Effects of Online Professional Development in
Augmentative and Alternative Communication for
Special Education Teachers and Speech Language Pathologists

BY

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EFFECTS OF ONLINE PROFESSIONAL DEVELOPMENT IN
AUGMENTATIVE AND ALTERNATIVE COMMUNICATION FOR
SPECIAL EDUCATION TEACHERS AND SPEECH LANGUAGE PATHOLOGISTS

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Abstract

The needs of students receiving special education services have changed significantly over the past decade, and have required more specialized training for special education professionals. Students with complex communication support needs require highly trained professionals who are aware of potential communication interventions and strategies. This study evaluated the effects of an online professional development program designed for special education teachers and speech language pathologists who work with students who require augmentative and alternative communication supports. A switching replication research design was used with 21 speech language pathologists and 12 special education teachers to evaluate effects of the program on participant content-knowledge and self-efficacy (i.e., self-confidence) regarding the targeted content. Significant differences were found in relation to increases in knowledge and self-efficacy across participants in both professions. Results support previous research that online professional development is effective at increasing knowledge, and supports the hypothesis that it also increases self-efficacy. It should be noted that the researcher only researched increases in knowledge and self-efficacy and not actual teacher and therapist performance on targeted skills. Future research should look at the impact of online professional development on actual job performance of targeted skills.

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CHAPTER 1

INTRODUCTION

Background and Need for the Study

The field of special education currently experiences significant shortfalls in the number of certified teachers who are highly qualified and knowledgeable to serve the increasing number of students who require specially-designed instruction (Provost, 2009; Sindelar, Brownell, & Billingsley, 2010). Bergert and Burnette (2001) suggested that 98% of school districts across America had shortages of special education teachers. States continue to experience shortages in all disability areas of special education dating back to 1992 (U.S. Department of Education Office of Postsecondary Education [USDE-PE], 2012). In fact, the field continues to experience an increasing shortfall of special educators, despite the continued efforts of policy makers. The U.S. Department of Education's Office of Special Education Programs spends approximately $90 million per year in teacher and administrator preparation programs and teacher loan forgiveness programs to support the increase of special education teachers across the nation (Brownell, Hirsch, & Seo, 2004).

For nearly three decades, the field of education has been concerned with the development and retention of special educators (Billingsley, 2005; Boe, Cook, & Sunderland, 2008). As educational stakeholders seek to build the field of effective teachers, they must continue to battle the concern of high teacher attrition. Special education has been noted to have the highest rate of teacher turnover when compared to other subject areas (Ingersoll, 2001; Sindelar, et al., 2010). Longitudinal investigation has actually shown that the rate of attrition for special educators has been increasing (Billingsley, Carlson, & Klein, 2004). Although research has shown multiple factors may lead to lower attrition in certain districts, one specific factor that has been linked to

lower attrition rates is professional development (Billingsley, et al., 2004). Billingsley et al. also suggested that when ongoing professional development is related to the instructional needs of the students in the teacher's class, teachers have lower attrition and greater dedication to their teaching position. It has further been noted that it is one of the key responsibilities of educational leaders (e.g., superintendents, principals, associate principals) to provide special educators with training that will improve the abilities and skills (Thornton, Peltier, & Medina, 2007).

In a summary of school district spending on professional development, Killen, Monk, and Plecki (2002) reported that for the years between 1992 and 1998, school districts spent approximately $200 per student in their district on providing teacher training and development. For large districts with approximately 10,000 students, that results in an annual spending of over $2 million dollars on professional development activities. This need for teacher development can quickly become a financial burden on school districts to provide teachers with the necessary training. In recent years online professional development has become a popular method for providing training to teachers, due to the ability to provide longer term effects on teachers having on-demand access to the training. Additionally it allows school districts to initially invest in the development of the online training, but allows for having the training for future years without significant additional investment.

Similar trends in terms of shortages and retention exist for speech and language pathologists as well. Edgar and Rosa-Lugo (2007) report that there are many children in schools across the nation that have speech and language related needs but are either not receiving the services or are being served by underqualified personnel. They went on to indicate that data had projected shortages for speech and language pathologists at the national and state levels across

the country and indicated that the need for these professionals is increasing faster than the number of qualified people who are entering the field. Barton, Moore, and Squires (2012) further indicated that despite the implementation of various incentive programs and innovative personnel preparation programs there continue to be shortfalls in the number of speech and language pathologists needed to serve students in schools requiring such related services. This concern is only increasing due to the inability to provide early intervention services. Barton et al. indicated that it is has become a pressing need to have more speech and language pathologists in the elementary and preschool settings to provide early intervention services to hopefully address the needs prior to it becoming more debilitating for students as they go through their school year.

Research has shown that there are several factors that lead to the shortage and retention issues of speech and language professionals. The leading factors continues to be the increased caseload size as a result of the overall shortage of speech and language pathologists. Although it was recommended in 1993 by the American Speech-Language-Hearing Association (ASHA) that caseloads not exceed 40 students, the national average continues to rise to an average of 52 students, and in some districts reporting that caseloads are as high as 100 (Hutchins, Howard, Prelock, & Belin, 2010). Katz, Maag, Fallon, Blenkarn, and Smith (2010) conducted a study examining factors affecting retention of speech and language pathologists and found several that were important to retention: caseload size, level of collaboration, number of age group of students on a caseload, number of disabilities represented on a caseload, number of schools worked in, level of self-efficacy, and years of experience.

