THE EFFECTS OF ELEARNING INSTRUCTION ON THE QUALITY OF WRITTEN IEP GOALS & OBJECTIVES

A Dissertation
Submitted to
the Temple University Graduate Board

In Partial Fulfillment
of the Requirements for the Degree
DOCTOR OF PHILOSOPHY IN EDUCATION
WITH SPECIAL EDUCATION CONCENTRATION

by
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May 2020

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ABSTRACT

The Individualized Education Program (IEP) is intended to serve as a planning tool to ensure that school teams provide students with disabilities a free and appropriate public education (FAPE) (Blackwell & Rosetti, 2014). An essential step in the IEP process includes the development of meaningful and measurable IEP goals based on students' present levels of performance and specific areas of need (Christle & Yell, 2010). Despite the significant role that the IEP plays in meeting legal requirements of the IDEA, research has shown that the quality of IEPs for students with disabilities is generally low (Blackwell & Rosetti, 2014; Rakap, 2015), especially for students with autism (Etscheid, 2003). Research evaluating IEP quality for students with autism revealed that many IEPs failed to include goals and objectives that addressed students' deficits in social communication or social interactions (Ruble, McGrew, Dalrymple, & Jung, 2010) despite explicit recommendations for best practices (NRC, 2001).

The purpose of this study was to train pre-service teachers to use results from a curriculum-based assessment to write quality IEP goals and objectives for students with autism. The study used a randomized group design in which undergraduate students (N = 32) enrolled in an introductory special education course were randomly assigned to a training group. Participants assigned to the Captivate Group (n = 16) participated in a series of interactive eLearning modules in which there were opportunities for the learners to respond to questions and engage in various learning interactions. The training provided to participants in the Video Group (n = 16) served as a treatment-as-usual condition in which participants viewed video recordings of the eLearning modules, but did not have opportunities to engage in any learning interactions. A two-way mixed

analysis of variance was conducted to examine within group differences from pre- to post- test and between group differences based on the method of eLearning training received. Additional analyses were conducted in order to compare the quality of goals and objectives written for academic skills and goals targeting communication skills.

Results indicated significant improvement for both groups on the quality of written goal and objectives from pre- to post-test . Although the Captivate Group performed slightly better on the post-test, there was no significant effect for training received. Additional analyses examining group outcomes on specific quality indicators revealed some noteworthy differences between groups. The data also confirmed statistically significant differences between participants' total academic scores and total communication scores at pre-test, meaning that goals and objectives written for academic skills met more quality indicators compared to goals and objectives written for communication skills. A second paired samples t-test on participants' post-test totals showed significant differences in quality for the Video Group, but not the Captivate Group.

Keywords: IEP quality, special education teacher preparation, students with autism

DEDICATION

I dedicate this dissertation to my parents, Peter and Christine Russo. All of the opportunities I've had in my life were a result of your hard work and sacrifice. Thank you for instilling these values and for teaching me the importance of taking pride in everything I do, no matter how small the task may be.

ACKNOWLEDGEMENTS

I would like to thank the members of my dissertation committee for providing the guidance needed to complete this project. Dr. Joesph Boyle, I am so grateful for your support, from helping with recruitment to offering your thoughtful feedback and advice to help improve this project. Dr. Ken Thurman, thank you for your mentorship all these years. Your passion and dedication to this field has inspired me since my undergraduate days and played a significant role in shaping the educator that I am today. Dr. David Mandel, thank you for starting Philly AIMS and for your continued efforts to improve services for students with autism in Philadelphia. As a teacher, your work provided me with essential training and now as a classroom-based consultant on your team, I see the depth of your passion for social justice and I have the privilege of continuing to do the work that I love. To my advisor, Dr. Matthew Tincani, thank you for encouraging me to pursue this project and for allowing me the extra time, providing additional advising sessions, and offering numerous rounds of edits. Thank you for your patience, humor, and guidance for the last eight years.

I would also like to express my gratitude to individuals outside of my committee who played an instrumental role in helping me complete this project. Dr. Arthur Dowdy, thank you for your assistance with recruitment and for going above and beyond to support this project. Zinnia Piotrowski and Diana Cooney, I am forever grateful for your mentorship and friendship for the last five years. Thank you for sharing your time, clinical expertise, and for helping me to become a better clinician. Thank you to Dr. Molly Candon and Dr. Julie Worley for imparting your research experience and helping me continue this project with confidence.

I would also like to thank Sharon Hart for being my dedicated teammate in the classroom for nine years. Thank you for teaching me how to manage a classroom and for always supporting me and the students in Room 211. I learned so much from our work together and I am forever grateful for your commitment to the students and for your friendship. Finally, I want to thank my husband, Jon Campisi, for taking care of us and for allowing me to focus my efforts on this project. Thank you for your unwavering support these last eight years.

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CHAPTER 1

INTRODUCTION

The Individualized Education Program (IEP) is intended to serve as a planning tool to ensure that school teams provide students with disabilities a free and appropriate public education (FAPE) and is perhaps the most critical component of the Individuals with Disabilities Education Act (IDEA), (Blackwell & Rosetti, 2014). The IEP must adhere to specific procedural and substantive requirements outlined in the law and must be reasonably calculated to provide some educational benefit to the student in order to provide a Free Appropriate Public Education (FAPE). An essential step in the IEP process includes the development of meaningful and measurable IEP goals based on students' present levels of performance and specific areas of need (Christle & Yell, 2010).

Despite the significant role that the IEP plays in meeting legal requirements of the IDEA, research has shown that the quality of IEPs for students with disabilities is generally low (Blackwell & Rosetti, 2014; Rakap, 2015). Failure to meet the substantive requirements outlined in the law is by definition a denial of a FAPE and opens schools up to the possibility of litigation. Research has shown that problems with IEPs for students with autism are the fastest growing and most expensive area of educational litigation (Etscheid, 2003). As a result, the quality of IEPs for students with autism has become an area of interest in the field and findings indicate that there is need for improvement (Ruble et al., 2015).

In an effort to address this need for improvement, researchers have focused on the development of interventions and training procedures to help teachers improve the quality of the IEPs that they write with demonstrated success (Pretti-Frontzcak & Bricker, 2000; Shriner, Carty, Rose, Shogren, Kim, & Trach, 2012). Increased training and professional development

for teachers is needed in order to improve IEPs for students; however, in-person training is met with challenges including cost, time constraints, and geographical barriers (Chang, Pham, Sobolewski, Doughty, Jamal, Kwan, Little, Brenkert, & Mathison, 2014). As a result, researchers are beginning to examine the effectiveness of asynchronous eLearning as means of delivering professional training (German et al., 2013). While synchronous e-learning via live webinars requires participants to view the content at the same time, asynchronous eLearning allows learners to view content at anytime (Noesgaard & Orngreen, 2015). The use of asynchronous eLearning modules is most relevant in the medical field, and has demonstrated positive learning outcomes for a number of students and medical residents in place of in-person, didactic training (Chang et al., 2014).

Over the last decade, several studies have been published investigating the effectiveness of asynchronous eLearning modules with a variety of students including undergraduate students (Nosik & Williams, 2011; Pollard et al., 2014), graduate students (Walker & Rehfeldt, 2012), medical students and residents (Chang et al., 2014), and behavioral therapists (Granpeesheh, Tarbox, Dixon, Peters, Thompson, & Kenzer, 2010). Researchers have used asynchronous eLearning modules on a variety of topics including training individuals to implement discrete trial training procedures (Nosik & Williams, 2011; Pollard et al., 2014), the principles and procedures of Applied Behavior Analysis (Granpeesheh et al., 2010), and single-subject methodology and concepts (Walker & Rehfeldt, 2012). The results of these studies demonstrate the potential benefits of utilizing asynchronous online modules to teach a variety of skills. The growing number of studies investigating the effectiveness of eLearning indicates several factors to consider when developing on-line trainings. These factors include interaction between the learner and content, instructional scaffolding, modeling, and support. A second important

factor noted is practice, which requires the learner to practice the skill through case studies or simulations (Noesgaard & Orngreen, 2015). Due to the need for active engagement, researchers have utilized Adobe Captivate software to develop eLearning modules (Pollard, Higbee, Akers, & Brodhead, 2014; Nosik & Williams, 2011; Walker & Rehfeldt, 2012; Chang et al., 2014). This particular software allows instructors to include video models and voice narration and can be programmed to include questions throughout the presentations to assess learning and ensure active engagement.

In summary, the literature on IEP quality clearly demonstrates a need for increased training for pre-service teachers and educators who currently develop IEPs for students. This need is perhaps more urgent for professionals who serve students with autism, as this has been documented as the costliest area of special education litigation (Etscheidt, 2003). Therefore, further research is needed to examine effective practices to teach educators how to write high quality IEPs that are based on objective assessments and align with the needs of students with autism.

In the current study, undergraduate students enrolled in an introductory special education course were taught to use results from a curriculum-based assessment to write measurable IEP goals and objectives through participation in a series of three e-learning modules. A two-way mixed analysis of variance (ANOVA) was conducted to examine within group differences from pre- to post- test and between group differences based on the method of eLearning training received. Additionally, independent samples t- tests were conducted in order to compare the quality of goals and objectives written for academic skills and goals targeting communication skills.

The research questions for this study are as follows:

1- To what extent does training delivered online improve the quality of IEP goals and short-term objectives written by undergraduate students enrolled in an introductory special education course?

2- What are the effects of the type of training received on the quality of written IEP goals and objectives?

3- Are there differences in the quality of goals and objectives that target social communication skills compared to goals and objectives that target academic skills?

CHAPTER 2

LITERATURE REVIEW

IEPs and Special Education Law

Over the past four decades, special education law has evolved from the Education for All Handicapped Children Act (EAHCA) of 1975 to its latest reauthorization in 2004, the Individuals with Disabilities Education Act (IDEA). Although the law has been amended and modified since its inception, the cornerstone has consistently been the requirement that schools provide students with disabilities a free and appropriate public education (FAPE; Zirkel, 2013). The IDEA defines FAPE as special education programs and services designed to meet students' individual needs provided by the public-school system at no cost to the students' parents or guardians (IDEA 20 U.S.C. § 1400, 2004). In other words, FAPE is a safeguard for students with disabilities to ensure that public education facilities cannot exclude them on the basis of disability (NRC, 2001).

Although changes have been made, the IDEA has consistently required school teams to develop an IEP as a means of providing students with a FAPE that is reasonably calculated to provide educational benefit. The IEP has been described as the primary tool for individualizing special education programs and services for students with disabilities (Blackwell & Rosetti. 2014; Rakap, 2015). The IEP has been at the center of most IDEA related court cases because this document has been the primary evidence of whether or not school teams have provided a FAPE (Christle & Yell, 2010).

When developing a student's IEP, teams must adhere to both procedural and substantive guidelines outlined in the IDEA. One important procedural requirement is the inclusion of a statement of the student's present levels of academic achievement and functional performance

(PLAAFP). The student's PLAAFP should be obtained through formal and informal assessments in the identified area(s) of need related to the student's disability (Hedin & DeSpain, 2018). This procedural requirement has been cited in the literature as a common area that IEP teams fail to fulfill, often resulting in legal disputes between schools and families (Christle & Yell, 2010).

The language used in the IDEA specifically states that hearing officers should use the substantive guidelines outlined in the law to determine if a student has been denied a FAPE (IDEA 20 U.S.C. § 1415(f)(1)(B)(i)(3)(E)(i)). Substantive errors commonly made by IEP teams include failure to address all of the student's educational needs; failure to link assessment data to instructional goals and objectives; and failure to develop annual goals that are measurable (Shriner et al., 2012; Christle & Yell, 2010). Any of these substantive errors can lead hearing officers to conclude that the IEP is insufficient and that the student has been denied a FAPE.

For several decades, the substantive requirements of IDEA were based on the Supreme Court's ruling in the seminal case, *Board of Education v. Rowley* (1982), requiring school teams to develop an IEP that is reasonably calculated to provide some educational benefit (Zirkel, 2013). The interpretation of the substantive standard set by the Rowley case varied across the circuit courts, with some courts holding school teams to a higher standard and others inferring a lower standard (Zirkel, 2013; Prince, Yell, & Katsiyannis, 2018). The recent U.S. Supreme Court decision in *Endrew F. v. Douglas County School District* is thought to have elevated the substantive standard from *Rowley*, requiring that the IEP be "reasonably calculated to enable the child to make progress appropriate in light of his circumstances" (*Endrew*, 2017, p. 15-16). It is unclear how this decision will be interpreted in future educational hearings, but it is imperative from a legal standpoint that educators are prepared and equipped to fulfill the procedural and

substantive requirements outlined in the law. In response to the *Endrew* decision, experts recommend that IEP teams ensure that they address all of the students' needs through formal and informal assessments; the IEP includes academic and functional goals that can be measured; and that the IEP includes a statement describing how goals will be measured and monitored for progress (Prince, Yell, & Katsiyannis, 2018).

IDEA Requirements: Measurable Goals/Objectives

The importance of clearly written, measurable IEP goals has been re-emphasized after the U.S. Supreme Court's decision in the *Endrew* case that the IEP must be reasonably calculated to enable the student to make appropriate progress in light of his/her circumstances (Prince, Yell, & Katsiyannis, 2018). The terminology used in the court's decision prompts the following questions: (a) what sections of the IEP will provide evidence that it has been *reasonably calculated,* (b) how can the IEP be written to ensure that student progress is monitored?

Assessment is an essential step in developing a reasonably calculated IEP. Objective data derived from formal and informal assessments are used to write a statement of the student's strengths and needs, also referred to as present levels of academic achievement and functional performance (PLAAFP). Researchers have continually emphasized the significant role that assessment plays in the IEP process, especially with the development of measurable annual goals (Hedin & DeSpain, 2018). Once the student's specific needs are identified, the team uses the information derived from assessment to write measurable goals and objectives that the student can reasonably achieve within the annual IEP term. Annual goals that are developed from a comprehensive assessment process are more likely to be individualized and align with the

student's specific needs (Pretti-Frontczak & Bricker, 2000), and therefore serve as evidence that the IEP has been reasonably calculated (Prince, Yell, & Katsiyannis, 2018).

The mandate for inclusion of measurable goals in the IEP has always been part of the IDEA; however, the outcome from the *Endrew* (2017) case has elevated the *de minimis* standard previously accepted. This decision will require IEP teams to provide sufficient evidence that a student has made progress in the identified area of need, or proof that the team made necessary instructional changes when progress is not demonstrated (Prince, Yell, & Katsiyannis, 2018). The information obtained from student assessment serves as baseline data that can be used to quantify the student's PLAAFP in the specified area of need and compared to data that is collected throughout the IEP term to measure progress. In order to adequately measure student progress, IEP teams need goals that are clearly and concisely written, and include indicators for how the skill or behavior will be measured (Hedin & DeSpain, 2018).

Components of Measurable Goals and Objectives

Instructional goals and objectives are a common topic of interest in the field of education, and recommendations for best practice often cite the work of Robert F. Mager, Ph.D. (Weatherly & Yell, 2017). According to his work, the purpose of writing educational objectives is to clearly identify the expected outcome or behavior from the student, and to connect performance data to the original objective to verify that the instruction was effective. When instruction begins with specific, measurable learning objectives, the instructional process becomes much more efficient and effective (Mager, 1997). Although variations exist in the recommended structure, the general consensus is that goals and objectives should include the following components; a

condition, the learner's name and the behavior, and a criterion for mastery (Mager, 1997; Rakap, 2015; Hedin & DeSpain, 2018).

The purpose of stating the condition is to clearly identify when or where the student is expected to perform the target skill. The condition statement also communicates to the IEP team when or during which activities data will be collected to monitor student progress on the goals and objectives. The condition statement might include a description of the instructional setting, the instructional activity, and/or a description of the instructional materials (Hedin & DeSpain, 2018). It is important that the condition statement includes enough information so that all members of the IEP team, including the parents, have consistent expectations related to the instructional goal/objective (Pretti-Frontczak & Bricker, 2000).

