TEACHING EDUCATORS TO USE THE SYSTEM OF LEAST PROMPTS TO SUPPORT COMMUNICATION OF INDIVIDUALS WITH AUTISM SPECTRUM DISORDER (ASD) WHO USE AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAC)

A Dissertation in Special Education

by

Ashley Rae McCoy

© 2018 Ashley Rae McCoy

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

August 2018
The dissertation of Ashley Rae McCoy was reviewed and approved* by the following:

David B. McNaughton  
Professor of Education (Special Education)  
Dissertation Advisor  
Chair of Committee  

David L. Lee  
Professor of Education (Special Education)  
Head of the Department of Educational Psychology, Counseling, and Special Education  

Janice C. Light  
Hintz Family Endowed Chair in Children’s Communicative Competence  

Tracy Raulston  
Assistant Professor of Education (Special Education)  

Pamela S. Wolfe  
Associate Professor of Education (Special Education)  

Mary Catherine Scheeler  
Associate Professor of Education (Special Education)  
Professor-In-Charge  

*Signatures are on file in the Graduate School.
ABSTRACT

The present study evaluated the effects of online training on educators’ knowledge and use of the system of least prompts (SLP) to support the communication of individuals with Autism Spectrum Disorder (ASD) who use augmentative and alternative communication (AAC). A quasi-experimental pre/post test group design with switching replications was used to measure the knowledge, planning, and implementation of SLP. The three dependent variables were: (a) percent correct on knowledge of system of least prompts, measured by a 30-item multiple choice quiz, (b) percent correct on performance of planning for system of least prompts, measured by a task analysis checklist, and (c) percent correct on performance of SLP implementation during teleconference role-plays, measured by a task analysis checklist. Results indicate that the training was effective in increasing educators’ knowledge of SLP as well as the ability to plan for SLP. Implementation of SLP also increased over time, however, data analysis did not support the conclusion that this result was directly related to the online training alone. Additional results suggest that the participants viewed online instruction, with teleconference role-plays and case studies, as a socially valid activity. Participants reported learning a valuable skill and as a result of the training were more confident working with individuals who use AAC. Implications, limitations, and directions for future research are also discussed.

Keywords: system of least prompts, teacher training, autism spectrum disorder, augmentative and alternative communication
# TABLE OF CONTENTS

LIST OF TABLES ........................................................................................................................................ vi

LIST OF FIGURES ....................................................................................................................................... vii

ACKNOWLEDGEMENTS ........................................................................................................................... viii

Chapter 1 INTRODUCTION ....................................................................................................................... 1

  System of Least Prompts ..................................................................................................................... 2
  Augmentative and Alternative Communication ................................................................................. 4
  SLP to Teach AAC ............................................................................................................................... 4
  Strategy Instruction .............................................................................................................................. 5
  Online Learning ..................................................................................................................................... 6
  Present Study ........................................................................................................................................ 7

Chapter 2 METHOD ................................................................................................................................... 9

  Participants ........................................................................................................................................... 9
  Setting .................................................................................................................................................. 10
  Materials ............................................................................................................................................. 11
  Research Design .................................................................................................................................. 13
  Dependent Variables ............................................................................................................................. 13
  Independent Variable .............................................................................................................................. 15
  Procedures .......................................................................................................................................... 17
  Measures ............................................................................................................................................. 22

Chapter 3 RESULTS .................................................................................................................................. 26

  Participation Analytics .......................................................................................................................... 26
  System of Least Prompts Knowledge Assessment ............................................................................... 27
  Planning for System of Least Prompts Assessment ........................................................................... 29
  Implementation of SLP Assessment ....................................................................................................... 31
  Degree Status ....................................................................................................................................... 36
  Procedural Fidelity ................................................................................................................................. 37
  Inter-rater Reliability ............................................................................................................................... 37
  Social Validity ....................................................................................................................................... 38

Chapter 4 DISCUSSION ............................................................................................................................ 40

  Effective Training ................................................................................................................................. 40
  Efficient Training ................................................................................................................................ 48
  Socially Valid Training .......................................................................................................................... 51
  Generalization ...................................................................................................................................... 52
  Limitations .......................................................................................................................................... 53
Conclusion............................................................................................................. 54
References............................................................................................................ 56
Appendix A Tables............................................................................................... 69
Appendix B Figures.............................................................................................. 84
Appendix C Review of Relevant Literature.......................................................... 87
Appendix D Assessment Materials....................................................................... 115
Appendix E Training Materials........................................................................... 123
Appendix F Participant Assessment Examples.................................................... 131
LIST OF TABLES

Table 1: Participant Demographics ................................................................. 69
Table 2: Independent Variable Activities......................................................... 70
Table 3: Case Studies and Targeted AAC Supports......................................... 71
Table 4: Means and Standard Deviations of Participants by Group .................... 72
Table 5: Participant Individuals Scores on Assessments ................................... 73
Table 6: Types of Prompt Types Observed During Role-Play Assessments .......... 74
Table 7: Participation Analytics ....................................................................... 75
Table 8: Participant Social Validity Responses (5-point scale items)..................... 76
Table 9: Participant Social Validity Responses (Open response items)................. 77
Table 10: System of Least Prompts Key Terminology......................................... 83
LIST OF FIGURES

Figure 1: Knowledge Quiz Means by Group and Time………………………………… 84
Figure 2: Planning Means by Group and Time………………………………………… 85
Figure 3: Implementation Means by Group and Time………………………………… 86
ACKNOWLEDGEMENTS

First, and foremost, I acknowledge that none of this would have been possible without my Lord and Savior, Jesus Christ. There were times throughout this journey that I couldn’t see the next steps but in faith believed that “He who began a good work in you will carry it on to completion” (Philippians 1:8). Although there is still more work to be done in and through my life, I am grateful for the completion of this chapter.

I also want to recognize the endless contributions of my advisor, Dr. David McNaughton. Our weekly meetings provided me with a space to discuss, to wonder, to evaluate, and to question- skills that have been tremendously influential in my growth as a researcher and as an individual. Thank you, Dr. McNaughton, for the time and effort you invested in me; your mentorship and support has been invaluable.

To my committee members: Dr. Pamela Wolfe, thank you for your guidance during my teaching experiences. You have shaped who I am as an educator; always pushing me to consider what I want the students to learn and how am I going to get them there. I am confident I wouldn’t be the teacher I am today without you. Dr. Janice Light, I am indebted to you, first and foremost, for securing my funding through the AAC Leadership Training Grant. You worked tirelessly to complete the administrative details but also to include me in the AAC community, providing opportunities for me to think about AAC and individuals with CCN from a whole new perspective. Dr. David Lee, thank you for always having an open door for me to ask questions and bounce ideas. I have particularly benefited from your understanding of research design, which has helped me consider how to approach current and future research projects. Dr. Tracy Raulston, although it has only been a year that we’ve worked together, your insight into applied
behavior analysis and individuals with autism have been influential on my thinking. Your feedback on my work has been enormously helpful.

Other individuals who are not on my committee but who deserve recognition for their support of this project include: Dr. Katie Hoffman, Salena Babb, Naima Bhana, Jessica Gormley, Jackie Maguire, Kelsey Mandak, Theoni Mantzoros, and Tara O’Neill.

Last, but certainly not least, I acknowledge the support from loved ones. An endless thank you to my mom, Dr. Karen McCoy, for instilling in me a love for learning and for being my biggest cheerleader. I would not be who I am today without your love, support, guidance, and wisdom. Thank you, Moses, for being my rock. You have celebrated with me, spoken life over me, and comforted me; your love has brought me through all seasons of this journey. I couldn’t have done it without you. Lastly, thank you to my grandmother, my brother, and my friends for your listening ear and endless words of encouragement.

In conclusion, I would like to acknowledge two funding sources. This research was supported in part by funding received from the Penn State AAC Leadership grant from the U.S. Department of Education (grant #H325D11008). The contents do not necessarily represent the policy of the U. S. Department of Education and you should not assume endorsement. Additional funding for this research came from the Penn State College of Education Dissertation Research Initiation Grant.
Chapter 1

Introduction

Individuals with autism spectrum disorder (ASD) present with learning characteristics that require the use of specialized instruction to support skill acquisition (Scheuermann, Webber, Bouter, & Goodwin, 2003). As such, educators are required by law to utilize instructional techniques identified as evidence-based practices (EBPs) when educating individuals with ASD (Individuals with Disabilities Education Improvement Act [IDEA] 2004; No Child Left Behind 2001). More specifically, instructional strategies based on principles of applied behavior analysis have strong empirical validation and are recommended for individuals with ASD (Gerencser, Higbee, Akers, & Contreras, 2017; National Autism Center, 2009; National Research Council, 2001; Neely, Rispoli, Gerow, & Hong, 2016). Although these interventions have been identified, there is still significant need to train education professionals to implement EBPs (Rakap, Jones, & Emery, 2015; Wainer & Ingersoll, 2013). Training is of critical importance as teachers’ high fidelity implementation of EBPs is one of the most important variables in student achievement (Alexander, Ayres, & Smith, 2015; Kretlow & Bartholomew, 2010; Wong et al., 2013).

The need for teachers to be able to implement EBPs has placed an increased emphasis on teacher preparation programs to teach EBPs to preservice teachers (Kretlow & Bartholomew, 2010; Markelz, Riden, & Scheeler, 2017; McLeskey & Billingsley, 2008; Sawyer et al., 2017). However, it is recognized that generalization from training to natural, classroom environments does not frequently occur (Scheeler, 2008; Scheeler, Bruno, Grubb, & Seavey, 2009). One potential reason for the lack of generalization stems from the type of instruction provided to educators during preservice training, which is typically didactic and focused primarily on the preservice educators’ knowledge of the EBP (Alexander et al., 2015; Parsons, Rollyson, & Reid,
As such, teacher preparation programs typically address the question of what to do (i.e., knowledge about EBPs) but there is a need for effective instruction that ensures teachers have also learned fidelity implementation of EBPs (Alexander et al., 2015; Sawyer et al., 2017).

**System of Least Prompts**

Although there is growing literature on training to support educators’ use of EBPs, providing appropriate training and support will still require significant time and effort for both the learner and the instructor (Gerencser et al., 2017; Scheuermann et al., 2003). One potential way to increase efficiency of training is to identify key EBPs that can be used to support the learning of students with ASD in a variety of settings with a variety of skills. Selection of instructional practices that have wide applications has the potential to also increase long-term use and generalization to untrained contexts. One such EBP is prompting, specifically, the system of least prompts (SLP), which has been highlighted to be a foundationally important EBP for educators working with learners with ASD (Garland, Holden, & Garland, 2016; Sam, Cox, & Odom, 2017; Xu, 2016). Recently, the SLP has been empirically evaluated in teaching a variety of discrete and chained skills such as: play skills (Libby, Weiss, Bancroft, & Ahearn, 2008), between activity transitions (Cihak et al., 2010), and reading comprehension skills (Browder, Lee, & Mims, 2011).

The SLP includes at least three levels of prompting, arranged in a least to most hierarchy, with a constant time delay between prompts to allow students the opportunity to respond (Cooper, Heron, and Heward, 2007; Doyle, Wolery, Ault, & Gast, 1988; Neitzel & Wolery, 2009). As a first step in the SLP instructional sequence, a cue (e.g., natural environmental stimuli, task direction) is provided to signal the learners’ behavior (i.e., the task the learner is
expected to perform). Prompting, through the least to most hierarchy, is then added by the educator, as needed, to assist the learner in correctly performing the desired task. Through review of the extant literature, there is evidence from seminal work and research investigations suggesting that SLP prompting hierarchies generally follow the order of: verbal, gesture, model, and physical prompts (e.g., Cihak, Fahrenkrog, Ayres, & Smith, 2010; Cooper et al., 2007; Doyle et al., 1988; Finke et al., 2017; Humphreys, Polick, Howk, Thaxton, & Ivancic, 2013; MacDuff, Krantz, & McClannahan, 2001; West, 2008). This order of prompts is considered to be least to most intrusive, when intrusiveness is defined as the extent that the prompt intrudes on the learner’s body (Wolery, Ault, & Gast, 1992). It should be noted that there is currently no empirical research that validates this sequence of prompts as least to most; however, this information is of critical importance, particularly when evaluating prompt fading.

There exists a body of research suggesting that high frequency or repeated use of traditional verbal prompts (i.e., spoken directive) may result in poorer outcomes for learners, such as increased errors during training as well as reduced maintenance and generalization (Grow et al., 2009; West & Billingsley, 2005). Additionally, when compared with other types of comparable prompts, like a visual prompt, traditional verbal prompts produced comparatively more errors and were associated with poorer long-term outcomes (West, 2008). As such, it is interesting to consider verbal prompts from the applied behavior analysis literature in which “verbal” acts as an umbrella term that includes spoken, textual, visual/pictures, and sign language (Copper et al., 2007). For example, after asking a wh-comprehension question (e.g., “What color is the bird?”), verbal prompts could include any of the following: (a) spoken prompt (e.g., “red”), (b) textual prompt (e.g., showing the printed word red), (c) visual prompt (e.g., showing a red picture card), or (d) sign prompt (e.g., signing word red). Given the emerging
evidence surrounding the potential limitations of traditional verbal prompts (i.e., spoken directive), participants in the study were taught to consider verbal prompts as including: spoken, textual, visual/pictures, and sign language.

**Augmentative and Alternative Communication (AAC)**

It is estimated that 30% of children with ASD will not develop speech sufficient to meet their communication needs (Anderson et al., 2007; Wodka, Mathy, & Kalb, 2013). For these individuals, the use of augmentative and alternative communication (AAC) is recommended to support communication and participation in academic activities, relationships with family and friends, and community events (Beukelman & Mirenda, 2013; Ganz et al., 2011). The goal of expressive AAC is to “facilitate an individual’s ability to communicate more effectively with others”, while receptive AAC helps individuals with ASD “understand communication from others” (Mirenda, 2001, p. 142). Some common expressive AAC strategies for individuals with ASD include: Picture Exchange Communication System (PECS; Ganz, Hong, Gilliand, Morin, & Svenkerud, 2015), Functional Communication Training (FCT; Mancil, 2006; Olive, Lang, & Davis, 2008), and applications on mobile devices (Shane et al., 2012). Additionally, receptive AAC supports include schedules (Sevin, 2015) and visual symbols (Mirenda, 2001; Sterling-Turner & Jordan, 2007).

**SLP to Teach AAC**

The SLP has been used in teaching expressive AAC to individuals with severe disabilities, including individuals with ASD (Ahlgrim-Dezell, Browder, and Wood, 2014; Finke et al., 2017; Kagohara et al., 2012; Light, Binger, Agate, and Ramsay, 1999) as well as receptive AAC (Cihak et al., 2010; Dettmer, Simpson, Smith Myles, & Ganz, 2000; Mechling, Gast, and Seid, 2009). Additionally, Snell, Chen, and Hover (2006) in their review of the literature from
1997-2003 found eight studies that specifically used SLP to teach augmentative and alternative communication (AAC), with three additional studies using it in combination with another prompting method. Although there is research supporting both SLP and AAC, as well as SLP to teach AAC, there is still a significant need to train education professionals on SLP to support the use of AAC by persons with complex communication needs (i.e., speech insufficient to meet daily needs; CCN; Costigan & Light, 2010; Meder, 2017; Molt, 2017).

**Strategy Instruction**

Learning an EBP requires several types of knowledge to be mastered before an educator is successful at implementation (McCormick, 1997; Scheeler, 2008). The first type of knowledge, declarative or conceptual knowledge, is often referred to as “knowing that” - for example, the educator could describe the system of least prompts as requiring at least three levels (Paris, Lipson, & Wixon, 1983, p. 302). Of additional significance is procedural knowledge, or the “knowing how”- the educator would be able to demonstrate use of the steps of the system of least prompts (Paris et al., 1983, p. 302). “The literature on problem solving has most clearly illustrated the importance of this [inter] relationship [between conceptual and procedural knowledge], because… it is evident that it is the possession of conceptual knowledge that makes possible the effective use of the procedural knowledge…” (McCormick, 1997, p. 149).

Paris and colleagues (1983) suggest that these two knowledge types are important, but are not, however, sufficient. As such, Paris et al. (1983) put forth a third type of knowledge that must also be considered, conditional knowledge, or the “knowing when and why” (p. 303). It is through this conditional knowledge that learners are taught under which conditions the target strategy is appropriate and why it is only appropriate for some tasks and situations. It is argued
that learners’ develop strategic behavior only through the combination of all three types of knowledge: conceptual, procedural, and conditional (Paris et al., 1983).

In order to implement instructional techniques effectively (i.e., AAC, SLP), educators must develop this strategic behavior, requiring that they be provided with opportunities to practice and receive feedback on all three types of knowledge (e.g., Kent-Walsh & McNaughton, 2005; Parsons et al., 2012). Strategy instruction, a training sequence that was originally created to support individuals with learning disabilities in completing complex tasks, has been successfully applied to teaching adult learners (Deshler & Schumaker 1986; Douglas, McNaughton, & Light, 2013; Ellis, Deshler, Lenz, Schumaker, & Clark, 1991; Kent-Walsh & McNaughton, 2005). The strategy instruction model includes common training elements of description, model, rehearsal, and feedback (e.g., Ellis et al., 1991; Parsons et al., 2012) as well as the inclusion of critical instructional elements such as: addressing the issue of motivation, pre-teaching needed vocabulary, teaching with multiple exemplars, providing opportunities for scaffolded practice with feedback, teaching to mastery, and explicit promotion of generalization.

**Online Learning**

When evaluating interventions in which educators were taught to implement the SLP, the majority of studies have used traditional face-to-face instruction (e.g., Barton & Wolery, 2010; Horrocks & Morgan, 2011). However, when considering the need to provide training that is effective, efficient, and socially valid, online learning (e.g., telepractice, interactive computer training, distance learning) has become more prevalent primarily due to the associated benefits: time independent, learner controlled, cost effective, and global accessibility (Johnson, 2004; Meyen, Lian, & Tangen, 1997). In recent research, online training has been provided on specific EBPs such as: activity schedules (Gerencser et al., 2017), discrete trial instruction (Pollard,
Higbee, Akers, & Brodhead, 2014), incidental teaching (Neely et al., 2016), and reciprocal imitation training (Wainer & Ingersoll, 2012).

Although there is promise in the accessibility and efficiency of online learning, it has been argued that the elements of quality instruction remain constant, regardless of the delivery mode (i.e., via technology or traditional face-to-face; Ally, 2008; Clark & Mayer, 2016; Johnson, 2004). As noted by (Ally, 2008, p. 15), “learning is influenced more by the content and instructional strategy in the learning materials than by the types of technology used to deliver instruction.” As such, studies that have investigated online training of EBPs have commonly reported instructional activities including: written text, audio narration, graphics, video models, guided practice, and comprehension quizzes (Gerencser et al., 2017; Neely et al., 2016; Pollard et al., 2014; Rakap et al., 2015; Wainer & Ingersoll, 2012).

**Present Study**

At present there is limited research focusing on how both knowledge and performance of SLP is taught to educators in an online environment. As such, the present study sought to answer the question: What is the effect of online training on educators’ knowledge and use of the system of least prompts to support the communication of individuals with ASD who use AAC? The current study investigated the effects of an online instructional program to teach educators to use SLP to support expressive and receptive AAC by persons with ASD. Specifically, expressive AAC included the use of low-tech activity based communication boards (for use in contexts such as storybook reading, peer conversation) and receptive AAC included low-tech visual schedules and high-tech video models for activities of daily living and routines (for use in contexts such as putting away materials, folding laundry, and leisure skills). The researcher hypothesized that the online intervention would be effective in increasing participants (a) knowledge of system of least
prompts, (b) documentation of planning for system of least prompts, and (c) implementation of system of least prompts during structured role-play.
Chapter 2

Method

Participants

Participants were students recruited from a 15-week assistive technology course taught online by a large, public university in Pennsylvania. A total of 29 students were enrolled in the course. Seventeen were graduate students pursing a master’s degree in special education and 12 students were undergraduates ranging from sixth to ninth semester (i.e., junior, senior) with majors including: secondary education, elementary and early childhood education, and rehabilitation and human services. Although all students engaged in all instructional activities, 20 students (13 graduate students and seven undergraduate students) consented to have their performance video recorded and their activity results used for this research study. For the purposes of description, consented students will be described as participants.