Purpose of Study

The purpose of this study was to evaluate the effects of online professional development for use in training special educators and speech and language pathologists with regard to the support needs of students who could benefit from augmentative and alternative communication systems. To this point there has been little research on the effects of online professional development in the area of special education, although districts are quickly adopting it as a method of training teachers (Nagy, & Wang, 2007). It is important that school districts use the most effective teacher training methods to assist with the development, induction, and retention of high quality special education teachers (Desimone, 2009).

Rationale

From 2001 to 2010, the number of students receiving special education services increased from 6.30 million to 6.48 million (Scull & Winkler, 2011). Further, the percentage of students requiring more extensive supports has increased (i.e., autism, developmental delay, other health impairment). Table 1 compares the breakdown of the percentages of students from the various federally-defined disability categories from 2001 to 2010 (Scull & Winkler, 2011). Across the three categories there was a total percent increase of 12.4%.

Table 1.

Comparison of Disability Category Percentages (2001-2010).

	2001 Statistics	*2010 Statistics*	*Percent Change*
Autism	1.5%	5.8%	+ 4.3%
Developmental Delay	3.4%	5.7%	+ 2.3%
Other Health Impairment	4.8%	10.6%	+ 5.8%
Emotional Disturbance	7.6%	6.3%	- 1.3%
Mental Retardation	9.9%	7.1%	- 2.8%
Specific Learning Disability	45.4%	37.5%	- 7.9%
Speech/Language Impairment	22.0%	21.8%	- 0.2%
Other Disabilities	5.3%	5.1%	- 0.2%

The increase in the population and percentage of students with more complex disabilities and support needs has resulted in changes for professionals involved in their education (Scull & Winkler, 2011). School districts have been required to employ additional related service personnel (i.e., speech and language pathologists, occupational therapists, physical therapists, etc.), but often lack the funding to employ enough related service providers to work daily with each student (USDE-PE, 2012). In a study that analyzed the results of a national survey of speech and language pathologists, it was determined that 93.5% of students received services from a speech therapist for two or less days per week for 21- to 30-minutes per day (Mullen & Schooling, 2010). As a result of providing services to students for only two days per week for such a minimal amount of time, related service providers are serving more as a consultant to the special education teacher (Cirrin et al., 2010). Often after minimal training from the related service provider, the teacher is left to implement the ongoing interventions and strategies for the duration of the entire rest of the school day each day (Starling, Munro, Togher, & Arciuli, 2012). Without the thorough background knowledge and experience with a broad range of interventions and strategies, special educators will be unable to successfully meet the needs of students with complex communication support needs (Scull & Winkler, 2011). In addition, the special education field will continue to experience high rates of attrition without a strong field of knowledgeable and experienced teachers.

To compensate for the shortage of special educators, the federal mandate, No Child Left Behind Act of 2001, P. L., 107-110, H. R. 1 (NCLB), encouraged the creation of alternative and emergency teacher certification programs with a focus on the ability to, "move [teaching] candidates into the classroom on a fast-track basis." (U.S.D.E., 2002, p. 15). These alternative or emergency certification options commonly require components of classroom experience, on-the-

job training, school district-university cooperative training programs, standardized assessments (PRAXIS series), or district mentoring programs (Rosenberg & Sindelar, 2005). Despite the popularity of alternative programs, it has been noted that special educators completing these alternative route programs have much lower scores on the PRAXIS exams when compared to teachers in traditional teacher preparation programs, and additionally these teachers lack the sufficient level of methodological skills necessary to meet the needs of the students in their classroom (Sindelar, Daunic, & Rennells, 2004).

The process of educating special educators has been an ever evolving practice that has changed significantly over the past 150 years (Brownell, Sindelar, Theresa-Kiely, & Danielson, 2010). Currently teacher preparation has become less focused and has considerable heterogeneity across the variety of programs available (Goe, 2006). This heterogeneity has occurred due, in part, to emphasis on access to general education curriculum for all students and through the desegregation of students who were typically taught in more restrictive and secluded educational environments (Brownell et al., 2010). Special educators currently require a set of teaching skills that enables them to effectively work with a variety of students with individualized support needs (Scull & Winkler, 2011). The challenge is, therefore, to create comprehensive special education preparation programs that satisfactorily prepare teachers to meet this new challenge of a more diverse special education population (Nagy & Wang, 2007).

Brownell et al. (2010) suggested that the response-to-intervention (RTI) model currently used in schools is a good representation of the needed expertise for special educators. For RTI to be effectively implemented, special education teachers must possess a more comprehensive and sophisticated knowledge-base than that of general education teachers. General education teachers will implement supports and interventions for Tiers 1 and 2 with some assistance from

special educators at Tier 2, but special education teachers need to implement even more specialized interventions and strategies at the upper Tier 2 and the Tier 3 level. Currently, the majority of special education teacher preparation programs are not configured to provide this specialized training during the time constraints of a two-year graduate training program or four year undergraduate training program (Billingsley, Griffen, Smith, Kamman, & Israel, 2009; Sindelar, Brownell, & Billingsley, 2010).

One key specific area of the educational services for students with significant disabilities is the implementation of augmentative and alternative communication (AAC) interventions and strategies. Augmentative and alternative communication is defined as an approach to replace or supplement the use of natural speech (Schlosser & Wendt, 2008). The practice of using AAC has been employed for many years. Some effective communication approaches have included teaching the use of gestures, sign language, graphic or pictorial symbols, communication boards, speech-generating devices, or object exchange (Mirenda, 2003). Traditionally, speech and language pathologists and school district AAC specialists have been the experts in AAC interventions, strategies, and evidence-based practices, and have been the primary staff involved in conducting assessments to determine specific AAC needs (Kent-Walsh, Stark, & Binger, 2008).