The goal statement must include the learner's name followed by a description of an observable behavior stated in positive terms. The observable behavior should be clearly defined and agreed upon by the entire IEP team and should be directly related to the intended outcomes. To ensure that the behavior is observable and objective, it can be helpful to include a topographical description of the behavior that describes how the student will demonstrate of perform the skill (Mager, 1997).

In addition to the condition and performance, a measurable goal or objective statement must include criteria for mastery. The purpose of including the criteria is to distinctly describe how well the IEP team expects the student to perform the skill, the timeframe in which the goal is to be achieved, and how often the student is expected to perform the skill to demonstrate mastery (Mager, 1997). Criteria are particularly useful within short-term objective statements because they indicate the expected level of performance at designated time-points during the IEP term (Hedin & DeSpain, 2018). The IDEA explicitly states that students who will take alternate

assessments must have IEPs that include benchmarks or short-term objectives that correspond with each annual goal (IDEA, 2004). The short-term objectives serve as benchmarks that can be used to determine if the student is making adequate progress in meeting the criteria outlined in the annual goal. If the student is not meeting the criteria outlined in the short-term objectives, the IEP team should meet to discuss the students' lack of progress and make any necessary instructional changes. This process will ensure that IEP teams are compliant with the elevated substantive standard of the IDEA and will serve as documentation of best practice in providing the student a FAPE that is reasonably calculated for the student to make appropriate progress (Prince, Yell, & Katsiyannis, 2018).

Interventions Targeting IEP Quality

Research has demonstrated that targeted, in-person training is an effective means of teaching educators to use assessment results to write quality IEP goals and objectives (Pretti-Frontczak & Bricker, 2000; Boavida, Aguair, & McWilliams, 2014). In an effort to address concerns regarding IEP quality, Pretti-Frontczak and Bricker (2000) led an intervention to train educators how to use a curriculum-based assessment to write high-quality IEP goals and objectives. Participants were 86 professionals working in early childhood special education across five states. Participants were asked to submit three IEP goals with corresponding objectives for students on their caseloads to establish measures of IEP quality pre-intervention. The participants included teachers, related service providers, and a few administrators. The IEP goals/objectives submitted were written for students ranging from three to six-years-old with mild, moderate, or severe disabilities.

Participants attended a two-day training to learn how to use results from the Assessment, Evaluation, and Programming System (AEPS) to write goals/objectives. The training was separated into six components, including (a) a description of the AEPS components, (b) a rationale for using the AEPS, (c) practice opportunities for administering the AEPS, (d) practice opportunities to summarize assessment results, (e) using the AEPS to select goals/objectives, and (f) using a five-step process to write measurable goals and corresponding objectives. Following training, participants were required to assess a student using the AEPS and use the results to write goals and objectives. The researchers used the *IEP/IFSP Goals and Objectives Rating Instrument* (GORI) to evaluate each goal/objective statement on five dimensions: functionality, generality, instructional context, measurability, and hierarchical relationship. The goals submitted following the intervention were rated as statistically significantly higher on all dimensions. The authors concluded that the two-day training was effective in teaching participants how to administer the AEPS, and to use the results to write quality goals and objectives (Pretti-Frontczak & Bricker, 2000).

In a similar study, Boavida, Aguaiar, and McWilliams (2014) investigated the effects of a targeted training program designed to teach participants to use assessment results to write functional, measurable IEP goals. Participants included 80 early childhood special education providers in Portugal. The training consisted of five in-person training sessions designed to teach participants to administer the Routines Based Interview (RBI) and use the results to write measurable, functional goals and objectives. Sample IEP goals were collected from participants prior to the training, and at a six- month follow-up after the training had ended. The researchers used the Goal Functionality Scale (GFSIII) to evaluate the quality and functionality of the sample goals. The mean GFS III score per IEP was 8.94 (SD = 3.03) before training and post-

intervention scores rose to 19.77, SD = 4.09; $t(67) = -16.09$, $p < .001$, $d = 3.04$. The results demonstrated a large effect size indicating that the training effectively taught participants to use results from the RBI to write higher quality IEP goals (Boavida, Aguair, & McWilliams, 2014).

In addition to group training, researchers have designed interventions to train educators to write goals and objectives through teacher consultation. Ruble, Dalrymple, and McGrew (2010) compared the quality of IEP goals for 35 teacher-student dyads randomly assigned to a control or intervention group. Teachers in the intervention group received consultation on writing IEP goals and objectives that specifically address the core deficits that are consistent with an autism diagnosis. During consultation, the coach worked with the teachers to write goals and develop teaching interventions that targeted students' specific social, communication, and behavioral needs. Students' IEPs were evaluated using the IEP Quality Assessment, a measure that was constructed and validated by the authors using quality indicators from the IDEA and recommendations from the NRC. Comparisons between the teacher-student dyads demonstrated higher quality scores for the intervention group ($M = 1.41$, $SD = 0.24$) compared to the control group ($M = 1.05$, $SD = 0.58$), $t(28$; equal variances not assumed$) = -2.6$, $p = .02$, $d = .81$ (Ruble, Dalrymple, & McGrew, 2010).

The results from these studies demonstrate promising outcomes and suggest that targeted training is a viable solution to teach educators to write goals and objectives that are individualized and legally sound. Although intensive training is effective, it is often met with significant barriers for researchers and school districts seeking to improve the quality of students' IEPs, including the availability of expert trainers, allotment of time for ongoing professional development, and the cost of providing intensive, in-person training (Pollard, Higbee, Akers, & Brodhead, 2014).

In an effort to circumvent the existing barriers, experts have utilized online learning platforms to deliver instructional content and provide resources for educators who write IEPs for students with disabilities. The University of Illinois IEP Quality Project (2006) focused on the development of a web-based tutorial that contained resources for IEP teams, including specific help topics and examples for each section of the IEP, planning worksheets to guide decision-making with student examples and scenarios, and a resource library with links to information on evidence-based practices (Shriner, Trach, & Yell, 2006). The developers of the tutorial evaluated its effectiveness by comparing the quality of IEP goals and objectives written by teachers who had full access, partial access, and no access to the web-based tutorial. IEPs were collected from teachers in all three groups pre- and post-intervention, and evaluated using the IEP Quality Indicator Scale for Goals/Objectives (IQUIS- Goals/Objectives, Yell et al., 2008). The scores on the IQUIS were generally low for all three groups at pre-intervention, and both the partial access and full access groups made significant positive improvements on quality ratings (Shriner et al., 2012).

The results from the University of Illinois IEP Quality Project are encouraging because they demonstrated that teacher access to a web-based tutorial resulted in improved quality of IEP goals and objectives. The web-based tutorial was made available to all teachers in the participating school district to serve as a continuing resource for teams to access throughout the IEP process (Shriner et al., 2012). These findings add to the existing IEP intervention literature, confirming that online training can yield positive effects in terms of IEP quality.

Recommendations for Future Training

Despite the existence of effective interventions, there are definite gaps in the research, specifically interventions aimed to teach professionals to write quality goals and objectives for students with autism. Reviews of IEPs for students with ASD suggest that the overall quality of written goals and objectives are low, and few IEPs include goals and objectives that specifically address students' social and communication needs (Ruble, McGrew, Dalrymple, & Jung, 2010). These findings align with stakeholder's perceptions that recommendations for best practice for students with ASD have been poorly implemented (Tincani, Cucchiarra, Thurman, Snyder, & McCarthy, 2014).

Over the past few decades, litigation concerning a FAPE for students with autism has become more prominent and costly for school districts (Burke & Goldman, 2015; Etscheidt, 2003). Further research is needed to develop effective interventions for special educators to learn how to write quality goals and objectives for students with ASD. Experts recommend that pre-service teacher programs focus more heavily on the development of IEP goals and objectives in order to adequately prepare special educators before they become teachers (Rakap, 2015). The importance of ongoing professional development and training on goal writing is also needed to ensure that special educators are informed of any changes or new recommendations for best practices. Studies investigating the efficacy of IEP interventions included recommendations for future research to teach participants how to use assessment results to write quality goals and objectives (Pretti-Frontczak & Bricker, 2000). Although the need for additional training is well documented in the literature, interventions involving in-person trainings can be expensive and also difficult to implement in geographically remote areas. Therefore, future research is needed to examine the effectiveness of IEP interventions delivered through eLearning platforms.

Use of eLearning to Meet Training Needs

Continued training and professional development delivered through eLearning is becoming more common due to the increased availability of technology and the potential cost-savings compared to in-person trainings (German et al., 2013). According to the literature, a major factor that influences effectiveness is the eLearning solution and process (Noesgaard & Orngreen, 2015). In order for eLearning to be effective, the learner must have opportunities to interact with the instructional content throughout the lesson and should receive immediate feedback related to her learning. Basic examples of learning interactions include answering multiple choice questions, fill-in-the blank responses, and true or false questions. More advanced examples of learning interactions include simulations, case-study decision-making, and answering open-ended questions (Noesgaard & Orngreen, 2015). The role of learning interactions in eLearning is consistent with recommendations for traditional classroom-based instruction in which the teacher must present learning content that will effectively and efficiently evokes the desired behavior of the student. By priming and shaping student responses and using techniques of sequencing, the teacher must program instruction that increases the student's chances of attaining the learning objective (Skinner, 1968). Whether instruction takes place in a classroom setting or online, the learner must have frequent opportunities to engage in responses that are specifically related to the intended learning outcomes.

In order to program frequent opportunities for the learner to respond, interventionists have used Adobe Captivate software to develop eLearning content (Chang et al., 2014; Pollard, Higbee, Akers, & Brodhead, 2014; Nosik & Williams, 2011). Adobe Captivate software includes features to create various learning interactions, including video simulations, drag-and-drop interactions, and software demonstrations. Each learning interaction can be programmed to

provide the learner with immediate feedback and advanced variables can be programmed using branch logic, moving through the learning content based on the participant's responses. Modules created using Adobe Captivate software are published to an online learning management system (LMS) that contains SCORM (shareable content object reference model) reporting capabilities, which records the learner's interactions and responses throughout the eLearning course (Bai & Smith, 2010). The instructor can then use the data collected on the students' responses to evaluate the effectiveness of the learning content.

Due to the increased use of eLearning platforms to deliver training, the effectiveness of these interventions has become an important topic for researchers. In a review of the eLearning literature, Noesgaard and Orngreen (2015) examined how effectiveness is defined. They concluded that eLearning interventions examined in educational research often define effectiveness by learning outcomes, such as a performance change from a pre-to-post-test or a letter grade in a course. In contrast, eLearning interventions within work-related training often define effectiveness as the transfer of application to practice (Noesgaard & Orngreen). Regardless of how effectiveness is defined, determining how effectiveness will be evaluated is an essential step in the development of any eLearning intervention.

Use of Asynchronous eLearning to Build Foundational Knowledge

A common advantage cited in the eLearning literature is the potential to provide foundational instruction that can be accessed at the learners' convenience, whereas in-person, didactic training is difficult to coordinate due to busy schedules and time constraints. Chang et al. (2014) examined the effectiveness of utilizing an asynchronous eLearning curriculum across multiple hospital sites to deliver training in pediatric emergency medicine (EM) as part of a

clinical rotation. Participants were 256 trainees from four large pediatric centers who were completing pediatric EM rotations. Participants in the control group received traditional, in-person didactic training and participants in the experimental group completed all of their training via asynchronous eLearning modules. Post-test comparisons between groups found a statistically significant association in improved test scores for the eLearning group. In addition to improved post-test scores, participants in the eLearning group had the opportunity to view the modules and repeat content as needed due to the individualized pace. The authors also noted that training delivered through asynchronous eLearning modules is an effective means to standardize training across multiple institutions, particularly at hospitals with limited resources to deliver adequate training (Chang et al., 2014).

In another study, Granpeesheh et al., 2010 examined the effectiveness of an interactive computer-training package to teach 88 newly hired behavioral therapists basic principles and procedures of applied behavior analysis (ABA). Participants in the control group received traditional in-person, didactic training while participants in the eLearning group completed modules that covered the same content. Between group comparisons from pre-to-post test demonstrated that both groups made statistically significant gains. It was noted that the gains made were statistically significantly higher for the group that received in-person training, which the authors hypothesized was due to the presence of a live trainer who was able to provide opportunities to ask questions and clarify misunderstandings. Although the group who received in-person training made greater gains, both groups demonstrated improved acquisition of the principles and procedures of ABA. These findings are consistent with other studies demonstrating that foundational content can effectively be taught using interactive eLearning solutions (Chang et al., 2014).

Utilizing eLearning solutions to deliver foundational content has proven to be effective and allows more time for complex instruction to be covered during traditional, in-person didactic trainings. German et al. (2013) examined the knowledge, competency, and retention outcomes of a two-phase model designed to train community mental health providers (CMH) in cognitive behavior therapy (CBT). In the first phase, 214 clinicians from various CMH agencies received training though in-person workshops followed by expert-led consultation in CBT (IPEL; in-person, expert led). In the second phase, 148 newly hired clinicians at the participating CMH agencies received web-based training followed by trained peer consultation in CBT (WBTP; web-based, peer trained). The web-based training curricula was identical to the content from the IPEL phase, and included various learning interactions, such as video recorded scenarios, decision-making prompts, and interactive quiz questions. Findings from this study showed no statistically significant differences in knowledge acquisition between participants, suggesting that the web-based training was not inferior to the in-person expert-led training. The researchers concluded that using a two-phase training model was effective in building and sustaining expertise within CMH organizations and can serve as a viable solution to deliver training in fields with high staff turnover. Furthermore, the WBTP phase required 8% of the resources of the IPEL phase, yielding significant savings in terms of training cost and time (German et al., 2013).

Use of Asynchronous eLearning to Teach Applied Skills

Due to the advancements and availability of interactive eLearning software, instructors now have the option of delivering performance training that would traditionally require the physical presence of an expert trainer. Pollard, Higbee, Akers, and Brodhead (2014) examined

the effectiveness of interactive eLearning modules in teaching four undergraduate special education students discrete trial instruction (DTI) procedures. Participants completed four eLearning modules on the principles and procedures of DTI, followed by in-person role-play of a DTI session with an adult trainer. The eLearning content included frequent opportunities for participants to answer open-ended questions and receive immediate feedback. Additionally, the modules included video examples of correct and incorrect implementation of DTI and self-guided practice opportunities in which the learner performed skills while viewing a video example. Following completion of the eLearning modules, participants were observed implementing DTI procedures with a child with autism. Implementation fidelity of DTI procedures increased from a baseline average of 25% to an average of 93%, suggesting that eLearning may be a viable tool for training practitioners in DTI.

In a similar study, Nosik and Williams (2011) trained four undergraduate psychology students working at a day program for adults with developmental disabilities to implement DTI and backward chaining (BC) procedures. The eLearning modules contained information on the teaching procedure, including the purpose, critical steps, prompts, and fading of prompts. Participants were required to answer several multiple-choice questions correctly before moving on to the next part of the module. The modules included video examples of correct and incorrect implementation of both procedures and participants were required to evaluate the video examples using a checklist. Immediately after viewing each module, participants were asked to implement the DTI or BC procedures with a live research assistant playing the role of the learner. All four participants showed rapid skill acquisition in both procedures following completion of the eLearning modules, demonstrating that computer-based training is a practical medium for the delivery of behavior skills training.

Important Considerations for eLearning

The benefits of utilizing eLearning for educational and training purposes are well documented in the literature (Bai & Smith, 2010). Delivering training through an eLearning solution can be both efficient and cost-effective (German et al., 2018) and has the potential to reach audiences that are geographically isolated (Pollard, Higbee, Akers, & Brodhead, 2014; Granpeesheh et al., 2010). Additionally, eLearning is flexible and can be completed at the learner's discretion, allowing individuals balancing multiple responsibilities to further their education (Nosik & Williams, 2011). These benefits alone have the potential to address disparities in training and education often experienced by professionals working in locations in which expert trainers are not readily available.