All participants were assigned to either Group A (i.e., Assessment 1, intervention, Assessment 2, control, Assessment 3) or Group B (i.e., Assessment 1, control, Assessment 2, intervention, Assessment 3). To ensure that both groups contained approximately equal number of graduate and undergraduate students, participants were initially grouped based on degree status, and then randomly assigned to either Group A or Group B. In Group A, five were graduate students and four were undergraduate students. In Group B, eight were graduate students and three were undergraduate students. The last graduate student participant assigned to a group was inadvertently placed in Group B on Canvas, rather than Group A. By the time this error was discovered, the participant had missed access to the training with Group A and her assignment could not be changed. It is for this reason that the groups contained nine (Group A) and 11 (Group B) participants. The researcher evaluated the results of both groups after Time 1,
specifically testing the homogeneity of variances, finding that even though the groups were uneven in number, they were not significantly different in their performance.

**Background information.** At the beginning of the study, all participants completed a demographic questionnaire. Participants ranged in age from 20-42 years old. Participants were all female and were primarily White/Non Hispanic or Latino (n=17). See Table 1 for participant demographics. Additional information was obtained regarding current employment, experience in working with children with disabilities, experience in working with individuals with CCN, and any prior coursework on instructional strategies for individuals with ASD. Overall, approximately half of participants had between one to five years of employment experience as a special educator of individuals with disabilities. Additionally, several participants (n=6) had short-term experiences with individuals with disabilities during volunteer opportunities or student teaching placements. When considering the experiences of participants with individuals who had CCN, approximately half had some previous involvement with individuals with different types of communication challenges, as well as learners who used some form of augmentative and alternative communication (AAC). However, there were 25% (n=5) who had no prior experience with individuals who had CCN. Lastly, five participants (25%) reported having prior coursework on instructional strategies, all mentioning that it was part of their undergraduate studies, with another 25% (n=5) indicating that they had some related training (e.g., overview course on ASD) but not coursework specific to instructional strategies. The remaining ten participants (50%) reported no prior coursework.

**Setting**

The setting of this study was the online learning environment; all assessments and instructional content were delivered via Instructure Canvas, an online learning management
system commonly used in United States higher education (Wainer & Ingersoll, 2013). Canvas was also the setting for the selected assistive technology course, so participants already had access through the university. This course was selected for this study because of the match between the educational content typically addressed in this class and the content of the independent variable (i.e., AAC), as well as the delivery method (i.e., online instruction). More specifically, the assistive technology course provided the what of assistive technology (e.g., available AAC options) and the current study added specific content on how to implement a specific evidence-based instructional strategy (i.e., system of least prompts) to support learners’ use of AAC. The course was designed to teach students about a range of assistive technology supports and how assistive technology can benefit learners with disabilities. Educational content covered assistive technology across domains: communication, writing, reading, and behavior, as well as information regarding alternative access methods and assistive technology in the Individual Education Plan (IEP). Participants completed the following standard course modules prior to Assessment Time 1: introduction, communication and storybook reading, reading instruction, and activities of daily living (e.g., visual schedules, video modeling).

Materials

Assessment materials. Participants were provided with an electronic copy of excerpts from three popular children’s books: Are You My Mother? (Eastman, 1998), The Very Hungry Caterpillar (Carle, 1994), and Little Blue Truck (Schertle & McElmurry, 2008). They also were provided with corresponding low-tech AAC communication boards with vocabulary relevant to each book. Each of the AAC storyboards contained 20 vocabulary items, arranged in a grid with five columns and four rows. All vocabulary items were represented with an image (e.g., Boardmaker® symbol, photo from the book) with the printed word beneath the image. Lastly, the
vocabulary items were arranged similarly across the three storyboards with nouns grouped on the left side and verbs on the right. Participants were directed to have the book pages and AAC storyboards printed for each of the teleconference assessments. Additionally, participants were provided with an activity description and learner profile. In the activity description, participants were told they would read the assigned story and ask the learner wh- questions throughout. The learner profile was a fictitious case student with ASD created by the experimenter. The learner profile contained at least two descriptors that would serve as keywords for the participant when making instructional decisions on the type of prompts to be used. For example, the learner profile stated that Kara was “tolerant of others helping her” and that she would “sometimes imitate the actions of others” indicating that physical and model prompts might be appropriate prompts to consider.

**Training materials.** All training materials were provided electronically in Canvas. Instructional content was presented as a combination of written text, relevant visuals (n=15), and videos (n=25) arranged across 48 digital pages. The researcher estimated that the training would take approximately 150-180 minutes to complete. All training videos, created by the experimenter for the instructional content, were uploaded into a private YouTube channel and embedded within the Canvas course. There were two types of videos: introductory (i.e., researcher lecture) and example (i.e., demonstrations of the use of SLP). The researcher recorded three introductory videos via Lightboard in the university multi-media lab that previewed the instructional content for each of the three sections. In addition, example videos of targeted skills were created using an iPhone 6s and the Insignia™ mobile photography kit: tripod, Bluetooth remote, directional microphone, and LED light. Videos ranged in length from 30 seconds to 4 minutes. See Appendix E for sample training materials.
Research Design

This study utilized a quasi-experimental, pre/post test group design with switching replications. One of the major advantages to this design is that all participants receive the intervention (Guthrie & Klauda, 2014). Additionally, Shadish, Cook, and Campbell (2002) suggest that the switching replication removes most threats to internal validity, making this one of the strongest experimental designs (Trochim, 2006). To begin, all participants completed Assessment 1. Then, Group A immediately entered intervention, followed again by both groups receiving Assessment 2. Lastly, the replication occurred with Group B entering intervention followed by both groups receiving Assessment 3. The following illustration diagrams the design (R = random assignment, A = assessment, X = intervention):

<table>
<thead>
<tr>
<th>Group A (R)</th>
<th>A₁</th>
<th>X</th>
<th>A₂</th>
<th>A₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group B (R)</td>
<td>A₁</td>
<td></td>
<td>A₂</td>
<td>X</td>
</tr>
</tbody>
</table>

Dependent Variables

There were three dependent variables measured to evaluate the effect of online training: (a) knowledge of SLP, (b) documentation of planning for SLP, and (c) role-play implementation of SLP. Dependent variables were measured during all three assessments and are presented in the order in which participants completed each component of the assessment. Participants did not receive feedback on any assessment during the study.

Knowledge assessment. The first dependent variable was a knowledge assessment: an online, 30-item, multiple-choice quiz. Assessment items included factual level questions about SLP (e.g., definitions of SLP terms) as well as case scenarios and photographs of teacher/learner interactions that required the participant to demonstrate knowledge on multiple levels, including conceptual, conditional, and procedural knowledge (Clark, 2014). All questions were in
multiple-choice format and were written to include both recognition (i.e., facts and concepts) and application (i.e., procedures/strategies) question types. Feedback was not provided on any knowledge assessment.

Potential quiz items were developed by the researcher after reviewing multiple sources on SLP (e.g., Cooper et al., 2007; Doyle et al., 1988; Neitzel & Wolery, 2009; Wolery et al., 1992) and then piloted with a small group (n=9) of special education masters students from a large university in Pennsylvania. Results from the pilot quiz were analyzed, specifically: the difficulty index, point biserial of correct, and point biserial of incorrect. Questions and answer options that performed well were selected (e.g., difficulty index between 0.3 and 0.7; point biserial between ± 0.3 and 1.0; Canvas, 2018). During intervention, the knowledge assessment performed with an average alpha level of 0.826 across groups at Time 3.

Furthermore, to strengthen the validity of the assessment questions, four faculty with a minimum of five years of experience in applied behavior analysis and/or intervention for individuals with severe disabilities, including at least two Board Certified Behavior Analysts (BCBAs), reviewed the 30-item quiz and confirmed that the test items appropriately addressed the concept, procedure, and conditions of system of least prompts (Cooper et al., 2007).

**Performance assessment.** The performance assessment included both planning documentation (i.e., dependent variable two) and teleconference role-play implementation (i.e., dependent variable three). Performance on planning documentation and role-play implementation were evaluated by scoring the percent of SLP steps written (planning document) and performed (role-play) correctly. Scoring was based on a modified least to most prompting checklist created by the National Professional Development Center on Autism Spectrum
Disorders (NPDC, 2010). Feedback was not provided on any performance assessment. See Appendix D for performance checklists.

**Independent Variable**

The intervention was a three-part online instructional module on the SLP developed by the researcher. The researcher had a bachelor’s degree in speech pathology and audiology, a master’s degree in severe special education, and an educational specialist’s degree in assistive educational technology. The researcher was a Board Certified Behavior Analyst (BCBA) and had over seven years of experience working directly with individuals with ASD. At the time of the study, the experimenter was pursuing a doctoral degree in special education with an emphasis on individuals with ASD who use AAC.

**Theoretical framework for instruction.** The training followed the instructional sequence of strategy instruction: (a) pretest and make commitments, (b) describe and model, (c) verbal practice, (d) controlled/guided practice, (e) advanced/independent practice, (f) posttest and make commitments, and (g) generalization (Deshler & Schumaker 1986; Ellis et al., 1991; Kent-Walsh & McNaughton, 2005). Each of the three instructional sections (i.e., prompting, planning for system of least prompts, implementing system of least prompts) repeated the strategy instruction steps of: describe and model, verbal practice, guided practice, and independent practice. See Table 2 for the instructional activities included in the independent variable. In addition, participants were taught short acronyms to help remember the steps involved in planning and implementation. Short comprehension quizzes with programmed feedback (n=4) were inserted throughout the training to provide participants with practice and immediate feedback for the content and requisite terminology. Participants also were directed to complete guided practice activities, which included faded worked examples (Atkinson, Derry,
Renkl, & Wortham, 2000). In these activities, participants were provided with an activity description and learner profile and then asked to identify the first/next step and to compare their response to an expert’s. Similarly, the independent practice for the planning components directed the participant to complete the entire process and compare their product to an expert response. For example, during the planning portion of the instructional module, the participants were given a learner profile and asked to prepare a planning document detailing how they would increase the learners’ independence with the target skill. After submitting their plan via Canvas, the participants were shown an expert response and asked to compare the two plans. Specifically, participants were directed to look for ways that their plan and the expert plan were similar, as well as different, and to generate possible reasons for the differences (i.e., what information was used to make the decision in the expert plan).

In addition to the use of a strategy instruction framework, general guidelines from identified best practices in instructional design were utilized to create the online training materials. First, explanations during describe and model stages were short and succinct with relevant visuals and examples incorporated (Clark, 2014; Clark & Mayer, 2016). Second, for the controlled and advance practice stages, there were spaced and frequent opportunities throughout the training for participants to engage with the content (e.g., questions, questions linked with examples, and/or drawing exercises; Clark, 2014; Clark & Mayer, 2016). Thirdly, instructional design principles for multimedia were applied for the creation of graphics and videos. These multimedia principles for graphics and videos (Clark, 2014; Clark & Mayer, 2016) include: (a) contiguity, presenting words and graphics near one another on-screen, (b) redundancy, explaining visuals with words in audio or text but not both, (c) coherence, limiting the quantity of information presented (e.g., less is more), (d) personalization and embodiment, using
conversational style, polite wording, and human voices, and (e) segmenting and pretraining, breaking complex lessons down into smaller parts and teaching important concepts and facts prior to procedures.

**Targeted AAC supports.** During parts two and three of the instructional module (i.e., planning and implementation), the participants practiced with four fictitious case students: Ky, Jessica, Shelley, and Lanre. Each case student was described as an individual with ASD and CCN who had demonstrated use of AAC for a targeted activity. However, the case learner’s progress was inconsistent or regressing (keywords to indicate the appropriate application of SLP). Additionally, each case student used a different type of AAC support: visual schedule for a leisure skill, video model for a domestic task, low-tech picture board for peer communication, and visual schedule for routine completion. During the instructional module, Ky was used for modeling, Jessica and Shelley for guided practice, and Lanre for independent practice. Immediate feedback was programmed into the training for the participants planning and implementation practice activities with these case students. At no point during the instructional module did the participants engage with the assessment case, Kara, or the targeted instructional activity (i.e., literacy activity). This was done intentionally to measure the participants’ ability to independently generalize the knowledge and strategies of SLP planning and implementation to the untrained context. See Table 3 for details on the case studies and AAC supports.

**Procedures**

**Participant communication.** Prior to Assessment Time 1, participants in each group were provided with a summary table of the Supporting AAC activities (i.e., quizzes, intervention, teleconference role-plays) that contained participation dates, assessment due dates, scoring information, and links to activity/assignment pages on Canvas. See Appendix D for a sample
summary table. Participants also received weekly emails from the researcher that contained a bulleted list of items each group was to accomplish that week, along with any deadline reminders. Additional reminder emails were sent to participants who had not yet completed the weekly task, at least 24 hours in advance of the deadline. Any participant who missed a deadline was emailed with one final reminder and an additional week to make up the assignment.

Extended work required a password, provided via email, as the assessments locked at the end of each one-week window. No participant was allowed to complete an assessment more than two weeks post due date, and only assessments that were permitted by the research design were offered for make-up (i.e., Group A participant completed two posttests in the same week).

The researcher also sent an email to the participants at least two days prior to the beginning of each performance assessment window (i.e., planning and teleconference role-play) that contained a link to the needed materials (i.e., low-tech AAC communication board, select storybook pages). Participants were subdivided into three sections (i.e., section A, section B, and section C) and each section contained participants from both groups (i.e., Group A, Group B). As such, each section received a unique email linked to a Google Drive folder with the targeted book and AAC board for that week. Inside the folder, participants were also given a link to a Doodle Poll that allowed them to select their teleconference day and time. Across the three assessments, sections rotated books and adult confederates so that all participants read each of the books with each of the confederates. See Appendix D for a sample materials and scheduling email.

**Assessment.** All participants first completed the 30-item knowledge assessment during Week 1 of the study. All participants then completed the performance assessments (i.e., planning documentation and role-play implementation) during Week 2, before Group A began
intervention in Week 3. All participants submitted the second knowledge assessment during Week 3 and completed the second performance assessments in Week 4. Group B completed the intervention module in Week 5, along with all participants’ completion of the third knowledge assessment. Lastly, all participants completed the third performance assessments during Week 6. All assessments occurred online and were scheduled at the convenience of the participant during a one-week window. Knowledge assessments and the planning portion of the performance assessments were completed at the participants’ discretion, as they were available on Canvas throughout the duration of the assessment week. Participants were told they would receive the assessments three times and that their final score (i.e., Assessment 3) would be included in their final grade for the assistive technology course.

**Performance assessments.** As a first step in the performance assessments, the participants were provided with an activity description, learner profile, and any needed materials (e.g., pages from a storybook, AAC support). The following provides the activity description with learner profile for assessment case, Kara:

For this activity, you will be provided with pages from (insert book) and a low-tech communication board. Using Kara’s case, create a planning document detailing how you would increase her independence with the target skill. Your plan must be submitted no later than 24 hours in advance of your scheduled role-play teleconference.

Kara is a 6-year-old girl with autism and limited verbal communication. As her teacher, you have identified several activities throughout the day to work on increasing her communication through the use of a low-tech communication board. Today you will read a book with Kara and ask 5-7 factual questions throughout. Although Kara has used her communication board independently before, she is inconsistent in her use. From working with Kara before, you know that she is tolerant of others helping her and that she will sometimes imitate the actions of others. Additionally, you are currently working with Kara to develop literacy skills such as letter sound correspondence and sound blending, however, these are skills that she has not yet mastered.

Second, participants created a planning document detailing how they would increase the learners’ independence with the target skill. Participants submitted planning documents (via
Canvas) in advance of their teleconference role-play. Next, participants engaged in a live teleconference role-play (recorded using BigBlueButton® within Canvas). Participants were instructed to conduct the targeted activity with an adult confederate (e.g., research assistant) playing the role of Kara. Before beginning the role-play, the research assistant confirmed that the participant had the needed materials (i.e., story pages, AAC communication board, plan) and explained the following: “We know that this experience is different and that it may feel a bit unnatural. Please do your best to engage with me as if I am a student with a severe disability who uses AAC. If at any point, you feel limited in your interactions because of the web conference, you may think aloud what you would do.” This phrasing was added as a workaround for the inability of the participant to interact physically with the adult confederate during the role-play session. During the role-play, the adult confederate followed a scripted list of behaviors in order to provide the participant with the opportunity to make use of a variety of key SLP skills. Each confederate had a different script with a unique response pattern. See Appendix D for a sample adult confederate script. At the conclusion of the role-play, participants were thanked for their participation and recording ended; no feedback on the participant’s performance was provided.

There is research evidence to support role-play with an adult confederate (e.g., research assistant, fellow trainee) as an effective instructional practice within traditional face-to-face instruction (Gerencser et al., 2017; Homlitas, Rosales, & Candel, 2014; Rosales, Stone, & Rehfeldt, 2009; Sawyer et al., 2017). Although video conferencing has been used as a delivery mechanism for delayed feedback within telepractice (e.g., Neely et al., 2016) the present study provided a novel use of video conferencing for assessing SLP implementation.

**Intervention.** After an Introductory Quiz was completed, participants received access to the instructional materials on SLP; a procedure to ensure that Group A and Group B received the
materials (e.g., intervention, control) appropriate to their group. During the intervention week, the targeted group received the SLP instructional module, while the other participated in the control activity. The intervention training consisted of three parts: (a) prompting and systematic prompting procedures, (b) planning for SLP, and (c) implementation of SLP. Additionally, as described above (i.e., Targeted AAC Supports) the training included three unique case studies for the participants to practice the application of SLP with three different types of AAC. The control training consisted of a standard educational module on a topic related to assistive technology such as funding or alternative access. Participants were given one week to complete the instructional activities, but could complete the module at any time during the one-week period.

Training of adult confederates. Three graduate students pursing a doctoral degree in special education or communication sciences and disorders from a large, public university in Pennsylvania were recruited to participate as adult confederates. The confederates played the role of Kara during the role-play assessments and were blind to the treatment condition (e.g., Tuyttens et al., 2014). Training was provided prior to the first assessment and consisted of: description, live model, rehearsal, and feedback. Confederates rehearsed until performance reached 100% accuracy in following the script.

Training of data coders. Three additional graduate students pursing doctoral degrees in special education or communication sciences and disorders from a large, public university in Pennsylvania, who were also blind to the treatment condition (e.g., Tuyttens et al., 2014), independently scored all performance assessments (i.e., planning documentation and role-play implementation). Videos and plans from each week were randomly assigned to one of three sets (i.e., set A, set B, and set C). Coders were then assigned one set for data coding, one set for reliability (i.e., a duplicate training set for another coder), and one set for training. Training was
provided individually and consisted of: description, model, practice, and feedback. Coders practiced with their assigned training set until performance reached at least 90% agreement with the researcher across 2 consecutive trials.

Measures

Data collection. Data were collected for both the knowledge and performance assessment activities. The knowledge assessment scores were automatically scored by Canvas and the experimenter retrieved participant scores at the conclusion of each assessment window. In addition, the planning document was submitted via Canvas during the assessment window. The experimenter downloaded all participant plans from Canvas at the conclusion of each assessment window. Lastly, the teleconference role-play sessions were recorded using BigBlueButton® Conferences. Videos were downloaded from Canvas and immediately uploaded to a secure cloud-based storage application at the completion of each participant’s teleconference session.

Procedural fidelity. To assess procedural fidelity of the adult confederates, the experimenter created a checklist of adult confederate behaviors that matched the assigned scripts. Data were collected for a minimum of 30% of all sessions for each confederate, across assessment weeks. A procedural fidelity score was calculated as the percentage of steps performed correctly by the confederate divided by the total number of steps and multiplying the quotient by 100. See Appendix D for a sample of the procedural fidelity checklist.