Despite being experts in AAC, the majority of speech and language pathologists feel strained by significant increases in their student caseloads (Woltmann & Camron, 2009). Dowden, Alarcon, Collan, Cumley, Kuehn, and Amtmann (2006) indicated that many speech therapists reported that their caseloads had reached unmanageable proportions and expressed that significant negative effects had occurred in service-delivery due to a lack of time and inability to provide the appropriate level of AAC support. It was further noted in the Florida survey that

speech and language pathologists reported that 83% of students with AAC support needs on their caseloads would have achieved higher academic and communication outcomes if the student had additional supports and services to facilitate consistent use of the AAC system throughout the school environments (Stark, Kent-Walsh, & Binger, 2007).

In a follow up study of preparation programs for speech and language pathologists, Ratcliff, Koul, and Lloyd (2008) reported that although there have been advances in the AAC field and training programs for speech and language pathologists, there continues to be challenges with addressing all of the training needs. They explained that due to advances in the fields of medicine and pharmacology, there are far more children that are surviving from conditions that, even ten years ago, would have not survived. Due to this increased survival rate, there has been an increase in the amount of support services that are needed to address children's needs, including training in using AAC systems. It was noted in their survey of university faculty members who trained speech and language pathologists that only one-third of faculty members felt that at least 75% of their students were prepared to work effectively with students with AAC needs. The majority of graduates of these preparation programs additionally reported that they did not feel adequately prepared to meet the needs of those students with AAC needs. It should not be surprising to note the lower self-efficacy of speech and language pathology graduates when, in the survey, 54% of the preparation program faculty evaluated themselves as having minimal to no expertise in AAC implementation and strategies.

The facilitation of consistent use of the AAC system can only occur through the daily instruction and training of special educators and speech and language pathologists, but it requires that they receive more extensive training and professional development in AAC implementation. Thus, the purpose of this study is to evaluate the effects of an online professional development

program focused on the area of AAC implementation for both special education teachers and speech and language pathologists.

Hypotheses

Within this study there are two hypotheses related to teacher outcomes of the research questions. They are:

1. Completion of an online professional development program regarding AAC implementation practices will increase the knowledge of special education teachers and speech and language pathologists related to effective implementation of various aspects of AAC systems.

2. The completion of an online professional development program will increase the special education teacher's or speech and language pathologist's self-efficacy level regarding effective implementation of AAC systems (i.e., more positive self-perception of their potential ability to perform various targeted skills related to implementing AAC systems).

Summary

The field of special education has struggled with retention and attrition for years and has sought to find more innovative methods of alleviating these areas of concern. A potential method that has received increasing focus and exploration to address these concerns is the use of online professional development activities. Despite the increased focus there has been a relatively limited amount of research conducted with special educators and speech and language pathologists. Therefore, this study will seek to further determine the potential for increasing special educator's and speech and language pathologist's knowledge and self-efficacy in a specific instructional training need.

CHAPTER II

REVIEW OF LITERATURE

Self-Efficacy

Self-efficacy is, "a belief about one's own ability to perform a task or achieve a goal" (Leithwood & Jantzi, 2008, p. 497). The idea and theory of self-efficacy originated in 1977 from Bandura's theory explaining that teacher beliefs were linked to their effort and investment in teaching, goal setting, and personal persistence (Bandura, 1977). The theory of self-efficacy is based in the assumption of two expectancies: efficacy expectation and outcome expectancy (Bandura, 1977). Efficacy expectation is made up of the belief that a person has that they can effectively execute a behavior that is needed to produce an expected outcome. Outcome expectancy beliefs follow efficacy expectations, and refer to the personal anticipation or assumption that if the person does engage in the efficacy expectations then they will achieve the targeted outcomes. Without both of these expectancies met, then high levels of self-efficacy cannot be achieved, and the outcomes are likely to not be achieved (Bandura, 1977).

Bandura (1977) explained that efficacy and outcome expectations are developed through four sources of influence. The first influence is through performance accomplishments, which include exposure, mastery of performance skills through experience, and by the participant modeling behaviors for others. The second influence is vicarious experience, which occurs through others modeling behaviors, and other modeling how to solve similar situations to the individual. The third source is verbal persuasion from suggestions, exhortations, and self-instruction. The final source is emotional arousal, leading from relaxation, repeated practice of challenging situation, and through addressing of fears or phobias.

The development of self-efficacy is crucial for teachers to provide instruction in a confident and well-organized method. Research has shown that teachers with higher levels of motivation have higher levels of self-efficacy (Skaalvik & Skaalvik, 2009). It has also been noted that increasing teacher self-efficacy leads to lower rates of teacher burnout and attrition, which has been noted as one of the major concerns in the field of special education (Skaalvik & Skaalvik, 2007).

Research has shown that administrator support of teachers and service providers is one of the key methods for developing higher levels of self-efficacy of teachers, and therefore one of the most important tasks that administrators have is working and helping teachers to develop their teaching skills (Tschannen-Moran & Hoy, 2007). One of the principle roles of administrators is to ensure that teachers have the adequate professional development needed for their positions and to ensure that teachers are utilizing the most current and innovative practices available to the field. Therefore, administrators are one of the key factors affecting school culture, and teacher motivation and self-efficacy.

Elements of Traditional Professional Development

During the 2004-2005 school year the federal government spent approximately $1.5 billion on projects addressing the implementation of professional development for teachers (Birman et al., 2007). This emphasis was based on previous research indicating that professional development led to positive teacher and student outcomes. One of the first studies conducted regarding professional development with teachers was conducted in 1989, when the researchers provided a specialized, comprehensive 80 hour training program to the treatment group of teachers (Carpenter et al., 1989). The results of this specialized professional development treatment demonstrated that the students of the teachers who participated in the professional

development program intervention outperformed the students of teachers who only received a four hour training program on three out of the six student outcome measures.