Another important benefit of eLearning is the availability of advanced software that permits the learner to interact with the instructional content. Technological improvements such as SCORM packaging, allow instructors to create lessons using eLearning software and to publish their courses on a learning management system (LMS). The first three letters in the acronym, SCORM, are referred to as SCOs, or shareable content objects. Essentially, all of the instructional content such as pictures, videos, text, and learning interactions make up the SCO's in an eLearning course. The last two letters of the acronym, RM stands for reference model, which refers to the standardized requirements within the eLearning industry. When instructional designers create eLearning content using an authoring tool that is SCORM compliant, the eLearning content can be published to an LMS with SCORM reporting capabilities. SCORM compliance is a standard that ensures that the eLearning content will link with any LMS and that the learner's experience will not vary across different LMSs (Papazoglakis, 2013). These

technological developments ensure that eLearning exercises align with best instructional practices by providing the learner with frequent opportunities to practice skills, programmed feedback, and realistic learning simulations (Walker & Rehfeldt, 2012). New eLearning software has transformed the role of the online learner from a passive to an active participant in the learning process.

While the benefits of eLearning are notable, it is important to consider the potential disadvantages when developing an eLearning course. Nosik and Williams concluded that their eLearning intervention was effective in teaching undergraduate students DTI; however, the development of one 20-minute training video took 40 hours to create. Based on their recommendations, one should compare the potential benefits with the cost of creating the eLearning content to ensure that valuable resources are not misallocated (Nosik & Williams, 2011).

Delivering training through eLearning without the presence of an expert trainer is often cited as a benefit; however, there are also potential disadvantages. Granpeesheh et al. compared learning outcomes for participants who received in-person versus online training in the foundational principles of ABA. Although both groups made statistically significant gains, the group that received in-person training had greater gains than the eLearning group. The authors attributed this discrepancy to the availability of an expert trainer to answer questions for the in-person group. Additionally, German et al. (2018) found that the absence of a live trainer decreased the chances of participants completing the entire training series compared with participants who received in-person training from an expert in CBT. The authors hypothesized that failure to complete the training series may have been due to lack of comfort with technology and decreased chances of accountability for not completing the training.

Based on the potential advantages and disadvantages of utilizing an eLearning solution, instructional content delivered through eLearning must be evaluated for efficacy (Walker & Rehfeldt, 2012). Regardless of whether instruction takes place on a computer or in-person, the instructor must create learning activities that align with the intended learning objectives. The instructor must then evaluate the students' data to verify that the instructional objectives are met, and should adjust learning activities when the data demonstrates poor outcomes.

Conclusions

The development of an IEP that is reasonably calculated to provide meaningful educational benefit is an essential requirement of the IDEA that ensures students with disabilities have been granted a FAPE. Under the IDEA, school teams must adhere to both procedural and substantive standards when developing an IEP, and failure to do so invites the possibility of costly litigation and potentially poor outcomes for students. Research on the quality of IEPs shows that the substantive requirements of the IDEA are most commonly cited in special education litigation, specifically the failure to link IEP goals to objective assessment data and that the IEP goals are often not measurable (Shriner et al., 2012; Christle & Yell, 2010).

The mandate for inclusion of measurable goals in the IEP has always been part of the IDEA; however, experts believe that the recent U.S. Supreme Court decision in *Endrew F. v. Douglas County School District* has elevated the *de minimis* standard previously accepted (Prince, Yell, & Katsiyannis, 2018). According to expert recommendations, this recent decision places more emphasis on the use of objective assessment data to write a comprehensive statement of the student's strengths and needs related to his disability and the development of measurable annual goals that are based on data derived from the assessment (Prince, Yell, & Katsiyannis, 2018).

A stricter interpretation of a FAPE now exists, yet research shows that IEP quality is generally low and would likely fail to fulfill the stricter substantive requirements of the IDEA. These findings are concerning for all students with disabilities, but perhaps more significant for IEP teams serving students with autism, as this population is more likely to resort to litigation (Burke & Goldman, 2015; Etscheidt, 2003). The general consensus among experts contends that pre-service teacher training programs need to employ better strategies to adequately prepare pre-service teachers to write quality IEPs that specifically address the core deficits consistent with an autism diagnosis (Burke & Goldman, 2015; Ruble, McGrew, Dalrymple, & Jung, 2010). Additionally, a significant need for training exists for teachers who currently serve students with autism based on findings that many IEPs fail to address students' social and communication needs, quite arguably the greatest area of need for students with autism (Ruble, McGrew, Dalrymple, & Jung, 2010).

Although research has demonstrated promising outcomes from targeted training (Boavida, Aguiar, &McWilliams, 2014; Ruble, Dalrymple, & McGrew, 2010; Pretti-Frontczak & Bricker, 2000), traditional in-person training can be costly and time-consuming, and requires the presence of an expert trainer. Therefore, research is needed to identify plausible solutions to the barriers that exist with providing pre-service teachers and experienced teachers training in writing IEPs. One potential solution is to deliver training online, using advanced eLearning software. Once developed, the eLearning content must be evaluated and analyzed to verify the efficacy of instruction.

In the current study, undergraduate students enrolled in an introductory special education course completed a series of e eLearning modules designed to teach participants how to use results from a curriculum-based assessment to write measurable IEP goals and objectives.

Comparisons between the quality of written IEP goals and objectives from pre- to post-test served as the primary outcome measure for this study.

The research questions for this study are as follows:

1. To what extent does training delivered online improve the quality of IEP goals and short-term objectives written by undergraduate students enrolled in an introductory special education course?
2. What are the effects of the type of training received on the quality of written IEP goals and objectives?
3. Are there differences in the quality of goals and objectives that target social communication skills compared to goals and objectives that target academic skills?

CHAPTER 3

METHODS

Design

The purpose of this study was to examine whether participation in a series of eLearning modules resulted in improved quality of written IEP goals and objectives among participants enrolled in an introductory special education course. In addition, this study sought to examine potential differences in outcomes between participants based on the method of eLearning using a randomized group comparison design. Participants were randomly assigned to receive training through participation in interactive learning modules or by viewing non-interactive videos. Further analyses were conducted to examine differences on specific quality indicators based on the type of training received and to identify differences in quality between goals written for academic and communication skills.

A statistical power analysis was completed using data from a brief pilot study in order to determine an appropriate samples size for the current study. The pilot study was completed during the previous semester and included 14 participants recruited from the same university program as the present study. The power analysis was calculated comparing participants' pre-test scores (M = 6, SD = 6.5) and post-test scores (M = 15, SD = 9.1). With an alpha = .05, and power = .80, the projected sample size needed was N = 32.

Dependent Measures

Pre- and Post-Intervention Measures

Comparisons between the quality of written IEP goals and objectives from pre- to post-test served as the primary outcome measure for this study. Participants were instructed to view

an example student's assessment, and use the results to write IEP goals and objectives related to the student's needs. The pre- and post-tests included the example student's assessment information from the STAR program. The STAR curriculum stands for Strategies for Teaching based on Autism Research and the student learning profile (SLP) is the curriculum-based assessment that is used to identify students' present levels of performance and to identify areas of need. The SLP includes six domains that assess specific skills that are consistent with recommendations for best practice when developing an educational program for a student with autism (Arick, Krug, Loos, & Falco, 2004) .

Since the SLP is not available as an electronic document, the assessment was modified for visibility and edited to match formatting, necessary for publishing on the course Canvas site. All of the content was retyped and matched the content within the original SLP. The pre- and post-test included the assessment pages and program guides from the *Spontaneous Language Concepts* and *Preacademic Concepts* sections. The assessment page included the following; the lesson name, an example instructional cue, the target skill, and the student's response. The program guide is used to help the instructor identify mastered lessons and to select a target lesson that follows the program's scope and sequence.

Participants were instructed to use the example student's assessment information from the *Spontaneous Language Concepts* section to select an appropriate target skill that followed the program scope and sequence. Participants were instructed to write one annual goal and two corresponding short-term objectives that addressed the student's communication needs. Next, participants were instructed to follow the same procedures using information from the *Preacademic Concepts* section to write one annual goal and two corresponding short-term objectives that addressed the student's academic needs.

IEP Quality Indicator Scale for Goals and Objectives

Participants' pre- and post-tests were evaluated using a slightly modified version of the *IEP Quality Indicator Scale for Goals and Objectives* (IQUIS- Goals/Objectives; Yell, 2008). The IQUIS-Goals/Objectives was developed for the federally funded IEP Quality Project in Illinois and was used to measure the quality of written IEP goals and objectives. The authors developed the measure after conducting a review of the literature and existing scales used to evaluate IEP quality. In order to validate the measure, a panel of national consultants completed a content analysis followed by two rounds of revisions based on feedback. The final measure included 12 items that correspond to a quality (substantive) indicator and was used to measure each IEP goal and corresponding objectives individually. The items are scored "1" if the statement meets the requirement and "0" if it does not meet the requirement (Shriner et al., 2012).

The IQUIS-Goals/Objectives was used in the Illinois IEP Quality Project, which focused on teaching participants to write standards-aligned IEP goals and objectives. The researchers reported that 93% of the IEP goals and objectives evaluated in this study were goals written for academic skills and the remaining 7% were goals targeting specific learning strategies (Shriner et al., 2012). The focus of the current study was to evaluate the substantive quality of IEP goals and objectives for students with autism, specifically goals that address deficits in the use of social communication. Therefore, the item on the IQUIS-Goals/Objectives that evaluates the inclusion of state standards was replaced with an item that evaluates participants' consideration of the STAR SLP lesson scope and sequence.

A codebook was created (see Appendix A) to include specific operational definitions for each quality indicator listed in the IQUIS- Goals/Objectives. Additionally, operational definitions were expanded for quality indicators examining the inclusion of a criterion on the goal and objectives statements. In response to the recent Supreme Court decision (*Endrew, 2017)*, experts recommend that IEP teams ensure that goal and objective statements include a clear description of plans to measure and monitor the skill and explicitly describe how mastery of the goal will be determined (Prince, Yell, & Katsiyannis, 2018). Therefore, the quality indicator examining inclusion of a criterion in the goal or objective statement was expanded to capture specific differences in quality based on participants' description of how the goal or objective will be monitored and measured for mastery. Goal statements were evaluated on 12 quality indicators and scored "1" if the statement met the indicator or "0" if the statement did not meet the indicator. The quality indicators for goal statements are listed in Table 3.1.

Each objective statement was evaluated on 13 quality indicators using the same soring criteria described for the annual goal statements. The quality indicators for objective statements are listed in Table 3.2. Participants' pre- and post-tests included one annual communication goal and one annual preacademic goal. Participants also wrote two short-term objectives for each goal. Therefore, participants could earn up to 76 points on the pre- and post-tests.

Table 3.1

The IEP Quality Indicator Scale- Goals (IQUIS)

Annual Goal Quality Indicator	Score	
Includes Condition	1	0
Condition Appropriate	1	0
Observable & Measurable Target Behavior		
Description of Behavior*	1	0
Behavior is Observable*	1	0
Criterion for Acceptable Performance		
Number for Mastery*	1	0
Timeframe*	1	0
Timeframe Precedes IEP*	1	0
Criterion & Data		
Expectation for Response*	1	0
Response Measured*	1	0
Data for Mastery*	1	0
Evidence of Consideration for Alignment with Assessment*		
Skill from Assessment*	1	0
Assessment Sequence*	1	0

Note. Items that were modified or added include an *

Table 3.2

The IEP Quality Indicator Scale- Objectives (IQUIS)

Short-Term Objective Quality Indicator	Score	
Includes Condition	1	0
Condition Appropriate	1	0
Observable & Measurable Target Behavior		
Description of Behavior*	1	0
Behavior is Observable*	1	0
Match Between Behaviors (Goal & Objective)		
Matches Goal*	1	0
Breaks Goal Down*	1	0
Criterion for Acceptable Performance		
Number for Mastery*	1	0
Timeframe*	1	0
Timeframe Precedes IEP*	1	0
Benchmark Date*	1	0
Criterion & Data		
Expectation for Response*	1	0
Response Measured*	1	0
Data for Mastery*	1	0

Note. Items that were modified or added include an *

Inter-rater Reliability

The pre- and post-tests were scored by the primary investigator and a second observer. Both raters are certified teachers with master's degrees in special education who have extensive experience developing IEP goals and objectives for students with autism. Additionally, both

raters are Board Certified Behavior Analysts and have over ten years of experience in teaching communication to students with autism.

In order to ensure inter-rater agreement, both raters independently scored one pre-test using the operational definitions included for each quality indicator on the IQUIS-Goals/Objectives. The independently scored pre-tests were then compared for agreements and disagreements, yielding agreement on 97% of the indicators. This process was repeated with a second pre-test and the raters had agreement on 99% of the indicators. Based on the high level of agreement, the second rater scored 30% of the pre-tests and 30% of the post- tests independently. The primary rater then compared each assessment for the total number of agreements to ensure that 80% agreement had been achieved.

Independent Variable

The purpose of this study was to examine whether participation in a series of eLearning modules resulted in improved quality of written IEP goals and objectives among participants enrolled in an undergraduate special education teacher preparation program. Participants were randomly assigned to one of two groups (hereinafter referred to as Captivate Group and Video Group) in order to examine potential differences in outcomes based on the method of eLearning in which the training was delivered. The content covered in both training conditions was identical, however, participants in the Captivate Group completed training with opportunities to interact and respond to the learning content. Table 3.3 includes an overview of the content covered in each module.

Module 1: Introduction to Writing Measurable Goals and Objectives

The first module provides an overview of the characteristics of autism and recommendations for best practices when developing an educational program for students with autism, highlighting the importance of including goals that address deficits in communication and social interactions (NRC, 2001). The rest of the module focuses on the components of measurable IEP goals and objectives, specifically the inclusion of a condition, a behavior, and criteria for mastery (Mager, 1997).

Module 2: Writing Measurable Communication Goals

The second module highlights the importance of using objective assessments to identify students' present levels of performance in all identified areas of need in order to develop an appropriate IEP (Pretti-Frontczak & Bricker, 2000; Hedin & DeSpain, 2018; Prince, Yell, & Katsiyannis, 2018). The module includes a brief introduction to the STAR SLP as a curriculum-based assessment for students with autism and illustrates specific components of the assessment that directly relate to the essential components of a measurable goal statement. The module demonstrates how to use the assessment information to identify mastered lessons and to select one target lesson for sample students using the program guide scope and sequence. Once a target lesson is identified, the learner is guided through the process of using the information in the *Spontaneous Language Concepts* section to write a communication goal and two corresponding short-term objectives.

Table 3.3

Module Content Overview

Module Title	Learning Objectives	Training Time	
		Video	Captivate
Module 1: Introduction to Writing Measurable Goals & Objectives	Brief overview of autism characteristics Recommendations for developing an IEP for students with autism Examine the difference between an annual goal and short-term objective Identify the components of measurable goals & objectives	14 minutes	19 minutes
Module 2: Using Assessment to Write Measurable IEP Goals	Role of assessment in the IEP process Introduce a curriculum-based assessment (STAR SLP assessment) Demonstrate how to use the SLP results to identify an appropriate IEP goal Demonstrate how to write a measurable goal using information from the assessment	17 minutes	23 minutes
Module 3: Teaching Spontaneous Language to Students with Autism	Discuss important considerations for teaching language to students with autism Review lessons in the Spontaneous Language Concepts section of the SLP View case examples for different students Summarize key points from the learning module series	16 minutes	23 minutes

Module 3: Teaching Spontaneous Language to Students with Autism

The content in the third module was developed based on results from a small pilot study that was conducted to test the utility of the modules. During the brief pilot study, 14 students enrolled in the same urban university as the present study, completed the pre-test, the first two modules, and a post-test. All of the participants completed the modules in the interactive conditions. The results from the post-test indicated significant improvement in the quality of written IEP goals and objectives t (13) = 3.96, p = .002. Although the results indicated a positive effect, it was clear to the raters that the condition included in the communication goals described communication skills that would be targeted during an adult-led, structured learning activity and did not specifically target students' use of language spontaneously. Therefore, the author created the third module with the goal of providing an overview of the different functions of communication.

