness, however the experimental literature base using the TAPS curriculum is limited. To examine the current literature on this intervention, a non-exhaustive literature search was conducted by searching four databases (ERIC n = 2, PsycNET n

= 6, ProQuest Theses & Dissertations A&I n = 41, and Google Scholar n = 101) for "talk aloud problem solving," to capture studies using the Learn to Reason with TAPS: Talk Aloud Problem Solving curriculum developed by (J. Robbins, 2014). 150 records were retrieved. After removing duplicates and screening abstracts for article type, relevance, English language or availability of an English translation; 26 articles were reviewed in full text. 15 articles were removed (n = 1 embargo, n = 6 nonexperimental articles like conference proceedings, literature reviews, and commentaries, and n = 8 did not use TAPS). 10 articles remained and will be discussed further in this section. In addition, to capture applications of "Think aloud pair problem solving (TAPPS)" (Lochhead & Whimbey, 1987), which is the foundational strategy the behavioral TAPS curriculum developed by Robbins is based upon, ancestral searching was conducted on the 10 included articles. An additional search was run using the terms "think* aloud pair problem solving" and "talk aloud pair problem solving" and relevant articles were selected for discussion in this chapter. Table 1 provides additional details of relevant peer reviewed articles, dissertations, and conference papers.

TAPS has been used with school age students to address skills such as sentence sequencing as related to content area instructional content for learners with low reading comprehension (Dembek & Kubina, 2018, 2018), analytical thinking skills for an autistic student (Ferris & Fabrizio, 2009), editing and writing skills related to math algorithms (Weber, 2016), and general problem solving skills for autistic middle school students (Will, 2017). All of these studies with school age students reported positive effects of the TAPS curriculum on the target dependent variables. However, there was wide variety in the way that TAPS was implemented, and the dependent variables were measured. For example, in the studies by Dembek & Kubina, the student employed the role of "problem solver" and the researcher was the "active listener." In

Table 1

TAPS Study Characteristics

Type	Citation	Country	Type	Design	N	Population	DV	Measure	Intervention Description	Reported Effects
Journal Article	Al Sultan, A., & Alasif, H. (2021)	Saudi Arabia	Q	Pre/post	64	Male middle school students	Scientific concepts and habits of mind	Questionnaire	TAPPS strategies used in science unit via a researcher developed teacher's guide	Use of TAPPS had a significant effect (P<.05) on scientific concepts test and habits of mind questionnaires, and there is a significant correlation between scientific concepts and habits of mind.
Journal Article	Anggraeni, R., Andriani, S., & Ad, Y. (2019)	Indonesia	Q	Post test only control design	NR	Eighth grade students	Critical thinking ability	Researcher developed test	TAPPS strategies with and without audio visual media	Use of TAPPS had a significant effect (P<.05) on student's critical thinking skills.
Journal Article	Dembek, G. A., & Kubina, R. (2018a)	US	Q	AB	1	Elementary school student with reading difficulty (tier 2)	Reading comprehension	Putting four sentences in order	TAPS plus Frequency Building to a Performance Criterion, researcher modeling stage (explicit instruction), practice stage with feedback	Improved responding reported as standard celeration of 1.3 during intervention and 2.25 during FBPC phase

Type	Citation	Country	Type	Design	N	Population	DV	Measure	Intervention Description	Reported Effects
Journal Article	Dembek, G. A., & Kubina, R. M., Jr. (2018b)	US	E	Multiple baseline across participants	5	Elementary school students with reading comprehension difficulty	Reading comprehension	Putting four sentences in order	Thinking Aloud Problem Solving in two stages, modeling of talking aloud, and practice with feedback from the expert	Improved responding in all participants, with some variability. Reported as standard celerations ranging from 1.25-1.75.
Journal Article	Ferris, K. J., & Fabrizio, M. A. (2009)	US	O	NR	1	Elementary age student with autism	Analytical thinking skills	Sequelic and tact responses	Reinforcement for TAPS responses during timed problem solving probes	Participant states what she knows, what is being asked, and what her plan is; improved problem solving approaches
Dissertation	Glass, A. R. (1992)	US	E	Randomized control trial	54	Seventh, eighth, and mixed high school grade students enrolled in technology education classes	Problem solving	Metacognitive language used during problem solving, responses to technical problems	TAPPS instruction: one partner told to talk as much as possible, one told to keep the problem solver talking and ask what they are thinking	TAPPS did not significantly affect how well students understood the problem, but did affect the amount that the students explicitly applied previously learned concepts and how frequently students monitored their understanding and identified misunderstandings, and develop or explain explicit solutions or plans

Type	Citation	Country	Type	Design	N	Population	DV	Measure	Intervention Description	Reported Effects
Dissertation	Lee, R. N. (2022)	US	E	Multiple baseline across participants	6	Graduate students in an ABA Master's program	Problem solving	Behavior Analysis Certification Board Exam	TAPS repertoire with participant as problem solver, researcher as active listener. Five taught skills: identifying question, define question, state necessary steps, state unnecessary steps, state answer. Content instruction included	Improved post test scores on BACB exam, increased problem solving language and increased time to take test
Dissertation	Neri-Hernandez, L. (2017)	US	Q	Pre/post	3	Staff members in a life skills classroom	Problem solving (to use with students)	WASI and TAPS Active Listener qualities	TAPS Curriculum (Robbins, 2014). Researcher acting as the problem solver and participants trained as active listeners	Improved use of active listener behaviors and qualities in two treatment participants (from 30-40% of intervals to 100%).

Type	Citation	Country	Type	Design	N	Population	DV	Measure	Intervention Description	Reported Effects
Journal Article	Noh, T., Jeon, K., & Huffman, D. (2005)	Korea	E	Randomized control trial	85	Male high school students, science majors	Problem solving	Researcher developed test and recordings of TAPPS verbal behavior	TAPPS instructional method provided by science teachers to the individual and group participants, following content instruction in the chemistry concepts	Statistically significant test score improvement for both individual and dyad groups over control, increased verbal problem solving behavior for TAPPS groups over control
Conference paper	Nufus, S. H., & Arnawa, I. M. (2018)	Indonesia	Q	Randomized 51 group post test only	51	Seventh grade students across five classes	Problem solving	Test of problem solving ability and behaviors (make a plan, look back, etc.)	TAPPS cooperative learning model	Statistically significant improvement on problem solving skills for treatment group
Journal Article	Ogundele, A. G., Umar, I. Y., Ma'aji, S. A., & Idris, A. M. (2023)	Nigeria	Q	Pre/post	80	College students enrolled in Machine Shop Practice course	Interest and retention of machine shop practices	Machine Shop Practice Cognitive Achievement and Retention Test and Machine Shop Practice Interest Inventory	TAPPS strategies vs. structured problem solving strategy	Significant results for increased interest in machine shop practices for TAPPS group, but the alternative strategy (structured problem solving) resulted in improved retention over TAPPS

Type	Citation	Country	Type	Design	N	Population	DV	Measure	Intervention Description	Reported Effects
Journal Article	Pate, M. L., & Miller, G. (2011)	United States	E	Randomized group posttest only	34	High school students in agriculture and industrial technology courses	Rate and success of engine troubleshooting test	Applied task: Troubleshooting a small engine system fault	TAPPS problem solving and active listening out loud, control group did not talk out loud	No significant results in success or rate for TAPPS group over control
Journal Article	Pate, M. L., Wardlow, G. W., & Johnson, D. M. (2004)	United States	E	Randomized group posttest only	30	Students in a college course on small power technology	Rate and success of engine troubleshooting test	Applied task: Troubleshooting a small engine system fault (one electrical, one air/fuel)	TAPPS problem solving and active listening out loud, control group did not talk out loud	TAPPS group had a significantly higher success rate and a shorter rate of completion
Dissertation	Weber, J. D. (2016)	United States	E	Multiple probe across dyads	4	Nine- and ten-year-old typically developing students	Ability to deliver effective peer feedback	components of a math algorithm solved by a naïve adult reader and verbally governed responses of writing correct steps	Scripted dialogue derived from TAPS curriculum	All participants demonstrated improvement in the dependent variables, reported as improved mean scores from baseline to intervention
Dissertation	Will, S. M. (2017)	United States	E	Multiple baseline with reversal	6	Middle school students in a special education classroom	Problem solving	Accuracy on a problem solving tests, demonstration of problem solving qualities	TAPS curriculum (Robbins, 2014)	Improved problem solving characteristics and accuracy in dyad probes, variability in post-intervention probes and independent probes

Note. Q = quasi experimental design, E = experimental design, O = observational study

the TAPS curriculum, it is recommended that the learners work in dyads and take turns in each role to develop both repertoires (J. Robbins, 2014). An individual, when working through a problem on their own, is able to act as their own active listener. This is intended to promote generalization to each individual's problem-solving abilities when working alone (i.e., as internal verbal behavior when confronted with a problem). Still, improvements were made in the student's targeted skill in these studies (sequencing four sentences in logical order).

Will (2017) conducted a multiple baseline with reversal dissertation study using the TAPS curriculum with fidelity. Students were scored on their demonstration of the five characteristics that are part of the TAPS curriculum verbal repertoires, which include having a positive attitude, being careful, breaking the problem into parts, avoiding guessing the answer, and being active with the problem. While graphed progress data showed growth, the reporting and analysis of the results of this study make it challenging to ascertain if there was adequate experimental control to demonstrate a functional relation between their improvement and the intervention. These students were tested using non-content specific brain teasers and were also measured at various points during the intervention using DIBELS, the Saxon Homeschool Placement Test, and the Woodcock Johnson III.

Neri-Hernandez (2017) used a small sample (n = 3) pre-post design in a dissertation study with three participants who were staff members working in a life skills classroom serving students with disabilities. Two staff received the TAPS intervention while one staff served as experimental control. The TAPS curriculum was delivered to the staff members with the aim of training them to be active listeners to the students with whom they work. They were observed working with students and the change in their active listening behavior was recorded. The measure was an observational checklist with operational definitions of the active listener traits

(follow along, catch mistakes, be like a teacher, check for accuracy, use encouraging words). These traits were identified in observed intervals by the experimenter checking “yes” or “no” to each trait. Both staff members receiving the condition improved to 100% criterion when working with the students, while the control member made no change. In addition, the staff were assessed using the Whimbey Analytical Skills Inventory, which is designed to capture problem solving and reasoning skills. The two participants receiving intervention improved their scores on the WASI by 23% and 11%. This novel and interesting application of TAPS for school staff training used the curriculum in full but was focused on measuring the outcomes of the staff as active listeners, rather than as independent generalized problem solvers.

In addition to Neri-Hernandez (2017), several other studies using TAPPS or TAPS with secondary or adult learners (Lee, 2022; Ogundele et al., 2023; M. L. Pate et al., 2004; M. L. Pate et al., 2004; M. L. Pate & Miller, 2011; Russell, 2022) in various capacities. M. L. Pate et al. (2004) used a posttest only control group design to assess the impact of TAPPS on undergraduate student’s ability to troubleshoot engine faults in a power technology course. The students in the intervention condition were paired with a listening partner and verbalized their thought process. They were significantly more successful than the control group students, providing initial evidence that content area decision making can be improved using verbal-problem solving behavior, an important piece of evidence related to the present study. A similar study in Nigeria assessed the learning of 80 students in a metalwork technology course, and found that students in the experimental TAPPS group had improved interest and retention of information (Ogundele et al., 2023).

Contrastingly, M. L. Pate & Miller (2011) found that there was no significant difference in the success rate of students in secondary career and technical education students in problem

solving an engine compression issue between the group trained with TAPPS and the group solving the issue independently. However, they note that there was a limitation in the small sample size of this study, and they theorize that TAPPS may be less effective for increasing fluency (accuracy + rate) versus retention, meta-cognition, and reasoning.

Two studies most similar to the present dissertation incorporated the TAPS curriculum into an experimental design aimed at training different areas of Board-Certified Behavior Analyst (BCBA) competencies. In her dissertation study, Lee (2022) delivered TAPS curriculum to students in an ABA master's degree program using a nonconcurrent multiple-baseline design across participants. A modification from the TAPS curriculum was that the researcher functioned as the active listener (rather than a peer) and also provided supplementary content knowledge instruction or resources if needed. Two dependent variables were measured. One was the presence of the TAPS skill repertoires, and the other was multiple-choice questions from practice tests for the BACB exam. The experiment demonstrated success in improving the use of TAPS components and resulting in gains on the students BACB practice exam scores. However, there were some limitations to this study. In baseline, participants were given problems to solve without any prompt to speak aloud, resulting in baselines of 0 for evidence of TAPS components. This may not fully reflect private events related to problem-solving language. For four of six participants, they immediately demonstrated 100% of the measured TAPS components following the intervention. Two participants showed more gradual growth. It may be possible to obtain a more accurate baseline by giving participants the prompt to talk aloud while solving the problems. Even so, this application of TAPS demonstrated promising results and social validity; as the participants noted that although using TAPS took additional time, their accuracy improved.

A recent study by Russell (2022) targeted ethics competencies of master's level students in a BCBA program. The randomized control trial included the experimental group receiving four additional instructional modules on ethics in different situations as part of the content of their course, while the control group was assigned a paper on the same topics. Verbal feedback was given during the four modules to increase participant's learning, and the use of TAPS was planned as a secondary component to intensify instruction if the verbal feedback was not effective. However, the authors found that the modules and verbal feedback were effective at improving their selected dependent variables and did not deliver the TAPS intervention.

The emerging body of literature on the TAPS intervention plus the reputation of success in the program of delivery utilizing TAPS at Morningside Academy show promise for the intervention to improve problem-solving behaviors in a variety of contexts. However, the intervention has not been systematically replicated across similar dependent variables, with fidelity to the curriculum, on the same population, or using the same research design. Additional experimental work using the TAPS curriculum could support its validity for evidence-based practice as a problem-solving intervention.

Purpose Statement and Research Questions

The purpose of this study was to test a novel application of the TAPS curriculum with pre-service special education teachers to improve their instructional decision making related to making the types of decisions necessary for high quality IEPs. Based on the bodies of literature discussed above, more research is needed on ways to improve and maintain the skills of special educators when writing high-quality, legally defensible IEPs. Because the TAPS curriculum directly addresses problem solving and reasoning rather than a specific content area, it has potential to improve the skills of educators who plan to work with many different student

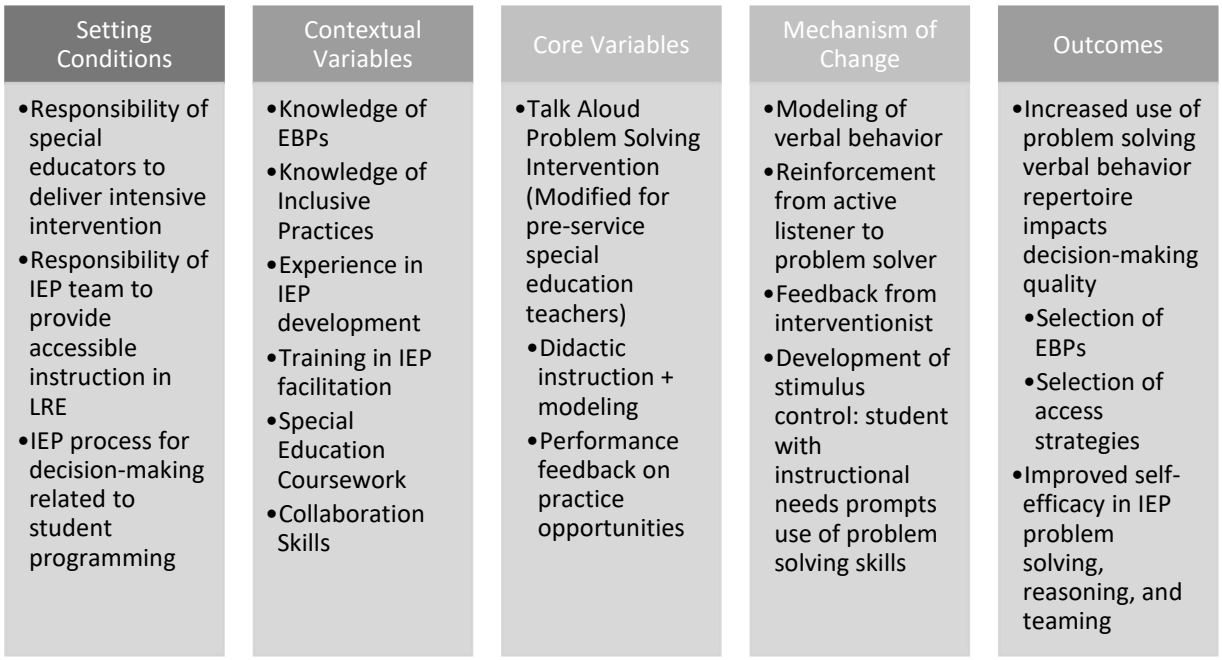
populations. As 39 states issue generalist special educator certifications; and shortened licensure programs, alternative pathways, and virtual degrees have become more common in the United States to address shortages and barriers to recruitment, it is critical that teacher preparation programs establish high-leverage instructional practices with a wide reach (National Council on Teacher Quality, 2020).

TAPS consists of lessons that explicitly teach verbal behavior repertoires for problem solvers and active listeners. In the context of IEP meetings where instructional decisions are being made, special educators are required to take on both roles. In addition, special educators must be their own internal problem solver and active listener when adjusting programs, drafting IEPs, and guiding a team in making high-quality instructional decisions. This study will focus on two critical components of the IEPs: instructional decisions (e.g., the evidence-based practices that will be used to address skill deficits and advance the student's progress towards the goal) and access strategies (e.g., the accommodations and modifications that specifically consider the child's needs and how barriers will be reduced so that the student can access the general curriculum, as required per IDEA). The TAPS curriculum aims to first externalize the educators reasoning and problem-solving thinking by encouraging conversational use of both problem solving and active listening phrases, that can then be shaped and trained through feedback. Then, TAPS emphasizes the generalization of the problem-solving behaviors from the dyadic setting to the private behavior of the individual. This study will investigate if training pre-service special educators in problem-solving vocal verbal behavior skills improves their self-efficacy in instructional decision making and IEP team leadership, and instructional decision-making quality.

The logic model for this study is illustrated in Figure 2. First, setting conditions are considered. The requirements of special educators per practice standards and IDEA are summarized, along with other setting conditions related to the pre-service educator's knowledge. There is wide variability in the approaches taken in special education training programs, which may result in some being more prepared related to content knowledge and instructional strategies than others. Contextual variables describe characteristics of the pre-service teachers that may influence their performance in this intervention and on the outcome tasks. The core variables briefly summarize the intervention components that will impact performance. The mechanism of change in this study is theorized to be the practice of using verbal problem-solving behavior, trained through didactic instruction and modeling and reinforced through performance feedback.

Figure 2

Logic Model



Through the use of multiple exemplars in training, participants will internalize new skills following the development of stimulus control. The stimulus of a student vignette (generalizable

to a variety of students with instructional needs) will prompt the use of vocal verbal or internal verbal problem solving language, following reinforcement and behavioral shaping during the training. These mechanisms may result in increased use of problem-solving verbal behavior, which may improve the quality of decisions being made. Distally, this has the potential to improve dyadic collaboration, which is another important component of IEP development, and teacher self-efficacy in solving novel problems and making high-quality instructional decisions.

Based in this logic model, this study will address the following research questions and sub questions: Is there a functional relation between the delivery of a vocal verbal behavior-based skills training package (modified Talk Aloud Problem Solving) and improved instructional decision-making skills for pre-service special education teachers?

- Is there a functional relation between the delivery of a vocal verbal behavior-based skills training package (modified TAPS) and increased use of problem-solving vocal verbal behavior in pre-service special education teachers during dyadic problem-solving conversations?
- Is there a functional relation between the delivery of a vocal verbal behavior-based skills training package (modified TAPS) and generalized use of problem-solving vocal verbal behavior in independent problem-solving opportunities?
    - What types of vocal verbal behaviors taught in the TAPS repertoire are used by the participants following the training?
    - Are some categories of behavior used more than others in dyadic or individual probes, and is this impacted by sequencing of the order of activity (e.g., dyadic probe followed by individual probe?)

- Does increased use of TAPS verbal problem solving behavior result in improved instructional decision-making?
- Does the attainment of problem-solving verbal behavior and instructional decision-making skills in dyadic practice maintain in independent practice over time?
- How do pre-service special education teachers rate the feasibility, acceptability, and perceived effectiveness (social validity) of the goals, procedures, and outcomes of the modified TAPS intervention?

CHAPTER II

METHOD

A description of the methodology used in this study is provided in this chapter. The areas addressed in this section include inclusion criteria, recruitment procedures, and plans for responding to attrition. Then, the experimental phases are each discussed in detail including measurement instruments, data collection procedures, implementation fidelity, and interobserver agreement. Finally, the data analysis plan is described. This study protocol is preregistered using the Open Science Framework platform at https://osf.io/dt6qa/ (Foster & Deardorff, 2017; Quinn, 2023a).

Participants

This study recruited eight pre-service special education teachers enrolled in a special education teacher preparation program anywhere in the United States, Puerto Rico, or other U.S. territories. Interested participants were required to meet the following criteria: (a) be currently enrolled in a part or full time undergraduate or graduate special education teacher preparation program leading to state licensure or the ability to sit for the state licensure exam, (b) demonstrate basic proficiency in the use of video conferencing software (Zoom), (c) demonstrate fluent and conversational vocal verbal skills in English, and (d) self-report having taken at least one undergraduate or graduate course covering instructional design/teaching methods and one course covering IEP development. Self-report during the intake meeting was used to determine proficiency in English language for discussing special education topics. Participants demonstrated technology proficiency by navigating to a breakout room and establishing that they could record the meeting from the room. Participants were required to use vocal verbal speech rather than sign language or speaking through an alternative communication device. Content such as mathematics, literacy, science, and social studies methods/curriculum/intervention,

individualizing and designing instruction and intervention, or evidence-based instructional practices/direct instructional methods counted as instructional design and teaching methods. Content such as IEP writing, professional practices in IEP meetings and development, IEP goal assessment, and interdisciplinary teaming practices counted as IEP development content.

Preferred qualification was given to participants who had completed at least 50% of their special education program coursework (e.g. for a 50 credit program, students would have completed 25 or more credits of the program) and had completed a minimum of one freestanding 3 or more credit undergraduate or graduate course (semester or quarter system) in instructional design/teaching methods and a minimum of one freestanding 3 or more credit undergraduate or graduate course (semester or quarter system) in IEP development. All participants were required to meet minimum inclusion criteria, but preferred qualifications were considered to prioritize participants for random selection. Additional potential participants meeting at least the minimum inclusion criteria beyond the planned eight participants were offered the opportunity to be placed on a waitlist in case of attrition requiring nonconcurrent addition of one or more dyads. Wait list participants would receive additional communication only if attrition required their consent and if they agreed to be contacted in this situation.