Yoon et al. (2007) conducted a thorough literature review of studies involving teacher professional development. By using the What Works Clearinghouse evidence standards to identify studies with the most effective research methodology, a total of nine high quality studies were identified. The studies were analyzed and pooled together to create an overall effect size of .55, therefore providing evidence that professional development has significant effects on the improvement of student outcomes.

There is a misconception in the field of education that professional development is easy to implement and does not require extensive planning and evaluation (Ross, 2011). Although there is a significant amount of preparation prior to implementing professional development there is no standard plan or criteria for creating effective training. Although there is not a standard plan there are several key themes that exist in effective professional development programs: (a) individualized professional development; (b) pedagogical content knowledge; and (c) technology integration (new to the field, but appears to be a promising practice)

Individualized Professional Development

Opportunities for professional development are more effective and far reaching when they are focused on the individualized skills and needs of the teacher for whom the training is intended (Dingle, Brownell, Leko, Gould-Boardman, & Haager, 2011). Teachers can be given opportunities to reflect on the progress of students and identify areas of instructional need. Professional development opportunities can then be designed around addressing these issues. The only concern with this potential strength of training is that it is difficult to utilize with little time to plan new professional development programs to address specific concerns. One potential

solution would be for school districts to have professional development activities prepared and readily available for training teachers in a variety of topics and skills. Currently there is no research investigating this practice of professional development.

Thornton et al. (2007) emphasize that professional development should take into account the current levels of expertise and experiences of the teachers involved in the training activities. For current levels of expertise and experiences to be determined, educational leaders (i.e., district level administrators, principals) must have a strong basis of background knowledge and experience in special education practices and methodologies. It is not possible to identify potential training needs without educational leaders personally possessing expertise and experience in the content and strategies that teachers should be implementing.

Pedagogical Content Knowledge

Often it is thought that if professional development is focused on improving teacher instructional behaviors, then the results will improve more effectively. Contrary to this hypothesis, several literature reviews have indicated that professional development focused mainly on improving teacher behaviors actually demonstrated smaller influence on student learning than training focusing on increasing teacher subject-matter knowledge, curricular-knowledge, or student subject-matter learning techniques (Kennedy 1998; Yoon et al., 2006). Pedagogical content knowledge refers to a teacher's understanding of how students learn specific subject matter knowledge (Vandriel, & Berry, 2012). Many people would refer to this knowledge as being based in student learning theories, emphasizing the ability to understand the scope and sequence of how students learn and assimilate new knowledge. The development of this knowledge is highly dependent on many of the environmental factors of the school in which the teacher works (i.e., professional relationships, student population, available time for

professional development, and the district support of professional development) (Little, 2006). To develop pedagogical content knowledge teachers must not only possess a broad range evidence-based interventions and strategies, but also recognize the way in which students learn and process new skills.

Technology Integration

The implementation and introduction of technology in the field of education has transformed the learning opportunities of both students and teachers. Technology has the ability to enhance the comprehension of training information and enhance teacher motivation to engage in professional development. Bausmith and Barry (2011) suggest the creation of online libraries of video lessons for integration into professional development activities. Video modeling has been used to educate and train new skills for students with autism, and Koc et al. (2009) utilized video case examples to model instructional methodology, strategies, and interventions in professional development for teachers. Results indicated that the teacher participants benefited from the ability to view real classroom settings in way that they could see the teacher-student interactions, environmental factors, and modeling of content knowledge methodology.

Benefits of Online Professional Development

Since the original research in 1989 regarding online professional development (Carpenter, Fennema, Peterson, Chiang, & Loef, 1989), many positive effects and benefits have been identified. These benefits have been identified through quantitative and qualitative research methodology throughout the years. The identified benefits include: (a) immediacy of on-demand professional development activities; (b) online professional development has the ability to be adaptable to specific teachers and their training needs; (c) ability to use all the same training methodology as traditional face-to-face professional development, but with the increased ability

to integrate technology applications; and (d) often times is a more economic method of providing professional development.

Immediacy of On-Demand Professional Development

Although professional development is intended to be a proactive approach to meeting the general and individualized needs of students in a teacher's classroom, teachers often express immediate concerns with situations or students in which they are uncertain of what interventions, strategies, or other changes to make to provide effective instruction. Since the inception of the mandates on higher student outcomes, many administrators have moved to creating professional development work days for teachers across a school district (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009). Often these professional development work days occur at the beginning of the school year prior to students starting the school year. These opportunities can provide valuable training, yet occur prior to the start of the school year. Throughout a school year, teachers will be faced with challenges to student learning or methods of teaching specific content, yet there is no professional development work day set aside for addressing the teacher's concern.

Through online training teachers can have immediate assistance through online training materials which are made available on an as-needed basis. In addition to having immediate training information, online professional development allows districts to access training and information from experts in the field of education. Although districts may not have the financial ability to bring in these experts on an as needed basis, the online material can possibly have audio, videos, and texts provided by those research and instructional experts (Whitehouse, Breit, McCloskey, Ketelhut & Dede, 2006).

Adaptability of Professional Development Activities

In order for teachers to truly develop needed skills, it is necessary that teachers have the ability to express and decide what skills they need assistance with in the instruction of students. In interviewing teachers it was identified that the traditional model of providing "standardized" professional development inservices to all teachers in a building, despite the individual teacher's needs, leads to teacher expressing a disinterest with professional development opportunities (Downer, Kraft-Sayre, & Pianta, 2009). They further reported that these traditional professional development activities were far less helpful than simply having time to find information and training from fellow teachers or the internet. Overall, the report indicated that teachers wished they had the ability to go online or to another immediate resource to find the information, rather than engaging in the pre-scheduled school district professional development activities.