The third module provides a very brief overview of important considerations for teaching language to students with autism, highlighting the fact that it is a very basic summary of a highly complex topic. Participants are guided through an example demonstrating how the function of saying "water" is different if a person is using the word to make a request, to answer a question, or to make a comment. The module includes an example student's program guide in which the student has demonstrated mastery of many lessons in the *Receptive and Expressive Language Concepts* sections of the SLP but has not mastered any lessons in the *Spontaneous Language Concepts* section. This example serves to show participants that although the student is able to use language to answer questions and participate in structured, teacher-led activities, he is not using language spontaneously in everyday, natural settings to make requests, to answer questions, or to make comments.

The second section of the third module guides participants through the three lessons in the *Spontaneous Language Concepts* section of the SLP; *Requesting, Initial Commenting, and Answering Wh- Questions*. This section of the module concludes by pointing out that the STAR SLP is just one assessment that can be used to identify students' present levels of performance in the area of communication and identifies other useful assessments, including *The Verbal-Behavior Milestones Assessment and Placement Program* (Sundberg, 2007) and *The Assessment of Basic Language and Learning Skills-Revised* (Partington, 2006). The final take-away from the brief overview provided is that "the primary purpose of a language assessment should be to identify specific verbal deficits and serve as a guide for the development of an appropriate language intervention program", (Sundberg & Partington, 1998, p. 8).

The third module concludes with individual examples of student goals for each of the three lessons in the *Spontaneous Language Concepts* section of the SLP assessment, including a goal to make request, a goal to make comments spontaneously, and a goal to answer questions during unstructured free play. The module concludes with a brief review of the content covered in the module series.

Captivate Group

The interactive eLearning modules were developed using Adobe Captivate software. Adobe Captivate software is used to create eLearning content that allows the learner to engage with the content through different interactions including simple quiz questions, drag-and-drop diagrams, and video simulations. Content created using Adobe Captivate must be published on a learning management system (LMS) in order for students to be able to access the courses.

Participants in the Captivate Group were required to complete several learning interactions throughout each module. The types of learning interactions included opportunities to answer multiple choice, true or false, and fill-in the blank questions related to the content covered in the module. In the event that the learner answered incorrectly, a text prompt with the correct answer was provided. In addition to answering knowledge check questions, learners were required to complete drag-and-drop learning interactions to label the components of a measurable goal, to distinguish annual goals and short-term objectives, and to sort behavior statements into categories labeled measurable and ambiguous. All of the drag-and-drop interactions were programmed to reject incorrect responses and the learner had infinite opportunities to provide the correct answer.

In addition to the knowledge check interactions, the modules presented to the Captivate Group included click-to-reveal interactions by programming advanced variables, allowing participants to choose the order in which certain content was viewed. Based on recommendations for eLearning best practices, an interaction was programmed at a minimum of every three minutes to ensure that the learner was an active participant (Walker & Rehfeldt, 2012). Appendix B includes a detailed summary of the learning interactions completed by the Captivate Group in each module.

Video Group

Participants in the Video Group were required to view the modules as recorded MP4 videos. The researcher created each video using Movavi Screen Capture Software to record the computer screen while completing the interactive learning modules. Once the video was recorded for each module, the researcher used Movavi Video Editing Software to remove all of

the learning interactions from the modules. Therefore, participants in the Video Group viewed the same content as the Captivate Group but had no opportunities to view or complete any of the learning interactions.

Participants

Participants in this study included undergraduate students enrolled at a large, urban university in the northeastern United States. Participants were recruited from an Introduction to Special Education course in the College of Education. Table 3.4 includes the number of participants recruited, the number of participants included in data analyses, and information regarding attrition for this study.

Recruitment

Permission to recruit participants and conduct the study was granted by the college, department, instructors of the course sections, and the university's Institutional Review Board. The instructors of the course sections uploaded a recruitment video on the course site. The recruitment video was created by the researcher using Movavi video editing software and contained video blocks and voice-over narration. The recruitment video provided a brief overview of the goals for the study. Additionally, the video reviewed the number of required assignments and the estimated time for completion of each task. The two-minute recruitment video concluded with a hyperlink to complete an electronic consent form through Qualtrics Database for students interested in participating in the study. The video also included email contact information for the researcher in the event that students had additional questions or concerns regarding participation in the study.

Students who chose to participate in the study earned extra credit upon completion of each requirement. In order to protect against coercion to participate, the course instructors offered a separate assignment to complete for extra credit for students who did not wish to participate in the study. Students in all sections of the course were permitted to complete either assignment voluntarily, but not both. Recruitment for the study was open for ten calendar days, after which students could no longer consent to participate. Electronic consent forms were completed by 46 participants before the end of the recruitment period.

Randomization

In order to plan for randomization of group assignment, the author created a list of participants organized chronologically by date that consent forms were received. Participants were randomly assigned to groups using a coin toss, with heads assigned to the Captivate Group and tails assigned to the Video Group. In order to ensure equal groups, the coin toss was conducted for every other participant and the next participant on the list was assigned to the opposite group (Video Group (n) = 23; Captivate Group (n) = 23).

Participant Attrition

Following randomization procedures, participants who consented to participate in the study (n = 46), were granted access to the Canvas course created for the study in order to complete the pre-test, eLearning modules, and post-test. As seen in Table 3.4, five participants did not complete any of the study components (Video Group = 3; Captivate Group = 2). Additionally, nine participants completed the pre-test only (Video Group = 4; Captivate Group = 5), and therefore data for these participants was excluded from all analyses.

Table 3.4

Study Participants

	Video Group	Captivate Group	Total
Consented to Participate	23	23	46
Consented- Completed All Components	16	16	32
Consented- No Components Completed	3	2	5
Consented- Completed Pre-Test Only*	4	5	9

*Data was excluded from analyses

Apparatus and Setting

Once group assignments were complete, the researcher added each participant to the Canvas course created for the study. An email notification was automatically generated to notify participants that they had been added to the course on Canvas. The researcher created a Captivate Group and a Video Group on the Canvas course page and published the interactive assignments for the Captivate Group to access and the video assignments for the Video Group.

Upon receiving the email notification of enrollment in the course, participants were given access to the pre-test, which was published and assigned to both groups. The email also included instructions for completing all of the study requirements. Participants were instructed to complete a pre-test, three eLearning modules, and a post-test before the deadline, which was 10 days after receiving notification of enrollment. The assignments could be completed at any time, but access to each assignment was contingent on completion of the previous assignment. In other words, participants could not access the first module until the pre-test was completed, the second module until completing the first, and so on.

Participants were required to complete the study assignments outside of class-time. Since the assignments were published to the Canvas course, students could complete each assignment on their personal computers or mobile devices at any time. The interactive eLearning modules were created using Adobe Captivate Software and were published as responsive projects, which allows users to access the material either on a desktop computer or a mobile device, such as a tablet or cell phone without altering the appearance of the content. The modules viewed by the Video Group were uploaded on Canvas as MP4 files, and could also be viewed on a computer, mobile device, or a cell phone.

Data Analysis

The statistical software packages SPSS was used for all data analyses. Preliminary analyses were conducted to test for potential differences between groups prior to receiving the intervention. Independent samples t tests were conducted to determine whether participants in the Captivate Group and Video Groups differed on any of the following variables; (a) number of college credit hours completed, (b) number of credit hours completed in the special education undergraduate program, (c) overall grade point average (GPA), and (d) quality of written goals and objectives on the pre-test. Since preliminary analyses revealed no statistically significant differences between groups, the researcher continued with further analyses.

In order to answer Research Question 1 ("To what extent does training delivered online improve the quality of written IEP goals and short-term objectives?") and Research Question 2 ("What are the effects of the type of training received on the quality of written IEP goals and objectives?") data analyses were conducted comparing participants' performance from pre- to post-test. A two-way mixed analysis of variance (ANOVA) test was conducted using the pre-

test and post-test scores as the within group factor and training received as the between group factor. This statistical test was selected due to the fact that the same participants were tested at two time points and participants were assigned to one of two groups (Howell, 2002). Results from the two-way mixed ANOVA were analyzed to determine whether the null hypotheses (the means of the levels of the within-subjects factor are equal; the means of the levels of the between-subject factor are equal; there is no interaction effect for group and time tested) could be rejected. Additionally, participants' pre-test and post-test scores were evaluated using the Shapiro-Wilk's test in order to test whether the data met the assumption of normality within each group (Howell, 2002).

In order to answer Research Question 3 ("Are there differences in the quality of goals and objectives that target social communication skills compared to goals and objectives that target academic skills?") paired samples t-tests were calculated comparing the quality of academic goals and objectives to the quality of communication goals and objectives written at pre- and post-test.

Additional Analyses

Additional analyses were conducted following the two-way mixed ANOVA in order to identify potential differences between groups on individual quality indicators in the IQUIS. Due to the small sample size of this study ($n < 20$), the researcher was unable to conduct analyses to compare differences between groups on each section of the pre- and post-tests, treating each section as a separate outcome variable (Howell, 2002). Therefore, the researcher ran McNemar's tests on the 12 individual quality indicators for the annual goal statements and McNemar's tests on the 13 individual quality indicators for each short-term objective statement.

Although McNemar's test is not commonly utilized in social sciences research, it has been cited as an ideal statistical test for examining differences in studies with related samples (Adedokun & Burgess, 2012). The purpose of conducting McNemar's test is to identify the proportion of participants with discordant paired data (did not meet indicator on pre-test and met indicator on post-test; or met indicator on pre-test and did not meet indicator on post-test) and identify the likelihood that these changes occurred by chance alone (Adedokun & Burgess, 2012).

Social Validity

Participants were asked to answer additional questions at the end of the post-test in an effort to gain user feedback on the training received. Participants responded to seven questions related to beliefs about the importance of learning to write IEP goals and objectives, the impact of quality IEP goals and objective for students with disabilities, and the participants' experiences completing the modules. Participants responded to each question using a Likert-rating scale and responses were examined for participants in each training group.

CHAPTER 4

RESULTS

Preliminary Analyses

Participants were randomly assigned to either the Video Group or the Captivate Group. Independent sample t-test were conducted on participant characteristics in order to verify that the variances between the two groups were not statistically significant prior to training. Participant characteristics are outlined in Table 4.1. Participants in the Video and Captivate Group did not differ on GPA ($t(30) = .958$, $p = .346$), course credits completed ($t(30) = .393$, $p = .697$), or number of special education courses taken ($t(30) = .367$, $p = .716$).

Table 4.1
Participant Characteristics

	Video Group (n = 16)		Captivate Group (n = 16)		Total (n = 32)			
Variable	M	SD	M	SD	M	SD	*t*	*p* value
GPA	3.39	.517	3.55	.406	3.47	.464	.958	.346
Credits	58.63	28.76	62.94	33.21	60.78	30.64	.393	.697
Special Ed. Courses	1.69	.793	1.81	1.11	1.75	.950	.367	.716

Additionally, an independent samples t-test was conducted on participants' pre-test scores to ensure that the group means were not statistically significantly different prior to intervention. The results summarized in Table 4.2 conclude that there were no significant differences between groups on the pre-test, $t(30) = -.527$, $p = .602$.

Table 4.2

Pre-Test Scores Group Comparison

	Video Group (n = 16)		Captivate Group (n = 16)		Total (n = 32)			
Variable	M	SD	M	SD	M	SD	*t*	*p* value
Pre-Test Score	19.94	10.98	18	9.78	18.97	10.27	-.527	.602

Due to the small sample size in each group (n > 20), participants' scores on the pre- and post-tests were examined to verify a normal distribution of scores within each group (Howell, 2002). Results from a Shapiro-Wilk test in Table 4.3 showed no significant departure from normality in the distribution of pre-test scores for the video group, W(16) = .963, p = .707, or for the captivate group, W(16) = .957, p = .660.

Table 4.3

Pre-Test Scores Test for Normality

					Shapiro-Wilk		
Group	n	Range	M	SD	Statistic	df	Sig.
Video	16	3- 41	19.94	10.976	.963	16	.707
Captivate	16	0 - 42	18.00	9.778	.957	16	.660

Additionally, results from the Shapiro-Wilk test in Table 4.4 verify that post-test scores did not violate the assumption of normality for the video group (W(16) = .946, p = .434) or the captivate group (W(16) = .930, p = .240).

Table 4.4

Post-Test Scores Tests for Normality

					Shapiro-Wilk		
Group	n	Range	M	SD	Statistic	df	Sig.
Video	16	12 - 64	38.88	16.966	.946	16	.434
Captivate	16	18 - 69	41.44	17.220	.930	16	.240

Analyses for the Primary Research Questions

In order to answer Research Question 1 ("To what extent does training delivered online improve the quality of written IEP goals and short-term objectives?") and Research Question 2 ("What are the effects of the type of training received on the quality of written IEP goals and objectives?") data analyses were conducted comparing participants' performance from pre- to post-test. A 2 X 2 mixed analysis of variance (ANOVA) test was conducted using time (pre- and post-test scores) as the within group factor and type of training received as the between group factor.

The results of the analyses displayed in Table 4.5 indicate that there was a significant main effect of time ($F(1,30) = 61.155$, $p < .001$, $\eta_{p2} = .671$) on the quality of written goals and objectives from pre- to post-test. These results show that participants in both groups wrote higher-quality goals and objectives after completing the training, however, there was no significant interaction between time and group ($F(1,30) = .690$, $p = .413$, $\eta_{p2} = .022$). Although the Captivate Group performed slightly better on the post-test ($M = 41.44$, $SD = 17.220$) compared to the Video Group ($M = 38.88$, $SD = 16.966$), there were no significant differences for the between-subjects factor analysis ($F(1,30) = .006$, $p = .941$, $\eta_{p2} = .000$).

Table 4.5

Post-Test Gains: Within & Between Group Comparisons

Source	*df*	MS	*F*	*p*	η_{p2}
Within-subjects effect					
Time (Pre/Post)	1	7182.562	61.155	.000	.671
Time x Group	1	81.000	.690	.413	.022
Error (Time)	30	117.448			
Between-subjects effect					
Group	1	1.563	.006	.941	.000
Error (Group)	30	282.773			

To answer Research Question 3 ("Are there differences in the quality of goals and objectives that target social communication skills compared to goals and objectives that target academic skills?"), paired samples t tests were conducted to compare the quality of written goals and objective. Participants were asked to write one annual goal and two corresponding short-term objectives targeting a communication skill on the pre-and post-test. Participants' communication scores could range from 0 to 38 points, earning one point for meeting each quality indicator (12 indicators for the annual goal; 13 quality indicators for each short-term objective). Participants' academic scores followed the same scoring criteria described for the communication scores.

Results from the paired-samples analyses shown in Table 4.6 reveal significant differences between pre-test communication total scores and academic total scores for the video group ($t(15) = 3.732$, $p = .002$) and also for the captivate group ($t(15) = 4.227$, $p = .001$). These results indicate that the quality of goals and objectives written for academic skills was greater in comparison to goals and objectives written for communication skills for both groups.

Table 4.6

Communication & Academic Score Comparison for Pre-Test

	Communication Total		Academic Total			
Group	M	SD	M	SD	*t*	*p* value
Video	8.88	5.726	11.06	5.495	3.732	.002
Captivate	7.81	4.400	10.19	5.564	4.227	.001

Another paired samples t-test was conducted to examine existing differences in quality between academic and communication scores on the post-test. As seen in Table 4.7, there was a significant difference in quality between academic and communication scores for the video group, ($t(15) = 4.111$, $p = .001$) but no difference for the captivate group ($t(15) = 1.985$, $p = .066$). Although academic scores remained higher for both groups, the difference in quality was only significant for the video group.