Data analysis. Data were analyzed using a two-way mixed analysis of variance (ANOVA; Bottge, Rueda, LaRoque, Serlin, & Kwon, 2007; Guthrie & Klauda, 2014). All assessment scores were independent so the two-way mixed ANOVA was conducted three separate times for each of the dependent variables: once for the knowledge assessment (i.e., the
30-item multiple choice quiz) and once for each of the performance assessments (i.e., planning documentation, role-play implementation). Post hoc analyses followed the sequence outlined by Cohen (2013). If there was a significant AxB interaction on the two-way mixed ANOVA, two separate one-way repeated measure ANOVAs (i.e., one for each group) were conducted to explore simple main effects. If a simple main effect was determined (e.g., A, B), a pairwise comparison with Bonferroni adjustment was conducted. If during the two-way mixed ANOVA, there was no significant AxB interaction, but there was a significant main effect (e.g., A, B), a pairwise comparison with Bonferroni adjustment was conducted to explore the main effect. Additionally, the practical significance of the data was evaluated using a partial eta squared ($\eta^2_p$) estimate of effect size. Richardson (2011) cites Cohen’s (1969) original definition of $\eta^2_p$ small, medium, and large effects as 0.01, 0.06, and 0.14, respectively.

**Coding.** Task analysis checklists were used to score participant behaviors on the performance assessments. The coders reviewed all participants’ planning document to identify the presence or absence of key items such as: three prompts selected and arranged in a least to most hierarchy, a task cue, response interval (repeated between prompt levels), and possible learner and corresponding adult responses (see Appendix D). Additionally, coders viewed all the participants’ role-play videos to assess the presence or absence of SLP behaviors such as delivering a cue, waiting (minimum of three seconds), and responding to learners’ attempts.

**Inter-rater reliability.** The coders scored all performance data and conducted reliability on one another for a minimum of 30% of sessions across each of the assessment weeks. Sessions were randomly selected for reliability analysis, with nine sessions from each of the three assessment weeks for a total of 18 sessions. Reliability was evaluated using trial-by-trial IOA (Cooper et al., 2007). A percent agreement score was calculated for each planning document by
dividing the number of trials agreement by the total number of trials and multiplying by 100 (Cooper et al., 2007). Then, an average percent agreement score for each set of paired coders was calculated by adding the percent agreement scores from each plan divided by the number of shared plans (i.e., \( n=6 \)). Lastly, the score from each pair was then averaged to calculate an overall agreement score. This process was repeated for video coding reliability. Trial-by-trial IOA was selected because it is a more sensitive measurement than total count IOA, which may overestimate the consistency of the coders (Cooper et al., 2007). For reliability calculations, each line on the task analysis checklist represented a trial (i.e., 19 trials on the planning documents and 75 on the role-play videos).

**Missing data.** Missing data were handled using *hot deck imputation*, a common method within social sciences that “allows for modeling of natural variability in missing data” (Cheema, 2014, p. 494). Hot deck imputation requires that a participant with missing data be matched on specific variables with other cases in the data set (Cheema, 2014). Matching cases are then used as a “donor poll” from which a case is randomly selected (Cheema, 2014). The variables for matching included: degree status and group. An a priori decision was made that all participants must have at least one pretest and one posttest score on each assessment that was originally generated (i.e., not imputed) to be included in analysis. For example, participants were required to complete at least one of two pretests (Group B) or at least one of two posttests (Group A) on all assessments (i.e., knowledge, planning, implementation) or the participant would be removed from analysis. Hot deck imputation was used once during the current study; Participant 14 had an imputed score for Knowledge Time 2.

**Social validity.** Participants completed a social validity questionnaire developed by the researcher based upon the construct of social validity by Schlosser (1999) and Wolf (1978).
Participants were asked to evaluate elements of social validity and to provide their perceptions on the importance of learning the SLP, the acceptability of the instructional methods used, and the impact of the instruction. Participants provided information by responding to questions on a scale of 1 to 5 (with 1: strongly disagree and 5: strongly agree). For example, the participants were asked questions like, “I think system of least prompts is an effective strategy for supporting communication”, “I think the teleconference role-play was an important activity for my learning”, and “I think online training is an effective and efficient way to learn”. There was also an opportunity for open-ended responses (i.e., “Describe what you liked about this training activity”, “Describe recommendations for improvements to this training activity”, “Would you recommend this training activity to other people like yourself? Please provide a rationale for your response”). See Appendix D for the full social validity questionnaire.
Chapter 3

Results

The aim of the present study was to evaluate the effect of online training on educators’ knowledge and use of the system of least prompts to support communication of individuals with ASD who use AAC. The three dependent variables, ordered by completion, were: (a) percent correct on knowledge of system of least prompts, measured by a 30-item multiple choice quiz, (b) percent correct on performance of planning for system of least prompts, measured by a task analysis checklist, and (c) percent correct on performance of SLP implementation during teleconference role-plays, measured by a task analysis checklist. Results for each of the dependent variables are presented below. The means and standard deviations for each dependent variable across time and groups are reported in Table 4 and participant individual assessment scores in Table 5. Additional results are reported for procedural fidelity, inter-rater reliability, and social validity. Results begin with an analysis of participation analytics, which may have impacted the subsequent results for the dependent variables.

Participation Analytics

When evaluating the individual participant scores for knowledge, planning, and implementation, several outliers were found; four had scores lower than average and one, a higher score. Outliers were identified by SPSS with significance at the 0.05 level. Specifically, low outliers were from Participant 3 on Knowledge Quiz 2 and Participants 3, 7, 12, and 18 on Planning Time 3, and a high outlier from Participant 15 on Planning Time 1. A potential reason for these outliers was evaluated by calculating participant analytics that included: content pages viewed, practice activities completed, and estimated time to complete training module. Although these provide some additional data, they are rough approximations, as a page view does not
indicate to what degree the participant engaged with the content. Similarly, the estimated time is based on page view time stamps which could be extended if a participant opened the page but began working on something else or walked away from the computer. See Table 7 for participant analytics. In reviewing the analytics, two participants with low outliers (i.e., Participants 3 and 7) viewed less than 60% of the training module and completed less than 30% of practice activities. Similarly, two other participants with low outliers (i.e., Participants 12 and 18) viewed 80% of more of the training module but completed less than 60% of the practice activities. The final participant (i.e., Participant 15) was an outlier on Planning Time 1 for scoring higher than the average; this participant viewed 100% of the training module and completed 100% of practice activities. Taken together, the four participants with low outliers completed 60% or less of the practice activities, and viewed 60%-80% of content, while the one participant with a high outlier completed 100% of both practice and content.

**System of Least Prompts Knowledge Assessment**

The researcher hypothesized that the online training would be effective in increasing participants’ knowledge of SLP on three levels: conceptual, conditional, and procedural. The knowledge assessment was administered at three separate times (Time 1, Time 2, and Time 3) and across groups (Group A, Group B). The repeated measure (i.e., time) was the within-subject factor and group assignment represented the between-subjects factor (i.e., sequence of instruction). Group A received intervention between Time 1 and Time 2; Group B received intervention between Time 2 and Time 3. Two participants were removed prior to analysis due to missing data, one from Group A and one from Group B and one participant (i.e., Participant 14) had an imputed score for Knowledge Time 2. A two-way mixed ANOVA was conducted for the remaining 18 participants. The results indicate a statistically significant main effect of time, $F(2,$
However, the main effects are qualified by a significant time by group interaction, $F(2, 32)= 17.524$, $p < 0.001$, $\eta^2_p = 0.523$. Figure 1 depicts the means for Group A and B across Time 1, 2, and 3.

Because of the significant time by group interaction, a post hoc analysis of simple main effects was conducted. Two, one-way repeated measure ANOVA (i.e., one for each group), were evaluated. For Group A, results indicate a statistically significant simple main effect of time, $F(2, 14)= 33.554$, $p < 0.001$, $\eta^2_p = 0.827$. Group B also had a statistically significant simple main effect of time, $F(2, 18)= 76.898$, $p < 0.001$, $\eta^2_p = 0.895$. A pairwise comparison with Bonferroni adjustment was conducted to determine when the increase in knowledge was statistically significant for Group A and Group B. For Group A, there was a statistically significant increase of 30.84%, 95% CI [17.88, 43.81] between Knowledge Quiz 1 and 2, and an increase of 35.14%, 95% CI [23.19, 47.08] between Knowledge Quiz 1 and 3. There was also an increase of 4.29%, 95% CI [3.22-11.82] between Knowledge Quiz 2 and 3, for Group A, which was not statistically significant. Group B results indicate a statistically significant increase of 32.44%, 95% CI [25.24, 39.64] between Knowledge Quiz 2 and 3 and an increase of 34.33%, 95% CI [27.11, 41.54] between Knowledge Quiz 1 and 3. There was also an increase of 1.89%, 95% CI [4.81, 8.59] between Knowledge Quiz 1 and 2, which was not statistically significant. Overall, these results suggest that the introduction of the intervention, between Knowledge Quiz 1 and 2 (Group A) and between Knowledge Quiz 2 and 3 (Group B), corresponds with the statistically significant increase in knowledge quiz performance.

**Quiz items.** Knowledge assessment items were individually evaluated to determine those which participants consistently performed well or that were consistently more difficult. Quiz
items represented: conceptual knowledge (n=14, 46.67%), procedural knowledge (n=12, 40%) and conditional knowledge (n=4, 13.33%). During Time 1, at least half of participants answered ten conceptual knowledge questions correctly (71.43%), four procedural knowledge questions (33%), and three conditional knowledge questions (75%). Additionally, during Time 1, there were nine questions that less than five participants answered correctly: three conceptual, one conditional, and five procedural. During Time 3 (e.g., post intervention for both groups) all questions, from all three types of knowledge, were answered correctly by at least six participants, however, three questions were consistently more challenging for students: (a) “When might it be helpful to repeat the direction before each prompt?”, (b) “In a teaching session, between what range (in seconds) can the response interval vary?”, and (c) “What should a teacher do if a learner consistently fails to respond at any prompt level?”; one conditional, one conceptual, and one procedural, respectively. Individual student performance on each of the knowledge assessments (i.e., Time 1, Time 2, and Time 3) is provided in Table 5.

**Planning for System of Least Prompts Assessment**

The researcher hypothesized that the online training would be effective in increasing participants’ SLP planning. The planning portion of the performance assessment was administered at three separate times (Time 1, Time 2, and Time 3) across groups (Group A, Group B). The repeated measure (i.e., time) was the within-subject factor and group assignment represented the between-subjects factor (i.e., sequence of instruction). Group A received intervention between Time 1 and Time 2; Group B received intervention between Time 2 and Time 3. A two-way mixed ANOVA was conducted. The results suggest a statistically significant main effect of time, $F(2, 36)= 101.677, p < 0.001, \eta^2_p = 0.850$, but the main effect of group failed to reach significance, $F(1, 18)= 0.831, p = 0.374, \eta^2_p = 0.044$. However, the main effect is
qualified by a statistically significant time by group interaction, $F(2, 36)= 24.186, p < 0.001, \eta^2_p = 0.573$. Figure 2 depicts the means for Group A and B across Time 1, 2, and 3 on the planning assessment.

Because of the significant time by group interaction, a post hoc analysis of simple main effects was conducted. Two, one-way repeated measure ANOVA (i.e., one for each group), were evaluated. For Group A, results indicate a statistically significant simple main effect of time, $F(2, 16)= 18.938, p < 0.001, \eta^2_p = 0.703$. Group B also had a statistically significant simple main effect of time, $F(2, 20)= 320.997, p < 0.001, \eta^2_p = 0.970$. A pairwise comparison with Bonferroni adjustment was conducted to determine when the increase in planning was statistically significant for Group A and Group B. For Group A, there was a statistically significant increase of 50.34%, 95% CI [24.67, 76.01] between Plans 1 and 2, and of 58.08%, 95% CI [34.74, 81.42] between Plans 1 and 3. There was an increase of 7.74%, 95% CI [13.99, 29.46] between Plans 2 and 3, which was not statistically significant. Group B results indicate a statistically significant increase of 73.56%, 95% CI [65.07, 82.05] between Plans 2 and 3, and an increase of 73.69%, 95% CI [65.01, 82.36] between Plans 1 and 3. There was also an increase of 0.13%, 95% CI [-4.38, 4.64] between Plans 1 and 2, which was not statistically significant. Overall, theses results suggest that the introduction of the intervention, between Plans 1 and 2 (Group A) and between Plans Quiz 2 and 3 (Group B), corresponds with the statistically significant increase in planning performance.

**Planning items.** Planning documents were evaluated to determine which steps participants consistently performed well or that were consistently more difficult. During Time 1, participant plans consistently included a list of potential wh- questions to ask (i.e., determine cue) as well as the correct student response. Participants also frequently mentioned the use of
modeling (n=10). Although this result is encouraging, it is not surprising because in a previous module within the course, students are presented with content related to: preparing a motivating activity, providing AAC, offering opportunities, and providing models. Additionally, two plans referenced increasing assistance or scaffolded support, but the specifics of these techniques were not identified in the plan. In comparison, during Time 3, all but five participants (n=15) reached criterion (i.e., 80%) with their planning documents. Specifically, plans included SLP components: selection of three prompts, arrangement of three prompts into least to most hierarchy, determination of cue, determination of response interval, and identification of the three possible learner response options and corresponding adult responses across the three levels of selected prompts. Items that participants missed during Time 3 included: identification of the correct learner response and adult response after the level 3 controlling prompt, writing the planning acronym (i.e., SADD IDx3), and drawing the diagram illustrated in the instructional module, each item represented a deduction of one point.

Individual student performance on each of the planning assessments is provided in Table 5. There were two participants who did not independently generalize the system of least prompts to their plan during Time 3 (i.e., less than 10% on planning Time 3). These participants received an email from the researcher at the conclusion of the assessment window with explicit directions to include SLP in their plan, as outlined in the instructional module. They were allowed one week to resubmit their third planning document. After this direction and opportunity to retake the assessment, both participants increased their scores, however, both participants’ scores remained below 55% (i.e., 15% and 54.55%). Updated scores are shown with original scores in Table 5; original scores were used for analysis.

**Implementation of SLP Assessment**
The researcher hypothesized that the online training would be effective in increasing participants’ implementation of SLP during teleconference role-plays. The implementation assessment was administered at three separate times (Time 1, Time 2, and Time 3) across groups (Group A, Group B). The repeated measure (i.e., time) was the within-subject factor and group assignment represented the between-subjects factor (i.e., sequence of instruction). Group A received intervention between Time 1 and Time 2; Group B received intervention between Time 2 and Time 3. A two-way mixed ANOVA was conducted. The results suggest a statistically significant main effect of time: $F(2, 36) = 12.253$, $p < 0.001$, $\eta^2_p = .405$. There was not a statistically significant main effect of group: $F(1, 18) = 1.731$, $p < 0.205$, $\eta^2_p = 0.088$, nor was there a significant time by group interaction: $F(2, 36) = 2.834$, $p < 0.072$, $\eta^2_p = 0.136$. Figure 3 depicts the means for Group A and B across Time 1, 2, and 3 on the implementation assessment. Participant performance on each of the implementation assessments is provided on Table 5.

Because there was no significant time by group interaction, the significant main effect of time was evaluated using a post hoc, pairwise comparison with Bonferroni adjustment. There was a statistically significant increase of 13.5%, 95% CI [3.1, 23.8] between Time 1 and 3, and of 10.4%, 95% [3.4, 17.3] between Time 2 and 3. There was an increase of 3.1%, 95% CI [-10.3, 16.6] between Time 1 and 2, which was not statistically significant. Overall, this result suggests that there were statistically significant increases in implementation performance across time, specifically from Time 1 to Time 3.

**Implementation items.** Videos and coded checklists were evaluated to determine how participants performed on implementation targets summarized as: deliver cue, wait, and respond. Details on participant performance of each step are provided below.
**Deliver cue.** Across all implementation assessments, participants consistently asked a wh-question as the cue. Questions were both factual and inferential. For example, “where is the mother bird sitting?” or “Why did the little caterpillar keep eating?” Although this result is encouraging, it is not surprising for several reasons. One, participants were told as part of the activity description to ask wh-questions throughout the literacy activity. Secondly, the majority of participants were early childhood/elementary education majors or current educators so asking wh-questions was likely a known skill. It should be noted, however, that one participant was observed during all three implementation assessments to provide the cue by stating, “point to X” or “show me X”. This was still scored correct as it signaled the learner to respond.

**Wait.** Another component skill of SLP targeted during the implementation assessment was “wait” (i.e., provision of the response interval between hierarchy levels); a correct wait time was a minimum of three seconds. During Time 1, three participants provided no appropriate wait time on any opportunity, five participants provided appropriate wait time on 50% or fewer opportunities, 11 participants provided appropriate wait time between 51-90% of opportunities, and two participants provided appropriate wait time on all opportunities. On average participants’ provided appropriate wait time on 58.26% of opportunities during Time 1. Conversely, during Time 3, all but one participant provided appropriate wait time in at least 50% of opportunities (n=19), five participants provided appropriate wait time between 51-90% of opportunities, and 15 participants provided appropriate wait time on all opportunities. On average participants’ provided appropriate wait time on 90.4% of opportunities during Time 3.

**Respond.** Across implementation assessments, participants consistently responded to the learners’ correct behaviors by providing reinforcement (e.g., confirmatory feedback, verbal praise). Participants were also observed responding to learners’ no response by provision of
prompts. See Table 6 for the types of prompts observed during Implementation Time 1 and 3. The most common type of prompt seen during Time 1 was a verbal prompt, with all participants providing no less than five verbal prompts per session. All but one participant utilized model prompts during Time 1 and 55% (n=11) of participants used gesture prompts. Lastly, two participants made use of the talk aloud for physical prompts during Time 1. Results also indicate that all participants delivered at least two prompts simultaneously on one or more prompting opportunities during Time 1, with 40% (n=8) of participants combining prompts five or more times. In comparison, during Time 3, verbal prompts were still the most common type of prompt observed, however, 40% (n=8) of participants used five or less verbal prompts per session. Additionally, a wider variety of prompts were used during Time 3; two participants used visuals as a type of verbal prompt and one participant, textual. Also, all but three participants utilized model prompts during Time 3 (n=17) and 50% (n=10) of participants used gesture prompts during Time 3. Lastly, 40% (n=8) of participants made use of the talk aloud for physical prompts during Time 3. Results also indicate that four participants delivered a single prompt during all prompting opportunities, 13 delivered at least two prompts simultaneously during one to four prompting opportunities, and two participants delivered at least two prompts simultaneously during five prompting opportunities. Overall, although participants continued to primarily use spoken directives as the most common type of prompt, participants were observed engaging in a greater variety of prompts (i.e., visual/textual, physical) and less prompting combinations during Time 3.

However, this does not necessarily mean that the prompts used followed SLP hierarchy (i.e., verbal, gesture, model, physical) or that the prompts were consistently applied across prompting opportunities (i.e., trials). Consistency was defined as use of the same three prompts
During Time 1, no participants correctly delivered prompts that followed the SLP hierarchy. Also during Time 1, no participants’ prompts were consistently provided across trials. Comparatively, only one participant correctly delivered prompts that followed the SLP hierarchy during Time 3. However, 65% (n=13) of participants provided prompts consistently across trials, meaning that they used the same three prompts during all five trials of the teleconference role-play. These results, taken together with the results for frequency of prompt types used, suggest that participants did learn to be more consistent in their use of prompts, but that provision of combined prompts (e.g., verbal + model) may have reduced the number of participants who followed SLP during Time 3, as participants were taught to use the revised SLP procedure in which the spoken directive is only delivered once, as a verbal prompt, not repeated with subsequent prompts.

The third possible way that participants were evaluated in their response to the learner was with the provision of error correction. The error correction procedure taught to participants included two steps: (a) interruption of the incorrect response and (b) immediate provision of the next prompt in the SLP hierarchy. For example, if the error occurred during the intermediate level, the error correction would be interruption followed by the presentation of the controlling level prompt. Participants were also instructed to refrain from using feedback like, “no”, “that’s wrong”, or “stop” when the error occurred. Overall, although some improvement was observed, error correction remained a challenging step in the SLP procedure for participants during role-play teleconferences. During Time 1, no participants correctly performed the error correction procedure, however, during Time 3, two participants included both steps of the error correction procedure. Furthermore, during Time 3, only 15% (n=3) of participants used negative phrases
(i.e., “no”) during error correction. Rather, 75% (n=15) of participants moved directly to the provision of the next prompt, but failed to include the response interruption.