Increase Technology Application

Traditional professional development often incorporates the use of lecturing, with an occasional inclusion of Powerpoint presentations, or short video clips. These methods have been used for many years and have been accepted as the method of providing traditional professional development. The utilization of online training methods has introduced a new emphasis on the integration of all possible computer technology tools and methods (Dede et al., 2009). Typical online professional development activities include many of the traditional professional development methods (i.e., voice-over to imitate lecturing and video modeling for demonstrations of targeted skills), but also introduces tools such as online comprehension quizzes, sequencing of activities based off participant responses, corrective feedback for incorrect responses, linking to online resources (i.e., online journals, professional websites), opportunities for teacher professional development choices, online discussion groups with other

professionals and teachers, provide assignments/tasks, taking virtual tours of other classrooms or facilities to model interventions, and the ability for teachers to self-navigate at a individualized pace of learning.

Economic Emphasis

Although many school administrators have increased their emphasis on the professional development of the teachers in their respective schools, during recent years they have been forced to be even more economically critical of unnecessary expenses. Professional development can be expensive to implement to maintain effective teacher development over an extended period of time (Wayne, Yoon, Zhu, Cronen, & Garet, 2008). In a summary of school district spending on professional development, Killen, Monk, and Plecki (2002), reported that for the years of 1992-1998 school districts spent approximately $200 per student in their district on providing professional development. For large districts with approximately 10,000 students, that results in an annual spending of over $2 million dollars on professional development activities.

Although the initial costs of creating online professional development for teachers in a school district or state may be high, this initial investment will have more long term effects and accessibility than a traditional professional development inservice that must be implemented year after year (Collins, Schuster, Ludlow, & Duff, 2002). Once online, the professional development activities can be accessed by teachers whenever they feel they need assistance and for many years beyond. Teachers can be directed to specific online professional development activities either independently or through suggestions and guidance of school administrative staff (Ross, 2011).

Elements of Online Professional Development

In the early stages of online professional development, Smith and Ragan (1993) sought to develop the theoretical base of online professional development and proposed a design process that included eight steps: (a) learner analysis; (b) content analysis; (c) analysis of the learning task; (d) assessment of learner performance; (e) development of instructional strategies; (f) production of instruction using technology; (g) a thorough evaluation; and (h) revision instruction. In seeking to update the theoretical-base provided previously, Ross (2011) compiled a book summarizing the most effective instructional model components for delivering online professional development. The information and research presented in the text was supported by additional references conducted by outside researchers. In summarizing the development and implementation components of online professional development, Ross created an online professional development framework including six key areas of focus and development: (a) Needs assessment; (b) Determining desired outcomes; (c) Taking inventory; (d) Develop instructional content; (e) Develop system components; and (f) Evaluate effectiveness.

Needs Assessment

The purpose of the needs assessment is to determine the need for the online professional development. Online professional development can initially be difficult and expensive to develop, and therefore the developer should ensure that there is an actual need for the professional development area potentially being targeted. Typically a district, state, or university will identify a specific area of concern that prompts the need for teacher training. The developers must also identify perspective participants that will be included, and take note regarding the participant group's previous knowledge regarding the possible topic/content. The professional development should also be aligned with current initiatives that are addressing

teacher knowledge and skill development, and increased student outcomes. Ross (2011) suggests that institutions choose approximately three areas to target with online professional development, which areas are identified through the needs assessment.

Determining Desired Outcomes

It should be fairly easy from the needs assessment to determine the areas in which teachers would benefit from professional development, but determining the desired outcomes can be more difficult. The major cause of difficulty results from the financial factor of online professional development. Ross (2011) explains how the more complex an online professional development program becomes, the more expense it can create. Therefore, institutions must take time to evaluate their overall desired outcomes. There are six areas of desired outcomes which have barring on the overall cost of development and implementation: (a) What are the desired outcomes?; (b) How will the outcomes be measured?; (c) What technical support is available?; (d) What content and program support is available?; (e) What technology is required?; and (f) How easy is the technology to use?

Taking Inventory

The process of actually beginning to put together the online professional development program occurs during this stage of development. If the program developers are unaware or lack the adequate knowledge and experience with the content that will be presented then a content consultant/developer will be need to be employed (Ross, 2011). Although many institutions would think it is simple to develop professional development activities, the process is much more difficult and complex. Assessments may be necessary to determine the current level of knowledge and experience that perspective participants have with the content and technology options being presented and implemented (Ross, 2011).

Develop Instructional Content

After assessing and planning the details and timeframe for implementation, the actual instructional content is developed. Ross (2011) suggests that professional development developers should first develop the assessments that will be used to determine teacher progress. The purpose for developing assessments first is that the assessments will identify the content that should be addressed and mastered by each teacher participant. The content can then be developed from the items of the assessment. The process of developing instructional content should include creating a storyboard with a summary for each module of the online professional development program, writing a script for each module, and incorporating activities and media.

Develop System Components

After the online professional development activities and modules are created and ready to implement, there are several steps to follow for successful implementation. The first step is to identify the initial teachers who will participate and orient the teachers regarding the technology use. If the program will need program facilitators to assist with the use of the technology and program, then the facilitators will be trained. At that point all components are together and the program can be implemented with all participating teachers (Ross, 2011).

Evaluate Effectiveness

Even in the early emergence of online instruction and professional development, researchers noted the importance of subjecting the training program to high standards of evaluation (Meyen, Lian, & Tangen, 1998). Ross (2011) suggests that online professional development must be evaluated upon the teacher outcomes that are targeted during the development stages of each specific program. The final method of evaluating the online professional development program is to determine the overall value of the program. Possible

areas to address would include participant interview feedback, participation rates, and costs per participant.