Table 4.7

Communication & Academic Score Comparison for Post-Test/

	Communication Total		Academic Total			
Group	M	SD	M	SD	*t*	*p* value
Video	17.13	9.729	21.75	7.707	4.111	.001
Captivate	19	10.912	22.44	7.294	1.985	.066

Additional Analyses

Although results from the mixed ANOVA indicated there was no significant interaction between time and group, there was a large main effect for time within each group. Therefore, additional analyses were conducted to examine participants' progress from pre- to post-test.

Appendix C includes descriptive statistics for participants' scores on individual goals and objectives and shows that both groups' scores improved on each goal and objective. The Captivate Group's post-test scores were slightly greater on each goal and objective; however, it was difficult to determine if differences existed between groups on specific quality indicators, therefore McNemar's tests were calculated to answer this question.

Data from each analysis are included in the following sections. In addition to reporting the test statistic and level of significance from each analysis, the researcher reported the number and percentage of participants in both groups with pre-post test scores in each of the following four categories; did not meet indicator on pre-test and met indicator on post-test; did not meet indicator on either the pre- or post-test; met indicator on both the pre- and post-test; met indicator on the pre-test but did not meet indicator on the post-test. The purpose of reporting these results was to identify which quality indicators participants showed improvement with and if there were any differences between the two groups.

Additionally, results on each quality indicator were examined to determine if a non-significant effect was due to participants' prior knowledge and to ensure that scores on these indicators would not be attributed to any effects of the training received. The researcher was also interested in identifying specific indicators on which participants as a group did not demonstrate improvements as an effect of training and most importantly, to identify any indicators on which participants' met criterion on the pre-test but not on the post-test. In order to evaluate the effectiveness of the modules it is essential to analyze the results and determine if there are any unwanted negative effects as a result of the training.

Annual Goal for Communication

The data displayed in Table 4.8 includes results from McNemar's tests conducted for each of the 12 quality indicators for the annual communication goal. Both the Video Group (X_2 (1) = 4.167, p = .031) and the Captivate Group (X_2 (1) = 5.143, p = .016) were more likely to include a condition statement in the communication goal and to include a condition that matched the behavior in the goal (Video Group (X_2 (1) = 5.143, p = .016) (Captivate Group (X_2 (1) = 5.143, p = .016) after completing the module series.

There were some indicators on which there appeared to be differences between the Video Group and Captivate Group. McNemar's tests yielded significant results for the Captivate Group on five additional quality indicators including *"Behavior is Observable"* (X_2 (1) = 7.111, p = .004), *"Number for Mastery"* (X_2 (1) = 4.167, p = .031), *"Includes a Timeframe"* (X_2 (1) = 5.143, p = .016), *"Response Measured"* (X_2 (1) = 6.125, p = .008), and following the scope and sequence of the SLP assessment (X_2 (1) = 5.143, p = .016). The results for the Video Group on these quality indicators were not significant.

There also appeared to be no improvement in quality for either group on the following indicators, *"Timeframe Matches IEP Term"* and *"Data for Mastery"*, suggesting a lack of clarity or omission in the training content. Careful inspection of the data also showed that participants appeared to perform worse on the post-test for the indicator "*Expectation for Response*", with discordant paired data (met indicator- did not meet indicator) for four participants from the Video Group. Finally, it is important to note that null findings for quality improvement for either group on the following indicators, "*Description of Behavior"* and *"Matches Skill(s) from Assessment",* were due to a high proportion of participants who met those indicators on the pre-test.

Table 4.8

Communication Goal Quality Indicators

Quality Indicator	Group	No-Yes % (n)	No- No % (n)	Yes-Yes % (n)	Yes-No % (n)	Test Statistic	McNemar p value
Includes Condition	Video	38% (6)	50% (8)	12% (2)	0% (0)	4.167	**.031***
	Captivate	44% (7)	56% (9)	0% (0)	0% (0)	5.143	**.016***
Condition Appropriate	Video	44% (7)	50% (8)	6% (1)	0% (0)	5.143	**.016***
	Captivate	44% (7)	56% (9)	0% (0)	0% (0)	5.143	**.016***
Description of Behavior	Video	13% (2)	6% (1)	81% (13)	0% (0)	.500	.500
	Captivate	13% (2)	13% (2)	74% (12)	0% (0)	.500	.500
Behavior is Observable	Video	44% (7)	13% (2)	30% (5)	13% (2)	1.778	.180
	Captivate	56% (9)	19% (3)	25% (4)	0% (0)	7.111	**.004***
Number for Mastery	Video	31% (5)	69% (11)	0% (0)	0% (0)	3.200	.063
	Captivate	38% (6)	56% (9)	6% (1)	0% (0)	4.167	**.031***
Includes a Timeframe	Video	19% (3)	62% (10)	19% (3)	0% (0)	1.333	.250
	Captivate	44% (7)	38% (6)	18% (3)	0% (0)	5.143	**.016***
Timeframe Matches IEP	Video	31% (5)	69% (11)	0% (0)	0% (0)	3.200	.063
	Captivate	31% (5)	62% (10)	6% (1)	0% (0)	3.200	.063
Expectation for Response	Video	31% (5)	13% (2)	31% (5)	25% (4)	.000	1.00
	Captivate	38% (6)	25% (4)	31% (5)	6% (1)	2.286	.125
Response Measured	Video	25% (4)	75% (12)	0% (0)	0% (0)	2.25	.125
	Captivate	50% (8)	50% (8)	0% (0)	0% (0)	6.125	**.008***
Data for Mastery	Video	31% (5)	69% (11)	0% (0)	0% (0)	3.20	.063
	Captivate	31% (5)	69% (11)	0% (0)	0% (0)	3.20	.063
Skill(s) from Assessment	Video	6% (1)	19% (3)	75% (12)	0% (0)	.000	1.00
	Captivate	31% (5)	13% (2)	44% (7)	13% (2)	.571	.453
Assessment Sequence	Video	30% (5)	38% (6)	19% (3)	13% (2)	.571	.453
	Captivate	44% (7)	50% (8)	6% (1)	0% (0)	5.143	**.016***

Annual Academic Goal

The data displayed in Table 4.9 includes results from McNemar's tests conducted for each of the 12 quality indicators for the academic goal. There was only one quality indicator, "*Condition is Appropriate"*, on which McNemar's tests were significant for both the Video Group (X_2 (1) = 4.000, p = .039) and the Captivate Group (X_2 (1) = 8.100, p = .002).

There appeared to be differences between the Video Group and Captivate Group on some of the quality indicators for the academic goal. McNemar's tests yielded significant results for the Captivate Group for the following quality indicators; *"Includes a Condition"* (X_2 (1) = 6.125, p = .008), *"Response Measured"* (X_2 (1) = 4.167, p = .031), and *"Assessment Sequence*" (X_2 (1) = 4.000, p = .039). Although the Captivate Group showed more improvement on the aforementioned quality indicators, the Video Group demonstrated greater improvement on the following indicators, "*Number for Mastery"* (X_2 (1) = 4.167, p = .031) and *"Expectation for Response"* (X_2 (1) = 7.111 p = .004).

There also appeared to be no improvement in quality for either group on the following indicators, *"Behavior is Observable", "Timeframe", "Timeframe Matches IEP Term"* and *"Data for Mastery"*, suggesting a lack of clarity or omission in the training content. Finally, it is important to note that null findings for quality improvement for either group on the following indicators, "*Description of Behavior"* and *"Matches Skill(s) from Assessment",* were due to a high proportion of participants who met those indicators on the pre-test.

Table 4.9

Academic Goal Quality Indicators

Quality Indicator	Group	No-Yes % (n)	No- No % (n)	Yes-Yes % (n)	Yes-No % (n)	Test Statistic	McNemar p value
Includes Condition	Video	38% (6)	31% (5)	25% (4)	6% (1)	2.286	.125
	Captivate	50% (8)	25% (4)	25% (4)	0% (0)	6.125	**.008***
Condition Appropriate	Video	50% (8)	31% (5)	13% (2)	6% (1)	4.000	**.039***
	Captivate	62% (10)	25% (4)	13% (2)	0% (0)	8.100	**.002***
Description of Behavior	Video	6% (1)	0% (0)	94% (15)	0% (0)	.000	1.000
	Captivate	19% (3)	0% (0)	81% (13)	0% (0)	1.333	.250
Behavior is Observable	Video	44% (7)	19% (3)	30% (5)	6% (1)	3.125	.07
	Captivate	38% (6)	38% (6)	19% (3)	6% (1)	2.286	.125
Number for Mastery	Video	38% (6)	13% (2)	50% (8)	0% (0)	4.167	**.031***
	Captivate	25% (4)	13% (2)	56% (9)	6% (1)	.800	.375
Includes a Timeframe	Video	25% (4)	56% (9)	19% (3)	0% (0)	2.250	.125
	Captivate	44% (7)	44% (7)	6% (1)	6% (1)	3.125	.07
Timeframe Matches IEP	Video	31% (5)	69% (11)	0% (0)	0% (0)	3.200	.063
	Captivate	25% (4)	69% (11)	6% (1)	0% (0)	2.250	.125
Expectation for Response	Video	56% (9)	31% (5)	13% (2)	0% (0)	7.111	**.004***
	Captivate	38% (6)	38% (6)	19% (3)	6% (1)	2.286	.125
Response Measured	Video	31% (5)	69% (11)	0% (0)	0% (0)	3.200	.063
	Captivate	38% (6)	62% (10)	0% (0)	0% (0)	4.167	**.031***
Data for Mastery	Video	31% (5)	69% (11)	0% (0)	0% (0)	3.200	.063
	Captivate	25% (4)	75% (12)	0% (0)	0% (0)	2.250	.125
Skill(s) from Assessment	Video	6% (1)	13% (2)	44% (7)	6% (1)	2.286	.125
	Captivate	25% (4)	13% (2)	56% (9)	6% (1)	.800	.375
Assessment Sequence	Video	44% (7)	31% (5)	19% (3)	6% (1)	3.125	.07
	Captivate	50% (8)	31% (5)	13% (2)	6% (1)	4.000	**.039***

Communication Short-Term Objectives

The data displayed in Table 4.10 includes results from McNemar's tests conducted for each of the 13 quality indicators for the first short-term communication objective. There was only one quality indicator, "*Breaks Down Goal"*, on which McNemar's tests were significant for both the Video Group (X_2 (1) = 4.000, p = .039) and the Captivate Group (X_2 (1) = 6.125, p = .008).

There appeared to be differences between the Video Group and Captivate Group on some of the quality indicators for the first short-term communication objective. McNemar's tests yielded significant results for the Video Group for the following quality indicators; *"Includes a Condition"* (X_2 (1) = 5.143, p = .016), *"Condition is Appropriate"* (X_2 (1) = 5.143, p = .016), and *"Matches Goal*" (X_2 (1) = 4.000, p = .039). McNemar's tests were not significant for either group on the other nine quality indicators for the first short-term objective.

The data displayed in Table 4.11 includes results from McNemar's tests conducted for each of the 13 quality indicators for the second short-term communication objective. Results were significant for both the Video Group (X_2 (1) = 4.167, p = .031) and the Captivate Group (X_2 (1) = 5.143, p = .016) on the quality indicator, "*Number for Mastery"*. There were differences between the Video Group and Captivate Group on some of the quality indicators for the second short-term communication objective. McNemar's tests yielded significant results for the Video Group for the following quality indicators; *"Includes a Condition"* (X_2 (1) = 5.143, p = .016), *"Condition is Appropriate"* (X_2 (1) = 5.143, p = .016), and *"Behavior is Observable*" (X_2 (1) = 4.000, p = .039). Additionally, McNemar's tests were significant for the Captivate Group on the following indicators; *"Matches Goal"* (X_2 (1) = 6.125, p = .008) and *"Breaks Goal Down"* (X_2 (1) = 7.111 p = .004).

Table 4.10

Communication Objective 1 Quality Indicators

Quality Indicator	Group	No-Yes % (n)	No- No % (n)	Yes-Yes % (n)	Yes-No % (n)	Test Statistic	McNemar p value
Includes Condition	Video	44% (7)	50% (8)	6% (1)	0% (0)	5.143	**.016***
	Captivate	38% (6)	44% (7)	6% (1)	12% (2)	1.125	.289
Condition Appropriate	Video	44% (7)	50% (8)	6% (1)	0% (0)	5.143	**.016***
	Captivate	38% (6)	50% (8)	6% (1)	6% (1)	2.286	.125
Description of Behavior	Video	19% (3)	6% (1)	69% (11)	6% (1)	.250	.625
	Captivate	12% (2)	0% (0)	88% (14)	0% (0)	.500	.500
Behavior is Observable	Video	44% (7)	6% (1)	44% (7)	6% (1)	3.125	.070
	Captivate	25% (4)	19% (3)	44% (7)	12% (2)	.167	.688
Matches Goal	Video	50% (8)	25% (4)	19% (3)	6% (1)	4.000	**.039***
	Captivate	44% (7)	32% (5)	12% (2)	12% (2)	1.778	.180
Breaks Goal Down	Video	50% (8)	32% (5)	12% (2)	6% (1)	4.000	**.039***
	Captivate	50% (8)	44% (7)	6% (1)	0% (0)	6.125	**.008***
Number for Mastery	Video	32% (5)	56% (9)	12% (2)	0% (0)	3.200	.063
	Captivate	44% (7)	50% (8)	0% (0)	6% (1)	3.125	.070
Includes Timeframe	Video	12% (2)	76% (12)	12% (2)	0% (0)	.500	.500
	Captivate	32% (5)	62% (10)	6% (1)	0% (0)	3.200	.063
Timeframe Precedes IEP	Video	12% (2)	76% (12)	12% (2)	0% (0)	.500	.500
	Captivate	25% (4)	69% (11)	6% (1)	0% (0)	2.250	.125
Benchmark Date	Video	12% (2)	88% (14)	0% (0)	0% (0)	.500	.500
	Captivate	25% (4)	76% (12)	0% (0)	0% (0)	2.250	.125
Expectation for Response	Video	6% (1)	32% (5)	32% (5)	32% (5)	1.500	.219
	Captivate	6% (1)	32% (5)	44% (7)	19% (3)	.250	.625
Response Measured	Video	6% (1)	88% (14)	0% (0)	6% (1)	.000	1.00
	Captivate	32% (5)	69% (11)	0% (0)	0% (0)	3.200	.063
Data for Mastery	Video	6% (1)	94% (15)	0% (0)	0% (0)	.000	1.00
	Captivate	19% (3)	81% (13)	0% (0)	0% (0)	1.333	.250

Table 4.11

Communication Objective 2 Quality Indicators

Quality Indicator	Group	No-Yes % (n)	No- No % (n)	Yes-Yes % (n)	Yes-No % (n)	Test Statistic	McNemar p value
Includes Condition	Video	44% (7)	50% (8)	6% (1)	0% (0)	5.143	**.016***
	Captivate	38% (6)	44% (7)	6% (1)	12% (2)	1.125	.289
Condition Appropriate	Video	44% (7)	50% (8)	6% (1)	0% (0)	5.143	**.016***
	Captivate	38% (6)	50% (8)	6% (1)	6% (1)	2.286	.125
Description of Behavior	Video	12% (2)	6% (1)	76% (12)	6% (1)	.000	1.00
	Captivate	6% (1)	0% (0)	94% (15)	0% (0)	.000	1.00
Behavior is Observable	Video	50% (8)	12% (2)	32% (5)	6% (1)	4.000	**.039***
	Captivate	32% (5)	32% (5)	32% (5)	6% (1)	1.500	.219
Matches Goal	Video	18% (3)	44% (7)	32% (5)	6% (1)	.250	.625
	Captivate	50% (8)	32% (5)	18% (3)	0% (0)	6.125	**.008***
Breaks Goal Down	Video	32% (5)	50% (8)	12% (2)	6% (1)	1.500	.219
	Captivate	56% (9)	38% (6)	6% (1)	0% (0)	7.111	**.004***
Number for Mastery	Video	38% (6)	56% (9)	6% (1)	0% (0)	4.167	**.031***
	Captivate	44% (7)	56% (9)	0% (0)	0% (0)	5.143	**.016***
Includes Timeframe	Video	6% (1)	76% (12)	18% (3)	0% (0)	.000	.1.00
	Captivate	32% (5)	62% (10)	6% (1)	0% (0)	3.200	.063
Timeframe Precedes IEP	Video	6% (1)	76% (12)	18% (3)	0% (0)	.000	1.00
	Captivate	25% (4)	69% (11)	6% (1)	0% (0)	2.250	.125
Benchmark Date	Video	18% (3)	82% (13)	0% (0)	0% (0)	1.333	.250
	Captivate	12% (2)	82% (13)	6% (1)	0% (0)	.500	.500
Expectation for Response	Video	18% (3)	44% (7)	25% (4)	12% (2)	.000	1.00
	Captivate	18% (3)	25% (4)	38% (6)	18% (3)	.000	1.00
Response Measured	Video	6% (1)	88% (14)	0% (0)	6% (1)	.000	1.00
	Captivate	32% (5)	69% (11)	0% (0)	0% (0)	3.200	.063
Data for Mastery	Video	6% (1)	94% (15)	0% (0)	0% (0)	.000	1.00
	Captivate	19% (3)	81% (13)	0% (0)	0% (0)	1.333	.250

Academic Short-Term Objectives

The data displayed in Table 4.12 includes results from McNemar's tests conducted for each of the 13 quality indicators for the first short-term academic objective. McNemar's tests were significant for both groups on the quality indicator "*Breaks Down Goal"*, Video Group (X_2 (1) = 5.143, p = .016) and Captivate Group (X_2 (1) = 7.111, p = .004) and "*Expectation for Response"* Video Group (X_2 (1) = 5.143, p = .016) and Captivate Group (X_2 (1) = 4.167, p = .031). There were differences between groups on a few quality indicators for the first short-term academic objective. McNemar's tests yielded significant results for the Captivate Group for the following quality indicators; *"Condition is Appropriate"* (X_2 (1) = 4.063, p = .039), *"Behavior is Observable*" (X_2 (1) = 6.125, p = .008), and *"Matches Goal"* (X_2 (1) = 4.167, p = .031). The results were not significant for the Video Group.