Demographics

Participant demographic characteristics were acquired via self-report on a Qualtrics platform demographics survey. See Table 2 for detailed information by participant. Of eight participants, 75% were in the 18 - 24 years age range, with one in the 25 - 34 years age range and one in the 35 - 44 years age range. All participants had earned some college credit, with one having an associate degree and the seven others having no degree yet. Seven participants

Table 2

Participant Demographic Characteristics

Participant	Age Range	Race/Ethnicity	Education	Gender
Claire	18 - 24	White	Some college credit, no degree	Female
Blake	18 - 24	African American or Black, and White	Some college credit, no degree	Male
Ava	18 - 24	East Asian, and White	Some college credit, no degree	Female
Audrey	35 - 44	White	Some college credit, no degree	Female
Jessica	18 - 24	White	Some college credit, no degree	Female
Cassidy	18 - 24	White	Some college credit, no degree	Female
Lauren	18 - 24	White	Some college credit, no degree	Female
Anna	24 - 35	White	Associate's degree	Female

identified as female, with one male. Six participants identified as White, with one participant identifying as African American and White, and one identifying as East Asian and White.

Recruitment Procedures

Because this study was implemented virtually to allow for broader reach, participants were recruited by sharing the informational flyer (see Appendix A) to specific outlets targeting faculty in teacher preparation programs, enabling faculty to share with their eligible students (e.g., Teacher Education Division of the Council for Exceptional Children's Facebook page, Council for Exceptional Children online forum). 36 interested participants took a brief screening survey to ensure their eligibility (see Appendix B). As eligibility was verified based on survey responses, eight participants were randomly selected to begin the intake and consent process. Of the initial eight selected, one participant did not follow through on providing adequate verification of the eligibility criteria and another eligible participant from the survey respondents was contacted. Similarly, another initial potential participant was unable to schedule a time to meet for the intake meeting and did not follow up with enrollment, so another potential

participant was randomly selected to move forward with the intake process. All included participants stated that they were enrolled in a special education preparation program, had not been and were currently not employed as special education teachers, had taken at least one course in both IEP development and instructional design, and were not enrolled at the University of Oregon. Descriptions of degree eligibility, programs, and degree progress provided by the participants are available in Table 3. Pseudonyms for all participants are used throughout.

A virtual meeting was held with each participant to provide an overview of the purpose of the study, basic information about the research process, and the details of their participation including the anticipated risks and benefits. Participants were provided with the consent information and form and given an opportunity to review and ask any questions related to their participation in this study. Participants were provided with a Qualtrics link where they had access to the consent information to confirm or deny their consent and participation. Consenting participants were then asked to provide their general availability for scheduling the study sessions and complete a demographics survey (see Appendix C).

As part of recruitment efforts, participants were notified that they will be paid for their participation in this study at a reasonable rate to ensure fair compensation for their time and contribution to this research, and to ensure no loss of wages due to time spent completing this study. As posed by Largent & Lynch, (2017), the training opportunity provided in this study has a reasonable benefit to advance the skills and confidence of the participants, and although they *might* choose not to participate in this type of training, it is unlikely that they would find this training unreasonable and would otherwise certainly choose not to participate. To that end, offering payment for time spent participating in this study was unlikely to serve as undue i

Table 3

Degree and Licensure Eligibility Information Provided by Participants

Dyad	Participant	State	Degree Eligibility Upon Completion	Progress In Degree	Licensure Eligibility Upon Completion
A	Jessica	Indiana	Bachelor's in elementary and special education	Senior year	K-6 elementary general education and K-12 special education (mild)
A	Anna	Minnesota	Bachelor's in special education	Senior year	K-12 special education
B	Lauren	Texas	Bachelor's in elementary and special education	Senior year	K-6 elementary general education and K-12 special education
B	Blake	Indiana	Bachelor's in elementary and special education	Sophomore year	K-6 elementary general education and K-12 special education (mild)
C	Ava	Minnesota	Bachelor's in elementary and special education	Junior year	K-6 elementary general education and K-12 special education
C	Audrey	Indiana	Bachelor's in special education	Senior year	K-12 special education (intense intervention), K-6 special education (mild)
D	Claire	Minnesota	Bachelor's in special education	Junior year	K-12 special education, 5-8 social studies education
D	Cassidy	Minnesota	Bachelor's in special education	Junior year	K-12 special education

influence for participation. Participants were paid $375 dollars at completion of the study via Visa gift card.

Attrition

In an experimental single-case design study, there must be opportunity to document a minimum of three demonstrations of a basic effect of the intervention on the dependent variables at three different points in time. This study took a preventative approach to potential attrition by beginning with four dyads, which allowed for flexibility if one or both participants from one of the dyads was unable complete the study for any reason. Efforts were made to schedule intervention sessions with the participants at times that will consistently be feasible in their schedule and reminders were sent in their preferred modes of communication to prevent absence. If attrition occurred in one participant, the dyad containing that participant was to be dropped from the study due to infeasibility of repairing participants once the study had started. If the researcher anticipated that the 6 remaining participants were to complete the study, there was to be no change to the number of participants enrolled in the study. However, if the researcher anticipated further attrition or another one or two participants drops out of the study, one or more additional dyads were to be added in a nonconcurrent tier (i.e., not starting baseline assessment at the same time) and to follow the same phase progression as participants in the other tiers (Ledford, 2022). If additional participants were added to the study, case randomization would not have been possible due to a priori nature of assignment of the previously enrolled participants, but the other planned randomization strategies were to be implemented. Because of the once-per-week meeting schedule, if a scheduling conflict arose for one participant, the dyads were usually able to reschedule to an alternate time within the same week. A small number of probes were missed due to absences related to extraneous factors (illness, car accident, unexpected work conflict) that were unable to be rescheduled. Unfortunately, due to serious illness requiring hospitalization, Blake (a participant in dyad B) was unable to complete the study activities after

the ninth week and missed the final three weeks of the intervention (practice) phase. Blake's dyad had completed all three intervention (training) sessions and one practice session prior to his attrition, and those results are presented here. This case of attrition occurred after the intervention had already been delivered to this dyad, resulting in a reduction in the number of datapoints collected in the final practice phase. Because of this timing, another dyad was not added to the study.

Settings

The intervention was delivered virtually with real-time audio-visual transmission using widely available HIPAA compliant Zoom video-conferencing software provided by the University of Oregon. The researcher facilitated assessment and experimental sessions from a quiet, private, distraction free space. Participants were expected to attend the sessions from a location with high-speed Internet where they were able to talk freely, hear the audio from their Internet enabled device (tablet, laptop, or desktop computer) using a speaker or headphones, see the other participant and the researcher in real time, and fully attend to the session. Participants' general locations (e.g., city) were documented as part of the demographic information collection to determine geographic spread of participants, state level licensure requirements and to document mean (and range) number of miles from the researcher's University.

Seven of eight participants were in the mid-west region of the United States, with one in the south. The locations represented were various cities in Minnesota, Indiana, and Texas. The participant in Texas was student teaching and planning to be employed there but was receiving licensure through a program in Wyoming. Regarding licensure requirements, Minnesota indicates four potential tiers of licensure. All tiers require a bachelor's degree, three require completion of a teacher preparation program. Beyond this, there are several options for

eligibility, including coursework, state pedagogy tests, or classroom experience. Indiana requires completion of a degree program and standardized tests in pedagogical areas related to content (e.g., Exceptional Needs: Mild, Intense Intervention). Similarly, in Texas, a Texas-specific licensure exam as well as completion of a bachelor's degree and a qualifying teacher education program was required. The participants were an average of 2,132 miles from the researcher's university (range = 1,903-2,284).

Roles

Interventionist

The PI was the interventionist in this study and met with the participants during the consent, intake, intervention, and follow up sessions. The specific roles of the PI include: (a) consent and information meeting with each participant, (b) pre and post assessments for each individual participant, (c) contacting participants and other research assistants to coordinate and manage the implementation of the study, (d) developing and modifying the materials and assessments to be used in the intervention sessions, (e) conducting all the intervention sessions, (f) compiling data from each intervention and assessment session, and (g) training graduate research assistants in data collection and coding procedures for the purpose of measuring dependent variables, implementation fidelity, and interobserver agreement. The PI is a white, English speaking, cis-gender female who is a United States citizen. She has eight years of professional experience as a special education teacher to students with disabilities at the elementary level in public education in the United States. She is a certified special and general education teacher and a doctoral candidate in the special education program at the University of Oregon. She has experience teaching graduate level courses to pre-service special education teachers.

Research Assistants

Graduate student research assistants assisted with data collection procedures including coding vocal verbal behavior from recorded intervention sessions, coding procedural fidelity of the interventionist, and coding for reliability. They were trained by the PI in data collection including opportunities for practice, questions, and feedback. The research assistants in this study included four doctoral level students in special education who have experience authoring student IEPs, working in schools, and supporting the instructional planning of students with disabilities. They have professional backgrounds as behavior analysts, special educators, and speech language pathologists. One research assistant was a master's level school psychology graduate student who had experience supporting students with disabilities in schools and working in a special education environment.

Materials

Hardware and Software

The interventionist used a Lenovo laptop with an internal video camera and speakers. The participants used their personal or school provided laptops or tablets and internet connections to attend the sessions. Each device used encrypted communication through Zoom using wireless access. Zoom is approved by the federal Health Insurance Portability and Accountability Act of 1996 (HIPAA), Pub. L. 104-191, 42 U.S.C. §§ 1320d et seq. approved, approving this software to protect the privacy of its users. Training on how to use the necessary device and software settings to participate in this study was provided to consented participants as needed to ensure that there were no barriers to access, and common technical glitches can be quickly resolved. Recorded sessions were stored on secure cloud-based file storage only accessible to the research team as needed for coding purposes.

Table 4

TAPS Curriculum Sequence

Lesson	Topics/Activities
Introduction	Introduces the idea that a problem solver is someone who has questions to answer. Provide models and generate examples.
Lesson 1: Introducing the Qualities	Five qualities of a problem solver and active listener are introduced. The verbal repertoire of the qualities is introduced and modeled.
Lesson 2: Vocabulary	Key vocabulary words and phrases are taught to build verbal repertoire.
Lesson 3: Identifying TAPS Words	Written examples are given and students circle/highlight TAPS words and phrases, practice with partner
Lesson 4: Slapjack Game	Card game with TAPS words and phrases for fluency practice
Lesson 5: Discuss Individual Talking Aloud	Discuss and give approval for individuals to use problem solving language in self-talk

Intervention Materials

The PI used the Talk Aloud Problem Solving curriculum kit with modifications. TAPS is commercially available for purchase at https://www.talkaloudproblemsolving.com. The instructional kit includes a teacher guide, student workbook, poster, a set of cards for an instructional game (Slapjack), a video model of students engaging in TAPS, and a published workbook with logic problems. The curriculum includes general lesson guidance as well as scripted lesson components. The standard lessons in the initial kit follow the sequence outlined in Table 4.

Modifications to TAPS Curriculum. In addition to the TAPS curriculum, a general overview of IEP decision making, instructional EBPs, and accommodations and modifications was modeled during the training lessons, and a reference sheet of evidence-based practices and accommodations and modifications (access strategies) was available to participants. While it was expected that participants have basic knowledge of IEPs and instruction per the inclusion criteria and self-report in initial eligibility, this served to minimize potential variation in participant familiarity and level of training with these concepts.

TAPS is designed to be untethered from a particular content area and applicable to a wide variety of subjects and skills. In this study, modifications were made to the TAPS materials to be more closely aligned with the vocal verbal behavior that might be used at an IEP meeting or instructional problem-solving meeting between school professionals. For example, one of the taught problem solver qualities is to "avoid guessing the answer." It is unlikely that special educators making IEP decisions are "guessing" in the traditional sense of the word. To modify this item, it was changed to "avoid making assumptions," which may occur if a teacher chooses a certain instructional strategy or approach without data, assessment, or reasoning based on known information. See Table 5 for a comprehensive list of modifications to the phrases included in the TAPS training content.

All components of the TAPS lessons were taught during the training phase of the intervention delivery. Because the TAPS curriculum is designed for classroom use, some modifications were needed in structure for feasibility and acceptability for adult learners participating online. To restructure the lessons, the components were regrouped from five into three lessons. In lesson 1, participants were introduced to the characteristics of problem solvers and active listeners. They rehearsed stating the characteristics, and proceeded to distinguish

Table 5

TAPS Content vs. Modified TAPS for Pre-Service Special Education Teachers

Original Content	Modified Content
Introduction: Build background knowledge of problem solving with common examples (e.g., I have to make lunch, but I don't have any bread, what can I make?)	Introduction Modification: Mixed general examples + • Add contextual examples from special education field, introduce concept of instructional decisions as problems to be solved
Lesson 1: Introduce verbal repertoire of problem solver and active listener characteristics.	Lesson 1 Modification: Introduce problem solver and active listener as two roles in IEP development process (e.g., sped teacher + gen ed teacher or related service provider) and internal dialogue
• Problem Solver: o Have a positive attitude o Be careful o Break the problem into parts o Avoid guessing the answer o Be active with the problem	• Problem Solver: o Have a confident and open minded approach o Attend to all the information o Break the problem into parts o Avoid making assumptions o Be active with the problem
• Active Listener o Check for accuracy o Stay with problem solver o Catch mistakes o Don't give the problem solver the answer, lead your partner to the information o Use encouraging words to keep the problem solver talking aloud	• Active Listener o Check for accuracy and feasibility o Stay with problem solver o Catch mistakes o Don't insist on your answer, lead your partner to additional information to consider o Use encouraging words to keep the dialogue going
Lesson 2: Teach vocabulary and phrases through reading and highlighting examples, guided practice.	Lesson 2 Modification: Teach vocabulary and phrases through reading and highlighting examples, guided practice.
Problem Solver Sentences:	*Problem Solver Sentences:*

- Positive Attitude:
  - I will try to solve this problem.
  - I can find the answer to this question.
  - I will try to explain why this is my answer.
  - I'm going to try to find the evidence that I need.
  - I think I can find the evidence to solve this problem.
  - I can find the words that prove this is the answer.

- Confident and Open Minded:
  - I will try to solve this problem.
  - I can find the answer to this question.
  - I will try to explain why this is my solution.
  - I'm going to try to find the evidence and strategy that I need.
  - I think I can find the evidence to solve this problem.
  - I can find the words to rationalize my solution.

- Be Careful:
  - I am pointing to the words that tell me the answer
  - I am checking the words carefully
  - I will now read parts of the passage again because I need more information.
  - Let me use a pencil to mark each item that I will need.
  - I'll go back and read it again to make sure I have it right.

- Attend to all the information
  - I am finding the data to support my solution
  - I am listening to input from the team
  - I will check back on relevant data and records
  - Let me note my rationale
  - I'll go back and look at the plan all together to make sure it makes sense

- Break the Problem into Parts
  - I don't know the meaning of the word, so I will look at the words that are near that word.
  - I don't know the meaning of a word, so I will look at the sentence before that word.
  - I don't know the meaning of a word so I will look at the sentence after that word.
  - I think I will draw a picture of this part of the story.
  - I think I will draw a diagram of this part of the problem.

- Break the Problem into Parts
  - I am missing some information, so I will come up with a plan to find it.
  - I am not sure about this part, so I will ask the person who knows.
  - I am not sure of a strategy for this, so I will consult a resource.
  - I will create a visual to show the parts of the problem.
  - I will write an outline of the options.

- Avoid guessing the answer.
    - I don't need to guess because all the information is here.
    - This seems right but I better check to see if I really have the answer.
    - I think I can figure it out, but I'll draw a picture to make sure.
    - It's got to be one of the two answers. Let me see what's missing so I can figure out which it is.
    - Aha! I see it. Wait, I better not jump to conclusions, I'll go through this again.

- Be an active problem solver.
    - I am trying to get a picture of what is happening in this story.
    - I am imagining a picture of what is happening in this passage
    - I am drawing a diagram
    - I am drawing some symbols to help me understand
    - I am reading the question aloud before I pick my answer.

Active Listener Sentences:

- Words to say to help the problem solver have a positive attitude:
    - You need to try to solve this problem
    - You can find the answer to this question
    - Try to explain why this is your answer
    - Try to find the evidence that you need
    - You can find the evidence to solve this problem

- Avoid making assumptions.
    - I don't need to guess because all the information is here.
    - I know one approach, but I should check to see if it is really the best fit.
    - I think I can figure it out, but I'll consult a resource to make sure.
    - I'm considering two approaches. Let me get team input to help figure out the best way.
    - I know what to do. Wait, I better not jump to conclusions, I'll check the data and team input.

- Be an active problem solver.
    - I am trying to get a picture of the student's strengths and needs.
    - I am imagining what services and supports could look like.
    - I am creating a daily schedule.
    - I am outlining some options to help me understand.
    - I am reviewing all the information before I make a recommendation.

Active Listener Sentences:

- Words to say to help the problem solver be confident and open minded:
    - We can solve this problem
    - You can find the answer to this question
    - Give more information about your solution
    - Try to find the evidence that you need

- You can find the words that prove this is the answer

- You can find the evidence to solve this problem
- You can find a strategy that matches this problem

- Words to say when the problem solver doesn't show concern for accuracy
  - Point to the words that tell you the answer.
  - Check the words and sentences carefully
  - Read part of the passage again because more information is needed

- Words to say when the problem solver isn't considering all the information
  - Have you considered this piece of information?
  - Let's look at the data.
  - Let's get information about this from another resource.

- Words to say when the problem solver doesn't break the problem into parts
  - If we don't know the meaning of a word, then we look at the words that are near that word.
  - If we don't know the meaning of a word, then we look at the sentence before the word.
  - If we don't know the meaning of a word, then we will look at the sentence after that word.
  - Can you draw a picture of the story?
  - Can you draw a diagram of this part of the problem?

- Words to say when the problem solver doesn't break the problem into parts
  - Let's come up with a plan for finding this missing information.
  - If we are not sure about this part, let's ask the person who knows.
  - If we aren't sure, let's consult a resource to find a strategy for this part.
  - Can you create a visual to show the parts of the problem?
  - Can you write an outline of the options?

- Words to say when the problem solver guesses the answer
  - You don't need to guess because all the information is here.
  - You can get the answer without guessing.

- Words to say when the problem solver is relying on past strategies or habits
  - You can try something different to address this need.
  - You can use the data to choose a new approach.

• It's better to be right than to guess. • Don't hurry, you have time to get the right answer. ▪ Words to say when the problem solver is not active • Try to get a picture of what's happening in the story. • Imagine a picture of what is happening in this passage. • Draw a diagram • Draw some symbols to help you understand • Read the question aloud before picking an answer	• It's better to be find the best fit than rely on habit. • Let's take our time to consider all the information. ▪ Words to say to keep the dialogue going • Let's look at the big picture. • Imagine what this strategy could look like in practice. • Make an outline. • Let's write down some potential strategies. • Look back at the data.
Lesson 3: Identify TAPS Words Review sentences/examples, models, identify key words by circling/highlighting Lesson 4: Slapjack Game Students play slapjack identifying examples and non-examples. Lesson 5: Discuss Self-Talk Model and give approval of self-talk	Lesson 3: Identify TAPS Words Review sentences/examples, models, identify key phrases in virtual activity Lesson 4: Slapjack Game Virtually accessible flash card fluency game identifying examples and non-examples Lesson 5: Discuss Self-Talk Model and give approval for self-talk in general contexts and related to special education decisions

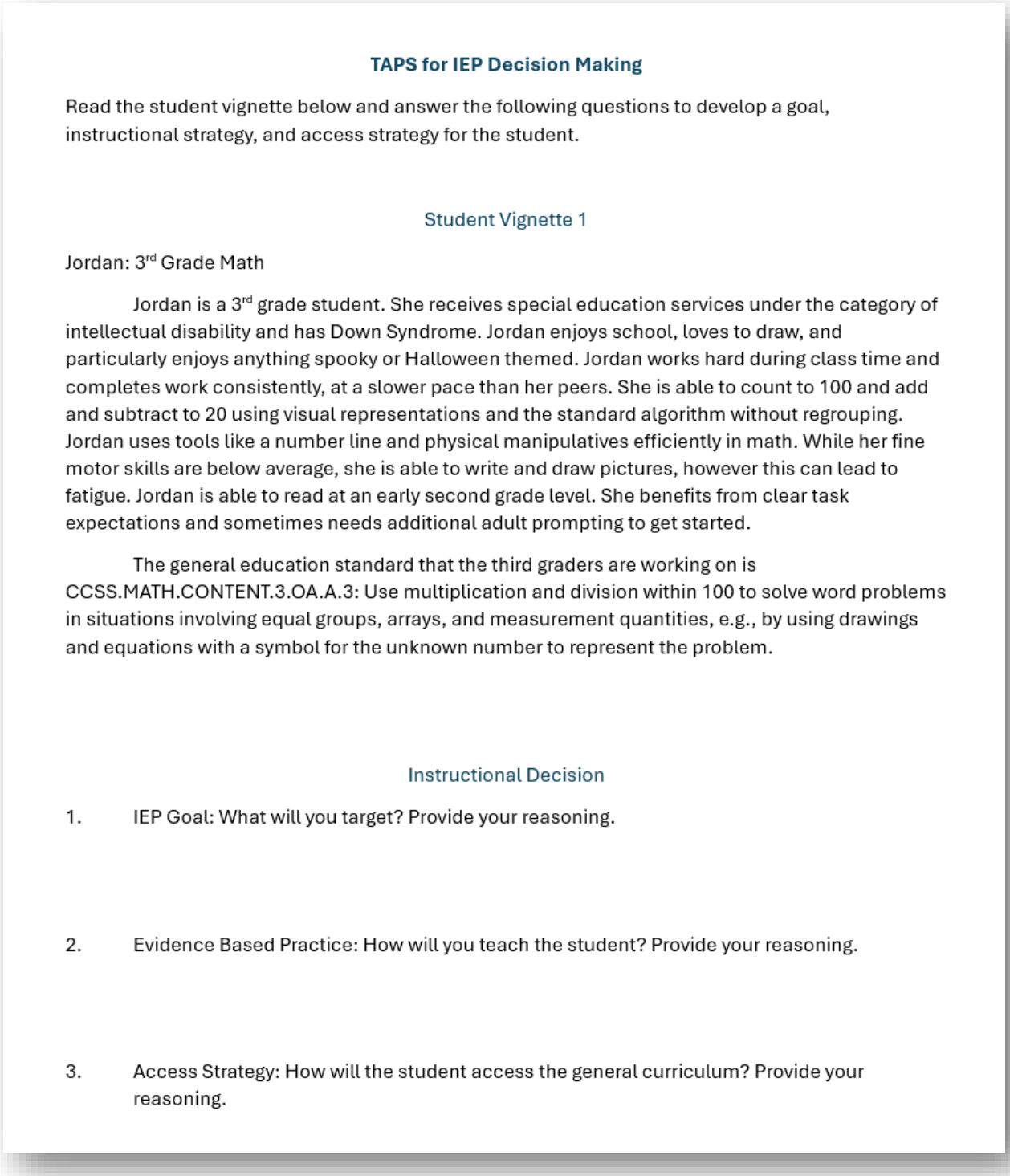
between examples and non-examples of TAPS language that models each problem solver and listener characteristics. The lesson concluded with modeling the decision making of instructional decision making with a script that includes TAPS language. In lesson 2, participants reviewed the characteristics and completed an interactive activity in which they highlight the specific TAPS language and phrases in written examples of dialogue related to special education decision making. A student vignette was then modeled for the participants including the verbal decision

making using TAPS problem solver language. In lesson 3, participants review the characteristics of problem solvers and active listeners. They completed a fluency flash card game that requires prompt responding of "yes" or "no" to TAPS phrases in a flash card style presentation that asks "Is this something a strong (problem solver/active listener) would say?" This was followed by instructional content related to internalizing both TAPS repertoires and using TAPS in independent problem solving. A final student vignette was modeled with a script that included and highlighted TAPS phrases in the independent problem solving process.