**Degree Status**

Because both groups contained approximately equal number of graduate and undergraduate students, a secondary analysis of assessment scores was conducted to evaluate if there was a difference in assessment performance related to the participants’ degree status rather than group assignment. Three, separate two-way mixed ANOVA were conducted to evaluate the interaction between the two factors: time (within subjects factor) and degree status (between subjects factor) on each of the assessments.

**Knowledge.** The results indicate a statistically significant main effect of time, \( F(2, 32) = 39.047, p < 0.001, \eta^2_p = .709 \). However, the main effect of degree status was not statistically significant, \( F(1, 16) = 1.924, p = 0.184, \eta^2_p = 0.107 \), nor was there a statistically significant time by degree status interaction, \( F(2, 32) = 1.245, p = 0.302, \eta^2_p = 0.072 \). A post hoc, pairwise comparison with Bonferroni adjustment was conducted to evaluate the significant main effect of time. There was a statistically significant increase of 17.6%, 95% CI [4.4, 30.8] between Time 1 and 2, 19.0%, 95% [8.0, 30.1] between Time 2 and 3, and 36.6%, 95% CI [4.4, 30.8] between Time 1 and 3. Overall, this suggests that participants showed statistically significant increases across all three times, regardless of the degree status.

**Planning.** The results suggest a statistically significant main effect of time: \( F(2, 36) = 43.130, p < 0.001, \eta^2_p = .706 \). However, there was not a statistically significant main effect of degree status: \( F(1, 18) = 0.228, p = 0.639, \eta^2_p = 0.1013 \), nor was there a statistically significant time by degree status interaction: \( F(2, 36) = 1.438, p = 0.251, \eta^2_p = 0.074 \). A post hoc, pairwise comparison with Bonferroni adjustment was conducted to evaluate the significant main effect of
time. There was a statistically significant increase of 25.7%, 95% CI [5.0, 46.3] between Time 1 and 2, 41.8%, 95% [19.2, 64.5] between Time 2 and 3, and 67.5%, 95% CI [54.0, 81.1] between Time 1 and 3. Overall, this suggests that participants showed statistically significant increases across all three times, regardless of the degree status.

**Implementation.** The results suggest a statistically significant main effect of time, $F(2, 36)= 9.240, p = 0.001, \eta^2_p = .339$. However, there was no statistically significant main effect of degree status, $F(1, 18)= 1.345, p < 0.261, \eta^2_p = 0.070$, nor was there a statistically significant time by degree status interaction, $F(2, 36)= 0.415, p = 0.663, \eta^2_p = 0.023$. A post hoc, pairwise comparison with Bonferroni adjustment was conducted to evaluate the significant main effect of time. There was a statistically significant increase of 13.4%, 95% CI [6.0, 20.9] between Time 1 and 3 and 11.7%, 95% [3.8, 19.6] between Time 2 and 3. There was also an increase of 1.7%, 95% CI [9.3, 12.8] between Time 1 and 2, which failed to reach significance. Overall, this suggests that participants showed statistically significant increases from Time 1 to Time 3, regardless of degree status.

**Procedural Fidelity**

Confederate adherence to the scripted responses during teleconference role-plays was evaluated by task analysis checklist. Each confederate conducted 20 sessions in total. Six sessions from each confederate were randomly selected for scoring of procedural fidelity, two from each assessment week. Results indicate that procedural fidelity was maintained across evaluated sessions by: Confederate A with 99% accuracy, Confederate B with 96% accuracy, and Confederate C with 99% accuracy.

**Inter-rater Reliability**
Three doctoral students independently coded all planning documents (n=60) and implementation videos (n=60) using task analysis checklists. Eighteen plans and 18 videos were evaluated for inter-rater reliability, six from each assessment week (i.e., 30% of data across all sessions). On planning documents, Coders 1 and 2 had an average agreement score of 91% (range, 84%-100%), Coders 2 and 3, 86% (range, 74%-100%), and Coders 1 and 3, 87% (range, 58%-100%). Lastly, the score from each pair was then averaged to calculate an overall agreement score. Overall, the three coders had an agreement score of 88% on the scoring of planning documents. The same procedure was used to calculate a percent agreement score for the implementation videos. On videos, Coders 1 and 2 had an average agreement score of 78% (range, 57%-89%), Coders 2 and 3, 82% (range, 60%-92%), and Coders 1 and 3, 81% (range, 52%-92%). Overall the three coders had an agreement score of 80% on the scoring of implementation videos.

Social Validity

All participants were provided an opportunity to provide feedback about the training goal, content, materials, and procedures; 19 participants responded (Group A n=9, Group B n=10). On average, participants rated all social validity statements between a 4 (somewhat agree) and 5 (strongly agree) on a 5-point scale. However, there were several participants who provided scores of neutrality (i.e., 3.0 rating) or disagreement (i.e., between 1.0-2.0 rating). Participant ratings can be found in Table 8. Because of the difference in instructional sequence (i.e., Group A, Group B), the researcher also calculated an average rating by group for each question. For all but one question, Group A provided a higher rating than Group B; Group B rated the effectiveness of online instruction higher than Group A. The highest rated question for Group A (mean=4.89), and highest overall rating from both groups (mean=4.70) indicated that
participants felt they had learned a valuable skill that could be applicable to current or future students. For Group B, the highest rated question (mean=4.60) indicated that participants felt system of least prompts was an effective strategy for supporting AAC. Conversely, the lowest rated question for Group A (mean=4.00) was in relation to the effectiveness of online instruction, and the effectiveness of the teleconference role-plays for Group B (mean=4.00). The teleconference role-plays also received the lowest combined rating from both groups (mean=4.06), however, a score of 4.0 indicated somewhat agreement.

In addition to rating seven questions on a 5-point scale, participants were provided with three open response questions. See Table 9 for participant feedback to open response items. Participants reported satisfaction with the instructional activities specifically related to: video demonstrations and video models; repeated opportunities to practice (i.e., planning, teleconference, and quizzes); use of multimedia (e.g., text, visuals, and video); case study examples; and overall organization of the content. Participants suggested the following for improvement: allowing participants to select a book and create a corresponding storyboard; modifying the sequence of activities (i.e., instruction before teleconference, reducing number of teleconferences, both groups accessing instruction at the same time); varying the case study across assessments; adding a discussion board for sharing of personal experiences; and allowing participants two weeks to complete the instructional content. All participants who provided feedback, except one (n=18), would recommend the training activity to others. The one participant who would not recommend it felt as though the activity was not applicable to her, as she reported already using AAC with her students. However, this participant indicated that she would recommend it to others who may not be familiar with AAC.
Chapter 4

Discussion

The present study sought to answer the question: what is the effect of online training on educators’ knowledge and use of SLP to support the communication of individuals with ASD who use AAC? Results indicate that online training was effective in increasing knowledge and planning performance for both graduate and undergraduate participants, who had a range of experiences with individuals with disabilities and CCN. Participants also demonstrated an increase in SLP implementation over time; however, data analysis did not support the conclusion that this result was directly related to the online training alone. Furthermore, participants were in agreement on the social acceptability of the online module and activities. The results are discussed further below, from a perspective of effective, efficient, and socially valid training, along with limitations and future directions.

Effective Training

There is a clear need for educators, particularly those who work with individuals with ASD, to have effective training on learner characteristics and evidence-based instructional strategies (Alexander et al., 2015; Scheuermann et al., 2003). However, providing meaningful training opportunities to educators has historically been difficult (Rakap et al., 2015). There is evidence suggesting that purposeful and strategic educator behavior requires a combination of knowledge (e.g., about an EBP; Parsons et al., 2012; Wolf, 2014) as well as performance skills (e.g., usage of EBP; Parsons et al., 2012; Sawyer et al., 2017). As such, training that focuses on only one of these may limit the educator in fully acquiring the EBP, which may subsequently impeded their long-term and generalized used of the skill (Kennedy, 1998; Rakap et al., 2015; Scheeler, 2008).
Previous research investigating SLP has focused primarily on implementation performance when the participant is given a SLP hierarchy predetermined by the researcher (Barton & Wolery, 2010; Garland et al., 2016; Sawyer et al., 2017). These previous studies measured the effectiveness of training by evaluating implementation fidelity of participants, reporting positive results of implementation performance after face-to-face training (Barton & Wolery, 2010; Sawyer et al., 2017) and TeachLivE (e.g., a virtual learning environment; Garland et al., 2016). In the present study, however, the effectiveness of online training was measured three ways: (a) conceptual, conditional, and procedural knowledge of SLP, (b) demonstrated planning for SLP, and (c) implementation of SLP (all measures had an 80% criterion). Not only does the present study differ from past studies in the evaluation of effectiveness (e.g., focus on both knowledge and performance outcomes), participants were expected to generate their own SLP hierarchy (as part of the planning document) to implement within the role-play. Implications are herein discussed.

**Knowledge of SLP.** As outlined above, the present study extends the current literature on training educators in the use of SLP by including knowledge as a measure of training effectiveness. Although other studies have provided an overview of the procedure during training (e.g., description), there has been no evaluation of the effect of training on the participants’ knowledge. However, the acquisition of conceptual, conditional, and procedural knowledge has implications for immediate and long-term use of the SLP by participants (Kennedy, 1998; Parsons et al., 2012). As Leaf et al. (2015) argue there is need for education professionals to have EBP knowledge to make sound instructional decisions; simply being able to implement the procedure as directed is not sufficient, rather educators must “be able to modify the procedures when a learner is failing to make progress despite correct implementation of that procedure”
Conceptual, conditional, and procedural knowledge are required for educators to make procedural modifications that maintain the integrity of the EBP (Cook & Odom, 2013). The current study provides initial evidence that training can produce outcomes of statistical and practical significance with respect to SLP knowledge. Future research is needed to evaluate additional measures of knowledge as well as the subsequent effect of knowledge on implementation and decision-making.

**Planning for SLP.** As with knowledge, the extant literature has not yet evaluated the ability of participants to plan for SLP implementation as a measure of training effectiveness. Previous SLP research has provided participants with a researcher created, least to most hierarchy for use during implementation assessment, measuring the ability of participants to implement SLP as written. However, in the real world, educators must make instructional decisions, based on learner and task characteristics, including: number and types of prompts, wait time, and reinforcement (Neitzel & Wolery, 2009). The present study adds to the research on SLP by including planning as a measure of training effectiveness, with statistically and practically significant results. In the current study, participants were evaluated on their ability to: select three prompts, arrange selected prompts in a least to most hierarchy, determine cue, determine response interval, and determine the three possible learner responses and corresponding adult response (e.g., correct learner response resulted in reinforcement from adult). Participants learned these important SLP elements as a direct result of the training, but not only were they able to identify each planning step, participants also made instructional decisions for the contents of each step based on learner and activity details provided in a case study vignette. Although participant results indicated a significant increase in planning performance, it should be noted that Group A did not reach criterion (i.e., 80%). Future research should further
explore the effects of planning, specifically, how participants make instructional decisions and the implications of these decisions on learner skill acquisition.

**Implementation of SLP.** Previous literature on SLP has provided evidence that educators can learn to implement the SLP as a result of face-to-face and virtual instruction (Barton & Wolery, 2010; Garland et al., 2016; Sawyer et al. 2017). The present study adds additional evidence of increased SLP implementation fidelity. However, this contribution to the extant literature should be interpreted with caution. Although there were statistically significant increases in implementation fidelity over time, Group A did not reach criterion (i.e., 80%). Additionally, there was not a significant time by group interaction during implementation analysis, meaning that the “effect of time was not different for the two groups” (Cohen, 2013, p. 562). As such, the significant change in implementation performance may not be directly related to the provision of training. However, there still existed a statistically significant result across time. This result suggests that all participants had greater fidelity of SLP implementation from Time 1 to Time 3 and from Time 2 to Time 3. It is possible that the participants became more familiar with the assessment task, however, there are other possible reasons for this result herein discussed.

To begin, there is a potential artifact with implementation scoring that may have impacted the results (i.e., “an outcome or result that appears to exist because of the way it is measured” Cooper et al., 2007, p. 690). Confederates were trained to respond during role-plays based solely on number of attempts (i.e., prompts) from the participant, which were not contingent on prompt type or on the following of the SLP hierarchy. This decision was made because there existed a possibility that if increasing prompts had been required during pretests, participants may have learned how to conduct SLP from the assessment procedures rather than
the training. Therefore, in the main scoring of implementation videos, participants received credit for providing some type of prompt, delivered at an appropriate time. Implementation videos were also scored on appropriate intermediate and controlling level prompts and adherence to SLP; however, this reflected only a possibility of three additional points per trial. The main scoring, which likely emphasized the delivery of any prompt attempts, may have artificially inflated the pretest scores simply because the participant provided some type of prompt, even if it was not a fidelity implementation of SLP. When reviewing the data, this artifact may have influenced the results, as both groups had an average score between 60-70% on Time 1. Future research should carefully consider how best to measure implementation performance in order to detect these changes in participant behaviors. Additionally, asking individuals familiar with the SLP procedure to make pre/post test video comparisons may allow for the evaluation of whether there were socially valid changes in participant behavior (Cooper et al., 2007).

It is also possible that the planning document created by participants increased the fidelity of SLP implementation. It is interesting to note that during Time 3, participants had a marked improvement in the consistency of prompts delivered within and across trials; increasing from 0% consistency on Time 1 to 100% consistency on Time 3 for 65% (n=13) of the participants. In support of this idea, Chalmers and Laurence (1993) suggest “a plan is a mental blueprint that guides action and acts as a set of personal instructions that can be applied to a task” and that plans can be particularly beneficial when performing “complex activities that require anticipatory and regulatory organization or arrangement of pieces” (p. 192). Furthermore, one participant commented about the plan and its potential role in implementation consistency, “I think (as a teacher myself) we tend to use different levels of prompts without realizing, but I can see how effective it could be to plan the hierarchy and implement the system” (P9). To this end,
future research is needed to determine the effect of planning on the immediate implementation of SLP as well as long-term and generalized use.

It is also possible that although the training was robust in increasing participant knowledge of SLP and planning performance, the section focused on implementation may not have been sufficient. Although the instructional activities mirrored that of planning (i.e., description and model, guided practice, and independent practice), the independent practice for implementation required more effort from participants than other sections. Participants were provided with a learner profile, targeted SLP steps, and needed AAC materials (e.g., visual schedule) and were directed to video record their completion of the targeted activity with another individual (e.g., significant other/spouse, roommate, friend). Videos were then uploaded to Canvas. In reviewing participant analytics, only 30% participants completed the independent practice for implementation of SLP (n=6). Additionally, unlike the prompting and planning training sections, the independent practice did not contain automated feedback from the researcher. As such, participants’ engagement with the implementation training section may have also impacted the results.

It should also be noted that although the independent practice for prompting and planning training sections provided participants with automated feedback, the extent to which participants used this feedback for subsequent assessments was not evaluated. For example, participants were asked to complete a quiz that compared specific elements of their plan and an expert comparison plan that were similar, different, and potential reasons for any differences. The results of this quiz were not evaluated; therefore, the impact of the automated feedback is presently unknown. The effect of performance feedback has been well documented in the training literature, but is frequently conceptualized as the trainer providing individualized feedback to the participant.
relative to their performance (e.g., Hemmeter, Snyder, Kinder, & Artman, 2009; Parsons et al., 2012). Future research should consider an analysis of automated feedback to investigate the impact of this presentation of feedback on participant performance.

Furthermore, it is also possible that the amount of content presented in a one-week training reduced participants’ ability to fully acquire all necessary components. McCormick (1997) would argue that fidelity implementation requires the integration of multiple types of knowledge and performance skills. When evaluating Group A specifically, the mean scores on Time 2 assessments (i.e., knowledge, planning, and implementation) were all below criterion (i.e., 78%, 58%, 68%, respectively) as were planning and implementation during Time 3 (i.e., 69%, 74%, respectively). Although there were significant increases from Time 1, it is possible participants had not fully acquired the knowledge and planning components of SLP, which subsequently impacted implementation performance. Participant 11 commented, “Because this lesson was so vital to the course, having it chunked into two separate lessons would allow students to spend more quality time on the skills presented in the lesson instead of worrying about getting through it due to time constraints.” The additional time may or may not have increased participant participation and performance; however, future research should investigate the effects of variations in training duration. Additionally, research is needed to evaluate the effect of introducing one training section at a time, with mastery required for progression, on SLP implementation performance.

**Teleconference implementation.** The teleconference provided an avenue for participants to demonstrate their use of SLP in a controlled context; however, there were several limitations that should be addressed. First, the virtual interaction between the participant and the adult confederate could have resulted in missed behaviors. For example, the participant may have
missed the confederate response because they were looking at the book rather than at the computer screen. Conversely, the confederate may have missed a participant attempt because they were looking at the communication board. It is possible for an educator or learner to not perceive all behaviors during face-to-face instruction, but the teleconference may have increased the likelihood for this to occur. Secondly, since participants could not physically interact with the adult confederate during the teleconference role-play, they were given the option to talk aloud what they would do. Several participants were observed using this option to provide error correction interruption and to provide physical prompting during Time 3. However, one participant noted that the “teleconference was more frustrating because I felt very limited and it was not as natural to talk through what I would naturally be doing” (P15). It is interesting to note that this participant also described the training as not relevant to her because of current AAC use in her classroom. As such, it may be that the teleconference role-plays are more beneficial for novice learners, but not for those who may be more advanced in their use of the targeted skill. This idea is consistent with research on novice versus expert learners, suggesting that novice learners may benefit from more structured, controlled practice activities (e.g. Clark, Kirschner, & Sweller, 2012). To this end, researchers and teacher educators should gather information regarding participants’ prior knowledge and experiences to match the instructional activities as best possible. However, it is likely that participants will be heterogeneous and an exact match for every participant may not be possible, particularly in traditional face-to-face training. Future research should evaluate the effect of online training that allows participants to “test out” of activities or instructional content as a way to provide insight into the types of instructional activities beneficial to novices or experts, and to identify essential training elements.
Follow-up training. There were SLP components that participants learned to implement with high levels of fidelity (e.g., wait time), however, when reviewing the concepts and procedures of SLP for which participants continued to have difficulty post training, the most common was implementation of error correction. This finding is consistent with other studies that have taught instructional strategies with multi-step error correction procedures (i.e., Picture Exchange Communication; Jurgens, Anderson, & Moore; 2012). As such, this result highlights the need for follow-up training to ensure participants are able to conduct this procedural element with fidelity. Additionally, there were several participants who remained below criterion on each of the three assessments. Although this may be partially attributed to low levels of participation, as revealed by participation analytics, it may also be that the online training and practice activities were not sufficient to support the learning of SLP for all participants. There is research to suggest that coaching is an effective strategy that may be beneficial for provision of follow-up training, which can be tailored to target specific areas of need for each participant (Ganz et al., 2013; Garland et al., 2016; Kretlow & Bartholomew, 2010).

Efficient Training

In addition to the effectiveness of training, efficiency should also be considered. Efficiency is important when evaluating training packages as effectiveness outcomes may be tempered in real world application by cost and time demands for both the learner and the instructor (Wainer & Ingersoll, 2013). In previous research that taught an education professional to implement SLP, at least one measure of time efficiency was reported (Barton & Wolery, 2010; Garland et al., 2016; Sawyer et al., 2017). For example, training duration was reported as 45 minutes (Barton & Wolery, 2010) and calculated as 200-240 minutes (Sawyer et al., 2017). Within the present study, measures of efficiency were comparable; training duration averaged
180 minutes. However, the present measure of training time is a rough approximation as it was calculated by reviewing page view time stamps reported by Canvas. Additionally, in the present study, participants were allowed to engage with the instructional materials for as long as they wanted during the one-week intervention window, as the training was delivered online. This differs from previous SLP studies in which researchers delivered a one-time, structured training. As such, it is interesting to note that participants across studies engaged with the content for similar durations of time, whether self-directed or instructor led.