The data displayed in Table 4.13 includes results from McNemar's tests for each of the 13 quality indicators for the second short-term academic objective. Results were significant for both groups on the following indicators; "*Breaks Goal Down*", Video Group (X_2 (1) = 6.125, p = .008) and Captivate Group (X_2 (1) = 7.111, p = .004); "*Number for Mastery"*, Video Group (X_2 (1) = 5.143 p = .016) and Captivate Group (X_2 (1) = 5.143, p = .016); and "*Expectation for Response"* Video Group (X_2 (1) = 6.125, p = .008) and Captivate Group (X_2 (1) = 5.143 p = .016). There were group differences on some of the quality indicators for the second short-term academic objective. McNemar's tests yielded significant results for the Video Group on two additional quality indicators; *"Behavior is Observable"* (X_2 (1) = 4.000, p = .039) and *"Matches Goal"* (X_2 (1) = 4.167, p = .031). McNemar's tests were significant for the Captivate Group on two different indicators; *"Includes Condition"* (X_2 (1) = 6.125, p = .008) and *"Condition is Appropriate"* (X_2 (1) = 8.100 p = .002).

Table 4.12

Academic Objective 1 Quality Indicators

Quality Indicator	Group	No-Yes % (n)	No- No % (n)	Yes-Yes % (n)	Yes-No % (n)	Test Statistic	McNemar p value
Includes Condition	Video	38% (6)	38% (6)	18% (3)	6% (1)	2.286	.125
	Captivate	50% (8)	6% (1)	32% (5)	12% (2)	2.500	.109
Condition Appropriate	Video	38% (6)	38% (6)	18% (3)	6% (1)	2.286	.125
	Captivate	64% (10)	6% (1)	18% (3)	12% (2)	4.063	**.039***
Description of Behavior	Video	18% (3)	0% (0)	82% (13)	0% (0)	1.333	.250
	Captivate	18% (3)	0% (0)	82% (13)	0% (0)	1.333	.250
Behavior is Observable	Video	44% (7)	18% (3)	32% (5)	6% (1)	3.125	.070
	Captivate	50% (8)	38% (6)	12% (2)	0% (0)	6.125	**.008***
Matches Goal	Video	32% (5)	18% (3)	50% (8)	0% (0)	3.200	.063
	Captivate	38% (6)	6% (1)	56% (9)	0% (0)	4.167	**.031***
Breaks Goal Down	Video	44% (7)	18% (3)	38% (6)	0% (0)	5.143	**.016***
	Captivate	56% (9)	18% (3)	25% (4)	0% (0)	7.111	**.004***
Number for Mastery	Video	25% (4)	6% (1)	64% (10)	6% (1)	.800	.375
	Captivate	12% (2)	18% (3)	56% (9)	12% (2)	.000	1.00
Includes Timeframe	Video	12% (2)	69% (11)	12% (2)	6% (1)	.000	.1.00
	Captivate	25% (4)	69% (11)	6% (1)	0% (0)	2.250	.125
Timeframe Precedes IEP	Video	12% (2)	76% (12)	12% (2)	0% (0)	.500	.500
	Captivate	25% (4)	69% (11)	0% (0)	6% (1)	.800	.375
Benchmark Date	Video	12% (2)	88% (14)	0% (0)	0% (0)	.500	.500
	Captivate	18% (3)	76% (12)	0% (0)	6% (1)	.250	.625
Expectation for Response	Video	44% (7)	25% (4)	32% (5)	0% (0)	5.143	**.016***
	Captivate	38% (6)	38% (6)	25% (4)	0% (0)	4.167	**.031***
Response Measured	Video	25% (4)	69% (11)	0% (0)	6% (1)	.800	.375
	Captivate	18% (3)	82% (13)	0% (0)	0% (0)	1.333	.250
Data for Mastery	Video	18% (3)	82% (13)	0% (0)	0% (0)	1.333	.250
	Captivate	18% (3)	82% (13)	0% (0)	0% (0)	1.333	.250

Table 4.13

Academic Objective 2 Quality Indicators

Quality Indicator	Group	No-Yes % (n)	No- No % (n)	Yes-Yes % (n)	Yes-No % (n)	Test Statistic	McNemar p value
Includes Condition	Video	18% (3)	38% (6)	38% (6)	6% (1)	.250	.625
	Captivate	50% (8)	12% (2)	38% (6)	0% (0)	6.125	**.008***
Condition Appropriate	Video	25% (4)	38% (6)	32% (5)	6% (1)	.800	.375
	Captivate	64% (10)	12% (2)	25% (4)	0% (0)	8.100	**.002***
Description of Behavior	Video	25% (4)	0% (0)	76% (12)	0% (0)	2.250	.125
	Captivate	25% (4)	0% (0)	76% (12)	0% (0)	2.250	.125
Behavior is Observable	Video	50% (8)	18% (3)	25% (4)	6% (1)	4.000	**.039***
	Captivate	25% (4)	38% (6)	38% (6)	0% (0)	2.250	.125
Matches Goal	Video	38% (6)	25% (4)	38% (6)	0% (0)	4.167	**.031***
	Captivate	38% (6)	12% (2)	44% (7)	6% (1)	2.286	.125
Breaks Goal Down	Video	50% (8)	25% (4)	25% (4)	0% (0)	6.125	**.008***
	Captivate	56% (9)	25% (4)	18% (3)	0% (0)	7.111	**.004***
Number for Mastery	Video	44% (7)	6% (1)	50% (8)	0% (0)	5.143	**.016***
	Captivate	44% (7)	18% (3)	38% (6)	0% (0)	5.143	**.016***
Includes Timeframe	Video	6% (1)	69% (11)	18% (3)	6% (1)	.000	1.00
	Captivate	25% (4)	69% (11)	6% (1)	0% (0)	2.250	.125
Timeframe Precedes IEP	Video	6% (1)	76% (12)	18% (3)	0% (0)	.000	1.00
	Captivate	25% (4)	69% (11)	6% (1)	0% (0)	2.250	.125
Benchmark Date	Video	12% (2)	88% (14)	0% (0)	0% (0)	.500	.500
	Captivate	18% (3)	76% (12)	0% (0)	6% (1)	.250	.625
Expectation for Response	Video	50% (8)	25% (4)	25% (4)	0% (0)	6.125	**.008***
	Captivate	44% (7)	32% (5)	25% (4)	0% (0)	5.143	**.016***
Response Measured	Video	32% (5)	64% (10)	0% (0)	6% (1)	1.500	.219
	Captivate	25% (4)	76% (12)	0% (0)	0% (0)	2.250	.125
Data for Mastery	Video	18% (3)	82% (13)	0% (0)	0% (0)	1.333	.250
	Captivate	18% (3)	82% (13)	0% (0)	0% (0)	1.333	.250

Interrater Reliability

A second rater independently scored 30% of the pre-tests and 30% of the post-tests. The primary rater then compared each assessment for the total number of agreements to ensure that 80% agreement had been achieved. Appendix D includes a detailed summary of agreements between raters for each goal and short-term objective. Overall, inter-rater agreement for pre-test scores was 96% and agreement for post-test scores was 95%.

Social Validity

The post-test included additional questions designed to measure participants' perceptions about the importance of writing quality IEP goals and objectives for students with disabilities, the responsibility of special education teachers to write quality IEPs, and participants' overall experience completing the modules. Table 4.14 displays participants' mean responses by group on each question. Group means were similar (.1 to .2 difference) for questions related to the importance of quality IEP goals and objectives. The Captivate Group's mean responses were higher (.3 to .6) for questions related to participants' experiences completing the learning modules. Appendix E includes a detailed summary of participants' responses on each question.

Table 4.14

Social Validity Measure

Social Validity Question	Video M	Captivate M
Learning how to use assessment to write IEP goals & objectives is important	4.8	4.9
Students with disabilities benefit from quality goals & objectives	5	4.8
Writing measurable IEP goals & objectives improves teacher's performance	4.7	4.8
I liked the training strategies used in the learning modules	3.9	4.2
The learning modules were easy to understand	3.8	4.4
The learning modules held my attention	3.1	3.6
The learning modules effectively taught me how to write IEP Goals & objectives	3.6	4

Likert-scale (1= strongly disagree; 2= disagree; 3= neutral; 4= agree, 5= strongly agree).

CHAPTER 5

DISCUSSION

Research has established the need to improve the quality of student IEPs, commonly citing failure to write goals and objectives that are based on data obtained from objective assessments, and neglecting to use assessments that measure students' needs in all areas related to his/her identified disability (Shriner et al., 2012; Christle & Yell, 2010). The urgency of this need has increased in response to the recent U.S. Supreme Court decision in *Endrew F. v. Douglas County School District*, which many experts conclude has elevated the previous definition of a FAPE (Prince, Yell, & Katsiyannis, 2018). An elevated standard of a FAPE impacts teams serving all students with disabilities, but one could argue that the impact is greater for teams serving students with autism based on the increased likelihood for litigation (Burke & Goldman, 2015; Etscheidt, 2003) and research demonstrating that teams often fail to include goals that address students' deficits in social communication, social interactions, and adaptive behaviors (Burke & Goldman, 2015; Ruble, McGrew, Dalrymple, & Jung, 2010).

Explicit training on using student assessment results to write quality IEP goals and objectives is needed in order to adequately prepare pre-service teachers to support future students. In the current study, undergraduate students enrolled in an introductory special education course completed a series of eLearning modules designed to teach participants how to use results from a curriculum-based assessment to write measurable IEP goals and objectives. The quality of written IEP goals and objectives from pre- to post-test served as the primary outcome measure, and outcomes were compared based on the type of training that participants received; interactive or non-interactive. Furthermore, this study sought to evaluate participant's written goals and objectives using specific quality indicators, in order to identify the following;

indicators met prior to receiving training, indicators met after receiving training, and indicators in which there was no increase in quality or a decrease in quality. Additionally, in an effort to identify a potential explanation for the lack of communication goals commonly cited in research on IEPs for students with autism, this study aimed to examine potential differences in quality between academic goals and communication goals.

This chapter summarizes the results of the current study and provides a discussion of the findings related to the primary research questions. Important considerations and limitations are presented as well as suggestions for future research.

Summary of Findings

Analyses for Research Question 1 ("To what extent does training delivered online improve the quality of written IEP goals and short-term objectives?") demonstrated significant improvement in participants' performance on the post-test after completing the eLearning modules. The results of the analyses displayed in Table 4.5 indicate that there was a significant main effect of time ($F(1,30) = 61.155$, $p < .001$, $\eta_{p2} = .671$) on the quality of written goals and objectives from pre- to post-test and the effect was considerably large. Although post-test scores improved significantly for both groups, the absence of a control group impedes the ability to definitively attribute this change to the training provided. Participants enrolled in the present study were simultaneously enrolled in an introductory special education course, therefore, improvements on the post-test could be a result of instruction received outside the parameters of the study, or other extraneous factors.

Although the results show that participants in both groups wrote higher-quality goals and objectives after completing the training, analyses for Research Question 2 ("What are the effects

of the type of training received on the quality of written IEP goals and objectives?") revealed there was no significant interaction between time and group ($F(1,30) = .690$, $p = .413$, $\eta_{p2} = .022$). Although the Captivate Group performed slightly better on the post-test (M = 41.44, SD = 17.220) compared to the Video Group (M = 38.88, SD = 16.966), there were no significant differences for the between-subjects factor analysis ($F(1,30) = .006$, $p = .941$, $\eta_{p2} = .000$).

Additional analyses were conducted in order to identify potential group differences in performance on individual quality indicators for each annual goal and short-term objective. Results from the additional analyses were mixed for both groups and varied across goal and objective statements.

Annual Goals

As shown in Appendix C, scores on the annual goal written for communication increased for both the Video Group (pre-test, M = 3.25, SD = 1.732; post-test, M = 6.19, SD = 3.209) and the Captivate Group (pre-test, M = 2.31, SD = 1.621; post-test, M = 6.75, SD = 4.025). McNemar's tests were significant for both groups on two quality indicators, "*Includes Condition"* and *"Condition is Appropriate"* with a larger percentage of participants demonstrating progress on the post-test. The Captivate Group's significant improvement on five additional quality indicators (*"Behavior is Observable"*, *"Number for Mastery"*, *"Includes a Timeframe"*, *"Response Measured"*, and *"Assessment Sequence"*) are notable, since the Video Group's progress was not significant. The majority of the content covered in Modules 2 and 3 focused on developing measurable communication goals and learners in the Captivate Group had several opportunities to engage in learning interactions as shown in Appendix B. The content viewed by both groups was identical except for the opportunities to complete the learning

interactions, leading one to conclude that the learning interactions had a significant impact on post intervention outcomes for the annual communication goal.

As shown in Appendix C, scores on the annual goal written for academics increased for both the Video Group (pre-test, M = 3.38, SD = 1.893; post-test, M = 7.38, SD = 2.705) and the Captivate Group (pre-test, M = 3.31, SD = 1.991; post-test, M = 7.31, SD = 2.938). McNemar's tests were significant for both groups on one quality indicator, *"Condition is Appropriate"* with a larger percentage of participants demonstrating progress on the post-test. The results for group comparisons were mixed on some of the quality indicators. Participants in the Captivate Group showed significant improvement on three indicators, *"Includes a Condition"*, *"Response Measured"*, and *"Assessment Sequence*". Although the Captivate Group showed more improvement on the aforementioned quality indicators, the Video Group demonstrated greater improvement on two indicators, "*Number for Mastery"* and *"Expectation for Response"*.

Short-Term Objectives

Additional analyses on the short-term objectives were mixed for both groups. Descriptive data included in Appendix C shows that scores for both groups increased on the short-term objectives, however, McNemar's tests on quality indicators varied across objectives and across groups. For example, results were significant on a quality indicator for the first short-term objective but not the second objective. These findings were apparent for both groups for both communication and academic objectives on the following quality indicators, *"Behavior is Observable"*, *"Behavior Matches Goal",* and *"Number for Mastery".* Careful inspection of the data revealed that the quality of the two short-term objectives was inconsistent, meaning that the first-term objective included the quality indicator, but the second objective did not, or vice versa.