Vignettes and Response Worksheets. The participant probe materials included a written student vignette that follows a standardized format that was randomly varied to include different student level characteristics and variables. See Figure 3 for an example vignette. The vignette include a brief description of the hypothetical student's basic information, strengths, preferences, present levels in one content area, and information about the general education grade level standard(s) in that content area. The vignettes were developed by the researcher with the support of large language model artificial intelligence (OpenAI, 2023). Exemplars and parameters were given to the language model with the direction to vary student vignettes by (a) disability type (specific learning disability, intellectual disability, autism, speech and language disorders, other health impairments, emotional disabilities, visual impairments, deafness, hearing impairments, deaf-blindness, orthopedic impairment, traumatic brain injury, or multiple disabilities); (b) demographic characteristics (age, grade, race, gender); (c) student interests, (d) student skill levels; and (e) subject areas (i.e., math, writing, reading, science, social studies standards). The vignettes included details related to the student's skill in the targeted content area, as well as some additional details that are not directly related to the skill area in order to provide a general

Figure 3

Example Student Vignette Response Worksheet



TAPS for IEP Decision Making

Read the student vignette below and answer the following questions to develop a goal, instructional strategy, and access strategy for the student.

Student Vignette 1

Jordan: 3rd Grade Math

Jordan is a 3rd grade student. She receives special education services under the category of intellectual disability and has Down Syndrome. Jordan enjoys school, loves to draw, and particularly enjoys anything spooky or Halloween themed. Jordan works hard during class time and completes work consistently, at a slower pace than her peers. She is able to count to 100 and add and subtract to 20 using visual representations and the standard algorithm without regrouping. Jordan uses tools like a number line and physical manipulatives efficiently in math. While her fine motor skills are below average, she is able to write and draw pictures, however this can lead to fatigue. Jordan is able to read at an early second grade level. She benefits from clear task expectations and sometimes needs additional adult prompting to get started.

The general education standard that the third graders are working on is CCSS.MATH.CONTENT.3.OA.A.3: Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Instructional Decision

1. IEP Goal: What will you target? Provide your reasoning.

2. Evidence Based Practice: How will you teach the student? Provide your reasoning.

3. Access Strategy: How will the student access the general curriculum? Provide your reasoning.

picture of strengths and interests. Vignettes that were generated using the large language model AI were reviewed and edited to ensure consistency in presentation, logic in content, and accurate and relevant examples. Based on the presented vignette, participants were asked to make an instructional decision that included three components presented in the following manner on the worksheet:

1. IEP Goal: What will you target? Provide your reasoning.
2. Evidence Based Practice: How will you teach the student? Provide your reasoning.
3. Access Strategy: How will the student access the general curriculum? Provide your reasoning.

Other Visuals. When working in dyads or individually on the student vignettes, participants had access to reference sheets that outline basic definitions and examples of evidence-based practices and accommodations/modifications (see Appendix D). Following the implementation of the intervention, participants were also given visuals that included the characteristics and phrases of problem solvers and active listeners, per the TAPS curriculum.

Measurement

As detailed in the sections below, participants in this study were measured on their rate of problem-solving vocal verbal behavior as taught in the TAPS curriculum during dyadic intervention sessions. A secondary outcome was the quality of instructional decision making resulting from the problem solving probes in each session. Generalization probes across each experimental phase assessed the use of vocal verbal behavior from both the problem solving and active listener repertoires, as well as instructional decision-making quality, during individual probes.

Pretest, Posttest, and Screening

Whimbey Analytical Skills Inventory. Participants were expected to participate in verbal problem solving with another individual as part of this intervention package. To ensure that participants were able to engage verbally in the problem-solving process, they were pre-screened with a non-content specific assessment of problem solving and reasoning ability with the Whimbey Analytical Skills Inventory (WASI). The WASI is a 38-question assessment of reasoning. This approach was taken in another study using the TAPS curriculum and participants receiving the intervention showed growth on the measure (Neri-Hernandez, 2017). The WASI was implemented with adult learners to establish a mean baseline of problem-solving skills and a way to ensure that participants would verbalize their problem solving out loud. In this study, participants were given the WASI in electronic form and instructed to verbalize their problem-solving process while working through the items. Participants who were substantially below expected verbal behavior were to be screened out of this study (e.g., demonstrate fewer than 5 verbal utterances or no utterances relevant to the stimuli). This measure was given individually again at the end of the study to allow for a pretest and posttest comparison. No participants were screened from the study based on their performance in the WASI.

This measure was also implemented at posttest (with an alternative, posttest form of the assessment) and used as a distal measure of problem solving skills. Participants were again asked to talk aloud throughout their decision making process as they took the assessment. The transcriptions of the video recordings of participants completing the WASI were transcribed using Microsoft Word software to obtain a verbal word count as a representation of the quantity of the individuals verbal behavior during the task. TAPS language was coded in both the pre and posttest samples. The WASI has been used in other measures of TAPS instruction (Neri-

Hernandez, 2017). While this test was selected for pre and post comparison due to its relevance to TAPS and more specifically, the earlier iteration of TAPPS developed by the same author (Lochhead & Whimbey, 1987), it should be noted that the WASI is a non-standardized measure and is presented here for descriptive and pre/post comparative purposes only.

Modified Bandura's Instrument: Teacher Self-Efficacy Scale. In addition to the WASI, participants were also given a modified Teacher Self-Efficacy Scale at pre and posttest (Bandura, 1990). This measure was used to establish teacher's self-perception of their ability to influence factors relating to the IEP instructional decision-making process before and after the TAPS intervention. See Appendix E for the scale. The Modified Bandura's Self-Efficacy instrument was selected as an established measure of self-efficacy for teachers, edited to include content specific to the IEP process and IEP decision making process. Minimal changes were made to ensure relevance while maintaining the structure of the original instrument. Each item was scored on a scale of 1 to 9. A score of 1 corresponded with the label "nothing" indicating the person does not feel that they are capable of impacting that item at all, and a score of 9 corresponded with the label of "a great deal" indicating that they feel strongly self-efficacious about their influence over that item. In the middle, a score of 5 is labeled as "some influence" in the scale. For the rating scales, mean, median, and range are reported for each item in tabular format. Open ended question responses are reported to share teacher's concerns, impressions, and changes in their levels of self-efficacy.

Response Measurement

Vocal Verbal Behavior. The primary dependent variable in this study is the use of problem solving and active listening vocal verbal behavior. Frequency counts of verbal utterances that approximated TAPS phrases were collected by category of trained TAPS verbal

Table 6

Operational Definitions of Vocal Verbal Behavior

	Examples	Non-Examples
Trained TAPS Verbal Behavior: Problem Solver	Verbal statements approximating trained Problem Solver statements from the TAPS curriculum (E.g., I am not sure of a strategy for this, so I will consult a resource. I will try to solve this problem. I'm going to get the evidence I need, I'll make sure all the parts make sense together).	Verbal statements related to the content area, general statements about teaching, off-topic statements, specific strategy suggestions, negative statements
Trained TAPS Verbal Behavior: Active Listener	Verbal statements approximating trained Active Listener statements from the TAPS curriculum (E.g., Give me more information about that idea. Have you considered this part? Let's come up with a plan. Tell me about your rationale.).	Verbal statements related to the content area, general statements about teaching, off-topic statements, specific strategy suggestions, negative statements

behavior in 30 second intervals. The operational definitions can be seen in Table 6. Qualifying verbal utterances included statements from the TAPS repertoire of taught verbal behaviors, as described in the modified TAPS curriculum. Approximations to the TAPS statements were also counted as verbal problem-solving behavior. For example, one taught phrase is "*I am listening to input from the team*," but in the dyadic context of this intervention it may be more naturally phrased as "*I'm listening to what you're saying.*" Non examples include verbal behaviors counter to the taught TAPS problem solving repertoire (e.g., "*I can't figure this out*," "*There's no good answer*.") or content specific discussion ("*Usually students work on essay writing in fourth*

grade," "*I like teaching multiplication*," "*I have a student who really likes this kind of activity."*). Verbal behavior was recorded in an Excel based data sheet using the structure seen in Appendix F. to support reliability coding and analysis of which types of verbal behavior are being used.

Instructional Decision Quality. Instructional decision quality was scored on a rubric from the permanent product recording of the vignette and response worksheets. See Table 7 for the rubric. This rubric was designed to capture the presence of a specific, measurable skill, an evidence-based instructional practice, and an access strategy (an accommodation or modification). Then, if presence of those items was established, additional points were given/not given based on the relevance of the response to the student's area of need, the grade level standard, the appropriateness of the choices, and the overall quality of the rationale and alignment across the responses. For example, if participants stated a goal of paragraph writing and an EBP of direct instruction with vocabulary flashcards, this would be an example of misalignment where the EBP could not reasonably be used towards the indicated goal. Response definitions for the rubric scoring can be found in Appendix G.

Generalization. TAPS training occurs in dyads, with one individual acting as the problem solver and another acting as the active listener. The desired generalization target of this dyadic practice is for each individual participant to develop and utilize private verbal behavior that allows them to be their own problem solver and active listener, enabling them to better reason and solve problems they are confronted with across different scenarios. To measure this, individual probes were conducted with each participant during all phases. This involved the participant working through a vignette on their own and talking aloud through their decision-making process.

Table 7

Scoring Rubric for Instructional Decision-making Worksheets

	Score 1 for Yes, 0 for No
IEP Goal	
Indicates a specific, measurable skill	
Is in the same domain as the area of need	
Is a pre-requisite for the general education content/standard	
Evidence Based Practice	
Indicates one or more specific evidence based instructional practices	
Indicated practice could reasonably be used to address the goal	
Access Strategy	
Indicates one or more accommodations or modifications	
A/M addresses a barrier that the student faces due to their disability/skill deficit	
A/M could reasonably be used for accessing the general education content/standard	
Rationale and Alignment	Score 3, 2, 1, or 0
Rationale Quality	
Overall Alignment	

Intervention Fidelity

Procedural fidelity was measured to ensure that the PI delivers the intervention as intended per the TAPS curriculum and research plan. Graduate research assistants (one doctoral student in special education who is experienced in teacher training and one school psychology master's student who is also a trained special educator) were trained by reviewing the fidelity rubric and scoring guides, observing examples of the training in progress, and discussing definitions for "yes" and "no" of each item. Following training, coders independently coded two videos to ensure 80% inter-observer agreement on implementation fidelity. Following this, 100% of intervention sessions were coded for fidelity, with 50% double coded to ensure reliability across coders. Coders were provided with a scoring rubric, the intervention session videos, and

the scripts from each lesson. They coded each session with the corresponding rubric and determined if the interventionist adequately followed the intended script and activities with no more than minor wording deviations. If agreement fell to 80% or lower, coders were to be retrained on new stimuli and additional definitions will be provided as needed to improve coder agreement (Li et al., 2023; Polanin et al., 2019). See Appendix H for the response criteria and example procedural fidelity form, respectively, that was completed in Qualtrics. Fidelity was calculated as a percentage (number of observed interventionist behaviors meeting quality standards per the fidelity codebook/ total number of behaviors on the fidelity checklist x 100).

Intervention fidelity was high, with a mean of 98.92%, with individual probes ranging between 92.31% - 100%. Initial coder agreement was 94.98%. For disagreed items, the two independent coders reviewed the item, discussed their score and reported their decision to the PI, resulting in 100% agreement without a third coder needed for resolution.

Inter-Observer Agreement and Inter-Rater Reliability

Inter-observer agreement (IOA) was calculated for the TAPS verbal problem solving behavior across all phases and conditions. Trained graduate research assistants (one doctoral student in special education who is a BCBA and has been trained in the TAPS curriculum and one doctoral student in special education who is a speech language pathologist and has experience with assessing and coding verbal language) coded the verbal behavior videos for IOA. They were trained by the PI by reviewing the code definitions and forms, viewing models and examples, and completing practice coding on two videos to ensure adequate reliability before being assigned videos to code independently. IOA was checked throughout the study to ensure agreement remained high. Total count IOA was calculated by dividing the number of agreed 30 second intervals by the total number of potential agreements and multiplying by 100 to

obtain a percentage score. IOA was calculated for 40% of the verbal behavior measurements, with a high level of agreement (96%). For any disagreed intervals, the two coders discussed the language used and made a final determination of the scoring of the TAPS language.

Inter-rater reliability was calculated for the instructional decision making scoring across all phases and conditions. For the worksheets, two coders who are doctoral candidates in special education and have experience working in schools, developing IEPs, and training other educational staff coded for IRR. Training was first provided to each group of coders by reviewing a coding guide, scoring sheet/rubric, and seeing modeled examples. Coders then practiced and received feedback on their codes to ensure adequate agreement (>80%) before being randomly assigned items to code independently. Total count IRR was calculated by dividing the number of agreed rubric items by the total number of potential agreements and multiplying by 100 to obtain a percentage score. IRR was calculated for 60% of the worksheets. Following the training phase, one coder fell below the 80% threshold for acceptable reliability in the first round with an overall agreement of 76%. Disagreements were discussed and retraining occurred by reviewing the rubric scoring, modeling examples, and answering clarifying questions. Following this, both coders met the 80% criteria with 81% and 82% agreement on the next randomly assigned sets of worksheets, respectively, resulting in an overall initial IRR score of 79%. Disagreements in IRR scoring were reviewed between coders by reviewing the rubric and worksheet and discussing the rational for given scores. Final agreement following this procedure was 100%. A third opinion was needed on four of the scores. The rubric scoring was highly sensitive to disagreements due to the interrelated nature of some of the items. For example, if one coder scored that there was a specific and measurable skill indicated for the goal, this opened up the potential points for the goal being aligned with the students area of need, a

Table 8

IOA and IRR Mean and Range by Dyad

Dyad	IOA Verbal Behavior Measurements	IRR Instructional Decision Making Measurements
Dyad A	94% [85%, 100%]	81% [50%, 100%]
Dyad B	94% [82%, 100%]	81% [40%, 100%]
Dyad C	97% [94%, 100%]	81% [40%, 100%]
Dyad D	99% [96%, 100%]	74% [50%, 100%]
Overall	96%	79%

pre-requisite for the grade level standard, aligned with the EBP and access strategy, as well as improved ratings on the overall rationale and alignment. If coders scored the presence of the specific measurable skill differently, that often resulted in the corresponding differences on the subsequent items. Participants also varied greatly in the level of detail they included in their responses, which sometimes resulted in differing interpretations of what was written. This is discussed further in the limitations section.

Social Validity

Social validity was measured through surveys and optional interviews after the intervention was completed. Participants were asked about the acceptability, feasibility, and effectiveness of the interventions using a modified TARF-R (Reimers & Wacker, 1988). The modified TARF-R scores range from 1 to 7, with one indicating Not at All _ and 7 indicating Very _, covering various constructs including willingness to complete the intervention, likelihood of discomfort, and others. Participants had the option to participate in individual exit interviews at the end of the intervention to obtain qualitative information about their experiences in the study and with the intervention. See Appendix E for the social validity survey. This data is reported as summarized quantitative and qualitative findings from the scored portions of the surveys (quantitative) and the open responses in the interview and narrative survey data

(qualitative). Illustrative quotes and examples are provided from the stakeholders that communicate benefits, concerns, and experiences with the study. For the rating scales, mean, median, and range are reported for each item in tabular format.

Experimental Design

This study used a multiple baseline across participants design, with participants paired in dyads (Ledford & Gast, 2018). Individual tiers of the multiple baseline construction will represent individual participants, and phase changes will occur at the same time for partners in dyads. While a multiple-probe design approach was initially planned to limit potential practice effects due to repeated exposure of the practice task, the combined factors of a two-week stagger, once weekly meetings based on participant feasibility, and measurement probes before and after each tiered entry into intervention resulted in continuous measurement characteristic of a multiple baseline, rather than multiple probe, approach.

Randomization

This study employed the use of a priori randomization to strengthen internal validity through decreasing Type 1 errors and control for potential sequencing and effects of dyadic participant dynamics (Kratochwill & Levin, 2010). First, individual participants were randomly paired in dyads to help control participant level characteristics such as experience and training level. If restraints on randomization such as scheduling availability or time zone resulted in issues in the randomization scheme, participants were to be randomized within their available pairings based on availability and this limitation will be reflected in the analysis. In this study, no issues were present with the initial randomized order. Case randomization was used to determine which tier of the multiple baseline design each dyad is assigned to. Within session, the order of the within session intervention activities (e.g., which participant is the problem solver or active

listener first, participant order of independent practice) was selected randomly to reduce Type 1 bias. Randomization was achieved by having the researcher's dissertation chair a priori (before start of baseline phase) randomly select the order of participant entry into intervention, randomly select the dyadic pairing, randomly sequence the vignettes to be delivered across the study, and randomly select within session intervention activity order. To facilitate randomization, the researcher will provide the dissertation chair with the chosen pseudonyms of the participants, but no identifying information. The dissertation chair used an online random number generator to make random selections, recorded the process using QuickTime screen capture, documented the results in writing, and shared the video and the results with the researcher via a shared file in secure cloud storage.

Phase Change Decisions

Participants were to move from baseline into intervention following steady state responding with a minimum of six datapoints. Probes were taken of the subsequent dyads in later tiers just prior to and at the timing of each phase change. If participants were non-responsive to the intervention (demonstrate little to no change in level of total TAPS verbal behavior following the training and three practice sessions), the researcher would intensify the practice condition by providing a higher rate of behavior specific praise for the trained vocal verbal behaviors that the participant is engaging in at a low or zero rate. If no change was seen within three probe points following this intensification, one session of re-training will be delivered to the individual.

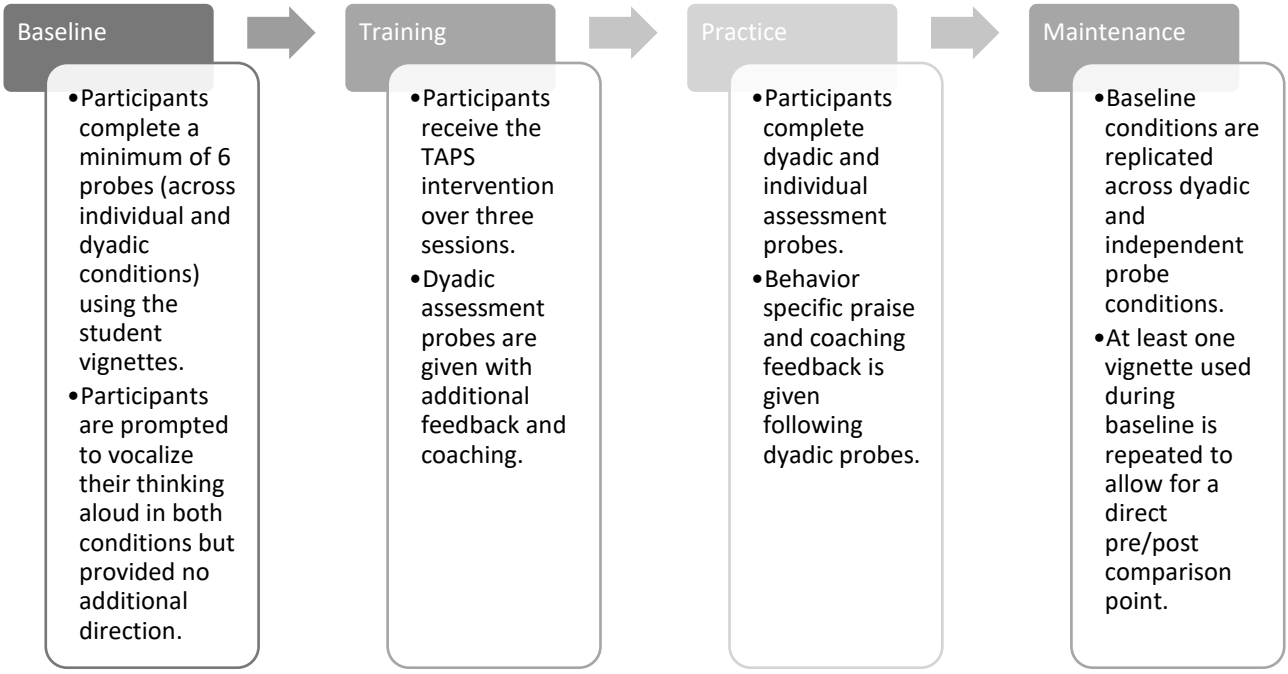
Procedures and Phases

This study had four phases: baseline, intervention (training), and intervention (practice), and maintenance. Baseline, training, and practice sessions occurred once per week over 12 weeks. Maintenance probes took place three weeks after the cessation of the intervention.

Participants were given the same length of time to work on each dyadic or independent probe to ensure experimental control. The student vignette measurement probe was pilot tested and was completed by the test participants in approximately 7-8 minutes. Based on this information, participants were given 15 minutes as a maximum cap for making their instructional decisions.