Literature of Online Professional Development for Special Education Staff

Due to the shortages and lack of adequate retention in special education it is highly important that special educators have access to the most effective and up-to-date professional development activities available. Despite their need to utilize more specialized instruction, research has indicated that professional development for special education teachers does not differ in many ways when compared to typical professional development programs. Bullock, Gable, and Mohr (2008) stated that the design and development of online professional development for special educators should be based on several components: (a) the nature of the instructional content; (b) teacher characteristics; (c) instructional environment (technology being used); (d) instructional planning team; (e) instructional format and strategies or activities; (f) technical and administrative support; and (g) evaluation of outcomes. Noticeably all of these components are the same or comparable to those presented by Ross (2011), which are applicable for the online professional development of all teachers.

Although the components are the same or similar for both general and special education teachers, there have been several studies that provide more specific details for the professional development of special educators. The themes of these studies include several key research areas: (a) individualized professional development activities; (b) content-related instruction; and (c) collaborative opportunities.

Individualized Professional Development Activities

As mentioned previously (Bullock et al., 2008; Ross, 2011), it is important that professional development be individualized to the teachers receiving the training. Due to the

significant shortage of special educators, there has been an increase in the number of alternative and emergency certified teachers who teach special education without the traditional, special education teacher preparation (Nagy, & Wang, 2007). Since these teachers lack the traditional training, it is even more important that specialized, individualized professional development activities be planned for each teacher. The preservice training and previous experiences are different for each teacher and therefore professional development needs should be assessed to determine individualized needs.

Teacher and service provider pre-knowledge and skills exist upon a continuum that can be evaluated to determine professional development needs. Johnson (2004) reports that learner characteristics have one of the greatest influences on the planning and implementation of professional development programs. The continuum of pre-knowledge and skills can be divided into five stages of professional development acquisition. These stages are explained in Table 2, which is adapted from a chart provided by Johnson (2004).

Table 2.

Stages of Professional Development Acquisition

Stage	*Description*
Stage 1: Acquisition	Gains knowledge of objective facts and rules for determining actions. The learner has little if any prior experience of what is being learned.
Stage 2: Advanced Beginner	Knowledge is applied and performance is improved by experiences from authentic situations.
Stage 3: Competence	Emergence of problem-solving skills, evidenced through performance improvement in authentic decision-making opportunities.
Stage 4: Proficiency	Ability to integrate knowledge, experience, and intuition to react to novel situations in a fluent manner.
Stage 5: Expert	Structured procedural knowledge base where there exist the use of routines to automate recurring tasks and to analyze situations and solve complex, novel problems.

Dymond and Bentz (2006) also emphasize this professional development planning component through a study involving the use of digital videos for the enhancement of special education teacher preparation. In the planning process they evaluated each teacher participant to determine their knowledge level of the subject. This evaluation was conducted to ensure that the participant would have the adequate background knowledge necessary to understand and apply the new information and training. In order to provide this individualized approach, Dymond and Bentz report that the professional development program must have access to a wide database of available video clips/segments. To support this database creation, educational institutions are encouraged to make their own video clips/segments.

Content-Related Instruction

Novice special educators and speech and language pathologists are often challenged with the tasks of working across multiple content areas with numerous students with varying disabilities (Gehrke, & McCoy, 2007). Too often in these situations the districts where teachers work do not have adequate professional development activities related to training in content-related knowledge. Billinsley, Israel, and Smith (2011) explain this content-related knowledge concern for novice teachers and reported that it would be beneficial for educational institutions to provide web-based resources for teachers to access professional development activities related to building content-related knowledge. They further explain that finding up-to-date evidence-based resources can be very time consuming which most teachers do not have with the increase in class size and other responsibilities and duties. As a result, teachers do not implement the caliber and frequency of evidence-based practices compared to teachers who have open access to professional development.

Research has indicated that even more specific and advanced content can be taught using online professional development. Lebel, Olshtain, and Weiss (2005) implemented a web-based online course covering augmentative and alternative communication. Although this program was designed more as a college credit course, it has implications for the methods of designing online professional development. The course was designed with progressive instructional units, which were designed using a course mapping process. The results indicated that participants progressed in both their knowledge and skills in assessing and implementing strategies and interventions related to augmentative and alternative communication. In addition to increasing knowledge and skills, the participants also indicated the positive effects of engaging in collaborative discussions with other students enrolled in the course.

Collaborative Opportunities

Many novice special educators and speech and language pathologists feel isolated and as a result have higher rates of attrition due to lack of collaboration with expert teachers from their field (Billingsley, Carlson, and Klein, 2004). Often schools may have only one special education teacher, which creates an even more significant barrier to collaboration and mentoring. As a result of this challenge, Herrington, Herrington, Kervin, and Ferry (2006) conducted a study evaluating the effects of an online community of practice for beginning teachers. This system was considered a mentoring, induction, and professional development program targeted for novice special educators within their first few years of teaching. The system involved the use of a web-based site that allowed novice teachers to access curriculum resources, communicate with other teachers through discussion boards, and reflect upon their practices through blog postings. The research demonstrated that teachers felt more positive regarding their instructional practices and less isolated within their school setting.

Lang and Fox (2003) and Bullock et al. (2008) both support this research suggesting that the most effective professional development activities involve collective and collaborative opportunities. These activities should be designed to allow for teacher exploration, questioning, and dialogue with other teachers. By incorporating these elements, professional development will promote the social, emotional, and intellectual engagement needed to make continuous positive changes to educational practices. Korir-Bore (2008) also conducted a study that evaluated the personal perceptions of perspective special education teachers enrolled in at least one online preservice preparation course. The participants reported that they preferred to have the option to engage in online interactions with other students and supervisory staff while participating in the course.