The Video Group's scores on the pre-test communication objectives (objective 1, M = 2.87, SD = 2.306; objective 2, M = 2.75; SD = 2.206) and pre-test academic objectives (objective 1, M = 3.96, SD = 2.435; objective 2, M = 3.75, SD = 2.324) show that overall, participants' scored higher on the first objective and therefore met more quality indicators. These findings were consistent for the Captivate Group on the pre-test communication objectives (objective 1, M = 2.88, SD = 1.628; objective 2, M = 2.62, SD = 1.628) and academic objectives (objective 1, M = 3.63, SD = 1.668; objective 2, M = 3.25, SD = 2.595).

Although the quality of the first communication short-term objective was greater at pre-test for both groups, the differences in quality decreased on the post-test for the Captivate Group The Captivate Group scores on the post-test communication objectives (objective 1, M = 6.06, SD = 3.696; objective 2, M = 6.19, SD = 3.526) show that participants were more consistent across objectives. This was not the case for the Video Group whose first short-term communication objective remained higher on the post-test (objective 1, M = 5.63, SD = 3.384; objective 2, M = 5.31, SD = 3.516). Although the Video Group's communication objective objectives were inconsistent, the difference in quality between the first and second academic objective decreased (objective 1, M = 7.19, SD = 2.713; objective 2, M = 7.19, SD = 2.509) indicating more consistency in between the two short-term objectives. These findings were also true for the Captivate Group on the post-test academic objectives (objective 1, M = 7.54, SD = 2.592; objective 2, M = 7.60, SD = 2.469).

Interpretation of the outcomes for short-term objectives were difficult on the aforementioned quality indicators due to inconsistent quality between the first and second objective statements. However, both groups made significant gains on the quality indicator, "*Breaks Goal Down"*, with significant outcomes for the Captivate Group on both

communication and both academic objectives, and significant outcomes for the Video Group on the first communication objective and both academic objectives.

Findings also revealed no significant improvement for either group on five quality indicators ("*Timeframe*", *Timeframe Matches IEP Term", "Benchmark Date", "Response Measured",* and *"Data for Mastery"*) for either short-term objectives. Additional examination of the data revealed that participants performed worse on the communication objectives for the quality indicator, "*Expectation for Response*", suggesting that the training content was unclear.

Differences in Quality by Target Skill

In order to answer Research Question 3 ("Are there differences in the quality of goals and objectives that target social communication skills compared to goals and objectives that target academic skills?"), participants' total communication score and total academic score were compared for both the pre-test and post-test. Analyses were completed for each group separately to indicate whether differences in quality changed after receiving training.

Results from the paired-samples analyses shown in Table 4.6 revealed significant differences between pre-test communication total scores and academic total scores for the video group ($t(15) = 3.732$, $p = .002$) and also for the captivate group ($t(15) = 4.227$, $p = .001$). These results indicate that the quality of goals and objectives written for academic skills was significantly greater in comparison to goals and objectives written for communication skills for both groups.

Another paired samples t-test was conducted to examine existing differences in quality between academic and communication scores on the post-test. Results shown in Table 4.7 reveal that academic scores remained higher for both groups on the post-test, however the difference

was significant for the Video Group ($t(15) = 4.111$, $p = .001$) but not for the Captivate Group ($t(15) = 1.985$, $p = .066$).

Discussion of Findings

Overall findings reveal that participants' scores were significantly greater on the post-test, meaning that participants wrote goals and objectives that met more quality indicators after receiving training. These findings are consistent with previous studies in which targeted training on using assessment to write quality IEP goals and objectives yielded significant post-intervention outcomes for participants (Pretti-Frontczak & Bricker, 2000; Ruble, Dalrymple, & McGrew, 2010; Boavida, Aguiar, McWilliams, 2014).

Although there was a significant change from pre- to post, initial analyses did not reveal any differences between groups. These results suggest that participants who received non-interactive, treatment-as-usual, training made similar progress in comparison to participants who received interactive training. These findings are not consistent with recommendations cited in the research, which emphasizes the importance of including interactive components in the eLearning content (Nosegaard & Orngreen, 2015). Findings in the present study demonstrated equal gains between participants who received interactive training and participants who had no opportunities to interact or engage with the training materials. Overall group comparisons did not yield significant differences, however, in-depth analyses of participant outcomes revealed interesting findings that warrant discussion.

Quality Differences Across Skill Type

One of the primary research questions sought to identify whether goals and objectives targeting academic skills is greater than goals and objectives targeting communication skills. Based on the existing research citing omission of communication goals and objectives in IEPs for students with autism (Ruble, Dalrymple, & McGrew, 2010), it was hypothesized that IEP teams exclude these goals because they are more difficult to write. Paired samples t-tests comparing participants' communication total score to academic total score confirmed the researcher's hypothesis for both groups' pre-tests.

Both groups completed three eLearning modules which included several example goals and objectives written for communication. Paired samples t-tests comparing communication and academic total scores was significant for the Video Group but not for the Captivate Group. These findings are noteworthy because the content covered in each module was identical across training groups, except for the learning interactions provided in the training for the Captivate Group.

Previous interventions designed to teach participants to write quality IEP goals and objectives did not report differences in quality based on the type of goal written (Pretti-Frontczak & Bricker, 2000; Ruble, Dalrymple, & McGrew, 2010; Boavida, Aguiar, & McWilliams, 2014). The results from the present study showed statistically significant differences in quality between goals written for academic skills compared to goals written for communication skills. These findings demonstrate the utility of analyzing quality differences based on the type of goal written and offer important insights for future researchers when developing training content.

Group Differences

Additional analyses revealed that the Captivate Group demonstrated progress on more quality indicators for the communication goal. This finding is noteworthy because the content covered in Module 2 and Module 3 focused specifically on using the SLP assessment to write communication goals. Participants in the Captivate Group were more likely to write a communication goal on the post-test that met the following indicators; *"Behavior is Observable" "Number for Mastery",* and *"Timeframe"*. These results were not replicated for the annual academic goal, which could suggest that participants did not generalize the skills to new, untrained content. For example, the content in Module 1 included learning interactions in which participants were asked to re-write a goal statement to include an observable behavior. The examples included ambiguous language, such as "student will identify" or the "student will request". The learner had to select an indicator or alternative statement so that the behavior could be seen or heard. The learners in the Captivate Group met this indicator for the annual communication goal, but did not generalize for the annual academic goal which many participants continued to use behavior descriptions such as "student will identify numbers". Additionally, there were some quality indicators on which the Captivate Group made greater progress for both annual goals (*"Response Measured"* and *"Assessment Sequence").* This finding is noteworthy because the learning interactions included in Modules 2 and 3 specifically targeted those components of measurable goals and the learners had opportunities to practice selecting lessons from the assessment and writing the criterion portion of the goal statement.

Module Content Needing Improvement

Participants' lack of progress on specific quality indicators must be examined in order to identify areas in which the content included in the learning modules needs improvement. Participants in both groups did not make progress on the following quality indicators for goals *"Timeframe Precedes IEP"* and *"Data for Mastery"*. Based on these findings, the content in each module should be reviewed and revised to include more explicit examples and improved learning interactions.

Participants in both groups failed to make progress on quality indicators for the short-term objective statements, including *"Includes Timeframe"*, *"Timeframe Precedes IEP"*, *"Benchmark Date"*, *"Response Measured"* and *"Data for Mastery"*. Analysis of these results verify that the module content should include more practice opportunities writing short-term objectives. One of the most important findings perhaps is the lack of progress, and in some cases regression, on the quality indicator *"Expectation for Response"* for the short-term communication objectives. Participants in both groups performed worse on this item on the post-test, suggesting lack of clarity in the training content. When developing instructional interventions, evaluating learner performance is an essential step in the process of revising and improving learning content. The learning modules should be reviewed and revised in consideration of this finding.

Participants' Learning Experience

Results from the social validity measure should also be discussed in order to identify potential differences between groups. Group responses were similar on items measuring participants' perceptions regarding the importance of quality goals and objectives. Appendix E includes detailed results from participants' responses.

Overall, participants in both groups either agreed or strongly agreed with the following statements; *"It is important for pre-service teachers to learn how to use assessment to write IEP goals & objectives"* (Video Group, 94%; Captivate Group, 100%); *"Students with disabilities will benefit from having measurable goals & objectives in their IEPs"* (Video Group, 100%; Captivate Group, 94%); and *"Writing measurable IEP goals & objectives is important to improve special education teacher's work performance"* (Video Group, 94%; Captivate Group, 94%). These findings indicate that participants felt it is important to learn how to write quality IEP goals and objectives in order to benefit students, and also to fulfill one's responsibilities as a special educator.

There were slight differences between groups on items measuring participants' overall experiences completing the trainings. In comparison to items measuring importance, less participants indicated that they agreed or strongly agreed with the statement, *"I liked the training and strategies used in the modules"* (Video Group, 75%; Captivate Group, 81%). This outcome was unexpected as it was anticipated that the Captivate Group would be more likely to agree or strongly agree with this statement. Similarly, participants in both groups were less likely to agree or strongly agree with the statement, *"The learning modules held my attention"* (Video Group, 31%; Captivate Group, 56%). Although participants in the Captivate Group were more likely to agree with this statement, a fairly large portion did not agree. Responses from the

Captivate Group were expected to be more favorable due to the frequent opportunities to engage in learning interactions.

Implications for Teacher Preparation Programs

A common problem cited in the research is the lack of connection between IEP goals and objective assessment (Prince, Yell, & Katsiyannis, 2018). Researchers have expressed that pre-service teacher programs should place more emphasis on teaching students to write quality IEP goals and objectives (Rakap, 2015), also noting the importance of explicit training on how to use assessment results to develop an IEP (Pretti-Frontczak & Bricker, 2000). The outcomes of this study revealed statistically significant improvement in the quality of goals and objectives written following training, regardless of the type of training received. Furthermore, the content included in the modules demonstrated how to use results obtained from a curriculum-based assessment in order to write an IEP goal that aligns with the student's needs. This finding suggests that pre-service teacher preparation programs can simultaneously teach students about curriculum-based assessments while teaching the components of measurable goals and objectives as opposed to teaching this content in isolation. Teaching these skills together offers pre-service teachers more practical learning opportunities and will better prepare them to fulfill their duties when they become teachers.

Limitations

In addition to reporting the results from the current study, it is important to discuss the limitations. Firstly, this study utilized a randomized group comparison design to compare the quality of written goals and objectives from pre- to post-test. Since both groups received

training, there was not an actual control group, rather the Video Group served as the *treatment-as-usual* condition. This is an important limitation to note when interpreting the null findings for the between-group comparisons.

Second, the primary researcher created all of the learning modules using Adobe Captivate software, and had no prior experience with advanced eLearning software. In other words, the interactive learning modules used in the present study did not include all of the possible advanced learning actions often cited in the eLearning literature. This is important to note when interpreting the results because of the lack of effect found for type of training received. In the event that the modules were authored by an experienced eLearning developer, it is possible that the results would differ from the present study.

Third, the measure used to evaluate the quality of written goals and objectives in this study was a modified version of the *IQUIS-Goals/Objectives* (Shriner et al., 2012). In the present study, the *IQUIS-Goals/Objectives* was modified to include quality indicators that addressed participants' consideration of assessment results when writing IEP goals and objectives. Additionally, indicators were added in an effort to measure the quality of the criterion included in the written goals and objectives. Although the original measure was formally validated in previous studies, the adapted version used in this study did not undergo formal validation procedures, and should be considered a limitation.

Finally, the sample size in the current study is another important limitation to consider. The number of participants ($n < 20$) in each group impacted the researcher's ability to conduct multivariate analyses, such as a MANOVA, in order to identify group differences on multiple dependent variables. Additionally, the small sample size prevents the researcher from making comparisons beyond the participants in the group.

Directions for Future Research

The results from the current study revealed that participants in both groups improved from pre- to post-test overall. Further data analyses also verified specific quality indicators on which participants improved, highlighting potential strengths in the eLearning modules. Similarly, data analyses also revealed specific quality indicators on which participants showed little improvement, and in some cases, performed worse after training. Information obtained from the analyses should be considered in order to revise and improve the content included in the modules. After revisions are made based on the data analyses, the study could be replicated with a different group of participants, and further analyses conducted to improve the eLearning modules. Testing interventions and evaluating learner outcomes are essential steps in the process of designing effective interventions. Replicating this study and using evaluation data to make improvements could lead to the development of more effective and efficient instruction.

The primary outcome measured in this study was the change in quality of written goals and objectives following training. However, it is worth noting that participants may have gained additional knowledge as a result of completing the learning modules. Since participants were undergraduate students with no prior experience writing IEPs, the modules included background information on the relationship between IEPs and special education law and recommendations for best practice when serving students with autism. Future studies examining the utility of eLearning interventions to teach participants an applied skill should include additional measures in order to capture improvements in content knowledge covered in the eLearning modules.

Another potential future direction would be to add an element of gamification to the eLearning modules. There is growing evidence that adding elements of gamification to eLearning content, such as inclusion of game fiction and social interactions, can increase

learner's motivation and in-turn improve learning outcomes (Sailer & Homner, 2019). Although participants in the Captivate Group were more likely to agree or strongly agree that they enjoyed completing the modules, the percentage of participants in this category was still low. While the Captivate Group had opportunities to engage in learning interactions, few participants enjoyed completing the interactions. Incorporating elements of gamification could lead to increased learner satisfaction.

Conclusion

Special education law mandates that school teams develop an IEP that is reasonably calculated to provide meaningful educational benefit. Failure to use appropriate assessments could be viewed as both a substantive and a procedural violation of the IDEA (Shriner et al., 2012; Christle & Yell, 2010), especially since the latest Supreme Court Decision (*Endrew*, 2017). The need for explicit training on writing IEP goals and objectives is widely accepted in the field of special education. This need is perhaps more significant for educators serving students with autism based on the increased likelihood for litigation and evidence demonstrating overall poor IEP quality for this population (Etscheidt, 2003; Ruble, McGrew, Dalrymple, & Jung, 2010). While several studies have demonstrated promising outcomes as a result of in-person trainings for teachers and pre-service teachers, (Boavida, Aguiar, &McWilliams, 2014; Ruble, Dalrymple, & McGrew, 2010; Pretti-Frontczak & Bricker, 2000), traditional in-person training can be costly and time-consuming. Therefore, research is needed to identify plausible solutions to the barriers that exist with providing pre-service teachers and experienced teachers training in writing IEPs. One potential solution is to deliver training online, using advanced

eLearning software. Once developed, the eLearning content must be evaluated and analyzed to verify the efficacy of instruction.

The current study sought to examine the efficacy of providing training on using assessment to write measurable IEP goals and objectives for students with autism. Undergraduate students enrolled in an introductory special education course were randomly assigned to the training groups in an effort to compare interactive training with a passive, treatment-as-usual training. The results revealed promising outcomes for participants in both training groups, demonstrating the utility of online training to teach this important skill.