Figure 4

Intervention Phases



Therefore, each session was estimated to take approximately 35 minutes considering transition times, with a maximum estimated time of 45 minutes. During the training phase, the three training sessions were planned to be one hour to allow for delivery of the intervention content in addition to the probes. See Figure 4 for a visual of the study phases and activities.

Baseline. In baseline sessions, participants logged into a Zoom session with the interventionist. Before the probes started, participants were informed of their roles and prompted to verbalize their thinking during their decision making. Participants were given the evidence-based practice reference sheet and accommodations and modifications reference sheet, as well as access to the worksheet. The problem solving participant was asked to share their screen so that the worksheet was visible to both participants and the screen recording. The dyad was asked to read a randomly selected student vignette and complete the response worksheet. Dyads worked through two vignettes in each session, randomly rotating through each role (problem solver, active listener, independent). Independent probes were randomized throughout. During independent probes, participants entered Zoom breakout rooms and their independent problem-solving process was recorded individually while they talked out loud. Data was coded individually for each participant's verbal behavior. Instructional decision-making quality was assessed per the rubric. Participants did not receive feedback on their responding or instructional decision-making quality during the baseline phase. There were minimum of six planned baseline datapoints, and baseline was to continue until there was a stable pattern of responding in the primary dependent variable of vocal verbal problem solving behavior. Additional baseline datapoints were to be added if there was high variability, in order to establish experimental control. No additional baseline data points were added in this study. Participants were moved into the intervention (training) phase described below based on a steady state of responding in the baseline condition.

Intervention (Training). In the intervention (training) phase, the TAPS curriculum was delivered over three sessions of approximately 60 minutes for a total training time of 180 minutes. During each intervention session, the dyadic probes and data collection followed the lesson. Participants were given behavior specific praise following their completed vignettes to reinforce their development of the TAPS verbal repertoire (e.g., "*Great use of the active listener language when you noticed that the problem solver needed to check back on the information*."). Participants had the reference sheets, as well as a visual of problem solver and active listener characteristics (per the TAPS curriculum materials) available for reference. The three training sessions did not include individual probe points, and the individual probe points were resumed in the intervention (practice) phase described below.

Intervention (Practice). In the intervention (practice) phase, the interventionist will started each session with a brief reminder to incorporate the TAPS language in their problem solving process to ensure that they demonstrated the TAPS characteristics of the problem solver and active listener (e.g., *"Remember to use TAPS language we learned in our lessons like 'Tell me your rationale for that' or 'Let me look back at the information' to keep your partner talking and active with the problem."*). Dyadic and individual probes occurred in randomized order throughout this phase. Behavior specific praise was given regarding the use of TAPS verbal behavior (e.g., *"I noticed you using that Active Listener phrase, and that made the Problem Solver rethink and strengthen their rationale behind their decision!).* Coaching feedback was also given by providing examples specifically identifying verbal behavior that could have been used during their work on the vignette or identifying opportunities to increase rate of verbal

problem-solving behavior (e.g., *"I noticed you used highlighting as you were reading through the vignette, remember to use TAPS language like 'I'm highlighting here to make an outline of the important information' so that your partner can hear your processing.").*

Participants were provided with the evidence-based practice reference sheet, as well as a visual of problem solver and active listener characteristics (per the TAPS curriculum materials). The practice condition was planned to ensure that there were a minimum of ten probes across the training and practice phases to allow for observation of multiple probes in each condition per participant. To support feasibility and ecological validity when considering eventual scaling of this intervention approach to implementation in teacher training coursework or larger group settings, the maximum number of practice sessions was planned to be 8.

Maintenance. Maintenance sessions followed the same procedures as the baseline phase. Participants were given the directions to talk aloud throughout their problem solving process and provided with the reference sheets, informed of their role, and given access to the randomly assigned worksheets. A probe in each of the conditions (active listener, problem solver, and independent) was planned for the maintenance phase. Each of these conditions was tested in a randomized order. At least one of the vignettes used in baseline condition was repeated in the maintenance phase to enable a comparison across the same vignette from beginning to end of the intervention.

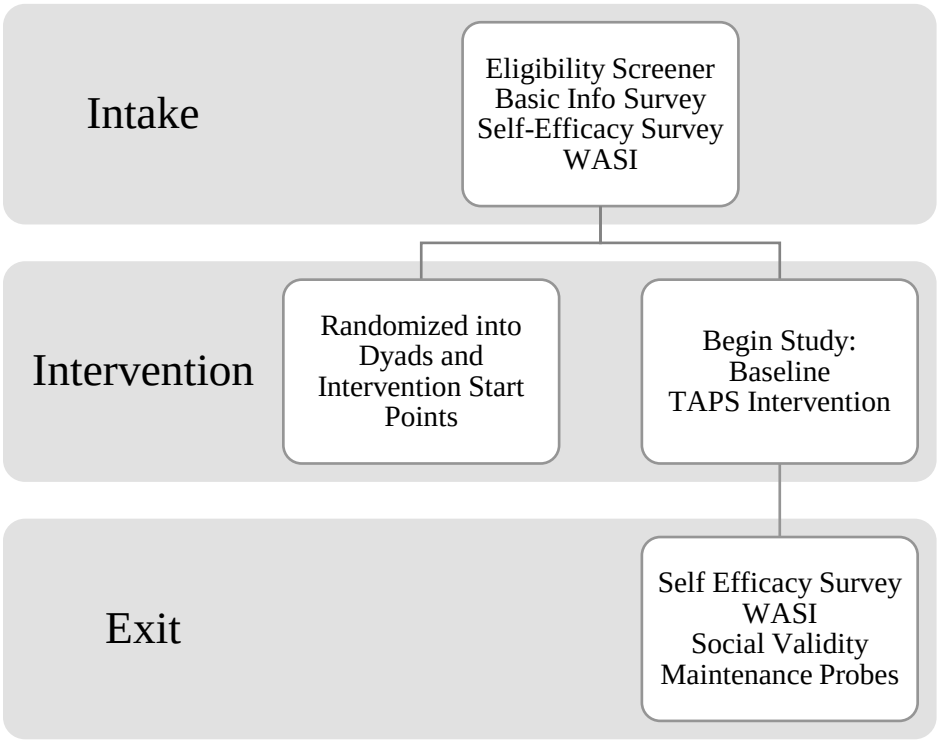
Analysis

Data was graphed using recommended conventions for display of single-case data (Dart & Radley, 2018; Ledford et al., 2019). Each individual participant's data is displayed on a line graph using different symbol markers to display the condition of the datapoint (e.g., participant

was the problem solver in the dyad, participant was the active listener in the dyad, participant was working independently). Participant graphs were examined across phases within each participant, as well as vertically to assess the presence of potential history effects or other

Figure 5

Participant Process Flowchart



confounding influences across participants. To determine if a functional relation exists, a basic effect should be evident at three different points in time. The use of visual analysis is the primary method for determining if there is evidence of a functional relation in single-case research design. Baseline data was visually analyzed for level, trend, and variability around the median data path. Changes in level (e.g., overall change in amount of verbal behavior), trend (e.g., increase or decrease over time in verbal behavior), and variability during baseline and intervention phases were compared. Graphs were also examined for immediacy of effect,

referring to how quickly after the introduction of the intervention the behavior was observed to change. Overlap was examined using visual analysis complemented by a Tau-U non-overlap statistic (Parker et al., 2011). The Tau-U calculator at https://singlecaseresearch.org/calculators/tau-u/ was used to complete these calculations (Vannest et al., 2016). As described on the calculator website, a Tau-U statistic can exceed statistical power of OLS linear regression when the dataset is non-conforming to parametric assumptions, making it an appropriate choice for small datasets in single-case analysis. Additionally, it can be calculated as a simple non-overlap statistic or control for positive baseline trend and provides p-values and confidence intervals. Consistency across phases was examined for patterns. Vertical analysis was conducted to examine potential history effects or transfer of intervention effects across tiers.

Statistical analysis was used to complement the results of visual analysis. A between case standardized mean difference (BC-SMD) was calculated using the R package SCDHLM, which will allow for the resulting Hedge's *g* statistic to be used in comparison with conventional group design study effect sizes and future meta-analyses (Pustejovsky et al., 2016; R Core Team, 2021). Hedge's *g* is calculated by finding Cohen's *d* effect size, which is the difference between the standardized means of two groups (in this case, baseline and intervention data) divided by the pooled standard deviation. Hedge's *g* correction uses degrees of freedom based on the sample size to correct for the small sample.

CHAPTER III

RESULTS

Dependent Variable: TAPS Verbal Behavior

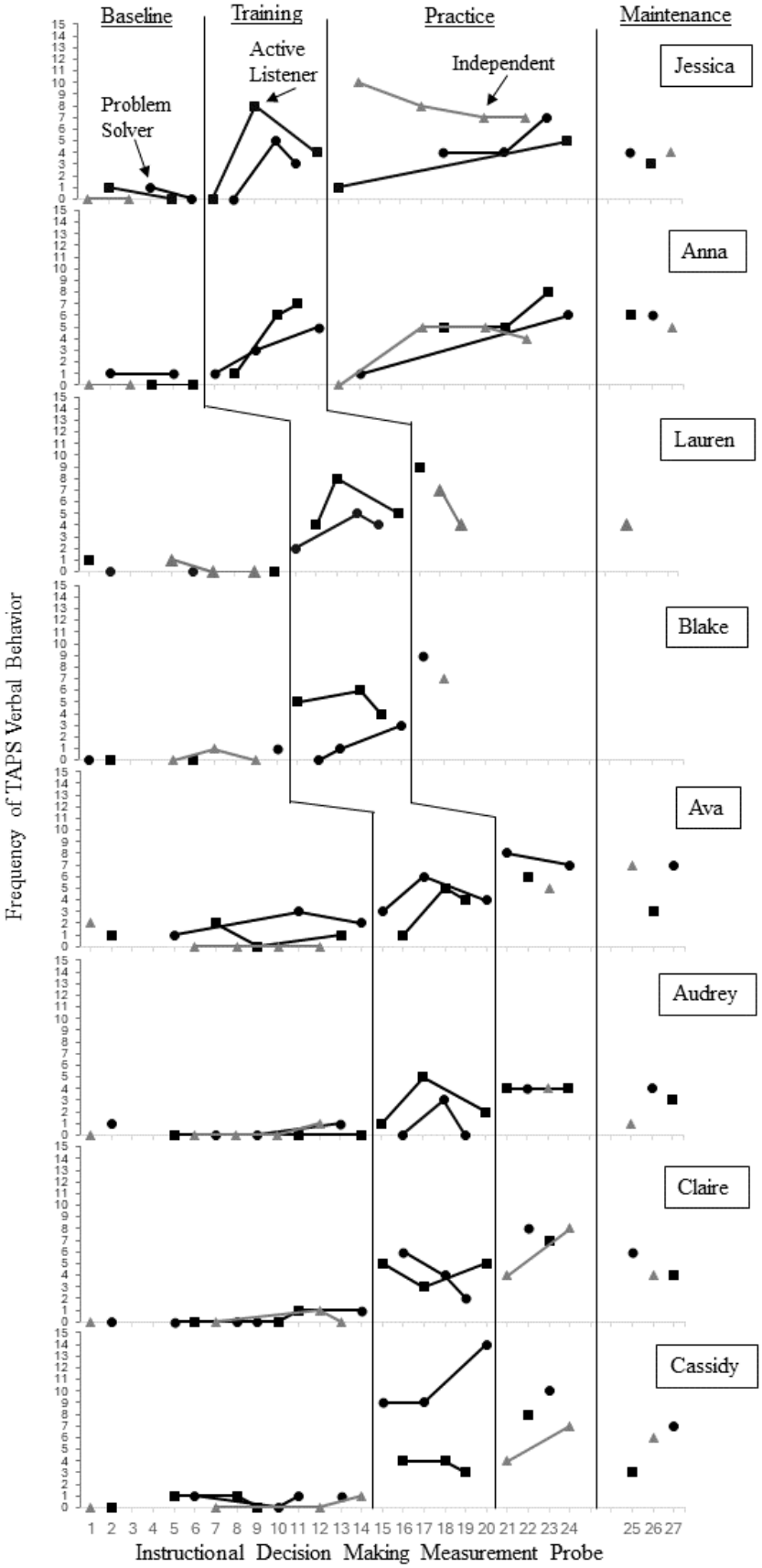
TAPS verbal behavior was the primary dependent variable in this study. This was defined as taught TAPS phrases or approximations of TAPS phrases as outlined in the curriculum. Participants were directly taught to use TAPS phrases during their instructional decision making probes while solving the student vignette worksheets. This variable was examined using visual analysis of graphed data, a Tau-U effect size, and hierarchical linear modeling to determine a BC-SMD. Visual analysis consists of considering the level, trend, variability, immediacy, overlap, and consistency of the data across phases within participants and vertically across participants and dyads. Figure 6 shows the graphed frequency counts of TAPS verbal behavior data. As indicated in the figure, closed black circles represent the problem solver role, closed black squares represent the active listener role, and gray triangles represent the independent generalization probes.

Dyad A

Dyad A consisted of Jessica and Anna, whose individual results are described below. In this dyad, there were low and stable baselines, a change in level following the implementation of the intervention, and an overall increasing trend in the intervention phase. There was a moderate amount of variability in their data between measurement probes and measurement conditions. The combined Tau-U effect size for this dyad was large and significant (Tau-U = 0.81, $p < 0.001$), and a basic effect of the intervention was demonstrated.

Figure 6

Frequency of TAPS Verbal Behavior



Jessica. Jessica demonstrated a low and stable baseline. Following the implementation of the intervention, there was a delayed response until after the delivery of lesson two, when Jessica's use of the TAPS language increased. There was an increase in level over the baseline phase, with moderate variability and an overall increasing trend over the course of the intervention phases despite that variability. Jessica demonstrated the highest level of TAPS language in the practice phase when working independently, demonstrating generalization from the dyadic training. In training, her use of TAPS language was higher in the active listener condition over the problem solver condition, but this pattern did not maintain in practice. The Tau-U effect size was large and statistically significant. (Tau-U = 0.8, $p < 0.01$). Jessica's TAPS language maintained at a level higher than baseline, but lower than her overall level during intervention.

Anna. Anna demonstrated a low and stable baseline. Following the intervention, Anna followed the same pattern as Jessica such that her level of TAPS language did not increase until after the second of three lessons, leading to a steep increasing trend during the training phase. Following this, the first measurement session in the practice phase demonstrated a return to baseline levels. However, the remaining practice phase measurements returned to a higher level of TAPS language use and remained consisted for the remainder of the intervention. Anna's independent probes also increased relative to her baseline levels, demonstrating generalization. This results in moderate variability over Anna's scores, but still demonstrates a change in level from baseline. In most dyadic probes, Anna demonstrated higher use of TAPS language in the active listener condition over the problem solver condition. The Tau-U effect size for Anna was large and statistically significant (Tau-U = 0.83, $p < 0.01$). Anna's TAPS language maintained at the same approximate level as her intervention scores across conditions.

Dyad B

Dyad B consisted of Lauren and Blake, whose results are described below. Blake unfortunately could not complete the final three weeks of the practice phase of the study because of attrition due to serious illness. However, the dyad was able to complete the training phase and one practice measurement opportunity, allowing for visual analysis and calculation of effect sizes. The combined Tau-U effect size for this dyad was large and statistically significant (Tau-U = 0.9, $p < 0.001$), and a basic effect was demonstrated.

Lauren. Lauren demonstrated a low and stable baseline. Following the intervention, there was an immediate increase in her use of TAPS language that continued in an overall upward trend over the intervention training and practice phases, with some variability. Due to attrition of Lauren's dyadic partner, there are fewer measurement probes in the practice phase. Generalization to independent use of TAPS language was observed. Similar to the participants in dyad A, her use of TAPS language was higher in the active listener condition. Despite this, the Tau-U nonoverlap score for Lauren was large, as she demonstrated no overlap with her baseline scores (Tau-U = 1, $p < 0.001$). Lauren completed one maintenance probe in the independent condition due to the attrition of her dyad partner, and maintained at the same general level of TAPS language as her intervention probes.

Blake. Blake demonstrated a low and stable baseline. Following the intervention, there was a change in level of Blake's use of TAPS language. Notably, there was an immediate effect on his use of active listener language, with a delayed and gradual effect on his TAPS language in the problem solver role. His use of TAPS language further increased in the practice probe that was able to be completed, and he did demonstrate generalization in the independent probe. His

use of TAPS language was higher in the active listener condition during training. The Tau-U nonoverlap score for Blake was large and statistically significant (Tau-U = 0.8, $p < 0.01$).

Dyad C

Dyad C consisted of Ava and Audrey. In this dyad, there were stable baselines, however Ava's baseline levels of problem solving language were slightly higher than Audrey's. Following the intervention for this dyad, they demonstrated an increasing trend across measurement opportunities with some variability. Similar to several other participants, there was a delayed effect of the intervention until after lesson two. The combined Tau-U effect size for this dyad was large and significant, (Tau-U = 0.08, $p < 0.001$), and a basic effect was demonstrated.

Ava. Ava demonstrated a stable baseline ranging from 0-3 uses of TAPS language, which was relatively low but the highest among the participants. Following the intervention, Ava followed the pattern of a delayed increase until after lesson two was complete. After this, there was an overall increasing trend in her TAPS language use including generalization to independent probes. Her use of TAPS language following the intervention was consistently higher in the problem solver role than in the active listener role. The Tau-U nonoverlap score for Ava was 0.9 ($p < 0.001$). Ava's use of TAPS language maintained an increase over baseline in the problem solver and independent condition, and was relatively lower in the active listener condition.

Audrey. Audrey demonstrated a low and stable baseline. Following the intervention, Audrey also followed the pattern of increase in TAPS language after lesson two of the intervention. Following that, she demonstrated variability including some overlap with baseline before stabilizing in the practice phase. This included generalization to the independent condition. Her use of TAPS language was higher in the active listener condition during the

training, but was equal across conditions in the practice phase. The Tau-U nonoverlap score for Audrey was large and significant, but represents the lowest change of all participants in the study (.72, $p < 0.01$). Audrey's use of TAPS language did not maintain in baseline in the independent condition, but did maintain at the same levels of her intervention performance in the problem solver and active listener condition.

Dyad D

Dyad D consisted of Claire and Cassidy. This dyad demonstrated low and stable baselines. This pair was unique in this study in that they demonstrated an immediate effect of the intervention following the first lesson of the TAPS curriculum. Following this, Cassidy demonstrated the highest TAPS language scores of all participants, and this dyad overall had a somewhat variable but large change in level. A basic effect of the intervention was demonstrated. The combined Tau-U effect size for this dyad was large and significant (Tau-U = 1, $p < 0.001$).

Claire. Claire demonstrated a low and stable baseline. Following the intervention, Claire's use of TAPS language increased immediately and did not return to baseline levels. In the practice phase, Claire's use of TAPS language demonstrates an increasing trend across all conditions, including generalization to the independent condition. Claire's responding during the training phase did not follow the common pattern among other participants, but instead she showed immediate gains after lesson one that slightly lowered in the second and third lessons, although they did not return to baseline levels. The Tau-U nonoverlap score for Claire was large and significant (Tau-U = 1, $p <0.001$).

Cassidy. Cassidy demonstrated a low and stable level of TAPS language in baseline. Following the intervention, her scores increased immediately and she continued on an increasing trend across conditions, including generalization to the independent measurement probes.

Cassidy demonstrated distinctively high rates of TAPS language in the problem solving condition, and continued to favor this condition throughout the training and practice phase. Similar to the other partner in her dyad, her use of problem solving language increased immediately at lesson one. Because of the immediacy of this effect and the lack of return to baseline, her Tau-U nonoverlap score was large and significant (Tau-U = 1, $p < 0.001$).

Vertical Analysis

Vertical analysis is critical in single case research to examine the data for internal validity and establish if a basic effect occurred at three separate points in time. When examining the data vertically, it is evident that there were no history effects (outside events that impacted the data at the same point in time across participants, unrelated to the study). Similarly, behavioral covariation suggesting extraneous variables impacting participant responding was not observed, such that one dyad entering into intervention did not influence the performance across additional dyads. This is not surprising given the telepractice format of the study, the geographic spread of participants across the United States, and the randomization of participants to dyads and the resultant lack of interaction between participants and dyads outside of the study. A basic effect was demonstrated at three different times across dyads.

Summary of Visual Analysis

Visual analysis indicates a change in level for all eight participants. Six of eight participants, with the exception of Claire and Cassidy, followed a pattern of demonstrating an increase in TAPS verbal behavior following the implementation of lesson 2. This trend could be explained by the more detailed exposure to the TAPS phrases in lesson 2 over lesson 1, whereas in lesson 1 the content is focused on the TAPS overarching characteristics. As predicted, the

overall trends continued such that use of TAPS language increased over time and continued in the practice stage while receiving feedback and coaching from the interventionist.

There was variability in the use of TAPS language during and following the training, despite the overall increase in level. One source of this variability was that some participants consistently had higher scores in one repertoire over the other (e.g., used more TAPS language in the problem solver role and less in the active listener) but this pattern was not consistent across participants or conditions. Several participants did share the pattern of demonstrating more TAPS language in the active listener condition. This could be explained by the problem solver using more of their time talking focused on the content and specific strategy suggestions they were making to respond to the vignette, while in the active listener role, the individual could focus more on using the active listener language to elicit more details or draw the problem solver's attention back to different information in the vignette. By the nature of the task, the problem solver also generally spoke more than the active listener in some instances, as they were describing their initial thoughts and what they would propose as their response to the worksheet items.

An immediate effect after one lesson of the modified TAPS curriculum was observed for Lauren, Blake, Claire, and Cassidy. For the other participants, the increase in TAPS language was observed after lesson 2. The pattern of increasing TAPS language after lesson 2 is consistent with the instructional sequence provided in the curriculum. There was consistency across phases such that baselines in all participants were low and stable across the baseline phase. Following that, all participants demonstrated increases in TAPS language over their baseline scores, with some variability either across probes or across roles.

While some participants (Lauren, Claire, and Cassidy) demonstrated no overlap from baseline to the intervention phases, the other five participants demonstrated 1-4 overlapping datapoints following the implementation of intervention.

Omnibus Tau-U

Tau-U was calculated using the web based calculator at singlecaseresearch.org/calculators/tau-u (Vannest et al., 2016). Tau-U is a nonoverlap statistic that is widely used in single case studies and meta-analyses. An omnibus Tau-U effect combines the results of all individual phase contrasts across participants. In this study, the omnibus Tau-U effect size was large and statistically significant (Tau-U = 0.89, p <0.001). Individual and combined Tau scores are reported above in each participant section as well as in Table 9.