Chen, Klein, and Minor (2008) implemented an online professional development program for early intervention special education professionals (i.e., special education teachers, speech and language pathologists, occupational therapists, and physical therapists). The focus was to develop skills in interdisciplinary teaming, in addition to working more effectively with the families of young children with multiple disabilities. Through online discussion groups, instant messaging boards, and specialized assignments, the participants were able to increase their knowledge and skills in working with families and children with multiple disabilities. The scores on a self-evaluation survey including 12-items related to targeted skills also demonstrated personal-awareness of growth. In a follow-up study, Chen et al. (2009) improved the online professional development program to include additional components (i.e., nine instructional modules, informative texts, graphics, and videos, and online quizzes). Results of the follow-up study indicated that participants improved content-related knowledge and the ability to work collaboratively with other professionals and families.

Comparison and Future Implications of Online and Traditional Professional Development

Although the current trend in the field is to implement online professional development within school districts and state agencies, there is actually little quantitative evidence indicating any differences in the student outcomes of teachers engaging in online professional development versus traditional in-person training. In one of the first studies to compare the two professional development methods, Lin and Davidson (1995) conducted a study evaluating student outcomes using both online and traditional training methods. The results indicated that there were no significant differences in student learning outcomes despite the implementation of the two different methods. Navarro and Shoemaker (1999) found no significant differences on six out of eight possible academic variables being evaluated in the participant group.

It should be noted that although there is no quantitative evidence of differences between the two professional development methods, there has been qualitative evidence supporting the use of online professional development. As mentioned previously in this review, teachers reported to prefer the access to the online professional development due to its ability to be readily available when necessary (Whitehouse, Breit, McCloskey, Ketelhut & Dede, 2006). Teachers further reported that the traditional professional development was typically implemented at inconvenient times when they did not perceive a problem in the skills targeted by such training. Overall, it appears that often teachers work under a problem-solving framework, in which they seek out information when they experience a problem or difficulty within the classroom. It is at these points when professional development must be readily available so teachers can use the available information to resolve classroom concerns. Another possible qualitative finding leads to financial benefits. With school districts and states facing budgetary challenges, it is important that the most effective professional development methods be consider

and accepted. As stated previously, some school districts spend more than $2 million dollars per school year on professional development, which from the majority of feedback from teachers is not worth their time and effort to attend. Online professional development has an initially high expense to implement but allows for long term effects while also allowing teachers to navigate the supports that are directly applicable to their current situation. For states considering the creation of professional development programs, the online professional development model can be highly appealing (Lock, 2006). The creation of online professional development programs can save extensive amount of money when considering the money that would be needed to employee professional development trainers to cover an entire state and reach teachers in every school district.

Dede et al. (2009) conducted a review of quantitative research results comparing online to traditional professional development. Through the review of literature, it was determined that there had not been any studies that had indicated there to be any quantitative evidence supporting any differences between the two methods. One aspect that was critical to this body of literature is that they proposed a research agenda for further investigating any possible differences. The suggestions within this agenda suggest that future research investigation should include studies evaluating four categories of online professional development: (a) *program design*, evaluating content, pedagogy, strategies, methods of delivery, and identification of best practices; (b) *program effectiveness,* evaluating teacher self-reports and short and long-term change outcomes; (c) *program technical design,* comparing the effect of individual communication multimedia tools and the effect of technology on specific goals of collaboration and creating a learning community; and (d) *learner interaction,* evaluating the quality of participant participation and the effectiveness of online communication and collaboration.

Summary

In applying Bandura's theory of self-efficacy (Bandura, 1977) to professional development for special educators and speech and language pathologists, it is reasonable to see how an online professional development program could assist in increasing a teacher's self-efficacy by addressing the efficacy and outcome expectations regarding AAC implementation. As teachers and speech and language pathologists are provided opportunities to learn new skills and knowledge, view modeling of various strategies and interventions, and discuss topics with researchers they will increase their overall self-efficacy. This study will seek to follow the guidelines set forth by Bandura and by the literature on implementing effective online professional development programs.

CHAPTER III

METHODS

This study seeks to address the specialized professional development needs of special education teachers and speech and language pathologists who work with students with complex communication support needs. The study explores the effectiveness of an online professional development program on AAC-related content in increasing the knowledge and self-efficacy level of special education teachers and speech and language pathologists related to the program content.

Research Questions

This study seeks to address two research questions related to the training of special education teachers and speech and language pathologists. Specifically, the two research questions include:

1. Does participation in an online professional development program including three modules related to AAC instructional content increase the participant's knowledge of the content matter, as measured by pre- and post-assessment measures of the participant's AAC content-related knowledge?

2. Does participation in an online professional development program including three modules related to AAC instructional content increase the participant's self-efficacy level in their ability to effectively implement AAC systems with students, as measured by pre- and post-assessment measures of the participant's self-efficacy level regarding the content?

Participants

Participants in this study included special education teachers and speech and language pathologists providing AAC services to students within the school setting. Participants were

employed in several school districts within early childhood, elementary, middle, and high schools. Participant inclusion criteria included: (a) current teacher or speech and language pathologist in a public or private school; (b) provides AAC services or training to at least one student within the school setting; and (c) an identified need for professional development in AAC. Additional information was obtained on the demographics (i.e., location of employment, years of experience, number of students utilizing AAC systems, previous professional development information) of each teacher and speech language pathologist who participates to determine any within group trends or similarities. Table 3 includes a summary of the professional experience of the participants included in the study.