Furthermore, efficiency should include time participants spent completing assessment activities. Assessment duration was calculated to average 254 minutes (Barton & Wolery, 2010) and 60 minutes (Garland et al., 2016). In these studies, participants only completed assessment of SLP implementation, however, the present study conducted knowledge, planning, and implementation assessments. The average duration for knowledge assessment (across Time 1, 2, and 3) was calculated as 18 minutes and implementation assessments (across Time 1, 2, and 3) averaged six minutes. Time spent on planning assessments could not be evaluated due to the submission method. The total time participants spent completing assessment activities during the present study (e.g., knowledge and implementation across Time 1, 2, and 3) averaged 72 minutes. This represents relatively low assessment time yet includes additional assessment measures, providing preliminary evidence of increased efficiency of online assessments.

Lastly, efficiency can also be represented by the amount of time spent developing instructional materials, programming, collecting data, training research assistants, etc. Previous SLP research does not provide this information, representing a gap in the current literature. However, there exists a need for future research to report data on these variables for evaluating efficiency outcomes. In the present study, approximations of research-related tasks (i.e., tasks
specific to conducting an experimental study) were calculated as four hours for research assistant training (i.e., adult confederates, data coders). Instruction-related tasks (i.e., time needed for replication in an university classroom/training) include both fixed and variable times. Fixed time is time required every semester/training, including items such as approximately 15 minutes per student to conduct a teleconference role play and 15 minutes to provide written feedback (one time, after final post test). In the current study, with 20 students, fixed time equaled 15 hours for confederates to conduct role-plays (three times per student) and five hours to review performance assessments (i.e., plans, videos) and provide written feedback, one time per student). Additionally, there are variable elements such as: five hours for planning and recording instructional videos. The videos are a variable component because once they have been developed they can be used for subsequent semesters/trainings, reducing the preparation time. Additional variable time spent developing the instructional materials as well as programming content and assessments in Canvas was not recorded. The researcher worked full-time on the these materials and programming for approximately three months, however, an accurate estimate of hours cannot be provided.

These measures are valuable for estimating training time but also have implications for training costs. Within the university setting, time spent by faculty developing instructional materials has an inherent cost component, as does using graduate assistantship hours or hiring adult confederates. As such, future research should evaluate the effect of having participants conduct teleconferences in small groups (when provided with structured guidelines and assigned roles), rather than with a trained confederate, potentially reducing the time and cost of training. This method of group practice has been shown to be effective and efficient in traditional face-to-face training (e.g., Sawyer et al., 2017), but has yet to be applied in an online environment.
Socially Valid Training

Results from this study extend the work of recent research utilizing online instruction to teach specific EBPs, which have reported parent and practitioner satisfaction with the training delivery format (e.g., online module; Gerencser et al., 2017; Neely et al., 2016; Pollard et al., 2014). In addition to the training materials and delivery format, participants in the present study were in agreement about the training outcomes. Specifically, participants thought SLP was an effective strategy to support communication, that they had learned a valuable skill, and that their confidence in working with individuals with CCN increased as a result of participation in this study. These variables are important aspects of social validity, as teacher buy-in and self-efficacy have been attributed to the sustained and generalized use of a strategy or instructional technique (Alexander et al., 2015; Kretlow & Bartholomew, 2010; Wolf, 2014). Also, as part of the strategy instruction model, long-term commitment to use is supported by the recognition and celebration of success (Kent-Walsh & McNaughton, 2005). Not only did participants in the present study rate the effects highly, many participants recognized changes within their own behavior, which has potential to increase their long-term and generalized use.

When specifically evaluating the social validity of teleconference role-plays, a novel technique for assessing SLP implementation, participants rated the activity as 4.06 (on a 5-point scale). This provides initial evidence of teleconference role-plays as an acceptable activity for skill evaluation within online instruction. Although the participants’ score represents a level of “somewhat agreement”, there is potential that the lower rating was due to the instructional sequence (i.e., Group A, Group B) and research design. With the pre/post test switching replications design, the assessment is administered three times: once before instruction for Group A and twice before instruction for Group B. In reviewing the open response feedback,
participants in Group B reported that they did not find it valuable to conduct the skill repeatedly without access to the instructional module or feedback; however, this sequence was inherent to the research design. As such, teleconference role-play may be an effective means of evaluating participants’ implementation performance; however, researchers should be cognizant of teleconference role-plays assigned before instruction, as this likely reduces the perceived social validity. Furthermore, it seemed that the participants viewed the teleconference role-plays as practice opportunities, not as performance assessment, which could have also influenced their rating on this component. To this end, researchers and teacher educators may find it useful for teleconference role-plays, with the provision of feedback, to be included as a practice activity within instruction, rather than just as a mechanism for assessment. Future research should evaluate the effect of teleconference role-play as an instructional activity prior to the natural environment implementation of SLP with a learner with ASD, which could be evaluated through video self-recorded sessions (e.g. Neely et al., 2016). The opportunity for educators to practice the skill in a low-risk environment and to build competence and fidelity before natural environment implementation may positively effect skill acquisition of learners (Alexander et al., 2015; Kretlow & Bartholomew, 2010; Garland et al., 2016).

**Generalization**

Although this study did not evaluate the generalization of the targeted skill to learners with ASD, there was an included measure of generalization to untrained contexts. As mentioned previously, the instructional module included case examples with activities and AAC supports that were different from the case used during assessment. See Table 3. As such, the participants’ use of planning and implementation strategies during assessment represents not only the ability of participants to use the targeted skills, but also the ability of participants to apply them to an
untrained context. This type of generalization is crucial as educators must learn to recognize novel opportunities appropriate for application of EBPs, specifically when generalized use provides additional opportunities for learners to practice valuable skills such as communication (Ganz et al., 2013). It should be noted that the participants were aware that they were being observed during the performance assessment, which may have created a testing effect. However, participants were never directly told to engage in SLP during any of the performance assessments. To this end, an additional measure of generalization would include observation of SLP application to untrained contexts in which the participants were not aware that they were being assessed.

**Limitations**

There are several limitations to the present study that have already been addressed, however, there are several herein highlighted. First, and most importantly, the participants in the present study learned to plan and implement SLP to support AAC with an adult confederate playing the role of a fictitious case student with ASD, however, it was not possible within this study for participants to engage directly with a learner with ASD. Although adult confederates are often used in research for role-play activities (e.g., Gerenscer et al., 2017; Pollard et al., 2014; Rosales et al., 2009) the ultimate goal is for the acquired skill to be utilized for the benefit of the learner with ASD. As such, natural environment implementation and concurrent learner data is a vitally important next step for researchers in evaluating the effectiveness of online, self-directed training.

Secondly, because participants were recruited from an online course and participation was required for all students, research activities counted towards the participants’ course grade. For example, participants received points for completing each of the teleconference role-play
assessments. They also received participation points on the first two planning assessments and first two knowledge quizzes, as both groups had not yet accessed the training module. However, the third planning document and third knowledge quiz were scored for accuracy. Because of the change from participation points to accuracy scoring, there was potential that participants put forth greater effort on the third assessment compared to Time 1 and 2; the data for Time 3 may reflect this change. Additionally, there were no points (participation or scored) attached to the completion of the training module or practice activities, which may have contributed to some participants’ low analytics. Future research should consider the implications of assigning value to training and practice completion or setting a minimum performance threshold before participants can advance to the next section.

Lastly, it should be acknowledge that both groups contained individuals who did not demonstrate a treatment effect (i.e., participants who did not reach 80% criterion on one or more of the dependent variable measures), herein referred to as nonresponders. Specifically, there were three nonresponders on the knowledge quiz, five on documentation of planning, and nine on role-play implementation. Although potential reasons for nonresponders have been addressed above (i.e., participation analytics), future research should consider evaluation of nonresponders through a three-tiered analysis (Light, 1999) as a way to potentially identify factors that may increase the likelihood that the participant will participate and respond to the training. To this end, it is important for researchers to not only discuss those participants who did well, but also those for whom the training did not result in the desired effect, in order to create training that is effective for all individuals.

**Conclusion**
To summarize, the present study found that online training focused on SLP to support communication of individuals with ASD who use AAC was successful in increasing participants’ knowledge and documentation of planning. Participants also demonstrated an increase in implementation performance over time. This study adds to the extant literature by extending the effectiveness, efficiency, and social validity of online instruction when teaching SLP to educators. Additionally, this study provides preliminary evidence of teleconference role-plays as a method of assessment, as well as educator written planning documents as a potential tool to increase consistency of SLP implementation. Furthermore, the majority of participants demonstrated the ability to generalize the knowledge, planning, and implementation from training activities to an untrained context during assessment. Future research is needed that evaluates the generalization to natural environments and concurrent skill acquisition for learners with ASD, as well as the impact of specific training components within the online environment for the creation of effective, efficient, and social valid instruction for both novice and more advanced educators.
References


Humphreys, T., Polick, A. S., Howk, L. L., Thaxton, J. R., & Ivancic, A. P. (2013). An evaluation of repeating the discriminative stimulus when using least to most prompting to


Molt, L. F. (2017). Current curriculum patterns for coursework in augmentative and alternative communication (AAC) in undergraduate and graduate academic programs in CSD. Presented at the annual American Speech and Hearing Association, Los Angeles, CA.


### Appendix A

#### Tables

**Table 1. Participant Demographics**

<table>
<thead>
<tr>
<th>Group</th>
<th>Participant</th>
<th>Degree Status</th>
<th>Current Employment</th>
<th>Age</th>
<th>Gender</th>
<th>Race &amp; Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>G</td>
<td>Social Worker</td>
<td>32</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>G</td>
<td>Diagnostic Kindergarten</td>
<td>26</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>G</td>
<td>Inclusive Preschool</td>
<td>26</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>G</td>
<td>Elementary Ed</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>UG</td>
<td>Student: EL &amp; EC Ed</td>
<td>20</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>UG</td>
<td>Student: EL &amp; EC Ed</td>
<td>21</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>UG</td>
<td>Student: Rehab &amp; HS</td>
<td>22</td>
<td>Female</td>
<td>Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>UG</td>
<td>Student: EL &amp; EC Ed</td>
<td>22</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>G</td>
<td>Inclusive Special Ed</td>
<td>25</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>G</td>
<td>Intervention Specialist</td>
<td>42</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>G</td>
<td>Learning Support</td>
<td>28</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>G</td>
<td>Instructional Aide ASD</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>G</td>
<td>Other</td>
<td>26</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>G</td>
<td>Learning Support</td>
<td>32</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>G</td>
<td>Early Intervention</td>
<td>29</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>UG</td>
<td>Student: SEC ED</td>
<td>20</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>UG</td>
<td>Student: SEC ED</td>
<td>21</td>
<td>Female</td>
<td>Asian</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>UG</td>
<td>Student: EL &amp; EC Ed</td>
<td>21</td>
<td>Female</td>
<td>White/ Non Hispanic or Latino</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>G</td>
<td>Learning Support</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>G</td>
<td>Special Ed ASD</td>
<td>25</td>
<td>Female</td>
<td>White/ Hispanic or Latino</td>
</tr>
<tr>
<td>Description</td>
<td>Model</td>
<td>Verbal Practice</td>
<td>Guided Practice</td>
<td>Independent Practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prompting &amp; Systematic Prompting Procedures</td>
<td></td>
<td>X</td>
<td>-</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning for System of Least Prompts</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementing System of Least Prompts</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: X= included activity, dash indicates activity not included
### Table 3. Case Studies and Targeted AAC Supports

<table>
<thead>
<tr>
<th>Case</th>
<th>Application</th>
<th>Feedback (Plan/Implement)</th>
<th>Activity</th>
<th>Considerations</th>
<th>SLP Keyword</th>
<th>AAC Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kara (6yo)</td>
<td>Performance Assessment</td>
<td>No/No</td>
<td>Responding to questions</td>
<td>Tolerant of physical Sometimes responds to model</td>
<td>Inconsistent use</td>
<td>Low tech story board</td>
</tr>
<tr>
<td>Ky (8yo)</td>
<td>Model</td>
<td>NA</td>
<td>Building Lego car</td>
<td>Responds well to model Sensitive to touch</td>
<td>Regressing in performance</td>
<td>Visual schedule</td>
</tr>
<tr>
<td>Jessica (15yo)</td>
<td>Guided Practice</td>
<td>Yes/Yes</td>
<td>Folding clothes</td>
<td>Seeks out physical attention</td>
<td>Regressing in performance</td>
<td>Video model</td>
</tr>
<tr>
<td>Shelley (10yo)</td>
<td>Guided Practice</td>
<td>Yes/Yes</td>
<td>Communicating with peers during lunch</td>
<td>Responds well to model Can read sight words</td>
<td>Inconsistent use</td>
<td>Low tech communication board</td>
</tr>
<tr>
<td>Lanre (5yo)</td>
<td>Independent Practice</td>
<td>Yes/No</td>
<td>Morning routine</td>
<td>Attempts to engage in conversation with adults</td>
<td>Inconsistent use</td>
<td>Visual schedule</td>
</tr>
</tbody>
</table>
Table 4. Means and Standard Deviations of Participants by Group

<table>
<thead>
<tr>
<th>Measure</th>
<th>Group A</th>
<th></th>
<th>Group B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$M$</td>
<td>$SD$</td>
<td>$n$</td>
</tr>
<tr>
<td>Knowledge Quiz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>8</td>
<td>47.90</td>
<td>10.22</td>
<td>10</td>
</tr>
<tr>
<td>Time 2</td>
<td>8</td>
<td>78.75</td>
<td>7.34</td>
<td>10</td>
</tr>
<tr>
<td>Time 3</td>
<td>8</td>
<td>85.42</td>
<td>7.35</td>
<td>10</td>
</tr>
<tr>
<td>Planning Documentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>9</td>
<td>8.26</td>
<td>5.09</td>
<td>11</td>
</tr>
<tr>
<td>Time 2</td>
<td>9</td>
<td>58.58</td>
<td>36.77</td>
<td>11</td>
</tr>
<tr>
<td>Time 3</td>
<td>9</td>
<td>68.69</td>
<td>31.78</td>
<td>11</td>
</tr>
<tr>
<td>Teleconference Role-Play Implementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>9</td>
<td>60.34</td>
<td>14.56</td>
<td>11</td>
</tr>
<tr>
<td>Time 2</td>
<td>9</td>
<td>68.77</td>
<td>12.53</td>
<td>11</td>
</tr>
<tr>
<td>Time 3</td>
<td>9</td>
<td>74.49</td>
<td>6.95</td>
<td>11</td>
</tr>
</tbody>
</table>
### Table 5. Participant Individual Scores on Assessments

<table>
<thead>
<tr>
<th>Group</th>
<th>Knowledge</th>
<th>Planning</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>37</td>
<td>87</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>53</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td>3</td>
<td>63</td>
<td>63</td>
<td>73</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>77</td>
<td>87</td>
</tr>
<tr>
<td>5</td>
<td>53</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>6</td>
<td>33</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>50</td>
<td>80</td>
<td>97</td>
</tr>
<tr>
<td>9</td>
<td>53</td>
<td>77</td>
<td>80</td>
</tr>
<tr>
<td>Grp A Avg</td>
<td>48</td>
<td>79</td>
<td>85</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>33</td>
<td>43</td>
<td>73</td>
</tr>
<tr>
<td>11</td>
<td>57</td>
<td>47</td>
<td>87</td>
</tr>
<tr>
<td>12</td>
<td>47</td>
<td>43</td>
<td>90</td>
</tr>
<tr>
<td>13</td>
<td>53</td>
<td>50</td>
<td>97</td>
</tr>
<tr>
<td>14</td>
<td>63</td>
<td>52*</td>
<td>83</td>
</tr>
<tr>
<td>15</td>
<td>47</td>
<td>60</td>
<td>93</td>
</tr>
<tr>
<td>16</td>
<td>67</td>
<td>67</td>
<td>83</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>40</td>
<td>57</td>
<td>77</td>
</tr>
<tr>
<td>19</td>
<td>43</td>
<td>47</td>
<td>80</td>
</tr>
<tr>
<td>20</td>
<td>53</td>
<td>57</td>
<td>83</td>
</tr>
<tr>
<td>Grp B Avg</td>
<td>50</td>
<td>52</td>
<td>85</td>
</tr>
</tbody>
</table>

Note: Asterisk denotes imputed score, Italics denotes updated score after explicit direction to use SLP
<table>
<thead>
<tr>
<th>Group</th>
<th>V</th>
<th>G</th>
<th>M</th>
<th>P</th>
<th>Multi</th>
<th>V</th>
<th>G</th>
<th>M</th>
<th>P</th>
<th>Multi</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>9</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>6</td>
<td>8</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>11</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>8</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>11</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>9</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>11</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>7</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>12</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>9</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: V=verbal, G=gesture, M=model, P=physical, Multi=combination of two or more prompt types
Table 7. Participation Analytics

<table>
<thead>
<tr>
<th></th>
<th>Percent of Content Viewed</th>
<th>Percent of Practice Completed</th>
<th>Estimated Time (Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>81</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>100</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>59</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>100</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>78</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>93</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>41</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>100</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>100</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>100</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>81</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>100</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>100</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>100</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>57</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>100</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>100</td>
<td>92</td>
</tr>
</tbody>
</table>
Table 8. Participant Social Validity Responses (5-point scale items)

<table>
<thead>
<tr>
<th></th>
<th>1 SLP effective strategy</th>
<th>2 Instructional Module</th>
<th>3 Practice Case Studies</th>
<th>4 Teleconference Role-Plays</th>
<th>5 Online Instruction</th>
<th>6 Confidence with AAC</th>
<th>7 Valuable Skill Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>P2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>P3</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>P4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>P5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>P6</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>P7</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>P8</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>P9</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Grp A Avg</td>
<td>4.78</td>
<td>4.33</td>
<td>4.56</td>
<td>4.11</td>
<td>4.00</td>
<td>4.44</td>
<td>4.89</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P10</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>P11</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>P12</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>P13</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>P14</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>P15</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>P16</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>P17</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>P18</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P19</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>P20</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Grp B Avg</td>
<td>4.60</td>
<td>4.10</td>
<td>4.50</td>
<td>4.00</td>
<td>4.50</td>
<td>4.10</td>
<td>4.50</td>
</tr>
<tr>
<td>Total Avg</td>
<td>4.69</td>
<td>4.22</td>
<td>4.53</td>
<td>4.06</td>
<td>4.25</td>
<td>4.27</td>
<td>4.70</td>
</tr>
<tr>
<td>Liked About Supporting AAC Activity</td>
<td>Recommendations for Improvement</td>
<td>Recommend to Others (with Rationale)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>---------------------------------</td>
<td>-------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1 I liked the demonstrations and the multiple chances to practice the skills I was learning.</td>
<td>I'm not sure what you could do to improve things.</td>
<td>I would definitely recommend this because I had such little exposure to AAC prior to this class and now feel much more comfortable.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2 I liked the repeated practice and the quizzes to help us check our understanding as we moved through the modules</td>
<td>It might be nice to let the students choose a story to use and make a communication board based on the story of their choice.</td>
<td>Yes. It was helpful to learn about the different levels of prompting and the rational behind those systems. I think the support AAC activity would definitely be useful to others who are new to navigating the world of assistive tech options and implementation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P3 I like the teleconference role plays and thought it was great how flexible Ashley was and how accommodating she was with my crazy schedule. I also just thought that the combination of all mediums for learning, text, visuals, and videos, were great and easy to follow</td>
<td>I would say structuring it differently if I had anything at all. I might have and intro to the system of least prompts then talk about the first part and then have a guided practice in planning this part. Then move on the the next part. Not sure if that's clear, like how I explained it, but just my opinion of course.</td>
<td>Yes - I think it is important to practice with others prior to actually working with a student with an AAC. I think because of this I have a more clear understanding of the levels of prompting to encourage student interactions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P4 I really enjoyed all of the videos using the SADD IDx3. They helped me learn how to make a plan and put it in effect. The multiple practice activities were also helpful so I could apply what I learned. I also liked the video models as well.</td>
<td>n/a</td>
<td>I would recommend the Supporting AAC activity to other people because I learned a lot on how to effectively help a student use the AAC device. I think it is very useful information, even though I currently do not need to use it in my classroom.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5 I liked that in the supporting AAC module,</td>
<td>I wish the supporting AAC module would come before</td>
<td>I would recommend this class for someone getting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
there was a video of the
girl going step by step
through the SADD IDx3
planning process.
Watching her go step by
step and listening to her
going through it instead of
only reading about it really
helped me better
understand.