Table 9

Tau-U Non-Overlap Scores and Statistics

	PAIRS	TAU	SD	P Value	CI 90%
Jessica	90	0.80	25.69	< 0.01	0.330<>1
Anna	75	0.83	22.91	<0.01	0.324<>1
Lauren	63	1.00	18.89	<0.001	0.507<>1
Blake	56	0.80	17.28	<0.01	0.296<>1
Ava	120	0.90	30.33	<0.001	0.484<>1
Audrey	120	0.73	30.33	<0.01	0.309<>1
Claire	120	1.00	30.33	<0.001	0.584<>1
Cassidy	110	1.00	28.40	<0.001	0.575<>1
Dyad A	165	0.81	-	<0.001	0.469<>1
Dyad B	119	0.90	-	<0.001	0.551<>1
Dyad C	240	0.81	-	<0.001	0.518<>1
Dyad D	230	1.00	-	<0.001	0.703<>1
All Phase Contrasts	754	0.89	-	<0.001	0.755<>1

BC-SMD

A BC-SMD was calculated as an additional statistical method to analyze the results, compute a design comparable effect size, and test for significance. As described in the methods section, this was calculated using R statistical software and the SCDHLM package. BC-SMD was calculated using a clustered model, such that datapoints for dyads were nested together. The estimation method was Restricted Maximum Likelihood. The findings indicate a large effect (Hedge's $g = 3.54$ [2.72, 4.35], $p < 0.001$).

BC-SMD estimate	Std. Error	95% CI (lower)	95% CI (upper)	Degrees of freedom	Auto-correlation
3.54	0.41	2.72	4.35	100.34	0.008

Dependent Variable: Instructional Decision Making

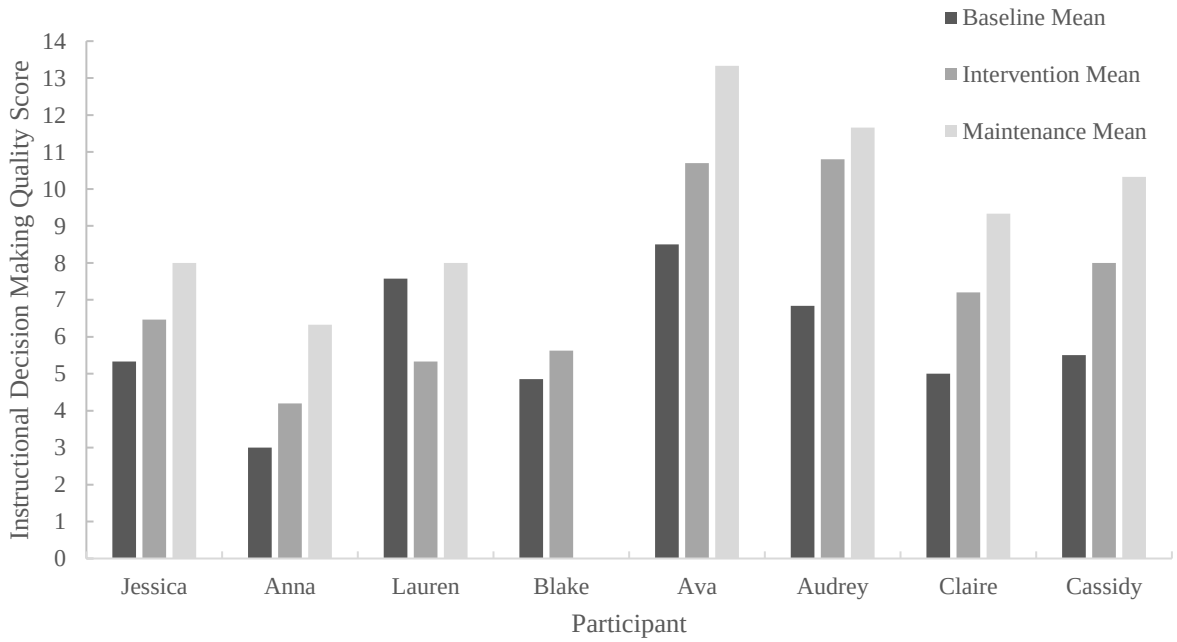
Instructional decision making scores based on the rubric are presented here by dyad as well as by independent, problem solver, and active listener condition from baseline to intervention. The rubric for the instructional decisions had a maximum score of 14 points. It is important to keep in mind that participants scores are partially interrelated due to the dyadic nature of the probes, so one member's score in the problem solving condition would be the same as the other member's active listener score.

First, when considering mean change within each participant from baseline to intervention as seen in Figure 7, small gains are present in seven of eight participants, with the exception of Lauren. It should be noted that Lauren and Blake (Dyad B) had fewer intervention points due to attrition, and after receiving the intervention, they had a substantial increase in their back-and-forth conversation during the probes which resulted in several unfinished worksheets

during the training phase. The gains continued such that average responses in maintenance demonstrated continued improvement for all participants.

Figure 7

Baseline to Intervention Mean Instructional Decision Making Scores Across Participants

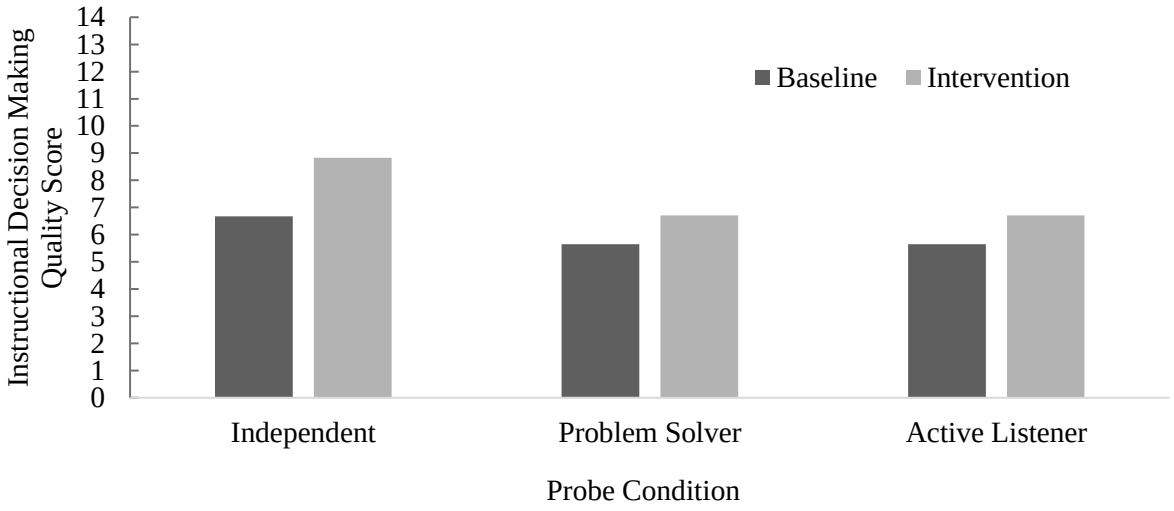


Looking at the data broken down by condition in Figure 8, modest gains are also seen from baseline to intervention in each role type. Independent probes show the greatest increase in scores. While these gains may represent growth due to the TAPS intervention, there was a high level of variability across baseline and intervention scores that makes it challenging to establish an experimental effect. Scores ranged from 0-14 in both baseline and intervention phases. In addition, it is possible that practice effects related to repeating the assessment task may have contributed to this overall change.

Examining the patterns of baseline to intervention changes in worksheet scores across participant dyads reveals more of the within participant variability across conditions. For

Figure 8

IDM Quality Scores by Phase and Condition



example, in Dyad A, one participant had substantially higher independent decision making scores. While both participants made gains across all conditions from baseline to intervention, the wide gap between their independent scores persisted. This pattern was notable in that when the participant with stronger independent scores (Jessica) was in the lead as the problem solver dying dyadic probes, the scores were higher than when Anna was in the problem solving role.

In Dyad B, Lauren had higher independent scores than Blake, and when Lauren was in the problem solving role, their dyadic scores were higher than when Blake was in the problem solving role. Following the intervention, Blake's independent scores improved substantially. Their dyadic scores became more similar, but, they were lower than their baseline scores. As noted above, due to attrition, there were fewer data points for this dyad. This dyad also struggled more than others to complete the worksheets within the 15 minute timeframe, which resulted in some markedly lower scores.

Figure 9

Dyad A IDM Quality Scores

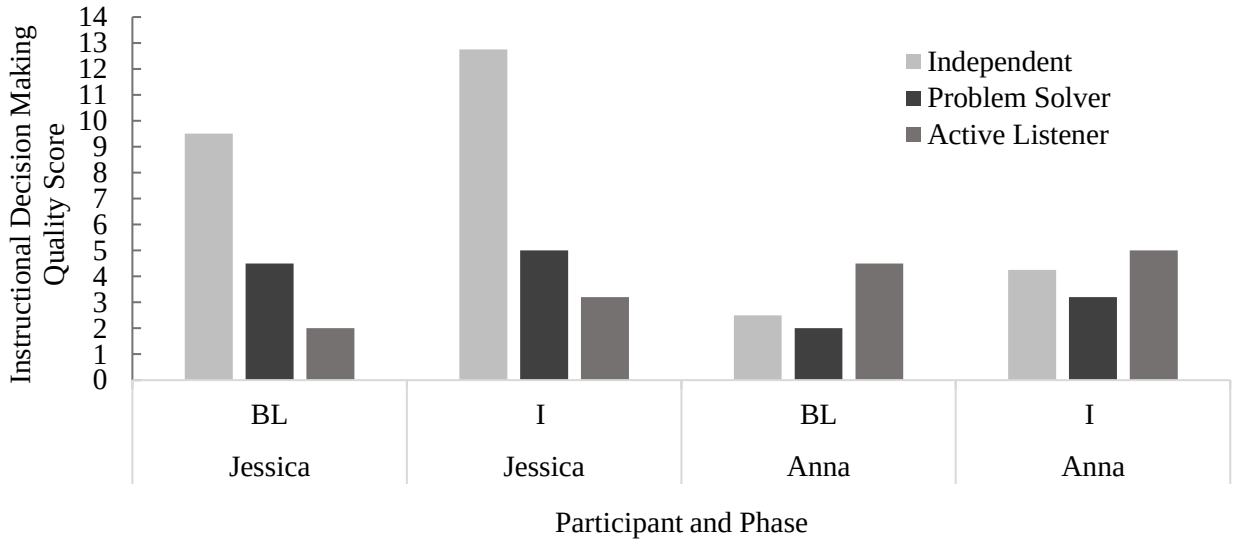


Figure 10

Dyad B IDM Quality Scores

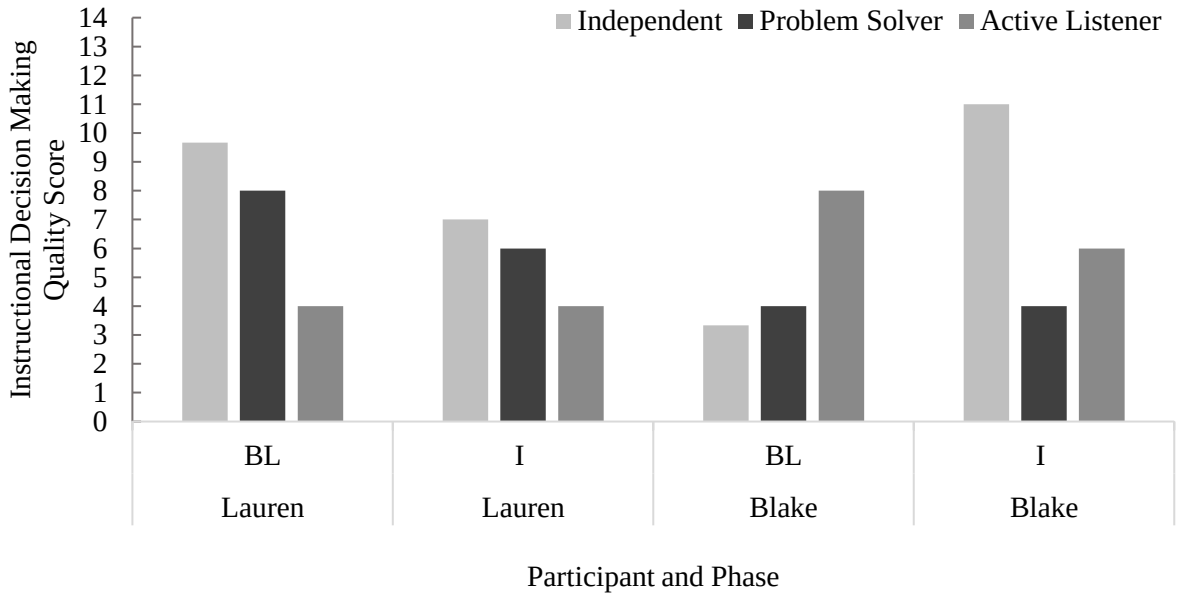
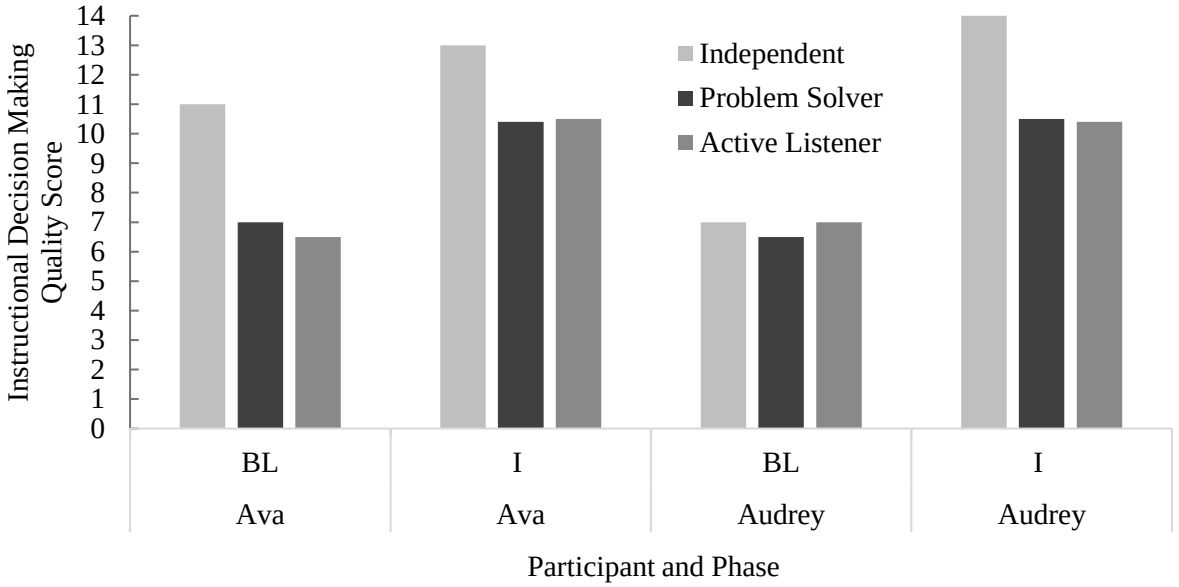


Figure 11

Dyad C IDM Quality Scores



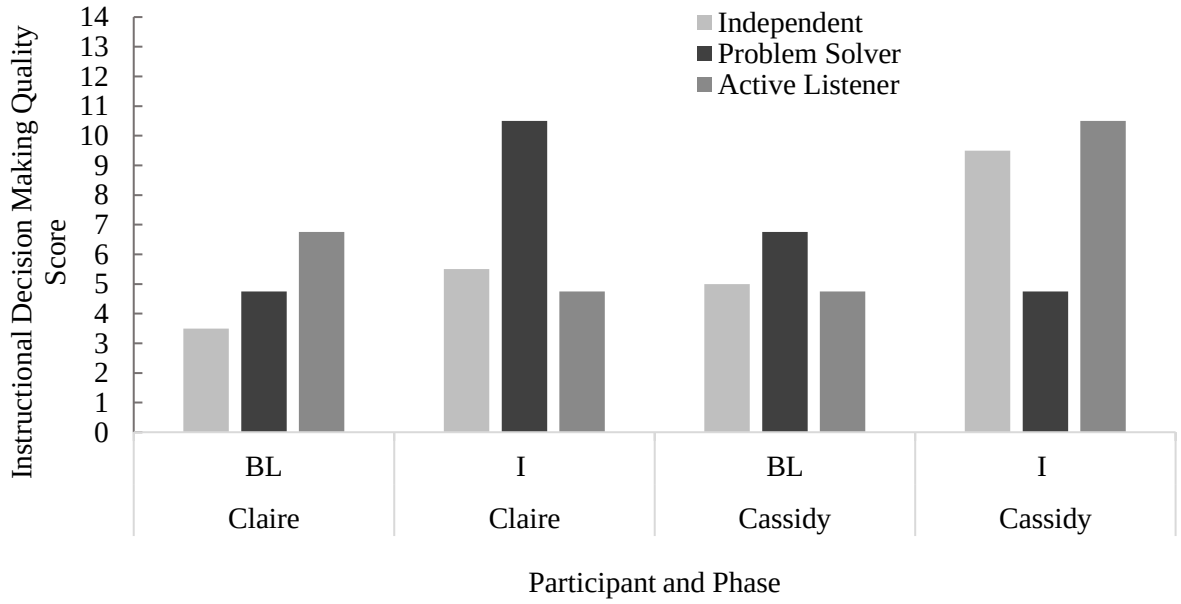
Dyad C's participants showed growth in both participants across all conditions. In the baseline phase, Ava's independent scores were higher than Audrey's. Unlike Dyad A and B, there was not a pattern of substantially stronger dyadic scores when the stronger independent participant was in the lead in the problem solving role. This pair was the most consistent across conditions.

Dyad D demonstrated growth from baseline to intervention in the independent condition for both participants. In the probes in which Claire was problem solver and Cassidy was active listener, there was another substantial jump from baseline to intervention. However, in conditions where Cassidy was problem solver and Claire was active listener, their scores slightly declined.

When considering the patterns of the instructional decision making data altogether, it is important to note that there was a standard deviation of 3.8 points in baseline and 4.3 points in

Figure 12

Dyad C IDM Quality Scores



intervention. While overall means increased in the intervention phases, the variability also slightly increased. As noted above, the magnitude of mean change across different participants and conditions also varied greatly, and patterns were not consistent.

Modified Bandura's Self-Efficacy Inventory

Means and ranges from the pre and posttest are reported in Table 10. At pretest, participants ratings of their self-efficacy was variable. Items that received lower minimum scores, indicating that at least one participant felt particularly ineffective in that item included obtaining instructional materials they need, getting parents involved in the IEP process, and getting administrators involved in the IEP process. Mean scores across all items ranged from 4.75 to 7.63, indicating an overall moderate level of self-efficacy on these items. Of note, on the items related to IEP goals, evidence-based teaching practices, and access to general education (the items that participants responded to as part of the secondary depended variable, instructional

decision making), participants reported the strongest ratings of 7.375, 7.625, and 7 at pretest, respectively.

At posttest, mean scores on all items increased, indicating that the participants' self-efficacy improved. On the items related to IEP goals, evidence-based teaching practices, access to general education, and alignment across these areas, there were some of the highest increases despite these being relatively highly scored areas at pretest. At posttest, these items all scored in the 8.4-8.7 range. Another notable increase into the 8-point range occurred on the two items related to assisting parents in understanding the IEP process and ensuring parents are comfortable.

While the scores on these scales showed moderate levels of self-efficacy with some variability at pretest, the open-ended responses indicated more uncertainty. Full pretest responses to open ended questions can be seen in Table 11. While some participants noted general confidence in the areas of leading IEP teams to make high-quality decisions and writing goals, selecting practices, and implementing access strategies; several others noted low confidence, overwhelm, lack of practice, and concerns about implementation.

Following the intervention, the open-ended responses corroborated the overall increase in self-efficacy scores seen in the scaled items. Full open-ended responses at posttest can be seen in table 12. While participants shared fewer comments in the open-ended questions at posttest, they stated confidence in leading IEP decisions, with one participant noting: "I have a better understanding of how I can use data to share my thinking on the best evidence-based practice for the student, as well as providing accommodations that allow the students to access the general education curriculum. By speaking my thoughts aloud, this allows me to share how I would best

serve the student using the data I have, while also allowing myself to be an active listener and take ideas from others at the table."