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APPENDIX A

IQUIS- GOALS & OBJECTIVES CODEBOOK

IQUIS Codebook Annual Goals

Quality Indicator	Operational Definition
Includes Condition	Statement of setting (in the classroom/hallway) OR Activity (during snack/free-time/group instruction) OR Materials (given a visual schedule/worksheet)
Condition Appropriate	The condition described in the goal statement allows for appropriate demonstration of the behavior.
Description of Behavior *	Description of what the student will do
Behavior is Observable *	Behavior can be seen/heard/observed
Number for Mastery*	Number of situations/people/ activities required for mastery
Timeframe *	Expected timeframe for mastery (month/weeks/report period)
Timeframe Precedes IEP*	Expected timeframe by/before end-of IEP term
Expectation for Response*	Expectation for response (independently, spontaneously, 1 prompt)
Response Measured *	Response(s) measured during data collection (1st response; 3/ 3 trials)
Data for Mastery *	Description of how data will be used to determine mastery (across 3 consecutive sessions/5 weekly probes)
Skill from Assessment*	Goal matches target skill outlined in SLP assessment
Assessment Sequence*	Goal matches appropriate scope and sequence of curriculum

Note. Items that were modified or added include an *

IQUIS Codebook Short-Term Objectives

Quality Indicator	Operational Definition
Includes Condition	Statement of setting (in the classroom/hallway) OR Activity (during snack/free-time/group instruction) OR Materials (given a visual schedule/worksheet)
Condition Appropriate	The condition described in the goal statement allows for appropriate demonstration of the behavior.
Description of Behavior *	Description of what the student will do
Behavior is Observable *	Behavior can be seen/heard/observed
Matches Goal*	Behavior in objective similar function to behavior in goal
Breaks Goal Down*	Objective statement breaks down skill/behavior in annual goal
Number for Mastery*	Number of situations/people/ activities required for mastery
Timeframe *	Expected timeframe for mastery (month/weeks/report period)
Timeframe Precedes IEP*	Expected timeframe by/before end-of IEP term
Benchmark Date*	Benchmark date includes month/year (objective 1: 3-4 months after baseline; objective 2: 3-4 months after first objective date)
Expectation for Response*	Expectation for response (independently, spontaneously, 1 prompt)
Response Measured *	Response(s) measured during data collection (1st response; 3/ 3 trials)
Data for Mastery *	Description of how data will be used to determine mastery (across 3 consecutive sessions/5 weekly probes)

Note. Items that were modified or added include an *

APPENDIX B

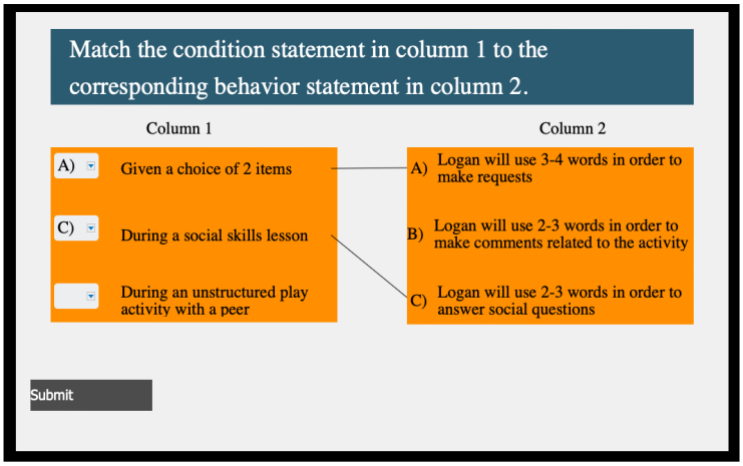
LEARNING INTERACTIONS COMPLETED BY CAPTIVATE GROUP

Module Learning Interactions

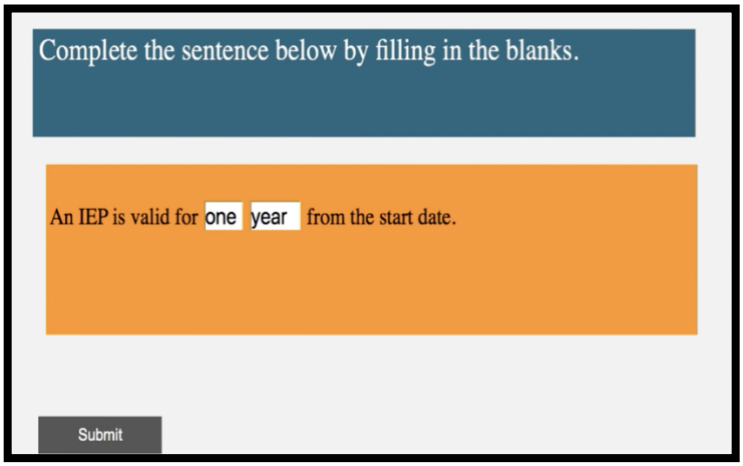
Interaction Type	Module 1	Module 2	Module 3
True/False Question	2	1	4
Fill-in-the-Blank	5	4	5
Multiple Choice	2	2	2
Drag-and-Drop	3	2	2
Hot Spot	-	2	4
Click-to-Reveal	10	9	5
Content Navigation	4	2	2

Example Learning Interactions

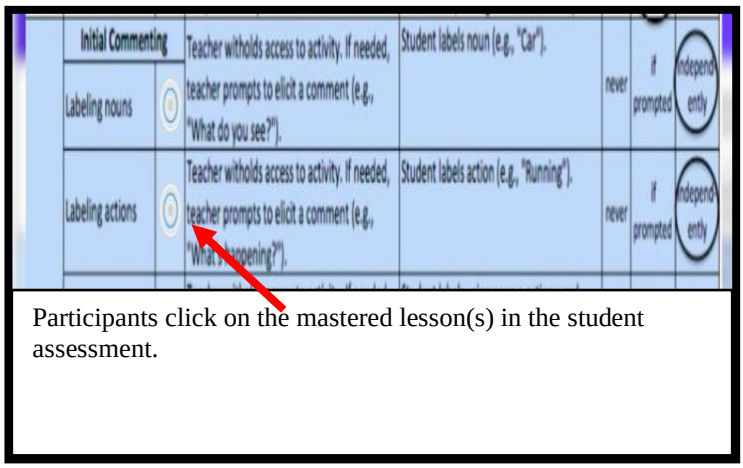
Screen Shot Example- Multiple Choice



Screen Shot Example- Fill-in-the-Blank



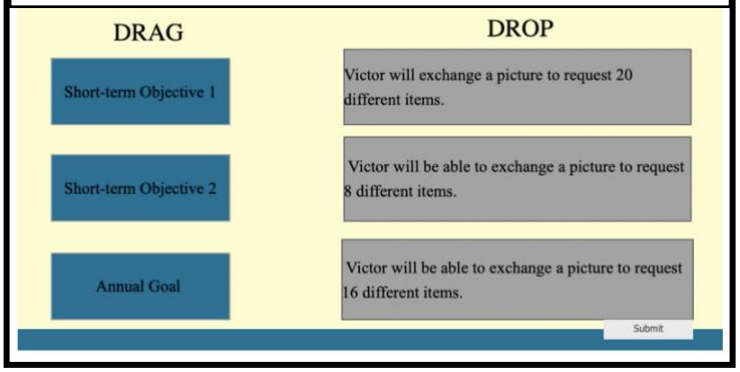
Screen Shot Example- Hot Spot



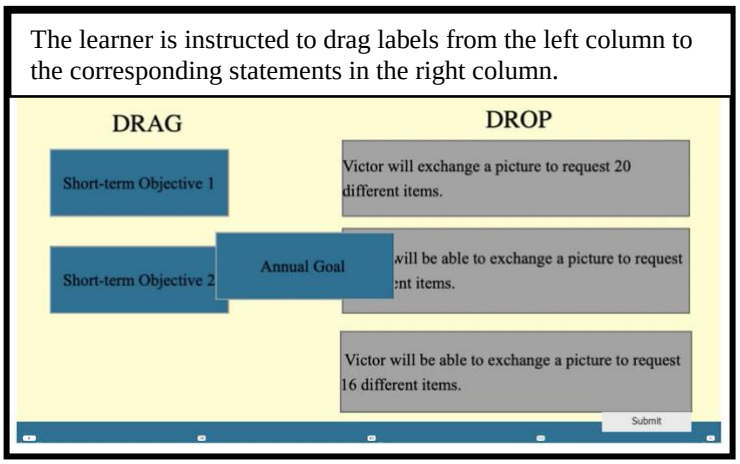
Participants click on the mastered lesson(s) in the student assessment.

Screen Shot Example- Drag-and-Drop

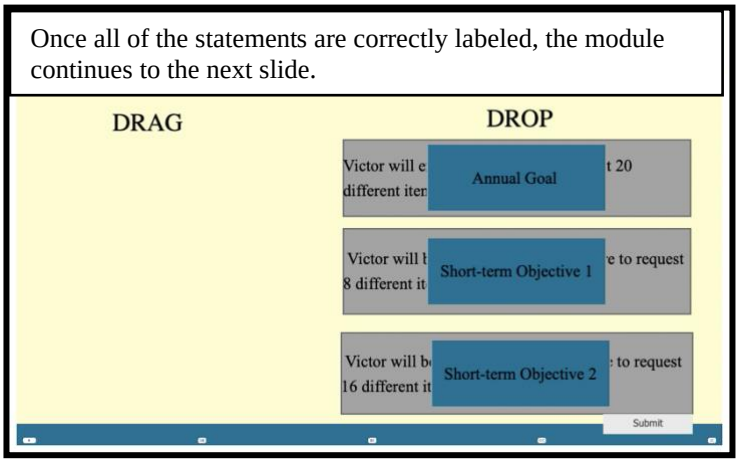
The left column displays labels and the right column displays IEP goal/objective statements.

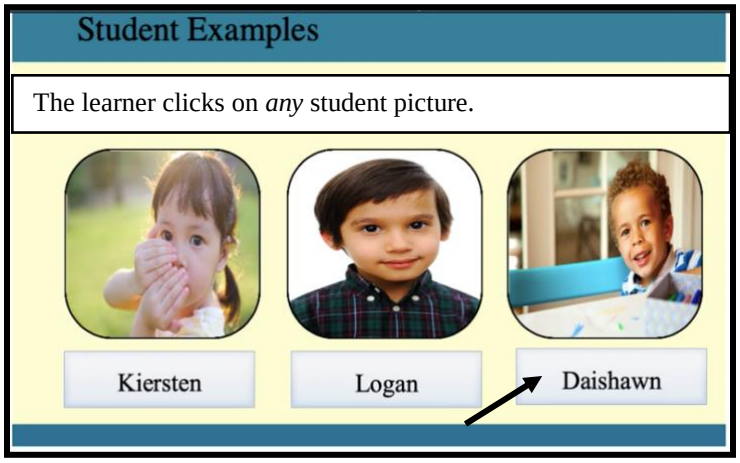


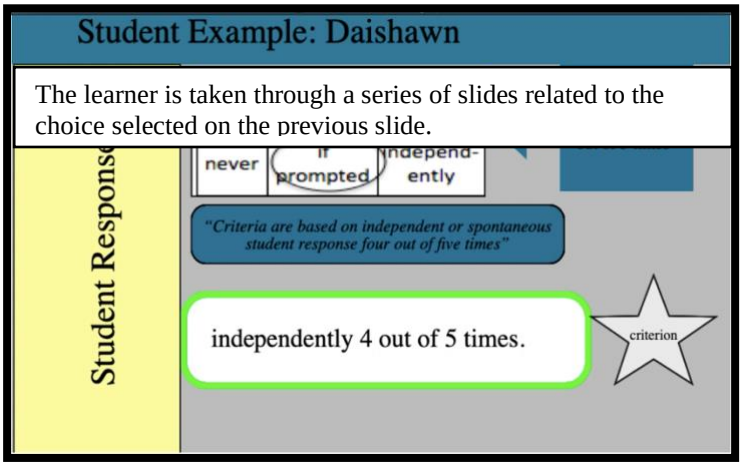
The learner is instructed to drag labels from the left column to the corresponding statements in the right column.

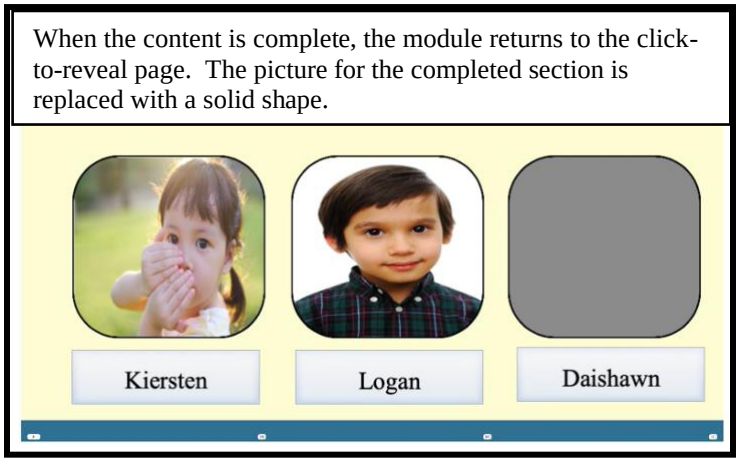


Once all of the statements are correctly labeled, the module continues to the next slide.




Student Examples
The learner clicks on *any* student picture.
Kiersten
Logan
Daishawn


Student Example: Daishawn
The learner is taken through a series of slides related to the choice selected on the previous slide.
Student Response
never
prompted
ently
"Criteria are based on independent or spontaneous student response four out of five times"
independently 4 out of 5 times.
criterion


When the content is complete, the module returns to the click-to-reveal page. The picture for the completed section is replaced with a solid shape.
Kiersten
Logan
Daishawn

APPENDIX C

DESCRIPTIVE STATISTICS PARTICIPANT SCORES

	Video Group				Captivate Group			
	Pre-Test		Post Test		Pre-Test		Post Test	
Test Component	M	SD	M	SD	M	SD	M	SD
Communication Goal	3.25	1.732	6.19	3.209	2.31	1.621	6.75	4.025
Communication Objective 1	2.87	2.306	5.63	3.384	2.88	1.628	6.06	3.696
Communication Objective 2	2.75	2.206	5.31	3.516	2.62	1.628	6.19	3.526
Communication Total Score	8.88	5.726	17.1	9.729	7.81	4.400	19	10.91
Academic Goal	3.38	1.893	7.38	2.705	3.31	1.991	7.31	2.938
Academic Objective 1	3.964	2.435	7.19	2.713	3.63	1.668	7.54	2.592
Academic Objective 2	3.75	2.324	7.19	2.509	3.25	2.595	7.6	2.469
Academic Total Score	11.06	5.495	21.75	7.707	10.19	5.564	22.44	7.294

APPENDIX D

INTER-RATER RELIABILITY SUMMARY

Pre-Test: Inter-Rater Reliability Summary

Test Section	Agreements	Disagreements	Total Items	Percentage Agreement
Communication Goal	105	3	108	97%
Communication Objective 1	110	7	117	94%
Communication Objective 2	112	5	117	96%
Academic Goal	102	6	108	94%
Academic Objective 1	114	3	117	97%
Academic Objective 2	114	3	117	97%
Total Test	657	27	684	96%

Post-Test: Inter-Rater Reliability Summary

Test Section	Agreements	Disagreements	Total Items	Percentage Agreement
Communication Goal	102	6	108	94%
Communication Objective 1	112	5	117	96%
Communication Objective 2	112	5	117	96%
Academic Goal	102	6	108	94%
Academic Objective 1	110	7	117	94%
Academic Objective 2	110	7	117	94%
Total Test	648	36	684	95%

APPENDIX E

SOCIAL VALIDITY SUMMARY

Question	Group	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
It is important for pre-service teachers to learn how to use assessment to write IEP goals	Video	--	--	6%	12%	82%
	Captivate	--	--	--	12%	88%
Students with disabilities will benefit from having measurable IEP goals & objectives	Video	--	--	--	--	100%
	Captivate	--	--	6%	12%	82%
Writing measurable IEP goals & objectives is important to improve special education teacher's work performance.	Video	--	--	6%	18%	76%
	Captivate	--	6%	--	6%	88%
I liked the training and strategies used in the learning modules.	Video	--	--	25%	63%	12%
	Captivate	--	--	19%	44%	37%
The learning modules were easy to understand.	Video	--	--	18%	82%	--
	Captivate	--	--	6%	44%	50%
The learning modules held my attention.	Video	6%	19%	44%	25%	6%
	Captivate	--	12%	32%	44%	12%
The learning modules were effective tools for teaching me how to write IEP goals & objectives.	Video	--	12%	32%	44%	12%
	Captivate	--	--	25%	50%	25%