P6      n/a

I feel like sometimes there
was SO much information
that it was hard to follow

P7      I liked being able
to practice reading to an
individual diagnosed with
autism. I feel that at first it
was something different
and felt odd but on the
second one I felt more
comfortable and confident.

I do not think there needs
to be improvements. I
thought that a lot of this
information that I learned
was very helpful.

P8      I liked how it was related
to the course content, and
how I had the opportunity
to do a plan myself and put
it into practice.

One recommendation
would be to change the
case study each time. I
think that it would have
given me more
experience/feedback with a
variety of learners.

P9      I liked the practice case
studies because it allowed
us to practice using the
planning strategy.
The video examples were
helpful in seeing different
models of how to use
system of least prompts for
individuals who use AAC.
Maybe include a
discussion board so that
people can discuss any
examples they have from
their own experiences? I
currently do not have any
students who use AAC, but
I want to learn as much as
I can so I am prepared if I
do have a student like that
one day!

a minor in special
education because by
taking this course online
you could manage your
time very well because
you could work at your
own pace. This modules
were unlocked up to a
certain point so you had
the opportunity to work
ahead.

n/a

Yes, the reason why is it
allows others the chance
to be aware of other
resources that can be used.

Yes I would - I feel that it
was helpful because I
wasn't just reading it, I
was able to put it into
practice and I can see
myself using it in the
future.

Definitely! I like that the
modules were set up in
stages to test our
knowledge with the
quizzes throughout. The
examples provided were
very helpful in starting to
understand how to
implement the system of
least prompts. I think (as a
teacher myself) we tend to
use different levels of
prompts without realizing,
but I can see how
effective it could be to
plan the hierarchy and
implement the system. I
P10 I think the content was good and well organized. Provide the module prior to the 1st two teleconferences. I do understand that the 1st two were to help with the comfort level of learners, but the actual "plan" and activities were non-beneficial because they were incorrect until the module was taught.

P11 I think the videos that modeled applying the least to highest hierarchy for prompting and talked through each step were very vital. Additionally, the videos that modeled interacting with children who utilize AAC devices were also very helpful. Lesson 9, supporting AAC, was the most beneficial lesson of this course; however, I felt that it should have been chunked into two separate lessons. Because this lesson was so vital to the course, having it chunked into two separate lessons would allow students to spend more quality time on the skills presented in the lesson instead of worrying about getting through it due to time constraints. I would also recommend more time being spend on apps that can be used with students with disabilities for special education teachers who do not work with student with severe communication needs. Yes, especially if they work with students with severe communication needs as a result of their disabilities.

P12 NR

P13 I really liked the teleconferences. It was awesome getting to work with other students in other parts of the country or world. I also thought it was cool that I was part of a NR

The only thing I wish was that I was in group 1, and knew the content before I did my first two teleconferences. I would have liked to see where I started from my first one, NR

Yeah definitely. If anyone would like to work with children with disabilities who needs to communicate with an AAC device, it is imperative they have the
to my third one. What were my strengths, and weaknesses? What could have I improved on? Also, would my time working with Kara have help her? Did she improve on the use of her device?

My only suggestion is reviewing the AAC test; making sure all of the content is clearly covered in the module. There were a few questions that I felt were unclear to answer and I had written everything down/reviewed the module more than once.

Yes! It definitely gives the teacher a great perspective on the advancement in AAC and how widely it can be applied. It also helps to better understand and communicate with individuals in our community or classrooms that may use AAC devices.

I probably would not recommend the supporting AAC activity to other people like myself because we already use this and it feels a bit redundant. I would recommend the module to others because, as our Assistive Technology Specialist pointed yesterday when I was talking to her about this class (before a SETT meeting no less!), it is good to go through this and get a perspective of General Education teachers who have no training or experience with AAC.
**P16**  I liked the videos walking through the SADD IDx3 process. It made the experience both visual and auditory and helped me remember the information better than the pages that just included written information.

Explain the process better to the students. The whole bit where we were split into two groups left me very confused about what to expect and the syllabus didn't help explain what was going on. Sending out the breakdown for the two groups earlier would be very helpful.

Yes, even if they weren't going into the field of education. It is just useful information for people without special needs to know when interacting with those with special needs. It helps the world to know that we might need to help our fellow humans and this gives us the tools to do so.

**P17**  I liked the supporting AAC activity with all the case studies and seeing the different examples of plans. Having the case studies helped me make my own plan with Kara.

I cannot think of any right now. I thoroughly enjoyed it.

Yes, I would recommend this class and supporting AAC activity. It's a great environment to learn and practice. I have not had much exposure to the use of AAC, so it was nice to be able to learn about them. It's extremely valuable information for teachers and for everyday life. One of the worst things people who do not use AAC can do is to treat people who use AAC differently.

**P18**  I liked all of the practice quizzes

I think that allowing all students the ability to see the module at the same time. Because one group was able to see it weeks prior to the other does not seem fair.

Yes, the videos and tabs in the module were very descriptive and helpful as well as the specific case studies.

**P19**  Practice

Be taught the skill then do the role-play not the other way around. We won't have students practice a skill wrong 2-3 times then teach them how to do it, we teach them and continue to help as they practice then test.

I would if it is beneficial to them. If you have a class of reg. ed students and there are no needs then its not beneficial

**P20**  I liked all of the content and activities provided in

Perhaps only having one teleconference role-play

I would recommend it because it gave me the
the lesson. I also liked that we were able to practice through planning and implementing.

without instruction is necessary. Then once the content was provided, providing an opportunity to practice before the graded assignment.

opportunity to plan and implement a lesson incorporating the use of an AAC device. Learning about it without practicing is not as effective.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prompt</td>
<td>Any assistance given to a learner</td>
<td>Verbal, gesture, model, or physical prompts (see below)</td>
</tr>
<tr>
<td>Cue</td>
<td>Signal for the learner to respond</td>
<td>Materials presented to the learner</td>
</tr>
<tr>
<td>Hierarchy</td>
<td>Sequence of prompts</td>
<td>Least to most, most to least</td>
</tr>
<tr>
<td>Response interval</td>
<td>Opportunity for the learner to respond</td>
<td>Waiting 5 seconds from presentation of the cue before delivering a prompt</td>
</tr>
<tr>
<td>Reinforce/reinforcement</td>
<td>Consequence that strengthens the learners’ future behavior</td>
<td>Providing behavior specific praise after the learner responds correctly</td>
</tr>
<tr>
<td>Independent level</td>
<td>Learner correct performance without prompting</td>
<td>Learner responds correctly after the cue, and during response interval</td>
</tr>
<tr>
<td>Intermediate level prompt</td>
<td>Prompt that only provides the learner with some assistance</td>
<td>Specific types of prompts vary depending on the learner</td>
</tr>
<tr>
<td>Controlling level prompt</td>
<td>Prompt that ensures the learner responds correctly</td>
<td>Specific types of prompts vary depending on the learner</td>
</tr>
<tr>
<td>Prompt modality</td>
<td>Form of the prompt</td>
<td>Verbal, gesture, model, physical</td>
</tr>
<tr>
<td>Verbal prompt</td>
<td>Prompt that is a vocal or non-vocal direction, clue, hint, or question</td>
<td>Spoken direction, written text, visual, picture, or sign language</td>
</tr>
<tr>
<td>Gesture prompt</td>
<td>Prompt that motions towards the activity or material</td>
<td>Pointing or eye gazing towards target/material</td>
</tr>
<tr>
<td>Model prompt</td>
<td>Prompt that shows the learner how to perform the desired behavior</td>
<td>Video modeling</td>
</tr>
<tr>
<td>Physical prompt</td>
<td>Prompt that provides direct physical assistance to the learner</td>
<td>Full physical guidance, partial physical guidance, light touch/shadow</td>
</tr>
</tbody>
</table>
Appendix B

Figures

Estimated Marginal Means on Knowledge Quiz

Figure 1. Knowledge Quiz Means by Group and Time
Figure 2. Planning Means by Group and Time

Estimated Marginal Means on Planning Documents

Percent Correct

Assessment Time

Group A
Group B

Figure 2. Planning Means by Group and Time
Figure 3. Implementation Means by Group and Time
Appendix C

Review of Relevant Literature

There are six areas of research relevant to the present study: system of least prompts (SLP), augmentative and alternative communication (AAC), the use of SLP to teach AAC to persons with ASD, the preparation of educators to use SLP with persons with ASD, online learning, and generalization.

System of Least Prompts

Although there are a range of evidence-based practices and instructional strategies for individuals with autism spectrum disorder (ASD), one particular skill, the system of least prompts (SLP), has been identified as foundationally important (Sam, Cox, & Odom, 2017). SLP is a type of prompting strategy that can assist students with ASD in quickly acquiring new skills, and is a frequently recommended instructional methodology for use with persons with ASD (Cooper, Heron, & Heward, 2007; Neitzel & Wolery, 2009; Wolery, Ault, & Doyle, 1992). At present, however, there is only a limited understanding of how SLP could be effectively and efficiently taught to educational professionals (Garland, Holden, & Garland, 2016; Xu, 2016).

SLP has been evaluated in teaching a variety of discrete and chained skills such as reading comprehension skills (e.g., Browder, Lee, & Mims, 2011), between activity transitions (e.g., Cihak, Fahrenkrog, Ayres, & Smith, 2010), and play skills (e.g., Libby, Weiss, Bancroft, & Ahearn, 2008). SLP has also been used to teach AAC to persons with complex communication needs. Snell, Chen, and Hoover (2006) reported that of the 40 studies included in their review of teaching AAC to learners with severe disabilities, eight studies specifically used SLP alone to teach AAC, while three used SLP in combination with another prompting method. More
recently, Finke et al. (2017) described the use of SLP to teach individuals with ASD to produce multi-symbol messages with aided AAC.

To successfully implement SLP, the instructor must attend to four procedural guidelines: (a) select and arrange prompts in a least to most hierarchy; (b) deliver the cue; (c) insert a constant response interval between prompts to allow students the opportunity to respond; and (d) reinforce correct responses, regardless of the prompt level, and provide the next level of prompting for incorrect or no responses (Doyle, Wolery, Ault, & Gast, 1988; Cooper et al., 2007; Wolery et al., 1992). The SLP most frequently includes four levels (i.e., independent, two intermediate prompts, and one controlling prompt), three prompting modalities (i.e., verbal, model or gesture, and physical), and a response interval of five seconds (Doyle et al., 1988; Wolery et al., 1992). See Table 10 for definitions and examples of key SLP terms.

**Key features of instruction using SLP.** The SLP is different from other instructional procedures in that there is always an opportunity for the learner to respond independently before a prompt is given. In addition, the prompts are sequenced from least to most intrusive (Cooper et al., 2007; Neitzel & Wolery, 2009; Wolery et al., 1992). For example, an educator might present a direction to the learner, “Touch the red bird” (i.e., deliver cue), pause five seconds (i.e., response interval), and if the learner does not respond, provide a spoken hint, “Look at the picture” (i.e., intermediate level verbal prompt). Then, after pausing an additional five seconds (i.e., response interval), and if the learner still does not respond, the educator would provide a more intrusive prompt like a model (i.e., pointing to the picture of the red bird). Additional features, specifically, the use of spoken directives and the prompting hierarchy, are explored below. It is from this body of literature that instructional decisions were made for teaching verbal prompts and prompt hierarchy in the present study.
**Spoken directives.** Spoken directions, hints, and clues are commonly used verbal prompts within SLP (Cooper et al., 2007; Doyle et al., 1988; MacDuff, Krantz, & McClannahan, 2001; Neitzel & Wolery, 2009). These verbal prompts are most often presented to learners as indirect verbal prompts (e.g., “What’s next?”) or verbal directions (e.g., “Zip your coat”; Doyle et al., 1988). In addition to being used as verbal prompts, spoken directives are commonly reported as the initial cue (i.e., signal for the learner to respond; Doyle et al., 1988). In the traditional SLP procedure, the cue is repeated at each prompt level, meaning that when a spoken directive is used as the cue, the verbal directions are repeated at each prompt level (i.e., intermediate, controlling). For example, if following the traditional SLP procedure and using a gesture, model, physical prompting hierarchy, the task would begin with a verbal cue and subsequent prompts would be paired with a repeated verbal (e.g., gesture + verbal, model + verbal). However, research suggests that individuals with ASD often have difficulty processing auditory information like verbal directions (O’Connor, 2012). Previous research by Hodgdon (1995) advocates for the reduction of verbal information as a way to “uncomplicate the auditory environment”, which may lead to positive learning outcomes for some students (p. 276).

West and Billingsley (2005) compared the traditional recommendation (i.e., repeated spoken directive at each prompt level) with a revised protocol in which the spoken directive was given only once at the verbal prompt level. Four participants, early elementary students with a diagnosis of ASD, were each taught three skills. The traditional procedure included the repetition of the spoken directive at each level of prompting: spoken directive (i.e., verbal prompt), gesture + repeated spoken directive (i.e., verbal prompt), and physical + repeated spoken directive (i.e., verbal prompt). In the comparison condition- the revised SLP procedure- all parameters were held constant (e.g., cue, response interval) except repetition of the spoken directive during
gestural and physical prompt levels was removed so that the prompts followed a verbal, gesture, and physical prompt progression. Results suggest that although both procedures were effective in teaching the new skill to mastery, the number of errors was reduced in the revised condition as well as requiring fewer instructional sessions. In other words, using the spoken directive only once was both more effective (e.g., fewer errors) and more efficient (e.g., fewer sessions needed).

Grow et al. (2009) also conducted a comparison of a revised SLP procedure (i.e., spoken directive delivered once as a verbal prompt with additional prompts: model, physical) however, the investigation involved a comparison with a multiple verbal prompts (i.e., spoken directives) condition to teach four elementary participants with developmental disabilities to build 5-piece tangram pictures. The authors’ rationale for the multiple verbal prompt condition stemmed from professional experiences of how teachers often provide prompts to students; verbal repetitions of the direction with additional coaxing or supportive statements. For example, in the multiple verbal prompts procedure, the second and third verbal prompts provided some repetition of the cue (e.g., “put on X”) as well as a coaxing or supportive statement (e.g., “you can do it” or “I know you can”, p. 149). Results indicate that although learning occurred with both prompting procedures, the multiple verbal prompts procedure was less efficient, requiring additional learning trials, as well as having poorer maintenance data. These results support the work of West and Billingsley (2005) suggesting that additional spoken directives as verbal prompts (e.g., repetition of the cue, coaxing statements) throughout the prompt hierarchy may still produce learning, but learning that is slower, contains more errors, requires additional learning trials, and results in lower levels of maintenance.
Evidence from these studies suggests that the revised SLP procedure, which provides the spoken directive only once, is more effective for increasing student-learning outcomes. Although learning still occurred with repeated spoken directives, learners made more errors, took more time, and had poorer long-term outcomes (e.g., less likely to maintain use of skill over time, less likely to generalize use of skill to untrained activities). The revised procedure with reduced spoken directives resulted in fewer errors, less learning time, and better long-term outcomes with maintenance and generalization. This is particularly important when working with individuals with ASD, as generalization has been a commonly reported deficit of the disorder and a frequent barrier to favorable intervention outcomes (DeMarchena, Eigsit, & Yerys, 2015; Vismara & Rogers, 2010).

Although there is evidence to warrant the reduction of spoken directives provided during SLP, there still remains the question as to whether or not spoken directives should be used at all. These inquiries about when to use spoken directives can potentially be reconciled by having educators make decisions about the prompt types included in the hierarchy relative to learner and task characteristics, rather than simply using a prescribed prompting hierarchy (Neitzel & Wolery, 2009). Task characteristic considerations include “matching the prompt type with the skill being taught” (Neitzel & Wolery, p. 6). Neitzel and Wolery (2009) provide the following example for considering task characteristics:

If a teacher is trying to teach a learner how to respond to “what’s that?” then verbal and model prompts would be most helpful. If a learner is being taught how to follow his picture schedule, then gestural and pictorial prompts might be more helpful in this situation. (p. 6-7)

Additionally, decisions about prompts should be based on student characteristics including the learners’ ability to imitate a model and the learners’ sensitivity or attention seeking of physical attention (Neitzel & Wolery, 2009). It is this decision-making that allows educators
to match prompts to learner characteristics and task requirements, for the purpose of optimizing effective and efficient instruction.

**Verbal behavior.** It is interesting to consider verbal prompts from a verbal behavior definition of “verbal” that looks at the function of language, rather than form (Cooper et al., 2007; Sundberg & Michael, 2001). Verbal prompts, as defined by Cooper et al. (2007), include: spoken directives, pictures, visuals, written text, and sign language. West (2008) compared the effects of two different types of verbal prompts: spoken directives versus line drawings of the desired skill (i.e., visual prompt), when teaching functional skills (e.g., setting the table) to four young children with autism. In the study, the two prompting conditions (i.e., spoken, visual) were identical except that instead of providing a spoken directive, the interventionist showed the student the visual card. Three of the four participants learned the task more efficiently (e.g., less time, less errors) with the visual than with the spoken directive. Additionally, the three participants were also able to generalize the skill using visuals across settings, people, and activities.

West (2008) also added a social validity component to the study by asking the educators what they liked/disliked about each procedure as well as making a comparison between the spoken directive and visual conditions. It was reported that instructors liked the visuals because students were able to independently initiate the activity rather than having to wait for an adult, and the student had a referent to support task completion. Conversely, the teachers felt that the visuals would require more time to prepare, and the use of visuals could be challenging if the materials shown varied from the actual task. When discussing the spoken directive, the teachers liked how easy it was to use, leading to ease of implementation in natural settings, however, they disliked that it required the physical presence of an instructor, which might be more difficult to
fade. Overall, the instructors in the West (2008) study indicated that they liked the visuals better than the spoken directives, although the instructors had varying opinions about the ease of implementation, and the intrusiveness of each procedure. From this study, which was conducted to evaluate the implications of different types of verbal prompts, there is evidence supporting the use of other forms of verbal prompts (e.g., pictures, visuals, written text, sign language) in place of more traditional spoken directives as a way to reduce auditory processing demands and increase skill acquisition for individuals with ASD.

**Prompting hierarchy.** Although there is no published evidence providing a systematic investigation of which prompts are more or less intrusive than the others, there is the suggestion that physical guidance is considered more intrusive than either verbal prompts or modeling (Cooper et al., 2007). For other prompt levels, some initial assumptions can be made regarding the hierarchical order based on how they are most frequently presented in the literature. For example, SLP prompt hierarchies are described in seminal literature as verbal, gesture, model, and physical (Doyle et al., 1988; Cooper et al., 2007; MacDuff et al., 2001) as well as frequently implemented in this order during research activities (e.g., Finke et al., 2007; Cihak et al., 2010; Humphreys et al., 2013; Light, Binger, Agate, & Ramsay, 1999; West, 2008). As such, there is sufficient rationale to suggest that SLP prompting hierarchies should generally follow the structure of verbal, gesture, model, and physical, (with selection of specific prompts appropriate to the learner and task).

**Augmentative and Alternative Communication (AAC)**

It is estimated that approximately 30% of individuals with ASD will not develop sufficient speech to meet daily communication needs (Anderson et al., 2007; Wodka, Mathy, & Kalb, 2013). These individuals are ideal candidates for AAC. AAC has a two-fold purpose: to
support effective communication with others (i.e., expressive communication) as well as to support communication from others (i.e., receptive communication; Mirenda, 2001). Some common expressive strategies for individuals with ASD include Picture Exchange Communication System (PECS) and Functional Communication Training (FCT; Ganz, Sigafoos, Simpson, & Cook, 2008; Mirenda, 2001). Additionally, Mirenda (2001) identified several methods of receptive communication common for individuals with ASD including: visual schedules and symbols (e.g., pictures, line drawings, Boardmaker®). In addition to having access to appropriate AAC technology, successful use of AAC depends, in part, on competent communication partners (e.g., educators) who are able to create communication opportunities and provide scaffolded levels of support (Light & Drager, 2007).