Table 10

Modified Bandura's Self-Efficacy Inventory

Question	Pretest				Posttest			
	Min	Max	Mode	Mean	Min	Max	Mode	Mean
How much can you influence the decisions that are made on IEP teams?	3	9	7	6.25	5	9	7	7.00
How much can you express your views freely on important IEP matters?	5	9	5	6	7	9	7	7.50
How much can you do to get the instructional materials you need?	2	7	5	4.75	5	8	7	6.63
How much can you do to get through to the students with the highest needs?	4	9	6	6.5	7	9	9	8.00
How much can you do to promote learning when there are barriers impacting the student from their life outside of school?	3	7	7	5.75	5	9	7	6.75
How much can you do to keep students on task on difficult assignments?	5	7	7	6.38	5	8	7	6.75
How much can you do to increase students' memory of what they have been taught in previous lessons?	3	7	7	5.63	5	9	7	6.75
How much can you do to motivate students who show low interest in schoolwork?	3	7	7	5.63	4	9	7	6.75
How much can you do to get students to work together?	5	8	5	6.13	5	9	7	6.75
How much can you do to get students to follow classroom expectations?	5	7	7	6.25	4	9	7	7.13
How much can you do to respond to challenging behavior in the classroom?	4	9	5	6.5	6	9	9	7.88
How much can you do to prevent challenging behavior from occurring?	3	7	5	5.63	6	9	7	7.00
How much can you do to get parents involved in the IEP process?	2	9	4	5	6	9	7	7.25

How much can you assist parents in understanding the IEP process?	4	9	7	6.63	7	9	9	8.75
How much can you do to make parents feel comfortable in the IEP process?	3	9	7	6.5	7	9	9	8.38
How much can you do to get general education teachers involved in the IEP process?	5	9	7	6.5	6	9	7	7.25
How much can you do to get related service providers involved in the IEP process?	4	7	7	5.88	4	9	9	7
How much can you do to get administrators involved in the IEP process?	2	7	4	5	4	9	9	6.88
How much can you do to ensure that students have high-quality goals on their IEPs?	5	9	7	7.38	6	9	9	8.38
How much can you do to ensure that you use evidence-based practice when teaching students?	5	9	8	7.63	6	9	9	8.13
How much can you do to ensure that students have access to the general education environment and curriculum?	5	9	7	7	6	9	9	8.13
How much can you do to ensure that goals, interventions, and access are aligned?	5	9	6	6.63	5	9	9	8.13
How much can you do to ensure that students show measurable progress on their goals?	5	9	7	6.75	6	9	9	7.75
How much can you do to ensure that all necessary IEP team members contribute to instructional decisions?	5	9	5	6.38	6	9	9	7.63

Table 11

Open-Ended Self-Efficacy Responses at Pretest

Pretest	**Question 1:** **Briefly describe your current confidence level in leading IEP teams to make high-quality instructional decisions for students with disabilities.**	**Question 2:** **Do you have any additional thoughts or perceptions related to your self-efficacy in IEP decision-making that you would like to share? Consider writing IEP goals, selecting evidence-based practices, and implementing modifications and accommodations.**
Claire	In my pre-services courses, I have completed an IEP meeting role-play activity, which was scripted. I am moderately comfortable leading an IEP meeting, but not confident.	I have concerns for my future self regarding implementation of modifications and accommodations because I am not confident in my ability to organize and plan for the use of paraprofessionals when implementing these interventions, modifications, and accommodations. How do I create a system for communication and data recording? How do I train a paraprofessional to record observations and data for monitoring progress towards goals? What are some resources or systems I can use to record data for different goals? These are things I would like to know in order to be more confident in my IEP decision-making skills.
Blake	I am pretty confident in my ability to mediate and help everyone feel comfortable and involved in an IEP team. I feel as though I am able to make sure things are understood for all parties, and that the student is going to be getting the very best that can be provided to them. However, I am not	Self-advocacy is a huge IEP goal in my book. I want students to be able to understand that they require different things in different areas, and to speak out and make sure that they get them. Speaking up for yourself goes a long way! I also like a measurable goal, like 80% proficiency in an area. Finally, making sure there are correct modifications and accommodations is huge. Being able to pick your own seat, some extra

	perfect in always understanding how much may be asking TOO much of a student. I do not ever want to make school feel "easy" for a student by them receiving too much assistance, but I still want them to receive what they require to be the best that they can be.	time on tests, and being able to get some extra movement throughout the day are three big ones that I think can work for a lot of students (whether they actually have an IEP or not).
Ava	I have never led a formal IEP team during a meeting or discussion during instructional decisions. My current confidence level is low.	I feel like I have been equipped, through college courses, with the foundational information I need to perform my roles. I do not feel as though the skills have been accessed yet, as I have not been given the responsibility to show and utilize them.
Audrey	I have sat in IEP meetings as a parent for nine years now, and have also sat in on them as support staff at times when I was working in the school. I feel like I know how to advocate well in the meetings, and what to push back on.	I feel as though my professors have done a thorough job of helping to write goals, with the present level of performance as well as a goal attainment scale that can help scaffold goals so there can be small successes celebrated along the way.
Jessica	As a pre-service teacher, I have some confidence in leading IEP meetings, but I have mostly been an observer in the meetings, as I am still learning how everyone contributes to the discussions.	I think writing goals is something I have somewhat of a confidence in, as I have done it many times in classes but I have seen different ways to write the goals, and it can make me nervous as to what is the right way to convey what I want to see the student do. I think I have a stronger confidence in choosing practices and implementing accommodations, but the goals drive this, and I think I can do it but have a lower confidence in that compared to carrying out the goals given to me.

Cassidy	I do not have high confidence in leading IEP teams to make decisions for students with disabilities. I have had minimal experience with IEP meetings, so the lack of practice makes me lack confidence in my ability to do so.	I am overwhelmed with how to make the best decisions for students using the information gathered from the student and involving the rest of the IEP team because I haven't been a part of the full process before.
Lauren	I have never led an IEP meeting or team before and my confidence is very low to start now. I haven't had the opportunity to sit in on many meetings either, so I'm not even confident with the meeting process.	I haven't had a lot of field experience with IEP meetings or teams. I've written a few IEPs for college courses but that's about it.
Anna	I have yet to do so, I feel some comfort.	*No response.*

Table 12

Open-Ended Self-Efficacy Responses at Posttest

	Question 1: Briefly describe your current confidence level in leading IEP teams to make high-quality instructional decisions for students with disabilities.	**Question 2: Do you have any additional thoughts or perceptions related to your self-efficacy in IEP decision-making that you would like to share? Consider writing IEP goals, selecting evidence-based practices, and implementing modifications and accommodations.**
Claire	I feel confident in my ability to lead IEP teams to make instructional decisions for a student.	*No response.*
Blake	"I feel pretty comfortable leading IEP teams. I definitely don't think that I'm perfect by any means. In a lot of scenarios though, I feel very comfortable taking charge and leading."	"It is very hard. I feel like this helped me a lot, but I still have so much to learn. I believe no one is perfect though, and we always have so much to learn."
Ava	I am confident that I can be an encouraging and guiding team member in the IEP process. To do this, I can use phrases to increase contributions from other team members and provide data and insight to problem-solve with others. I believe that I can explain the IEP process and rationale for decisions to the IEP team to aid their understanding.	In addition to my own personal toolbox, I have many resources -- research, other information, and professionals -- to consult to help me create individualized, measurable IEP goals, EBPs, and accommodations and modifications for my students.
Audrey	I have high confidence I can lead an IEP team.	*No response.*

Jessica	I feel very confident in being able to share my thinking using data, and being able to lead a team to a decision that is best for the student together.	I have grown immensely in understanding how I can share my thoughts and work with a team to develop high-quality IEP goals. I have a better understanding of how I can use data to share my thinking on the best evidence-based practice for the student, as well as providing accommodations that allow the students to access the general education curriculum. By speaking my thoughts aloud, this allows me to share how I would best serve the student using the data I have, while also allowing myself to be an active listener and take ideas from others at the table.
Cassidy	I am fairly confident in leading IEPs and the team to come to a conclusion on instructional decisions based on data.	An area that I feel that my skills are weaker in is writing IEP goals for individual students.
Lauren	I think I might struggle with leading an IEP team confidently, but I do know that I'm knowledgeable about the process and the steps every member needs to take.	*No response*.
Anna	I feel much more confident now.	*No response*.

Table 13

WASI Pre and Post Test Data

Participant	Score		Percent Correct		Verbal Word Count		TAPS Phrases	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Jessica	23	29	61%	78%	3,043	3,094	0	2
Anna	14	15	37%	40%	1,189	1,148	0	2
Lauren	24	28	63%	76%	1,511	1,973	0	2
Blake	18	-	47%	-	837	-	0	-
Ava	32	32	84%	86%	2,848	3,231	7	10
Audrey	27	29	71%	76%	1,751	765	0	0
Claire	28	34	74%	92%	4,188	3,383	0	7
Cassidy	23	28	61%	78%	1,731	3,536	3	8

Whimbey Analytical Skills Inventory

On the distal measure of problem solving skills, all participants maintained or improved their scores on the WASI, with gains ranging between 3-17%. Notably, the highest score on this assessment at pre and posttest was held by Ava, who was one of two participants to demonstrate the use of TAPS language during her pretest WASI. With the exception of Audrey, six participants demonstrated unprompted generalized use of TAPS language to this assessment task, which was unrelated to special education topics. Participants rate of talking aloud did not change systematically between pre and posttest, with increases seen in Jessica, Lauren, Ava, and Cassidy and decreases seen in Anna, Audrey, and Claire. Blake was unable to complete this assessment due to attrition.

Social Validity

A modified TARF-R, which included rating scales and open-ended response opportunities, was completed by the participants following the intervention. Overall, participants indicate high levels of understanding, acceptability, willingness, and impact of the intervention. For reverse scored items, they indicated no discomfort and little to no discomfort or

Table 14

TARF R Quantitative Results (Scales)

	Min	Max	Mode	Mean
How clear is your understanding of the TAPS intervention?	5	7	7	6.50
How acceptable do you find the TAPS intervention to be regarding IEP decision making?	6	7	7	6.75
How willing were you to carry out this intervention?	5	7	7	6.38
Given the challenges of IEP decision making, how reasonable do you find this intervention to be?	6	7	7	6.75
To what extent do you think there might be disadvantages in participating in this intervention?	1	3	1	1.88*
How likely is this intervention to make permanent improvements in your IEP decision making skills?	5	7	7	6.13
How confident are you that this intervention was effective?	6	7	6	6.38
How disruptive was it to carry out this intervention?	1	5	1	2.00*
How effective is this intervention likely to be?	5	7	7	6.13
How much did you like the procedures from the TAPS intervention?	3	7	7	6.25
How willing do you think other pre-service teachers will be to participate in this intervention?	5	7	6	6.00
To what extent are undesirable consequences likely to result from this intervention?	1	3	1	1.50*
How much discomfort did you experience during this intervention?	1	7	1	2.25*
How challenging do you find IEP decision making?	2	7	5	4.38
To what degree is IEP decision making of concern to you?	3	7	5	4.88

Note. Items marked with asterisk (*) are reverse coded such that a lower score indicates the absence of a negative outcome.

disadvantages to participating in this intervention. The full results of the rating scales are provided in Table 14, with 1 representing the lowest and 7 representing the highest possible score.

In the open-ended responses, participants generally spoke positively about the TAPS intervention, indicating that they felt more at ease and confident with communicating in a group about student's needs, and noting that they had not had any training like this in their pre-service preparation programs. Suggestions for changes to the curriculum largely focused on expanding the use of TAPS curriculum, including spending longer with the lessons, using TAPS in person, and being able to use TAPS in small groups to discuss real student situations from their practicum placements. Participants recommended TAPS for use with college students in training programs as well as with other types of teachers beyond special education. They also noted benefits related to understanding how to engage with problem solving when they were not the primary expert or taking the lead in the discussion, and they felt that understanding the structure of problem solving conversations was helpful. One participant indicated that they had a hard time being told to use specific language, as it didn't feel natural. This participant who indicated this was the participant with the most experience in IEP meetings (10+ years attending as a parent). This is important to consider as it may indicate that this intervention could have differential effects or would be most appropriate for educators who are earlier on in their careers, prior to having extensive experience in IEP conversations.

Table 15

Modified TARF-R Open Ended Responses

Participant	What aspects of the TAPS intervention did you find most valuable or beneficial? Please explain.	Are there elements of the TAPS intervention that you believe could be improved or enhanced? If so, please describe them.	How would you describe the overall quality and effectiveness of the TAPS intervention?	Researchers are interested in learning if this intervention would be useful to test further, use with broader populations, and recommend to others. Please share any additional comments, insights, or feedback you have about the training that you believe are important for us to know.
Jessica	"By understanding the different roles of the active listener and problem-solver, this allowed me to practice utilizing both types of phrases to support my partner. When in an IEP meeting, I would be playing the role of both, so by switching off, this allowed me to learn how I can be a strong problem-solver, as well as listen to others and be an active listener to push my partner to use the data and think about the best options. The TAPS intervention allowed me to be able to share my thinking in a way that is best for the team, and understand how I can lead a team to come to a strong decision."	"I think spending more time on the curriculum could be beneficial. I enjoyed learning about it for the lessons we did, and think the only improvement would be to spend more time with it and practice it as a group."	"I think the intervention was extremely effective, especially as we spent several weeks practicing the intervention. I believe this is a high-quality and effective intervention for pre-service special educators to learn about to help support them in being able to understand how they can be a problem-solver and lead the IEP team, as well as how they can be an active listener for the team and support others."	"I think this would be great to test further! I grew so much in my understanding of proper communication and how I can effectively work as a team to come to a shared goal, and I think so many pre-service special educators would benefit from this intervention. This is something I have never learned about or been exposed to in college, and I think this will benefit me greatly as I become a special education teacher."
Anna	"Learning how to boost each others ideas and grow off them."	"No"	"It really helped me feel at ease when it comes to	"This would really help students becoming case managers like me feel

			discussing these students and their needs."	comfortable before starting and being put in a group."
Lauren	"I really loved the case studies that my dyad worked through to show the skills we were learning."	"I would have loved this to be in person but obviously that's not really possible."	"I thought the intervention was great, and I learned a lot about my own communication style and how to improve my communication skills!"	"I think these are amazing skills for teachers of all types to have, not just SPED teachers!"
Blake	"The general ability to have somebody to bounce ideas off of. I definitely relied on Lauren to bail me out sometimes, but that's just because she is so talented in what she does."	"Not really. At the end of the day, it is something you either can live by or you can't. I think it's extremely effective and can be beneficial to anyone."	"Definitely extremely high quality, well ran, and quite effective."	*No Response.*
Ava	"I think the language of TAPS intervention for the active listener was most beneficial for me. It taught me how to be an encouraging participant of the IEP process even when I am not making the leading decisions or if I am not the expert on the problem at hand."	"I think the lesson portion of the TAPS intervention could be expanded for more practice to become more comfortable using the language. For example, a scripted role-play or introducing only a few phrases at a time."	"I think this was a great intervention for helping pre-service teachers become more comfortable with language in IEP meetings."	"This intervention with some improvements would be very effective in my opinion."
Audrey	"I found the learning how to explain reasoning as I go to be beneficial."	"I have a hard time being told what to say as it doesn't feel natural to me. Having an idea of things to focus on when leading and when supporting was helpful."	"Overall, it will be useful and effective in my future as a special education teacher."	"I think this could be very helpful and important for pre-service educators so that they can interact in a way that gives space to everyone on the team."
Claire	"I like the aspects of both the listener and the problem solver. Breaking the two	"I would make it personal to the teachers having the intervention. Invite them	"I would say it was effective, easy to understand, and easy to apply."	"I would recommend it to be included in college curriculum to give

	roles down made it easy to see how the parts fit together and gave structure to the discussion being had."	to bring in problems they have and try to work through it using TAPS."		teachers tools to work on the IEP problem solving process."
Cassidy	"I found the encouraging phrases to be the most valuable. I know that using them in a conversation can provide others to become engaged in conversation and decisions."	*No response.*	"I would consider the quality and effectiveness of this intervention excellent."	"I would advocate for using this intervention with all pre-service teachers, and also teachers as an ongoing training opportunity."

Research Question Summary

Research question 1: Based on the analysis above, a functional relation was established between the delivery of a vocal verbal behavior-based skills training package (modified TAPS) and increased use of problem-solving vocal verbal behavior in pre-service special education teachers during dyadic problem-solving conversations. This is evidenced by the increased level and trend in TAPS language following the implementation of the intervention and is supported by the calculated Tau-U and BC-SMD effect sizes.

Research question 2: Based on the analysis above, a functional relation was established between the delivery of a vocal verbal behavior-based skills training package (modified TAPS) and generalized use of problem-solving vocal verbal behavior in independent problem-solving opportunities. All participants demonstrated a change in their use of TAPS problem solving language based on a comparison of their baseline independent probes and their intervention practice phase independent probes. This suggests that although the training took place entirely in dyads, it was quickly generalized to independent use in this sample of participants.

Secondary to this question, an examination of the types of vocal verbal behaviors used by the participants following the training was conducted to answer: What types of vocal verbal behaviors taught in the TAPS repertoire are used by the participants following the training? A breakdown of language category by participant can be seen in table 16. When looking at the language used by the participants across categories, there was a slight pattern of increased usage in the categories of “confident and open minded” language, and lower average use in the category of “breaking the problem into parts.” However, there was variability across each category, and no specific pattern emerged across the participants or dyads.

Table 16

TAPS Language Use by Category

	Confident and Open Minded	Attending to All Information	Break Problem Into Parts	Avoid Making Assumptions	Active With the Problem
Jessica	22.54%	25.35%	11.27%	21.13%	19.72%
Anna	33.96%	7.55%	5.66%	18.87%	33.96%
Lauren	30.61%	14.29%	16.33%	6.12%	32.65%
Blake	29.73%	16.22%	16.22%	16.22%	13.51%
Ava	23.21%	17.86%	16.07%	25.00%	12.50%
Audrey	33.33%	14.81%	18.52%	7.41%	22.22%
Claire	20.37%	29.63%	7.41%	20.37%	20.37%
Cassidy	22.34%	24.47%	11.70%	21.28%	20.21%
Average	27.01%	18.77%	12.90%	17.05%	21.89%

An additional secondary question asked: Are some categories of behavior used more than others in dyadic or individual probes, and is this impacted by sequencing of the order of activity (e.g., dyadic probe followed by individual probe)? To examine this, the verbal behavior categories were broken down into condition by participant, as seen in table 17. There was a high level of variation across participants and conditions. Several participants demonstrated high levels of the "confident and open minded" language in the active listener condition. One participant, Lauren, demonstrated her highest levels of TAPS language in the "active with the problem" category across all three conditions. Otherwise, participants highest and lowest areas did not appear to demonstrate any trends across categories in certain conditions.

Given the high level of variability seen in this sample, more data from each participant in each condition would be needed to establish the presence of any patterns. For example, because of the longer baselines for dyads C and D, paired with the absence of independent dyadic probes in the training condition, there are only two independent intervention probes represented in this data. Further opportunities in each condition may result in either the establishment of clearer

Table 17

TAPS Language Categories by Condition

Participant	Condition	Confident and Open Minded	Attending to All Information	Break Problem Into Parts	Avoid Making Assumptions	Active With the Problem
Jessica	I	33.33%	33.33%	5.56%	5.56%	22.22%
	PS	20.00%	24.00%	8.00%	32.00%	12.00%
	AL	11.11%	22.22%	0.00%	22.22%	33.33%
Anna	I	35.71%	0.00%	7.14%	21.43%	35.71%
	PS	9.09%	13.64%	9.09%	40.91%	27.27%
	AL	43.75%	6.25%	3.13%	9.38%	40.63%
Lauren	I	33.33%	8.33%	16.67%	0.00%	41.67%
	PS	11.11%	11.11%	33.33%	22.22%	44.44%
	AL	37.04%	18.52%	11.11%	3.70%	25.93%
Blake	I	33.33%	11.11%	22.22%	11.11%	22.22%
	PS	10.00%	10.00%	40.00%	30.00%	10.00%
	AL	46.67%	26.67%	0.00%	13.33%	13.33%
Ava	I	0.00%	16.67%	33.33%	33.33%	16.67%
	PS	16.67%	20.83%	25.00%	12.50%	20.83%
	AL	46.15%	15.38%	7.69%	30.77%	0.00%
Audrey	I	25.00%	0.00%	25.00%	25.00%	25.00%
	PS	25.00%	25.00%	0.00%	25.00%	12.50%
	AL	42.86%	7.14%	21.43%	7.14%	21.43%
Claire	I	16.67%	33.33%	8.33%	25.00%	16.67%
	PS	30.00%	20.00%	10.00%	15.00%	25.00%
	AL	14.29%	38.10%	4.76%	19.05%	19.05%
Cassidy	I	36.36%	9.09%	9.09%	27.27%	18.18%
	PS	13.04%	32.61%	13.04%	23.91%	17.39%
	AL	36.84%	10.53%	5.26%	15.79%	31.58%

response patterns, or, an equalization of the categories over time. Similarly, drilling down each condition further by each position within a session (first or second) results in a very small number of data points for the purpose of comparison or establishing response patterns.

Looking at sequencing effects on TAPS language overall by visually examining the pairs of probes within each session does not reveal any distinct pattern. While it was common for individual participants to have patterns by condition (e.g., consistently higher in problem solver

than in active listener role), this type of pattern did not vary depending on role position within the session. Further examination of these types of patterns would be possible by systematically ordering the pairs in the same way across dyads, and restricting randomization such that an equal number of probes were conducted in the same condition in the same order.

Research question 3: Does increased use of TAPS verbal problem solving behavior result in improved instructional decision-making? Analysis of this secondary variable reveals modest mean gains from the baseline condition across seven of eight participants, and across all three conditions. However, due to high levels of variability in the data at both baseline and intervention, paired with the small sample size and lack of a control group, it is not possible to eliminate potential practice effects related to the assessment task as a contributing factor in the increases in mean scores.

Research question 4 addressed the maintenance of problem-solving verbal behavior in dyadic and independent probes over time. Maintenance data was relatively consistent across participants and the majority of participants and conditions maintained at a level over baseline, consistent with the intervention phase measurements. One participant, Audrey, did not maintain in the independent condition. Cassidy demonstrated maintenance at a similar level to other participants, but her maintenance scores were relatively lower than her high intervention (training) phase scores. Overall, with some variability, the effect of the TAPS intervention was demonstrated to maintain after a three-week cessation of the intervention.

Research question 5 addressed social validity: How do pre-service special education teachers rate the feasibility, acceptability, and perceived effectiveness (social validity) of the goals, procedures, and outcomes of the modified TAPS intervention? Feedback collected on the social validity survey was positive. All participants indicated that they believed the intervention was

effective. Participants had constructive suggestions for changes and extensions related to the TAPS curriculum and a variety of ways they could imagine it being used in pre-service training. They indicated that they benefitted from this intervention and found the lessons helpful for understanding how to talk through IEP decisions with a team. One participant indicated some discomfort with being told specific language to use.

CHAPTER IV

DISCUSSION

The purpose of this study was to examine the effect of a modified problem solving curriculum, TAPS, on the problem solving language and the instructional decision making quality of pre-service special education teachers. Due to persistent issues in the field related to IEP quality and IEP meeting facilitation for students with disabilities, research in this area is needed to examine and develop tested, valid, and effective training practices that can be used to improve these outcomes via teacher preparation programs. As pre-service teachers often report feeling underprepared for certain aspects of their roles, and there is pressure to further shorten and streamline teacher preparation programs, instructional approaches that are easy to embed and brief to administer are important to identify and disseminate.

Summary of Findings

Following a relatively brief 3 lesson TAPS intervention, participants demonstrated gains from pre to post intervention in both their self-efficacy and confidence, as well as a distal measure of reasoning and problem solving. TAPS resulted in increased verbal problem solving behavior and confidence during the instructional decision making process, and these gains generalized to the independent condition. While modest gains in instructional decision-making quality from baseline to intervention were demonstrated, establishing this secondary change as a result of the TAPS curriculum would require more research. The training in verbal skills to make these kinds of decisions was noted by some participants in the surveys to be something unique that they had not experienced in their pre-service training programs, demonstrating that there is a gap in both the research literature and in practice related to this type of training. Having problem solving discussions around instructional decisions is a critical function of an IEP team, and

developing explicit instructional programs for pre-service teachers to enable them to do this well is an important area to continue to test and explore.