**SLP & AAC**

This next section reviews select literature surrounding the use of SLP to teach learners with ASD to utilize AAC supports. AAC is one recommended method of enhancing the communication abilities of individuals with ASD (Beukelman & Mirenda, 2013; Ganz, 2015) and includes tools, strategies, and technology to support both receptive and expressive communication. The AAC literature includes the use of instructional strategies, including SLP, to teach expressive communication (Snell et al., 2006) and receptive communication (e.g., Cihak et al., 2010), however, there is limited research related specifically to learners with ASD.

**Expressive AAC.** Expressive AAC is defined as supports to help individuals communicate messages to others (Mirenda, 2001). Most recently, Finke et al. (2017) used the SLP to teach six elementary aged participants with ASD to produce multisymbol messages using a communication app on a tablet (i.e., Proloquo2Go). The AAC system was set up with vocabulary in grids, containing approximately 25-30 items (Finke et al., 2017). Instructional
activities were focused in the context of storybook reading and followed a traditional SLP procedure with a prompting hierarchy of: verbal prompt, verbal prompt + verbal model, verbal prompt + verbal model + model, verbal prompt + verbal model + model + verbal cue, full physical (p. 87). Results suggest that SLP was an effective instructional strategy for teaching all six participants to generate multisymbol messages using expressive AAC systems. These results persisted several months (e.g., two to eight) after intervention for five of six participants. Finke et al. (2017) assert that their results are significant because “there is limited evidence for LTM [least to most] prompting procedures for teaching language skills to school age children with ASD who use AAC” (p. 93).

Similarly, Kagohara et al. (2012) taught two adolescents with ASD to name pictures using AAC (i.e., speech generating device). Participants used an iPod touch to answer open-ended questions (e.g., what do you see?) when given a worksheet with four pictures, and closed-ended questions (e.g., What is this?) when shown a single photo (p. 1225). During instruction, a SLP procedure was implemented to teach the learners’ to respond to closed-ended questions and consisted of: verbal, verbal + gesture, and physical guidance. No prompting was given for open-ended questions. Results indicate that SLP helped both learners acquire picture naming in response to closed-ended questions. Additionally, these results were maintained over time (i.e., one month) as well as having potential impact on generalization to correct responding during the open-ended question condition.

**Receptive AAC.** Receptive AAC is defined as supports to help individuals understand communication from others, and includes schedules (both written and pictorial) and visual symbols for individuals with ASD (Mirenda, 2001). Although research suggests that individuals with ASD have strengths in visual perception and thus, visual supports are particularly effective
(Hine & Wolery, 2006; Quill, 1997), receptive AAC supports for individuals with ASD taught through SLP are sparsely represented in the literature. In their study, Cihak and colleagues (2010) taught four elementary participants to increase positive transition behavior using SLP and video modeling on a handheld device (i.e., iPod). The videos depicted the learner engaging in the desired behavior and successfully completing the transition. Participants were provided traditional SLP in the following order: verbal prompt, gesture + verbal explanation, model + verbal explanation, physical guidance + verbal explanation (p. 108). Training sessions continued until participants could complete the transition without prompting. The results suggest that participants learned to transition more independently and engaged in fewer disruptive behaviors during the transition and that these gains were maintained nine weeks post intervention.

Mechling, Gast, and Seid (2009) present a unique application of SLP through the use of personal digital assistants (PDAs) as a form of self-operated prompt. As described in their instructional procedures, the teacher provided the participant with an initial cue to begin the task but then the subsequent prompts, organized from least to most intrusive, were presented on the PDA. For example, at each step in the task sequence, the student could reference a picture prompt (e.g., visual), touch the photo to hear an auditory prompt while seeing the picture (e.g., visual + auditory), or watch a video of the step with voice over instruction (e.g., video + auditory). Results indicate that three high school participants with ASD were able to increase their independence and successful performance in food preparation across three different recipes.

**Instruction of Educators**

This next section focuses on empirical evaluations in training educators to implement the SLP across instructional activities. Two studies have specified looked at preservice educators (Garland, Holden, & Garland, 2016; Sawyer et al., 2017). As evidenced by the dates of
publication, this is a topic that has only recently started to receive attention in research; however, it is one that is high priority when considering the need for training to be both effective and efficient. It is also critical for training of partners who implement instruction in the natural environment to be empirically investigated, as there are likely differences between an intervention delivered by a researcher and a natural partner, such as treatment fidelity (Ganz et al., 2013).

To begin, Garland et al. (2016) taught six participants, enrolled in a graduate level course on curriculum and instruction for individuals with moderate and severe disabilities to implement the SLP in a virtual environment (i.e., TLE TeachLivE). Within TLE, participants were positioned in front of a TV screen and interacted with an avatar that was remotely operated by an actor through a webcam (Garland et al., 2016). In this particular study, the graduate students interacted with an avatar named Austin. Austin’s profile is that of a middle school student with ASD, an IQ of 55, and who is an emergent reader with some decoding abilities (Garland et al., 2016). Graduate students were taught to implement the following SLP with Austin during reading comprehension activities: visual, then gesture (p. 53). Results suggest that all the graduate students were successful at implementing SLP with fidelity, as measured by an implementation checklist. Participants maintained this performance during two week follow up probes.

This study is particularly interesting because of the virtual environment and the limited physical interactions with the avatar, specifically because physical prompting is considered one of the major forms of response prompts (Cooper et al., 2007). For example, Doyle and colleagues (1988) reported that 84% of reviewed studies included physical prompting in SLP procedures. Although it is promising that the students were successful in implementing this form
of SLP hierarchy that overall utilized less intrusive prompting, there is little evidence of what the graduate student would do if a more intrusive prompt might have been needed.

This leads to another important consideration: the avatar’s performance and training received. Garland et al. (2016) reported meeting with the avatar actor for one hour and providing the actor with a scripted protocol including: one correct independent response, two correct visually prompted response, and two gestural prompted responses (p. 51). Additionally, “no more than two prompted trials were to be delivered to the same level in a row” (Garland et al., 2016, p. 51). There was no generalization data evaluating the transfer of SLP skills to the natural environment or with “real” students; however, this study represents a significant first step in the literature towards training preservice educators to implement the SLP.

Sawyer et al. (2017) in a group pre/post test design taught seven undergraduate participants to implement seven evidence based practices (EBPs) identified from the National Professional Development Center on ASD that included least to most prompting (i.e., SLP). Unlike Garland et al., (2016), all instructional sessions took place in classrooms with face-to-face instruction. At the beginning of each session, with one EBP taught at a time, the researcher conducted an instructional presentation to the whole group, which lasted no more than 10 minutes. Any questions asked by the students were answered and the presentation ended when participants did not have any additional questions. Following this lecture, all participants moved into behavioral skills training sessions (BST) and were grouped in dyads or triads. All groups initially reviewed an implementation checklist with the researcher and then observed the researcher model the EBP with a confederate adult who acted as the learner. Following this, dyads and triads were given the opportunity to role-play, with each participant being given the opportunity to act as the student and the teacher. During role-play activities, a researcher
observed and provided feedback. Role-plays continued until participants indicated they were ready to “check out”, a procedure that involved the undergraduate student conducting the targeted EBP with the researcher. Performance criterion on checkouts was 100% accuracy. Participants who did not perform at criterion were instructed to return to role-play until ready to try again. These BST sessions were reported to last approximately 20 minutes. Pre and post-tests consisted of one of two researcher-generated scenarios that the participants were asked to role-play. The scenarios included information regarding the learner’s profile (e.g., characteristics), classroom setting, and a target EBP. Sawyer et al. (2017) reported that any needed materials for each scenario were provided to participants. Results of this study suggest that the undergraduate students were able to increase their fidelity of trained EBP implementation through instruction and BST. However, this study also did not provide any generalization data to the natural environment or with students with ASD.

Taken together, Garland et al. (2016) and Sawyer et al. (2017) provided opportunities for the preservice educator to receive instruction on the targeted skill as well as to practice and receive feedback. These training elements are consistently reported as critical to training performance skills in both students and adults (Ellis, Deshler, Lenz, Schumaker, & Clark, 1991; Parsons, Rollyson, & Reid, 2012). Additionally, the students demonstrated the ability to implement the SLP when provided with a prescribed hierarchy and needed materials.

**Online Learning**

Online learning, also known as e-learning, distance learning, telepractice, or interactive computer training, has become increasingly more prevalent in higher education (Meyen, Lian, & Tangen, 1997), primarily due to the associated benefits: time independent, learner controlled, cost effective, globally accessible, and interactive (Johnson, 2004). Specifically within special
education, online learning has flourished over the last 20 years as a means of increasing the number of special educators to work with individuals who have severe disabilities, including individuals with ASD (Johnson, 2004). In addition, the field of applied behavior analysis has begun exploring online learning as a means of effectively and efficiently training parents and professionals to implement specific EBPs like picture activity schedules (Gerencser, Higbee, Akers, & Contreras, 2017), discrete trial training (Pollard, Higbee, Akers, & Brodhead, 2014), and incidental teaching (Neely, Rispoli, Gerow, & Hong, 2016) with learners with ASD.

Although there is promise in the global accessibility of online learning in training educators, it has been argued that the elements of quality instruction remain constant, regardless of the delivery mode (i.e., via technology or traditional face to face; Ally, 2008; Clark & Mayer, 2016; Johnson, 2004). “Learning is influenced more by the content and instructional strategy in the learning materials than by the types of technology used to deliver instruction” (Ally, 2008, p. 15). As such, the following section evaluates elements of successful instruction, both in traditional face-to-face and online.

**Elements of instruction.** One of the most common instructional elements, highlighted across training methodology, is the opportunity for practice and feedback (Ally, 2008; Clark & Mayer, 2016). “There is a growing body of literature on the effectiveness of performance feedback for supporting teachers to use new practices. This might represent one of the most consistent findings in the literature on professional development” (Hemmeter, Snyder, Kinder, & Artman, 2009, p. 108). Performance feedback is represented in Behavior Skills Training (BST), which has been effective in teaching important instructional skills to education professionals, such as discrete trial instruction and mand training (Nigro-Bruzzi & Sturmey, 2010; Sarokoff & Sturmey, 2008). Likewise, strategy instruction, first described by Deschler and Schumaker
(1986) as an approach for students with learning disabilities to learn how to approach complex instructional demands, has also applied practice and feedback to training communication partner behaviors (Douglas, McNaughton, & Light, 2013; Kent-Walsh & McNaughton, 2005).

In addition to practice and feedback, core instructional elements highlighted in literature about learning include: (1) gain learner attention/motivating the learner; (2) set objectives and performance expectations; (3) stimulate recall of relevant prior learning; (4) present target material in the form of readings, lectures, videos; (5) provide guidance through examples and explanations; (6) provide performance questions and practice activities to complete; (7) provide formative feedback of responses; and (8) enhance retention and transfer (Ally, 2008; Clark & Mayer, 2016; Johnson, 2004).

**Sequence of instruction.** When creating instructional content, elements beyond the principles of instruction should be considered, including the content sequence. Elaboration Theory (Reigeluth, 1999b), argues that content should be presented with increasing complexity; meaning that core concepts should be presented prior to prevision of detailed and complex specifics. In other words, working from simple to complex (Ally, 2008; Clark, 2008; Johnson, 2004). To implement Elaboration Theory principles, it is suggested that instructional designers first conduct an analysis of the content and then identify the most fundamental ideas (Johnson, 2004). It is from this foundational content that instruction grows from less to greater complexity. Furthermore, instructional principles suggest the need for chunking of information to assist with working memory (Ally, 2008; Johnson, 2004) as well as utilizing strategies to maximize online delivery such as: placing important information in the center of the screen, highlighting critical information, use of relevant visuals, animations, or audio (e.g., present text with audio or visual, but not both), and allowing learner control over the pace of instruction (Ally, 2008; Clark, 2014).
**Evaluation of learning.** Lastly, evaluation of learning and assessment procedures must also be considered within the online environment. Just like in traditional face-to-face instruction, the goal of assessment is to measure learners’ performance on instructional targets and like the above instructional elements, there is little different between learning evaluation across instructional delivery methods (Meyen, Aust, Bui, & Isaacson, 2002). Assessment activities include: ungraded activities and feedback embedded in instructional materials, self-assessment quizzes that allow learners to monitor their own learning, and formal feedback from course instructor on assignments (Meyen et al., 2002). Although these activities are similar to those that would be utilized in a traditional face-to-face course, the online system can help to streamline the assessment process allowing for more consistent and timely feedback to be provided to students (Meyen et al., 2002).

When considering what types of knowledge to assess, there are several knowledge forms targeted for increase during instruction. One type, declarative or conceptual knowledge is often referred to as “knowing *that*” (e.g., “I know that the system of least prompts requires at least three levels”; Paris, Lipson, & Wixon, 1983, p. 302). Of additional significance is procedural knowledge, or the “knowing *how*” (e.g., how to conduct error correction; Paris et al., 1983, p. 302).

The literature on problem solving has most clearly illustrated the importance of this [inter]relationship [between conceptual and procedural knowledge], because… it is evident that it is the possession of conceptual knowledge that makes possible the effective use of the procedural knowledge…” (McCormick, 1997, p. 149)

Paris and colleagues (1983) suggest that these two knowledge forms, while important, are not sufficient by themselves. As such, Paris et al. (1983) put forth a third type knowledge that must also be considered, conditional knowledge, or the “knowing *when* and *why*” (p. 303). It is through this conditional knowledge instruction that learners are taught under which conditions
the target strategy is appropriate and why it “is only appropriate for some tasks and situations” (Paris et al., 1983, p. 303). It is argued that learners’ develop strategic behavior only through the combination of all three forms of knowledge: declarative/conceptual, procedural, and conditional (Paris et al., 1983). This strategic behavior is particularly important when teaching educators to implement the SLP as there are times when another prompting procedure may be more effective (MacDuff et al., 2001).

**Generalization**

Transfer of learned skills to natural, classroom environments has been a common problem reported within special education for many years (Markelz, Riden, & Scheeler, 2017; Scheeler, 2008). Stokes and Baer (1977) addressed the issue by providing nine approaches to promote generalization. Although these approaches were conceptualized for student learning, they are applicable to all learners, including educators (Brock & Carter, 2013). Of Stokes and Baer’s (1977) original nine approaches, Markelz et al. (2017) report that five are most represented in the teacher education literature: (a) sequential modification, (b) natural maintaining contingencies, (c) train sufficient exemplars, (d) program common stimuli, (e) and mediate generalization. Additionally, online learning literature suggests that instruction must assist learners in applying information to real world situations (Ally, 2008).

In a recent literature review of training education professionals to implement Picture Exchange Communication System (PECS), McCoy and McNaughton (2017) found evidence of generalization across settings and people, when educators were first taught to implement PECS with an adult confederate (i.e., Homlitas, Rosales, & Candel, 2014; Rosales, Stone, and Rehfeldt, 2009). This result is promising as role-play with other students or an instructor is a feasible element for higher education classrooms, allowing preservice education professionals to master
important performance based skills. From this, the idea of pyramidal training should also be considered as a viable instructional practice. In pyramidal training, an expert teaches a small group of individuals (e.g., students) to implement a target skill. These students, once criterion is performed, then in turn train other students to implement the same target skill (Page, Iwata, & Reid, 1982). More recently, pyramidal training has been shown to be an effective and efficient training model for teaching implementation of picture exchange communication (Martocchio & Rosales, 2016) and trial-based functional analyses (Kunnavatana et al., 2013).

Ganz and colleagues (2013) evaluated generalization of PECS opportunities to untrained activities, finding that the educators did not provide any communication opportunities during activities that they were not explicitly trained (i.e., Ganz et al., 2013). In Ganz et al. (2013), the educators were trained to implement PECS across two contexts: art and gross motor, while generalization probes were conducted during center activities (e.g., blocks, sand, water table). In analyzing the generalization results, it is possible that the educators required additional training exemplars. However, it could also possibly be attributed to the training methodology; one that did not explicitly address generalization in the instructional sequence. For this reason, the current study utilizes strategy instruction as a way to promote generalization, in combination with multiple exemplar training (e.g., four case student examples) and using common stimuli (e.g., instructional materials common for learners with ASD).
References


http://dx.doi.org/10.1037/0022-006X.75.4.594


doi:10.1044/2016_AJSLP-14-0187


https://doi.org/10.1007/s10864-009-9085-6


https://doi.org/10.1177/088840640402700301

Kagohara, D. M., van der Meer, L., Achmadi, D., Green, V. A., O’Reilly, M. F., Lancioni, G. E., Sutherland, D., Lang, R. Marschik, P. B., & Sigafoos, J. (2012). Teaching picture naming to two adolescents with autism spectrum disorders using systematic instruction and

https://doi.org/10.1016/j.rasd.2012.04.001


https://doi.org/10.1080/07434610701553635


https://doi.org/10.1002/jaba.152


https://doi.org/10.1016/j.rasd.2007.04.002


Appendix D

Assessment Materials

Dependent Variable Measurement

Planning Data Sheet

<table>
<thead>
<tr>
<th>Planning Checklist</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set up</strong></td>
<td></td>
</tr>
<tr>
<td>Write acronym on page (SADD IDx3)</td>
<td>/1</td>
</tr>
<tr>
<td>1. Select 3 prompts to be used</td>
<td>/3</td>
</tr>
<tr>
<td>2. Arrange 3 prompts in least to most hierarchy (V, G, M, P)</td>
<td>/3</td>
</tr>
<tr>
<td>3. Determine cue</td>
<td>/1</td>
</tr>
<tr>
<td>4. Determine response interval</td>
<td>/1</td>
</tr>
<tr>
<td><strong>Hierarchy Level 1</strong></td>
<td></td>
</tr>
<tr>
<td>5. ID correct child response &amp; adult response (reinforce)</td>
<td>/2</td>
</tr>
<tr>
<td>6. ID incorrect child response &amp; adult response (error correct)</td>
<td>/2</td>
</tr>
<tr>
<td>7. ID no response from child &amp; adult response (prompt)</td>
<td>/2</td>
</tr>
<tr>
<td>8. Response interval</td>
<td>/1</td>
</tr>
<tr>
<td><strong>Hierarchy Level 2</strong></td>
<td></td>
</tr>
<tr>
<td>9. ID correct child response &amp; adult response (reinforce)</td>
<td>/2</td>
</tr>
<tr>
<td>10. ID incorrect child response &amp; adult response (error correct)</td>
<td>/2</td>
</tr>
<tr>
<td>11. ID no response from child &amp; adult response (prompt)</td>
<td>/2</td>
</tr>
<tr>
<td>12. Response interval</td>
<td>/1</td>
</tr>
<tr>
<td><strong>Hierarchy Level 3</strong></td>
<td></td>
</tr>
<tr>
<td>13. ID correct child response &amp; adult response (reinforce)</td>
<td>/2</td>
</tr>
<tr>
<td>14. ID incorrect child response &amp; adult response (error correct)</td>
<td>/2</td>
</tr>
<tr>
<td>15. ID no response from child &amp; adult response (prompt)</td>
<td>/2</td>
</tr>
<tr>
<td>16. Response interval</td>
<td>/1</td>
</tr>
<tr>
<td>17. ID correct child response &amp; adult response (reinforce)</td>
<td>/2</td>
</tr>
<tr>
<td>All items drawn as diagram/flowchart</td>
<td></td>
</tr>
</tbody>
</table>

Planning Score /33
### Teleconference Role-Play Implementation Data Sheet (Trial 1 of 5)

<table>
<thead>
<tr>
<th>Target</th>
<th>Description</th>
<th>Score</th>
<th>Actor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivers cue (e.g., wh- ?)</td>
<td>+ - NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waits (3 sec)</td>
<td>+ - NA</td>
<td>C</td>
<td>NR</td>
</tr>
<tr>
<td>Prompt 1 Least Intrusive</td>
<td>+ - NA</td>
<td>C</td>
<td>NR</td>
</tr>
<tr>
<td>Prompt 2 Intermediate</td>
<td>+ - NA</td>
<td>C</td>
<td>NR</td>
</tr>
<tr>
<td>Prompt 3 Most Intrusive</td>
<td>+ - NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial Score</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Sample Participant Communication Summary Table

<table>
<thead>
<tr>
<th>Activity</th>
<th>Week of</th>
<th>Due (by 11:59pm)</th>
<th>Scoring</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supporting AAC Quiz 1</strong></td>
<td>March 8-15</td>
<td>March 15</td>
<td>3 points participation: <em>score will not count towards final grade</em></td>
<td>Submit on Canvas</td>
</tr>
<tr>
<td><strong>Supporting AAC Activity 1</strong></td>
<td>March 15-22</td>
<td>24 hours before conference</td>
<td>3 points participation: <em>score will not count towards final grade</em></td>
<td>Upload to Canvas</td>
</tr>
<tr>
<td><strong>Supporting AAC Teleconference Role Play</strong></td>
<td>March 15-22</td>
<td>March 22</td>
<td>10 points participation</td>
<td>Schedule and materials emailed in week prior- Conferences via Canvas Conferences</td>
</tr>
<tr>
<td><strong>Lesson 7: Supporting AAC</strong></td>
<td>March 22-29</td>
<td>March 29</td>
<td></td>
<td>Complete on Canvas</td>
</tr>
<tr>
<td><strong>Supporting AAC Quiz 2</strong></td>
<td>March 22-29</td>
<td>March 29</td>
<td>3 points participation: <em>score will not count towards final grade</em></td>
<td>Submit on Canvas</td>
</tr>
<tr>
<td><strong>Supporting AAC Activity 2</strong></td>
<td>March 29-April 5</td>
<td>24 hours before conference</td>
<td>3 points participation: <em>score will not count towards final grade</em></td>
<td>Upload to Canvas</td>
</tr>
<tr>
<td><strong>Supporting AAC Teleconference Role Play</strong></td>
<td>March 29-April 5</td>
<td>April 4</td>
<td>10 points participation</td>
<td>Schedule and materials emailed in week prior- Conferences via Canvas Conferences</td>
</tr>
</tbody>
</table>
Sample Materials & Scheduling Email

I am writing with information regarding Supporting AAC Activity 1 and Teleconference role-play 1. We recognize that you have not yet received instruction so we ask you to complete both assignments as best as you can. You will receive 3 points for submission of a plan (Activity 1) and 10 points for participation in the teleconference role-play.