Effect of TAPS on Verbal Problem Solving Behavior

As described in the results section, a functional relation was established between the delivery of a modified TAPS curriculum and an increase in dyadic and independent use of verbal problem solving language. This was confirmed through the use of visual analysis, complemented by the calculation of a Tau-U nonoverlap statistic (Tau-U = 0.87) and a BC-SMD (Hedge's g = 3.58). Both indicate large effects and were found to be statistically significant at $p < 0.001$. Additionally, the dyadic TAPS training generalized to independent probes for all participants. When interpreting these results, it is important to consider that there was variability within the overall level and trend changes.

While the TAPS verbal behavior measurement demonstrated change from baseline to intervention, there were additional changes in the participants' approaches to dyadic problem solving that were not entirely captured in the verbal behavior measure. For example, it was typical in the dyadic baseline probes for the person in the problem solving role to describe what they were going to write down for each component of the worksheet, and for the active listener to give a general approval or make a few suggestions based on their personal experience. The dyads finished well within the 15 minute time limit in baseline probes. Following the intervention, there was an increase in back-and-forth conversation between the problem solvers and active listeners, with the active listener usually more engaged in asking questions about the problem solvers choices and pointing out more details and information that could be used in the solution. Participants often thanked each other for providing suggestions or pointing out ways to bring in additional information from the vignette. Problem solvers were observed coming up

with multiple potential responses and soliciting feedback about what might be the best fit, or describing additional information they would seek about the student. Overall, increased engagement in the problem solving process was observed. In some instances, this resulted in the dyads failing to finish the three questions in the probe within 15 minutes or took nearly full 15 minutes to complete it. While the increased engagement and discussion was positive, it also negatively impacted the worksheet scoring when probes were incomplete, which may have resulted in a slightly deflated intervention decision making score. This is consistent with the finding from the Lee (2022) study in which BACB exam participants were taking extended time to go through the TAPS problem solving process, which improved the quality of their responding but in a timed situation, had disadvantages for efficiency. Considering the number of instructional decisions and academic areas commonly covered in IEPs, it is important that instruction in these types of conversations consider typical time constraints of IEP meetings.

In this same vein, the interpersonal and relational aspect between the dyads may have influenced the acquisition of the TAPS language and changes to problem solving. As each participant's personality and approach was slightly different, so were the dynamics that developed between the dyads. Dyad C participants, for example, were routinely focused on the task at hand and was relatively formal with one another throughout the intervention. Dyad B, contrastingly, would intersperse chatting and joking with one another while working on the response vignettes. While this sometimes contributed to increased time to complete the vignettes and in some instances, incomplete worksheets; this dynamic also appeared to make the participants of Dyad B more likely to prompt each other to use the TAPS approaches, catch mistakes, and engage back and forth with their thoughts about the student (e.g., "*Write an outline down first, we can come back and argue about it later!*"). Experimentally, interpersonal factors

could be controlled for in future studies by randomizing participants to different partners at different measurement opportunities and examining effects across different pairs. This could be logistically challenging in an experimental format but may be useful to consider in practice if using TAPS for IEP decision making in an applied setting like a college course or professional development.

Effect of TAPS on Instructional Decision Making Quality

As stated in the analysis above, this study was unable to establish an experimental effect of the TAPS curriculum on instructional decision making quality. There were modest gains across all conditions and seven of eight participants, however, scores remained variable and certain conditions (e.g., one participant's independent scores or leadership in the problem solver role) often drove an overall change. As this study took a novel approach to assessing the construct of instructional decision making, valuable observations were made that can inform further examination of this important skill area in future studies, as discussed in the future research section.

For example, one notable pattern that was observed in Dyad A, and to a slightly lesser extent in Dyad B, was that one participant had substantially higher independent instructional decision making scores at baseline. When the stronger participant was taking the lead in the problem solver role, the dyadic scores were also higher. However, they were not as high as the strong participant working on their own. This may suggest that in the process of discussion and compromise, scores between a stronger and weaker decision-maker come out somewhere in the middle. Similarly, in Dyad B, one participant was farther along in their program (close to graduation) and one was in the middle (sophomore year). In this dyad, the more novice participant appeared to pick up on strategies and approaches that the stronger participant used,

going as far as to say out loud during independent probes "*This is where [Partner] would suggest [strategy]*," or "*I wish [Partner] was here to help me out with this one*." This is a clear example of internalizing the dynamic of dyadic problem solving that is intended to happen in the TAPS curriculum, which may have been facilitated in this case by the more expert/novice dynamic between them. This phenomenon could be leveraged instructionally, or alternatively, controlled for by ensuring a more even match between pairs. In a class of students in a college course, it may be more likely that everyone is on a more similar level in terms of training and knowledge acquisition. While there would still be variability, the expert/novice dynamic would not be as pronounced, which may influence how far a dyad can develop their skills and ideas in instructional decision making without training any additional content. In an expert/novice dynamic, a novice may be able to use TAPS problem solving and reasoning strategies as a way to gain new knowledge and skills, which could be a valuable skillset for new teachers entering the field with more expert colleagues.

Although scores on instructional decision making only modestly improved, the participants overwhelmingly reported increases in their self-efficacy and confidence with having problem solving conversations around student's needs. This is a valuable outcome, but suggests that additional instruction and feedback targeting the instructional decision making itself may be necessary to ensure both skillsets grow together.

Contribution to the Empirical Literature

This study contributes to the emergent literature on TAPS interventions and to the experimental literature on pre-service teacher training. As discussed in the literature review, several studies have examined the approach of TAPPS/TAPS for different skillsets, populations, and purposes, with no replication of the same approaches across multiple research teams.

Conducting this study using the foundational lesson components of the commercially available TAPS curriculum kit facilitates future replications and extensions while maintaining fidelity to the core intervention components. In the present study, participants worked out loud (i.e., were asked to verbalize their thoughts) in both dyadic and individual probes across all phases. This addresses the limitation of several of the existing studies using TAPS, in which the researcher took the role of the active listener, resulting in substantial modification from the intended development of both skill repertoires in a dyadic pair which then generalize to independent problem solving. By situating the researcher only in the instructional role in this study, there is a stronger approximation to a typical instructional situation (e.g., professor teaching a college course on IEP development in which students work in pairs), that lends itself to improved ecological validity when compared to having the instructor acting as one of the partners in the dyad.

Experimental literature related to training practices for pre-service special educators is limited, and no experimental literature was found related to training pre-service special educators to facilitating problem solving conversations in IEP development. Logistical considerations related to conducting research with this population may be a contributing factor to the lack of research in this area. Conflicts related to undue influence, as well as students being enrolled in training courses with set curriculum expectations per licensing bodies, may interfere with conducting experimental approaches to training. This study contributes to the literature in this area in two ways. First, by providing experimental evidence that the modified TAPS curriculum positively impacted participants problem solving language use and was generally found to be a valuable and acceptable intervention for pre-service special educators. Second, the use of telepractice methodology and a multiple baseline design with staggered introduction of the

intervention demonstrates an approach to conducting training and research with this population that does not interfere with pre-existing coursework or practicum requirements and can easily be delivered alongside various educator training programs. Further, this study successfully mitigated undue influence of participants by not recruiting participants from the researcher's own university teacher preparation programs.

Limitations

While this study demonstrates promising results of the TAPS curriculum, several limitations must be considered. First, researcher modifications were made to the original TAPS curriculum to make the content more salient for special education teachers. While care was taken to focus on modeling the TAPS language and characteristics specifically, the use of special education examples and models may have influenced changes in responding to the tasks that were not directly related to the TAPS repertoire. For example, modeling during the lessons included a mini student vignette and examples of the use of TAPS problem solving language to develop and instructional decision. The models could have exposed participants to a type of goal or access strategy that they had not used before. Similarly, using the researcher designed measure of the student vignette worksheets and researcher designed scoring rubric may limit generalizability to practice (development of real IEPs) or other teacher quality measures (such as Praxis or other standardized exams). Obtaining adequate IRR on the instructional decision making scores proved challenging due to variation in the amount of detail provided by participants and resulting differences in interpreting responses for scoring. The rubric was highly sensitive to coding disagreements due to the interrelated nature of some of the scoring items for dyads. For example, if one coder thought the response included a specific and measurable goal and the other did not, this influenced the scoring on goal alignment, EBP alignment to goal,

overall rationale, and overall alignment. Future research could consider different measurement approaches, such as multiple choice response type items with one correct answer, to further isolate the scoring. In addition to exploring a variety of assessment options, future research could explore expert approaches and consensus among faculty in the field regarding their current assessment practices of similar skill to work towards the development of a more standardized measure of instructional decision making quality. The student vignette worksheets were intended to act as a proxy for special education decision making skills as required in students IEP development processes, however the structure of the questions was presented in a manner that is moderately different from most IEP form presentations (where the goals and accommodations are not presented in the same section, and teaching strategy is normally not included) and may influence the logic and discussion surrounding instructional choices. The effect of the TAPS training in this study was not generalized to a more naturalistic IEP approximation, such as a standardized IEP form or a small group setting versus dyad. In addition, assessment data and IEP data in the field would likely be more complex and may have flaws (missing or out of date information) when compared to the hypothetical vignettes given to students here. Pre-service teachers may need additional strategies for dealing with missing information. The maintenance of problem solving language learned in the TAPS curriculum may be affected by group dynamics and meeting structures or forms that guide the conversation in certain ways, and this study did not extend into these more naturalistic factors.

The sample size included in this study was demographically aligned with the educator population in the United States, being majority White and female. It is a critical limitation that the social validity of the modified TAPS curriculum used in this study was not examined with a diverse group of individuals across different races, ethnicities, languages, and genders.

Despite the small sample size included in this study, there was considerable variability in individual's apparent content knowledge and skills related to IEP development and problem solving. Although participants were asked to affirm that they had taken IEP development coursework and instructional methods coursework as an approach to equalize participant background knowledge, some participants had more experience than others in observing IEP meetings or developing instruction. While this may be a positive amount of variability for the purpose of generalizability and assessment across skill levels, it also limits the conclusions that can be drawn about what level of pre-requisite knowledge is needed for TAPS to be an effective approach for influencing instructional decision making. While most participants were towards the end of an undergraduate degree in special education, the grouped ranged from an end of year sophomore level to two non-traditional students who had several years of experience in special education in different capacities (one as a paraeducator, one as a parent of a child who receives special education services). TAPS effectively increased the use of problem solving language across this range, however, future work may consider experience in special education or in IEP meetings as a potential moderating effect for improvements in instructional decision making quality. Participants in this study with less experience with IEP development, including the participant who was a sophomore and the participant who was a paraeducator, had lower independent instructional decision making scores overall. In dyadic probes, they benefitted from the expertise of having a more experienced partner in the problem solver role. This suggests that there may be an identifiable level of baseline knowledge and training about goals, EBPs, and access strategies that would be appropriate to establish as a prerequisite prior to using the TAPS intervention and expecting an effect on instructional decision making quality.

Finally, the design of this study had limited controls in place for addressing potential maturation or multi-treatment effects, particularly for the secondary dependent variable of instructional decision making. While it was unlikely that participants were receiving specific training in problem solving language to use while making instructional decisions, as this is not a typical part of pre-service teacher curriculums, participants were likely to be exposed to student plans and potentially IEP meeting experiences or instruction related to IEP decisions as part of their typical coursework or practicum placements. Because recruitment was not limited to participants in a single particular course sequence that could potentially ensure equal exposure to these concepts, participants may be receiving multiple or differing exposures to related content.

Future Research

More research by other researchers is needed that tests the TAPS curriculum across additional participants to replicate the effect presented here. Given the variability in implementation and curriculum modification present in the current TAPS/TAPPS literature, it is important to consider replication while maintaining the same instructional approach to accurately examine the effects of a standardized curriculum across diverse populations. In addition, extending the generalization effect to more naturalistic IEP situations would be an important next step for future research. While the assessment task in this study was designed to capture the content related to instructional IEP decisions, the structure of a typical IEP form and the format of a typical IEP meeting do not typically include the components of goal, EBP, and access strategy side by side. Rather, they are separated into different sections, and include several other components like short term objectives, service minutes, testing accommodations, and others. Generalization of TAPS strategies to an authentic IEP meeting is an area future research should explore. This could extend in two ways: first, the use of TAPS language and problem solving

approaches in collaborative IEP meeting settings, and second, into generalized improvements in IEP quality in the field. While the logic model in this study ended with participant outcomes regarding their instructional decisions, future work that generalizes to more authentic settings and products should move forward in examining distal student outcomes following improvements in the IEP process.

The present study included participants who were all training to be special education teachers. This promotes the development of a special educator's approach to the Problem Solver and Active Listener repertoires and the development of the internalized repertoires for independent problem solving. However, the reality of making instructional decisions for students' IEPs in the teaching field is that this work is done with an interdisciplinary team. Special educators would need to step into the problem solving and active listening role with those from other fields, such as general educators, behavior analysts, speech language pathologists, occupational therapists, administrators, and others. Future research should examine the use of TAPS across different roles, including an examination of improved agreement or understanding in decision making when using these approaches. This may enhance collaboration skills and be increasingly pertinent for in-service teachers who are already working in these collaborative settings. Testing in interdisciplinary teams may be most feasible to conduct with in-service, rather than pre-service, teams as schools typically have a structure that includes availability of individuals across disciplines. This might not be available in every college or university preparation program. When considering offering TAPS as a professional development to in-service teachers, the brief duration and flexibility is a positive attribute when considering school schedules and time constraints. Using a wait-list randomized control design following the training would allow for comparison by groups against a control. Outcome measures could

include IEP quality, ratings of self-efficacy in team meetings, ratings of team meeting quality, as well as observations for use of TAPS language or TAPS characteristics in naturalistic meeting settings.

With replication in single-case studies, it may be possible to verify a TAPS curriculum as an evidence-based instructional practice for pre-service teachers. Following this, additional scaling to group design studies would be an appropriate next step for the investigation into more widespread use of this curriculum in pre-service teaching programs. Further examination is needed that compares direct instruction of the instructional decision-making skill with direct instruction of the instructional decision-making skill plus TAPS. Because the individual response quality on the vignettes was so varied across participants, it may be that participants needed additional instruction to build up their skills in goal writing, EBP choice, and access strategies prior to embedding the TAPS instruction that allows them to discuss these decisions effectively in meetings.

Future research could also further isolate and examine the mechanisms of change and key variables present in this intervention. In this study, the intervention was delivered as a three-lesson package. However, in the social validity responses, two participants indicated that they felt they would have benefitted from more time going over the lesson components. Studies that focus on identifying key mechanisms of change within the packaged intervention could support translation to practice by indicating which activities are beneficial for additional repetitions or further intervention for non-responders. Further examining the pattern demonstrated in this study that indicated lesson 2, or the combination of lesson 1 and 2, resulted in verbal behavior change for most participants may be useful for further intervention development. In this same area of

component analysis, it may be possible to identify and train a subset of TAPS phrases within each characteristic and obtain the same results with improved efficiency and fluency.

The participants in this study also felt positively about the practice with the student vignettes, as indicated in the social validity responses and in comments made to the researcher during sessions. They were engaged and often enthusiastic about the fictional students they were discussing. Further development, through expert consensus and trials with participants, could be conducted to develop a standardized set of student vignettes for assessment and training. While the student vignettes presented here were designed with a generalist special education licensure in mind, it did occasionally come up in the vignettes that individuals getting a "mild" special education credential were less familiar with strategies for students who had low incidence disabilities (e.g., one participant was unsure if it would be appropriate to attempt to teach multiplication to a student with Down Syndrome). Formal development across grade levels, disability types, levels of support needs, and cultural and linguistic characteristics could contribute to the field by providing a flexible, yet high quality resource for training activities.

Finally, future research should focus on testing the TAPS intervention as a component of pre-service training within existing coursework and training structures, which would demonstrate increased ecological validity for the intended purposes of this intervention.

Implications for Practice

The results of this study have important implications for practice. The modified TAPS curriculum used here was a brief, three lesson curriculum that would be suitable for use in classroom and training contexts for pre-service special education teachers. Teaching the "soft skills" of problem solving, team collaboration, and decision making can be complex, as these skills are situated within cultural and collegial norms, as well as within relationships between

collaborators. TAPS is an instructional tool that is flexible enough to apply broadly within many contextual circumstances. One specific challenge in the special education field is layering the instruction in these soft skills with the legal, procedural, and content knowledge required to develop defensible IEPs. While both skillsets are important, having procedural knowledge without the soft skills can result in issues in IEP quality. It is entirely possible to write a legally adequate IEP that lacks substantive quality and alignment that would ensure that the student is receiving a robust instructional program across their areas of need. Therefore, teacher preparation programs should emphasize the kinds of problem solving strategies present in the TAPS curriculum: looking at the big picture, considering all the information, and considering additional resources- just to name a few. The positive social validity results and self-efficacy score increases from the participants, paired with their positive comments about the intervention, indicate that incorporating this training into pre-service teachers' curriculum would be generally well accepted by students. The flexible nature of the curricular components that allowed the modifications in this study to be condensed into five lessons also provides flexibility for repetition and extension based on student performance in more natural classroom settings.

When considering implementation of the TAPS curriculum within teacher preparation programs, it would be important to consider what pre-requisite knowledge results in the best skill acquisition for the pre-service teachers. For practical purposes, faculty in teacher preparation programs may consider introducing TAPS once participants have demonstrated a baseline level of skill in goal writing, EBP identification, and access strategy use. This would ensure they are ready to work on the problem solving aspect of alignment across these areas, and identification of a goal area that is most appropriate for the student's present level.

Another area of consideration in practice is the flexibility that would allow TAPS to be implemented in an interdisciplinary course or professional development for interdisciplinary teams. In programs that are structured to have various professionals (special educators, general educators, BCBAs, school psychologists, SLPs, etc.) taking coursework together, there may be added value to an approach like TAPS as it provides a problem solving discussion structure (described positively by participants in this study) that might be even more useful when the discussion partners have differing areas of expertise. Literature has documented that service delivery and collaboration across fields can be challenging, and TAPS may represent one intervention approach that could support improved collaboration.

Further, an issue in the field is the lack of maintenance of trained skills in pre-service programs to practical applications once individuals are hired into their first jobs. There are often norms and expectations within school buildings that may override instructional approaches or strategies that students were taught. For example, pre-service special educators who are trained to provide general education curriculum access to students with higher support needs might be hired into a position in a self-contained classroom setting. If there has never been an expectation of inclusion for the students on their new caseload, this presents a substantial barrier to implementing the strategies that they have been trained to use. TAPS verbal behavior may be resilient to this issue, if the individual using the language as internalized both repertoires and engages in their use during problem solving discussion with colleagues. While reciprocation from the partner is not necessarily required, a repeated lack of reciprocation in collaborative problem solving or reasoning could result in decreased use or utility. Explicit instruction related to maintaining these approaches under different conditions in the field may be useful for novice practitioners.

Another important consideration for implementation and generalization of TAPS strategies with IEP teams in the field is the additional time needed for more intensive problem-solving conversations. Time for collaborative meetings to prepare for developing student plans, and time spent in formal IEP meetings, is often limited in school settings. As further research is conducted on TAPS approaches and problem solving in IEP teams, there may be more evidence for improved distal outcomes (e.g., generalized IEP quality) when teams use this structured problem solving approach, which could be used to advocate for additional time to complete this important work.

Conclusion

In this multiple baseline single case design study, a modified TAPS curriculum was tested with pre-service special educators. The results demonstrate that TAPS increased the participants' use of TAPS problem solving language as they worked in dyadic pairs to make instructional decisions related to IEP goals, evidence-based instructional practices, and access strategies. This effect generalized into their independent problem solving process. This suggests that TAPS may be a positive addition to pre-service teacher training, and it may support new teacher's self-efficacy in leading IEP teams to develop instructional decisions. The effect of the TAPS curriculum on the secondary variable of instructional decision making quality could not be experimentally established, however, modest gains from baseline to intervention were present. The participants found this intervention to be valuable, effective, and socially valid. They recommended the use of TAPS with other pre-service teachers and other types of educators, in addition to expanded practice opportunities such as use with real scenarios from practicum placements, more repetition of the lessons, and additional scripted practice. Future research

should continue to test and extend the TAPS curriculum to develop critical reasoning skills within pre-service special education teachers.

APPENDICES

Appendix A. Recruitment Materials

Seeking Pre-Service Special Educators for a Research Study!

About the Study

- Participants will receive training in a **verbal problem solving and reasoning curriculum**
- These skills will be applied to **making decisions for students related to IEP goals, teaching strategies, and accommodations and modifications**
- This study will help us understand how effective this approach is for training special education teachers

Consider participating if you...

- are enrolled in an undergraduate or graduate special education licensure program (K-12)
- have taken coursework in instructional methods and IEP development
- want to improve your skills and confidence in making high-quality instructional decisions for IEPs

Additional Details

- Training will be scheduled flexibly on Zoom over approximately ten weeks and is open to participants in the U.S., Puerto Rico, and territories
- Eight participants will be selected to complete the training and will be compensated for their time (TBD)

Use the QR code or go to bit.ly/3MAzLhV for the eligibility survey.

Questions? Contact Sarah Quinn for more info! **seq@uoregon.edu**

This study is supported by the University of Oregon and funded through United States Department of Education, Office of Special Education Programs Leadership Grant (#H325D190064). Project CO-LEAD: Collaboration Across Universities to prepare Leaders in Evidence Based Practices, Autism Spectrum Disorder, and Diversity, P.I. Machalicek
Approved by IRB ###

Recruitment Email

Dear _,

I am reaching out to you today with an exciting research study opportunity for pre-service special education teachers. I am seeking participants who have taken some coursework in IEP development and instruction who want to improve their instructional decision making and confidence in developing IEPs.

The study will involve participating in training that will take place over zoom, approximately twice per week for 30 minutes over the course of ten weeks. Scheduling will be flexible based on participant availability. Participants who complete the study, including pre and post surveys, will receive a $375 gift card.

Please share the attached flyer with pre-service special educators in your preparation programs, and let me know if you have any questions!

Thank you,

Sarah Quinn

Appendix B. Eligibility Survey

TAPS Study Eligibility

Start of Block: TAPS Study Eligibility

Q1 Thank you for your interest in participating in this study!

This study is seeking participants who are pre-service special education teachers who want to improve their problem solving skills when making instructional decisions for student's individualized education programs. Eligible participants will receive a Talk Aloud Problem Solving training that aims to support effective collaboration skills related to leading IEP meetings, making high-quality instructional decisions, and increasing the use of verbal problem solving behavior.