1. Using Kara’s case (below in italics), create a planning document detailing how you would increase independence with her communication. Your plan should be submitted in advance of your scheduled role-play teleconference (Activity 1 via Canvas). You will then use your plan during the teleconference role-play as you practice the targeted activity. This information is also available under Activity 1.

_Kara is a 6-year-old girl with autism and limited verbal communication. As her teacher, you have identified several activities throughout the day to work on increasing her communication through the use of a low-tech communication board. Today you will read a book with Kara and ask 5-7 factual questions throughout. Although Kara has used her communication board independently before, she is inconsistent in her use._

_From working with Kara before, you know that she is tolerant of others helping her and that she will sometimes imitate the actions of others. Additionally, you are currently working with Kara to develop literacy skills such as letter sound correspondence and sound blending, however, these are skills that she has not yet mastered._

2. I am providing you with pages from a popular children’s book as well as a corresponding low-tech AAC storyboard found here: 
   [https://drive.google.com/open?id=1KpcgMChz2RezyiLOobFUDTG_o5xHKZgK](https://drive.google.com/open?id=1KpcgMChz2RezyiLOobFUDTG_o5xHKZgK)
   You will need to have a **printed copy** of these materials for your teleconference role-play as well as a copy of your plan.

3. Also in the folder: 
   [https://drive.google.com/open?id=1KpcgMChz2RezyiLOobFUDTG_o5xHKZgK](https://drive.google.com/open?id=1KpcgMChz2RezyiLOobFUDTG_o5xHKZgK), you will find a **link to schedule** your teleconference session. If you have any questions or concerns about scheduling or any of the supporting AAC activities, please email Ashley McCoy: 
   [ajm6835@psu.edu](mailto:ajm6835@psu.edu)

4. Lastly, in the next 24 hours I will begin opening conferences on Canvas. You will likely receive an email inviting you to join- you do **not** need to log on when you receive the email. You will need to join the conference 10 minutes in advance of your schedule time.
Sample Adult Confederate Script

Book A, Response Pattern A

Once you and the student have both arrived and are in web cam view, press the button to begin recording the session.

Then state the following opening:
“Welcome! Today I’ll be playing the role of Kara, a 6 year old with autism and limited communication. You will be reading The Very Hungry Caterpillar and asking me wh- questions throughout.

Let’s begin by making sure that all the needed materials are present. Please hold up each of the following:
1. Storybook pages
2. Corresponding AAC communication board
3. A copy of your planning document

Great! Looks like we have everything that we need.

We know that this experience is different and that it may feel a bit unnatural. Please do your best to engage with me as if I am a student with a severe disability who uses AAC.

If at any point, you feel limited in your interactions because of the web conference, you may think aloud what you would do.”

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Teacher Behavior</th>
<th>Confederate Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question Number 1</td>
<td>Reads story &lt;br&gt;Asks a wh- question</td>
<td>Do not respond</td>
</tr>
<tr>
<td></td>
<td>1st attempt to get learner to respond</td>
<td><strong>Respond correctly</strong> within 3 seconds</td>
</tr>
<tr>
<td>Question Number 2</td>
<td>Reads story &lt;br&gt;Asks a wh- question</td>
<td><strong>Respond correctly</strong> within 3 seconds</td>
</tr>
<tr>
<td>Question Number 3</td>
<td>Reads story &lt;br&gt;Asks a wh- question</td>
<td>Do not respond</td>
</tr>
<tr>
<td></td>
<td>1st attempt to get learner to respond</td>
<td>Do not respond</td>
</tr>
<tr>
<td>2\textsuperscript{nd} attempt to get learner to respond</td>
<td>Do not respond</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>3\textsuperscript{rd} attempt to get learner to respond</td>
<td>Respond correctly within 3 seconds</td>
<td></td>
</tr>
</tbody>
</table>

**Question Number 4**

<table>
<thead>
<tr>
<th>Reads story</th>
<th>Asks a wh-question</th>
<th>Respond incorrectly within 3 seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describes/performs error correction</td>
<td>Respond correctly within 3 seconds</td>
<td></td>
</tr>
</tbody>
</table>

**Question Number 5**

<table>
<thead>
<tr>
<th>Reads story</th>
<th>Asks a wh-question</th>
<th>Do not respond</th>
</tr>
</thead>
<tbody>
<tr>
<td>1\textsuperscript{st} attempt to get learner to respond</td>
<td>Do not respond</td>
<td></td>
</tr>
<tr>
<td>2\textsuperscript{nd} attempt to get learner to respond</td>
<td>Respond correctly within 3 seconds</td>
<td></td>
</tr>
</tbody>
</table>

**Any**

<table>
<thead>
<tr>
<th>States that they are unsure of what to do next</th>
<th>Discontinue trial</th>
</tr>
</thead>
</table>

*“Let’s move on to the next question. Please continue reading”*

**Any**

<table>
<thead>
<tr>
<th>Makes no response within 10 seconds</th>
<th>Discontinue trial</th>
</tr>
</thead>
</table>

*“Let’s move on to the next question. Please continue reading”*

Confederate closing:

“We have finished for today. Thank you for your participation!”

Stop recording and end conference
Procedural Fidelity Checklist: Confederate Script A

<table>
<thead>
<tr>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enters webcam view</td>
</tr>
<tr>
<td>Begins session recording</td>
</tr>
<tr>
<td>States opening</td>
</tr>
<tr>
<td>Checks for needed materials</td>
</tr>
<tr>
<td>States “if you feel limited”</td>
</tr>
<tr>
<td>Attends to reading</td>
</tr>
<tr>
<td>Q1: responds after 1 attempt</td>
</tr>
<tr>
<td>Attends to reading</td>
</tr>
<tr>
<td>Q2: responds immediately</td>
</tr>
<tr>
<td>Attends to reading</td>
</tr>
<tr>
<td>Q3: responds after three attempts</td>
</tr>
<tr>
<td>Attends to reading</td>
</tr>
<tr>
<td>Q4: responds incorrectly</td>
</tr>
<tr>
<td>Q4: responds correctly, after error correction</td>
</tr>
<tr>
<td>Attends to reading</td>
</tr>
<tr>
<td>Q5: responds after two attempts</td>
</tr>
<tr>
<td>Discontinues trial for no response/statement of unsure</td>
</tr>
<tr>
<td>States closing</td>
</tr>
<tr>
<td>Stops recording</td>
</tr>
<tr>
<td>Ends conference</td>
</tr>
</tbody>
</table>
Social Validity Questions

5 Point Scale

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>2</td>
<td>Somewhat Disagree</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
</tr>
<tr>
<td>4</td>
<td>Somewhat Agree</td>
</tr>
<tr>
<td>5</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Rate the following questions on the 5-point scale

1. I think the system of least prompts is an effective strategy for supporting the communication of learners who use AAC
2. I think the instructional module (i.e., written text, video explanations, and video models) was an important activity for my learning
3. I think the practice case studies and guided examples were important activities for my learning
4. I think the teleconference role-play was an important activity for my learning
5. I think that online instruction (i.e., World Campus) is an effective and efficient way to learn
6. I think the Supporting AAC module and activities helped me to be more confident working with individuals who use AAC
7. I think I have learned a valuable skill that I will be able to use with other learners (now or in the future)

Open Response

1. Describe what you liked about the Supporting AAC activity (e.g., content, practice, and related activities)
2. Describe recommendations for improvements to the Supporting AAC activity (e.g., content, practice, and related activities)
3. Would you recommend the Supporting AAC activity to other people like yourself? Please provide a rationale for your response
Appendix E

Training Materials

Online Module Structure

Part 1: Introduction to Prompting Outline

<table>
<thead>
<tr>
<th>Section</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Prompting</td>
<td></td>
</tr>
<tr>
<td>Verbal Prompts</td>
<td></td>
</tr>
<tr>
<td>Gesture Prompts</td>
<td></td>
</tr>
<tr>
<td>Model Prompts</td>
<td></td>
</tr>
<tr>
<td>Physical Prompts</td>
<td></td>
</tr>
<tr>
<td>Check In: Introduction to Prompting (5 pts)</td>
<td></td>
</tr>
<tr>
<td>Introduction to Systematic Prompting Procedures</td>
<td></td>
</tr>
<tr>
<td>When to Use Which Procedure</td>
<td></td>
</tr>
<tr>
<td>System of Least Prompts</td>
<td></td>
</tr>
<tr>
<td>System of Least Prompts Hierarchy</td>
<td></td>
</tr>
<tr>
<td>System of Least Prompts Skills &amp; Activities</td>
<td></td>
</tr>
<tr>
<td>Other Important Terminology</td>
<td></td>
</tr>
<tr>
<td>Terminology (6 pts)</td>
<td></td>
</tr>
<tr>
<td>System of Least Prompts In Action</td>
<td></td>
</tr>
<tr>
<td>Check In: Introduction to Systematic Prompting Procedures (6 pts)</td>
<td></td>
</tr>
</tbody>
</table>
Part 2: Introduction to Planning Outline

- Introduction to Planning
- Planning Case Study: Ky
- Select prompts
- Arrange selected prompts
- Determine cue
- Determine response interval
- Identify student and adult responses
- Check In: Planning Acronym
- Practice Case 1: Jessica
- Practice Planning Activity: Jessica
- Practice Case 2: Shelley
- Practice Planning Activity: Shelley
- Practice Planning Activity: Lane
- Practice Planning Activity: Lane (Comparison)
### Part 3: Introduction to Implementation Outline

<table>
<thead>
<tr>
<th>Sub-Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Implementation</td>
<td></td>
</tr>
<tr>
<td>Implementation Example</td>
<td></td>
</tr>
<tr>
<td>Implementation Example Continued</td>
<td></td>
</tr>
<tr>
<td>Implementation with Ky</td>
<td></td>
</tr>
<tr>
<td>Check-In: Implementation</td>
<td></td>
</tr>
<tr>
<td>Implementation with Jessica</td>
<td></td>
</tr>
<tr>
<td>Practice Implementation Activity: Jessica</td>
<td></td>
</tr>
<tr>
<td>Implementation with Shelley</td>
<td></td>
</tr>
<tr>
<td>Practice Implementation Activity: Shelley</td>
<td></td>
</tr>
<tr>
<td>Other Implementation Considerations</td>
<td></td>
</tr>
<tr>
<td>Practice Implementation Activity: Lane</td>
<td></td>
</tr>
</tbody>
</table>
Sample Instructional Content

Physical Prompts

Lastly, physical prompts are direct assistance provided to the student from the teacher. The most common physical prompt is hand-over-hand guidance where the teacher fully guides the hand of the student to complete the task. This is referred to as full physical prompting. But, physical prompts can also be partial physical prompting which includes guidance at the forearm, guidance at the upper arm, or guidance at the shoulder. It could also be as slight as a light touch to initiate movement.

Let’s take a look at a few examples of physical prompting.

In the following example, the teacher is using full physical prompting to help the learner select the matching picture.

Here we see the same learner being asked to identify the dog but this time, with partial physical prompting.

System of Least Prompts Hierarchy

As the teacher, it is your job to determine which prompts to use from the possible types of prompts and to arrange these prompts in least to most hierarchy; least intrusive to more intrusive. Remembering that intrusiveness refers to the extent that the prompt intrudes on the learner’s body.

Here is how the system of least prompts hierarchy is commonly represented. You begin with independent on the top and as you work your way down the pyramid, the prompts are increasing in intrusiveness.

What prompt is the least intrusive?
- Verbal
What prompt is the most intrusive?
- Physical
Sample Practice Activities

Check In: Introduction to Systematic Prompting Procedures (with immediate feedback upon submission)

<table>
<thead>
<tr>
<th>Question 1</th>
<th>1 / 1 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which of the following are potential scenarios when system of least prompts might be a preferred prompting procedure? (select all that apply)</td>
<td></td>
</tr>
<tr>
<td>Learner is learning a new skill</td>
<td>Correct!</td>
</tr>
<tr>
<td>Increasing learner independent performance</td>
<td>Correct!</td>
</tr>
<tr>
<td>Learner uses the skill inconsistently</td>
<td>Correct!</td>
</tr>
<tr>
<td>Learner is regressing in use of skill</td>
<td></td>
</tr>
</tbody>
</table>

There are 3 potential scenarios: to increase learner independence, if the learner uses the skill inconsistently, or the learners’ use of the skill is regressing

<table>
<thead>
<tr>
<th>Question 2</th>
<th>1 / 1 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>What direction does the hierarchy follow in a system of least prompts?</td>
<td></td>
</tr>
<tr>
<td>least to most</td>
<td>Correct!</td>
</tr>
<tr>
<td>time delay</td>
<td></td>
</tr>
<tr>
<td>most to least</td>
<td></td>
</tr>
</tbody>
</table>
Practice Planning Activity: Lanre (Independent Practice with Comparison Activity)

Please upload your plan for Lanre:

Here is the plan I made for Lanre: [LanreFullPlan.pdf]

You will need this plan and the plan you created for the next activity.

<table>
<thead>
<tr>
<th>Question 1</th>
<th>1 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe the similarities between the plans in relation to:</td>
<td></td>
</tr>
<tr>
<td>a) prompts selected and least to most arrangement</td>
<td></td>
</tr>
<tr>
<td>b) cue</td>
<td></td>
</tr>
<tr>
<td>c) response interval</td>
<td></td>
</tr>
<tr>
<td>d) learner and adult responses</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 2</th>
<th>1 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe any differences between the plans in relation to:</td>
<td></td>
</tr>
<tr>
<td>a) prompts selected and least to most arrangement</td>
<td></td>
</tr>
<tr>
<td>b) cue</td>
<td></td>
</tr>
<tr>
<td>c) response interval</td>
<td></td>
</tr>
<tr>
<td>d) learner and adult responses</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 3</th>
<th>1 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>From any differences described above, consider why these might exist. For example, why did you select the prompts that you did? Why did you choose to cue the learner in that way?</td>
<td></td>
</tr>
</tbody>
</table>
Practice Implementation Activity: Jessica (with immediate feedback upon submission)

In this clip, Jessica is working on step 2: laying the towel flat. She did not respond during the first response interval, so I provided the level 1 prompt: verbal. After the verbal prompt, she responded correctly, so I provided reinforcement.

Watch this interaction below:

On what level do I begin for step 3: smooth (wrinkles)?

- Prompt level 2: Gesture
- Prompt level 1: Verbal
- Prompt level 3: Model
- Prompt level

Correct:

Independent

Even though Jessica required a verbal prompt to lay the towel flat, I return to the top of my planning document and start over for each step. For this reason, we begin by providing Jessica an opportunity to respond at the Independent level before any prompts are given.
Sample Instructional Video Links

Supporting AAC Introduction
https://youtu.be/FZ_gy_O1M8w

Introduction to Planning
https://youtu.be/5bmkTBk_WNQ

Select 3 Prompts
https://youtu.be/UdhsGFsJKBU

ID x3
https://youtu.be/X97yRoPmPdM

Implementation Example 2
https://youtu.be/uHkWX5ICx3s
Appendix F

Participant Assessment Examples

Planning Documents

Pretest Example: Participant 1

The goal of this plan is for Kara to increase her independent communication skills using her communication board while also building upon her literacy skills. In order to do this, we will read “The Very Hungry Caterpillar” and Kara will be asked a series of “wh-“ questions.

These questions will begin with basic informational questions, such as “who is the main character in the story?” before transitioning into questions requiring more recollection and recalling. These can be something such as “what day did the caterpillar eat pears?” or “where did the butterfly come from?”

Initial questions for Kara should help her build confidence. As she is tolerant to assistance and she is able to model behavior, facilitators can model correct answers for example questions before transitioning into Kara doing so herself.

Since letter sound recognition and sound blending are also goals that have not yet been mastered, we can work on these as well. By phrasing questions such as “What day of the week starts with an ‘mmm’ sound?” we can try to start working with her on identifying beginning word sounds. If Kara begins to struggle or shows she is not ready for this, we can fall back and continue to work more on content. The ultimate goal is for Kara to become confident and familiar with using her communication board.
Posttest Example: Participant 15

1. What did the horn do? Beep
2. What did the toad say? Croak
3. What did the pig say? Oink
4. What did the horse say? Neigh
5. Where did the dump truck get stuck? Mud

Kara answers correctly

Reinforce- “Yes! Nice job Kara!”

Kara answers correctly

Reinforce- “Yes! Nice job Kara!”

Kara answers correctly

Reinforce- “Yes! Nice job Kara!”

Have communication board out & ask comp. question

E.C.- gently move hands away & gesture towards answer

Immediate gesture towards answer

Kara answers #1 incorrectly

E.C.- gently move hands away & model answer

Immediate model of answer

Kara does not respond

Immediate physical prompt

Kara does not respond

Kara does not respond

Kara answers #1 incorrectly

E.C.- gently move hands away & prompt physically

Reinforce- “Yes! Nice job Kara!”
Teleconference Role-Play Implementation Videos

Pretest Examples

Graduate Student (Participant 1): https://youtu.be/Al6xFvDXiTY
Undergraduate Student (Participant 5): https://youtu.be/wQXOY578yZA

Posttest Examples

Graduate Student (Participant 1): https://youtu.be/l0nLOqTLnH8
Undergraduate Student (Participant 5): https://youtu.be/jRgftAC3VEc
VITA
Ashley Rae McCoy

EDUCATION

Ph.D. in Special Education 2018
The Pennsylvania State University
Ed.S. in Assistive Technology 2013
Simmons College
MS.Ed. in Severe Special Education 2011
Simmons College
B.S. in Speech Pathology and Audiology 2008
Miami University

PROFESSIONAL CERTIFICATIONS

Board Certified Behavior Analyst (BCBA)
Certificate for Online Teaching, The Pennsylvania State University (World Campus)
Massachusetts Educators License: Severe Disabilities (All levels)

PROFESSIONAL EXPERIENCES

2016-2018 Teaching Assistant, Guest Lecturer, and Course Instructor, The Pennsylvania State University, University Park, Pennsylvania
2013-2015 Autism Coordinator, District of Columbia Public Schools, Washington, DC
2011-2013 Autism Lead Teacher & Autism Academic Consultant, Sharon Public Schools, Sharon, Massachusetts
2008-2011 Autism Special Educator, New England Center for Children, Southborough, Massachusetts

PUBLICATIONS