To ensure that you meet eligibility requirements for this study, please fill out the following survey. Your responses are confidential. This survey will take approximately 5-10 minutes.

Please contact Sarah Quinn with any questions.

seq@uoregon.edu

End of Block: TAPS Study Eligibility

Start of Block: Contact Information

Q2 Please enter your name.

If desired, please include your title and/or pronouns.

_____

Q5 Please enter your email address.

_____

End of Block: Contact Information

Start of Block: Eligibility Criteria

Q15 Are you located in the United States or in a United States Territory?

o Yes (1)

o No (2)

o Other, please explain: (3) _____

Q17 Is your English fluency adequate for having conversations on the topics of special education, problem solving, and instructional planning?

o Yes (1)

o No (2)

o Not sure (3)

Q18 Are you proficient in using the basic functions of teleconferencing software (e.g., Zoom meetings)?

o Yes (1)

o No (2)

o Not sure (3)

Page Break

Q7 Have you ever been employed as a special education teacher?

This study is seeking pre-service teachers, meaning individuals who have not yet worked as a special education teacher.

o No, I have never been employed as a special education teacher. (1)

o Yes, I have been employed as a special education teacher. (2)

o Other (Please explain) (3) _____

Q3 Are you currently enrolled in a special educator training program?

(For example, undergraduate or graduate degree in special education, certificate coursework in special education, etc.)

o Yes, I am currently enrolled in a special educator training program. (1)

o No, I am not currently enrolled in a special educator training program. (2)

o Other (Please explain) (3) _____

Q16 Pre-service special education teachers currently enrolled at the University of Oregon are not eligible for this study. Please verify that you are not a student at the University of Oregon.

o I am not enrolled at the University of Oregon. (1)

o I am enrolled at the University of Oregon. (2)

Q4 Please briefly describe the program in which you are currently enrolled.

(For example, master's degree in special education, K-12, bachelor of arts in elementary and special education, additional endorsement licensure program, etc.)

_____

Q8 Please briefly describe your current progress towards completion of your enrolled program. If possible, indicate how many credits you have completed of the total credits in your program.

(For example, final year of master's program, junior year of bachelor's degree, 6 credits remaining in certificate track).

_____

Q10 Please briefly describe the teaching certifications you will be eligible for at the end of your enrolled program.

(For example, K-21 special education, secondary special education, elementary general education and K-12 special education, Pre-K-6, Birth-3, etc.)

_____

End of Block: Eligibility Criteria

Start of Block: Block 3

Q13 Have you taken a course that covers IEP development?

(For example, a course that covers the structure of the IEP document, including present levels, goals, and services; and the general nature of IEP team meetings or annual IEP review meetings)

o Yes (1)

o No (2)

o Not sure (3)

o Other, please explain: (4) _____

Q14 Have you taken a course that covers instructional methods?

(For example, courses that cover topics such as assessing students skills, creating lessons, designing interventions, or specific instructional methods in an academic subject area such as math, reading, writing, science, or social studies)

o Yes (1)

o No (2)

o Not sure (3)

o Other, please explain: (4) _____

End of Block: Block 3

Appendix C. Demographic Survey

Start of Block: Demographic Information

Q12 What is your age?

- 18-24 (1)
- 25-34 (2)
- 35-44 (3)
- 45-54 (4)
- 55-64 (5)
- 65-74 (6)
- 75+ (7)

Q13 What is your highest level of completed education?

- High-school graduate, diploma, or other equivalent (e.g., GED) (1)
- Some college credit, no degree (2)
- Trade, technical, or vocational training (3)
- Associate degree (4)
- Bachelor's degree (5)
- Master's degree (6)
- Professional degree (7)
- Doctoral degree (8)

Q9 I identify my race/ethnicity as (select all that apply)

- [ ] African American or Black (1)
- [ ] Native American or Alaskan Native (2)
- [ ] Other American Indigenous (non-U.S.) (3)
- [ ] Hispanic or Latino/a/e/x (4)
- [ ] East Asian (5)
- [ ] South Asian (6)
- [ ] Middle Eastern or North African (7)
- [ ] Caucasian or White (8)
- [ ] Multiracial or Biracial (9)
- [ ] A race/ethnicity not listed (Please indicate) (10)

_____

- [ ] Prefer not to reply (11)

Q11 What is your gender?

_____

End of Block: Demographic Information

Appendix D. TAPS Lesson Visuals

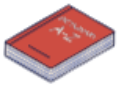
Evidence-Based Instructional Practices

Provide Systematic Instruction

- Review and integrate previously learned content
- When introducing new concepts, use accessible examples to support learning
- Sequence instruction so skills build incrementally
- Provide visual and verbal supports such as graphic organizers and video models
- Provide immediate, supportive feedback to address misunderstandings

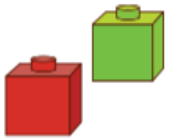
Teach Clear and Concise Subject Area and Academic Language

- Routinely teach vocabulary
- Use clear, concise, and correct language throughout instruction
- Provide visual supports when learning new terms
- Activate prior knowledge and use predicting strategies



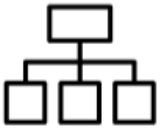
Use Concrete, Semi-concrete, and Representational Models

- Connect concrete and semi-concrete representations
- Provide ample opportunities for students to use different models, and review previously mastered models



Provide Explicit Instruction Using Different Materials, Problem Types, and Content to Promote Generalization

- Include a mix of previously and newly learned problem or question types
- Explicitly teach the connections between discrete and connected skills



Use Direct Instruction by Modeling, Providing Frequent Practice Opportunities, and Prompt Feedback and Reinforcement

- Ensure a high rate of correct responding
- Present new material in small steps and ensure mastery of each step
- Provide high quality modeling, think alouds, and worked examples
- Ask a large number of questions and check responses of all students
- Guide and scaffold new material
- Incorporate independent practice

Use Task Analysis to Break Down New Skills and Content

- Teach skills step by step using backward or forward chaining strategies
- Consider level of prompting and support provided, fade prompting over time to increase independent

Practices summarized and adapted from
https://ies.ed.gov/ncee/WWC/Resources/ResourcesForEducators

Access Strategies: Accommodations and Modifications

Identify a Learning Goal of Participation

- Determine if an alternate goal is needed when considering the grade level standard
- Select a learning goal that is meaningful and appropriately ambitious for the student
- Describe what successful and meaningful participation will look like

Ensure Accessibility in the Instruction Space

- Consider physical access including desk spaces, movement around the room, and seating options for a variety of needs
- Ensure communication tools like icon based visuals or AAC devices are present and accessible

Adapt Curriculum Tasks and Materials to Support the Goal

- Audio versions of text, large-print, braille materials
- Speech to text software, graphic organizers, manipulatives
- Break tasks into smaller parts
- Provide extra time, adult support, or breaks
- Change text level or task complexity level
- Provide word banks, matching activities, or other response modes

Incorporate Behavior Supports

- Visual schedules, first/then sequence, frequent reinforcement
- Scaffold and prompt routines like transitions, material management, task initiation, and response routines

Plan for Supports Within the Environment

- Consider whole, small group, and independent work times
- Plan for peer engagement, collaboration, and support opportunities

Practices summarized and adapted from: The IRIS Center and the TIES Center. (2022). Inclusion of Students with Significant Cognitive Disabilities: Supports in the General Education Classroom.

Traits & Phrases of Problem Solvers

Have a Confident and Open Minded Approach

- I will try to solve this problem.
- I can find the answer to this question.
- I will try to explain why this is my solution.
- I'm going to try to find the evidence and strategy that I need.
- I think I can find the evidence to solve this problem.
- I can find the words to rationalize my solution.

Attend to All the Information

- I am finding the data to support my solution
- I am listening to input from the team
- I will check back on relevant data and records
- Let me share my rationale
- I'll go back and look at the plan all together to make sure it makes sense

Break the Problem into Parts

- I am missing some information, so I will come up with a plan to find it.
- I am not sure about this part, so I will ask the person who knows.
- I am not sure of a strategy for this, so I will consult a resource.
- I will create a visual to show the parts of the problem.
- I will write an outline of the options.

Avoid Making Assumptions

- I don't need to guess because all the information is here.
- I know one approach but I should check to see if it is really the best fit.
- I think I can figure it out, but I'll consult a resource to make sure.
- I'm considering two approaches. Let me get team input to help figure out the best way.
- I know what to do. Wait, I better not jump to conclusions, I'll check the data and team input.

Be Active With the Problem

- I am trying to get a picture of the student's strengths and needs.
- I am imagining what services and supports could look like.
- I am creating a schedule.
- I am outlining some options to help me understand.
- I am reviewing all the information before I make a recommendation.

Traits & Phrases of Active Listeners

Active listeners...

- Check for accuracy and feasibility
- Stay with problem solver
- Catch mistakes
- Don't insist on your answer, lead your partner to additional information to consider
- Use encouraging words to keep the dialogue going

Help the Problem Solver to be Confident

- We can solve this problem
- You can find the answer to this question
- Give more information about your solution
- Try to find the evidence that you need
- You can find the evidence to solve this problem
- You can find a strategy that matches this problem

Help the Problem Solver Consider All the Information

- Have you considered this piece of information?
- Let's look at the data.
- Let's get information about this from another resource.

Help the Problem Solve Break the Problem Into Parts

- Let's come up with a plan for finding this missing information.
- If we are not sure about this part, let's ask the person who knows.
- If we aren't sure, let's consult a resource to find a strategy for this part.
- Can you create a visual to show the parts of the problem?
- Can you write an outline of the options?

Help the Problem Solver Avoid Relying on Habits

- You can try something different to address this need.
- You can use the data to choose a new approach.
- It's better to be find the best fit than rely on habit.
- Let's take our time to consider all the information.

Keep the Dialogue Going

- Let's look at the big picture.
- Imagine what this strategy could look like in practice.
- Make an outline.
- Let's write down some potential strategies.
- Look back at the data.

Appendix E. Modified Bandura's Instrument Teacher Self-Efficacy Scale

Post Modified Bandura's Instrument Teacher Self-Efficacy Scale

Start of Block: Introduction

Q1 The Talk Aloud Problem Solving intervention aims to increase problem solving skills, reasoning, collaboration, and quality in instructional decisions related to IEP development for students with disabilities.

To understand how this intervention helps teachers improve their self-efficacy, you will complete this scale before and after the intervention. Your responses will be kept confidential.

Please contact Sarah Quinn with any questions.
seq@uoregon.edu

End of Block: Introduction

Start of Block: Block 3

Q37 Please enter your name.

_____

Q39 Please enter your geographic location (city)

_____

End of Block: Block 3

Start of Block: Block 1

Q2 Efficacy to Influence Decision Making

Q3 How much can you influence the decisions that are made on IEP teams?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q4 How much can you express your views freely on important IEP matters?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q5 Efficacy to Influence School Resources

Q7 How much can you do to get the instructional materials you need?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Page Break

Q8 Instructional Self-Efficacy

Q9 How much can you do to get through to the students with the highest needs?

- ○ Nothing (1)
- ○ (2)
- ○ Very Little (3)
- ○ (4)
- ○ Some Influence (5)
- ○ (6)
- ○ Quite a Bit (7)
- ○ (8)
- ○ A Great Deal (9)

Q10 How much can you do to promote learning when there are barriers impacting the student from their life outside of school?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q11 How much can you do to keep students on task on difficult assignments?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q12 How much can you do to increase students' memory of what they have been taught in previous lessons?

- ○ Nothing (1)
- ○ (2)
- ○ Very Little (3)
- ○ (4)
- ○ Some Influence (5)
- ○ (6)
- ○ Quite a Bit (7)
- ○ (8)
- ○ A Great Deal (9)

Q13 How much can you do to motivate students who show low interest in school work?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q14 How much can you do to get students to work together?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Page Break

Q17 Behavioral Self Efficacy

Q16 How much can you do to get students to follow classroom expectations?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q18 How much can you do to respond to challenging behavior in the classroom?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q19 How much can you do to prevent challenging behavior from occurring?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Page Break

Q20 Efficacy to Enlist Family Involvement in the IEP

Q21 How much can you do to get parents involved in the IEP process?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q22 How much can you assist parents in understanding the IEP process?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q23 How much can you do to make parents feel comfortable in the IEP process?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Page Break

Q24 Efficacy to Enlist IEP Team Member Involvement

Q25 How much can you do to get general education teachers involved in the IEP process?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q26 How much can you do to get related service providers involved in the IEP process?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q27 How much can you do to get administrators involved in the IEP process?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q29 Efficacy to Make High-Quality Instructional Decisions

Q28 How much can you do to ensure that students have high-quality goals on their IEPs?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q30 How much can you do to ensure that you use evidence-based practice when teaching students?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q31 How much can you do to ensure that students have access to the general education environment and curriculum?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

Q32 How much can you do to ensure that goals, interventions, and access are aligned?

- ○ Nothing (1)
- ○ (2)
- ○ Very Little (3)
- ○ (4)
- ○ Some Influence (5)
- ○ (6)
- ○ Quite a Bit (7)
- ○ (8)
- ○ A Great Deal (9)

Q33 How much can you do to ensure that students show measurable progress on their goals?

- ○ Nothing (1)
- ○ (2)
- ○ Very Little (3)
- ○ (4)
- ○ Some Influence (5)
- ○ (6)
- ○ Quite a Bit (7)
- ○ (8)
- ○ A Great Deal (9)

Q34 How much can you do to ensure that all necessary IEP team members contribute to instructional decisions?

- Nothing (1)
- (2)
- Very Little (3)
- (4)
- Some Influence (5)
- (6)
- Quite a Bit (7)
- (8)
- A Great Deal (9)

End of Block: Block 1

Start of Block: Block 2

Q35 Briefly describe your current confidence level in leading IEP teams to make high-quality instructional decisions for students with disabilities.

_____

Q36 Do you have any additional thoughts or perceptions related to your self-efficacy in IEP decision-making that you would like to share? Consider writing IEP goals, selecting evidence-based practices, and implementing modifications and accommodations.

_____

End of Block: Block 2

Appendix F. Verbal Behavior Recording Form

Interval	TAPS Confident and Open Minded	Attending to All Information	Break Problem Into Parts	Avoid Making Assumptions	Be Active With the Problem	Un-Trained Phrases	Total TAPS
:00 - :30							
:31 - 1:00							
1:01 - 1:30							
1:31 - 2:00							
2:01 - 2:30							

Appendix G. Instructional Decision Making Scoring Rubric

Worksheet Prompts:

1. **IEP Goal**: What will you target? Provide your reasoning.
2. **Evidence Based Practice**: How will you teach the student? Provide your reasoning.
3. **Access Strategy**: How will the student access the general curriculum? Provide your reasoning.

	Yes (1 point)	No (0 points)
IEP Goal		
Indicates a specific, measurable skill	E.g., addition and subtraction within 100, writing a paragraph with a main idea and detail, increasing reading fluency to X wpm	E.g., will improve (subject area) skills, restates general education standard, does not state a skill
Is in the same domain as the area of need	E.g., a student with a deficit in reading skills due to their disability has a goal focused on reading	**If *indicates a specific, measurable skill* is 0, indicate 0 for this item.** E.g., a student with a deficit in reading has a goal focusing on social emotional competencies
Is a pre-requisite for the general education content/standard	E.g., the general education class is working on writing essays, the goal is to teach sentence writing; the class is working on multiplication, the goal for the student is to master repeated addition or skip counting	**If *indicates a specific, measurable skill* is 0, indicate 0 for this item.** E.g., the general education class is working on essay writing, the goal is to increase reading fluency
Evidence Based Practice		
Indicates one or more specific evidence based instructional practices	E.g., describes a direct instruction approach, the use of visuals, task analysis, modeling, spaced repetition, massed trials, etc.	E.g., does not name a specific evidenced based instructional practice, generally describes teaching the skill without specificity, names accommodations or materials
Indicated practice could reasonably be used to address the goal	E.g., massed trials used for letter naming fluency, task analytic instruction used for solving word problems	**If i*ndicates a specific, measurable skill* is 0, indicate 0 for this item.** E.g., task analytic instruction used for math fact fluency increase, no EBP is named
Access Strategy		

Indicates one or more accommodations or modifications	E.g., presentation of material is altered in a specific way, tasks reduced, additional supports like visuals, word banks, sentence frames, graphic organizers	E.g., no A/M are mentioned, general statements like "adapted materials," strategies not related to instructional design, adult or peer help will be offered, student will work on grade level work
A/M addresses a barrier that the student faces due to their disability/skill deficit	E.g., student has a working memory deficit, accommodation provided reduces working memory demand (use of multiplication table for math facts)	E.g., student struggles with decoding text in math word problems, is offered a calculator as accommodation
A/M could reasonably be used for accessing the general education content/standard	E.g., CCSS addresses comparing two texts for common themes, access strategy provides audiobooks or visuals to support thematic comprehension	E.g., CCSS addresses comparing two texts for common themes, access strategy provides speech to text dictation

	3	2	1	0
Rationale Quality	Rationale quality is proficient. 3 item responses provide a logical reason for the indicated choice and the rationales are connected across items.	Rationale quality is progressing. There are 2 item responses that provide a logical reason for the indicated choice, but the rationales are not connected across items.	Rationale quality is emerging. There is 1 item response that provides a logical reason for the indicated choice and the rationales are not connected across items.	No rationale is present in the response or the rationale provided does not provide a logical reason for the indicated choice.
Overall Alignment	Alignment is proficient. The responses indicate all points in at least score 2, and directly address a barrier or skill deficit resulting from the student's disability. The A/M could be used to support access.	Alignment is progressing. The responses indicate the same content area, the goal is a prerequisite skill, and A/M could reasonably be used to support access, but 1-2 items do not demonstrate connection	Alignment is emerging. The responses indicate the same content area, but scored 0 on *prerequisite skill* OR *A/M could reasonably be used to support access*	No alignment is observable in the response. There is no evidence that the response elements are connected to each other or the areas of need described in the student vignette.

Appendix I. Fidelity Form Example

Start of Block: Block 1

Q1 This form is intended to measure procedural fidelity of the delivery of the TAPS intervention for Lesson 1. Please complete this form once for each randomly assigned video observation.

Q2 Your name

_____

Q3 Video file

_____

Q4 The interventionist	Yes (1)	No (2)	n/a (3)
is prepared with technology and materials (1)	○	○	○
provides lesson agenda (slide 2) (2)	○	○	○
states lesson objectives (slide 3) (3)	○	○	○
delivers slide 4 script and OTR (4)	○	○	○
delivers slide 5 script and OTR (5)	○	○	○
delivers slide 6 script (6)	○	○	○
delivers slide 7 OTR (7)	○	○	○
delivers slide 8 script (8)	○	○	○
delivers slide 9 OTR and script (9)	○	○	○
delivers slide 10 OTR (10)	○	○	○
delivers slides 11-14 scripts and OTRs (Example A/B activity for Problem Solvers) (11)	○	○	○
delivers slide 15 script (12)	○	○	○
delivers slide 16 script and OTRs (13)	○	○	○
delivers slide 17-21 scripts and OTRs (Example A/B activity for Active Listeners) (14)	○	○	○

delivers slide 22 script (15)	○	○	○
delivers slide 23 script (16)	○	○	○
delivers slide 24 script (17)	○	○	○
delivers slide 25 script (18)	○	○	○
answers participants questions, as applicable (19)	○	○	○
implements two measurement probes (20)	○	○	○

Q5 Notes

_____

End of Block: Block 1

Appendix E. Modified TARF-R

Modified TARF-R for TAPS

Start of Block: Default Question Block

Q1 Thank you for participating in the TAPS intervention!

This survey will help the researchers understand how reasonable, acceptable, and effective you found the intervention to be. Your honest answers are appreciated. Your answers will be collected anonymously. This survey will take approximately 5-10 minutes to complete.

Please contact Sarah Quinn with any questions.
seq@uoregon.edu

End of Block: Default Question Block

Start of Block: Treatment Acceptability Rating Form- Revised

TARF 1 How clear is your understanding of the TAPS intervention?

- ○ Not at all clear (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very Clear (7)

TARF 2 How acceptable do you find the TAPS intervention to be regarding IEP decision making?

- ○ Not at all acceptable (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very Acceptable (7)

TARF 3 How willing were you to carry out this intervention?

- ○ Not at all willing (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very Willing (7)

TARF 4 Given the challenges of IEP decision making, how reasonable do you find this intervention to be?

- ○ Not at all reasonable (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very Willing (7)

TARF 5 To what extent do you think there might be disadvantages in participating in this intervention?

- None are likely (1)
- (2)
- (3)
- Neutral (4)
- (5)
- (6)
- Many are likely (7)

TARF 6 How likely is this intervention to make permanent improvements in your IEP decision making skills?

- Unlikely (1)
- (2)
- (3)
- Neutral (4)
- (5)
- (6)
- Very likely (7)

TARF 7 How confident are you that this intervention was effective?

- ○ Not at all confident (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very confident (7)

TARF 8 How disruptive was it to carry out this intervention?

- ○ Not at all disruptive (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very disruptive (7)

TARF 9 How effective is this treatment likely to be?

- ○ Not at all effective (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very effective (7)

TARF 10 How much do you like the procedures from the TAPS intervention?

- ○ Do not like them at all (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Like them very much (7)

TARF 11 How willing do you think other students will be to carry out this intervention?

- ○ Not at all willing (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very willing (7)

TARF 12 To what extent are undesirable consequences likely to result from this intervention?

- ○ No undesirable consequences are likely (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Many undesirable consequences are likely (7)

TARF 13 How much discomfort did you experience during this intervention?

- ○ No discomfort at all (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very much discomfort (7)

TARF 14 How challenging do you find IEP decision making?

- ○ Not at all challenging (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Very challenging (7)

TARF 15 To what degree is IEP decision making of concern to you?

- ○ No concern at all (1)
- ○ (2)
- ○ (3)
- ○ Neutral (4)
- ○ (5)
- ○ (6)
- ○ Great concern (7)

End of Block: Treatment Acceptability Rating Form- Revised

Start of Block: Block 2

Q20 What aspects of the TAPS intervention did you find most valuable or beneficial? Please explain.

_____

Q21 Are there elements of the TAPS intervention that you believe could be improved or enhanced? If so, please describe them.

_____

Q22 How would you describe the overall quality and effectiveness of the TAPS intervention?

_____

Q23 Researchers are interested in learning if this intervention would be useful to test further, use with broader populations, and recommend to others. Please share any additional comments, insights, or feedback you have about the training that you believe are important for us to know.

_____

Q24 If you would like to speak with the researcher regarding your experience, please put your contact information here.

_____

End of Block: Block 2

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