Table 3.

Participant Professional Experience

	Speech Language Pathologists (N = 21)	Special Education Teachers (N = 12)
No Experience	0	2
First Year	1	0
1-3 Years	4	5
4-7 Years	4	0
8+ Years	12	5

The researcher were also interested in determining the previous experience that participant's had with the implementation of AAC systems with students in school settings. Table 4 provides a summary of the experience and training (i.e., college courses, district professional development courses, and professional conferences) that participants had regarding the implementation of AAC systems.

Table 4.

Participant AAC Experience and Training

	Speech Language Pathologists (N = 21)	Special Education Teachers (N = 12)
Number of Current & Former Students utilizing AAC Systems	Mean = 9.62 Range = 0 – 40	Mean = 2.33 Range = 0 – 6
Number of Previous AAC Courses or Professional Development Experiences	Mean = 5.29 Range = 0 – 20	Mean = 4.00 Range = 0 – 15

To have more ability to potentially apply the results to the fields of special education and speech language pathology the research sought to obtain participants from a variety of locations. All participants included in the study worked in school systems (either public or private schools) working with students who had communication needs being addressed through AAC systems. Table 5 provides a summary of the locations, nationally and internationally, where participants were geographically located. As this study was conducted through online interaction there was no limit to the geographic location of participants.

Table 5.

Geographical Location of Participants

	States within the United States Represented	Other Countries represented
Speech Language Pathologists (N = 21)	Kansas (9) Michigan (6) Ohio (2) Connecticut (1) Florida (1) Oregon (1)	Australia (1)
Special Education Teachers (N = 12)	Kansas (7) Arizona (1) Kentucky (1) Tennessee (1) Virginia (1)	Canada (1)

Sampling Plan

To recruit participants, the researcher contacted several online listservs, special education and related service consortiums, and national, regional, and state disability organizations. These groups were contacted by the researcher to request participation from group members and from those who collaborate with the organizations. Those who were willing to participate in the study were be randomly assigned to either a treatment or control group. Random assignment was conducted by placing every other participant who was willing to participate into the treatment group. The other participants were assigned to the control group (i.e., Participant 1 assigned to treatment group, Participant 2 assigned to control group, Participant 3 assigned to treatment group, Participant 4 assigned to control group, and so on). Upon random assignment, each participant was assigned a private four-digit personal identification that they could use to identify themselves on each online assessment instrument.

Characteristics of Participants

All teachers and speech and language pathologists who completed the components of the study had the following common characteristics: (a) provided special education and AAC training services to students in the school setting; (b) worked with students who primarily utilize non-verbal communication modes and have limited use of spoken language; (c) self-perception of having a limited depth of knowledge and experience in AAC implementation. Additionally all participants were employed as public or private Pre-K-12 teachers or speech and language pathologists.

Dependent and Independent Variables

Within the field of education there are at least two important influences on teachers' professional development and their implementation of evidence-based practices: teacher

knowledge and teacher self-efficacy (Billingsley, Israel, & Smith, 2011; Tschannen-Moran & Hoy, 2007). Each of these components is necessary for the successful implementation of instructional practices that lead to increased student outcomes and, therefore, served as the dependent variables under study. Dependent measures addressed teacher/ speech and language pathologist knowledge of AAC content, teacher/ speech and language pathologist self-efficacy and outcome expectancy levels regarding effective implementation of AAC. The independent variable for this study was the participants' exposure to an online professional development package addressing AAC.

Teacher/Speech and Language Pathologist Knowledge

Often it is thought that if professional development is focused on improving teacher instructional behaviors, then the results will improve more effectively. Contrary to this hypothesis, several literature reviews have indicated that professional development focused mainly on improving teacher behaviors actually demonstrated smaller influence on student learning than training focusing on increasing teacher subject-matter knowledge, curricular-knowledge, or student subject-matter learning techniques (Kennedy 1998; Yoon, Garet, Birman, & Jacobson, 2006). Pedagogical content knowledge refers to a teacher's understanding of how students learn specific subject matter knowledge (Vandriel, & Berry, 2012). The modules in this study sought to build the teacher's/ speech and language pathologist's subject-matter knowledge and understanding of how students develop AAC competency.

In this study the changes in teacher's and speech and language pathologist's knowledge were measured through three assessments. Three online professional development modules were created and used with the participants, and each participant completed three assessments over the

modules as an overall package. The assessments each included 40 questions assessing content knowledge.

Self-Efficacy

Commonly in the education field, personal confidence and self-perception is referred to as self-efficacy (Tschannen-Moran & Hoy, 2007). Leithwood and Jantzi, (2008) defined self-efficacy as, "a belief about one's own ability to perform a task or achieve a goal." The idea and theory of self-efficacy originated in 1977 from Bandura's theory explaining that teacher beliefs were linked to their effort and investment in teaching, goal setting, and personal persistence (Bandura, 1977). The development of self-efficacy is crucial for teachers to provide instruction in a confident and well-organized method. One of the most influential aspects of self-efficacy is that teachers with higher levels of motivation also have higher levels of self-efficacy (Skaalvik & Skaalvik, 2009). Teachers who are not motivated and put forth less effort with their students will result in lower student outcomes.

As described previously, in this study the changes in teachers' and speech and language pathologists' self-efficacy levels were evaluated using three assessment surveys. In addition to the knowledge portion of the assessments, the assessments also included 20 questions linked to self-efficacy of implementing the content being addressed. It should be noted that the self-efficacy levels of teachers and speech and language pathologists were monitored with the anticipation that self-efficacy would lead to increased student communication outcomes and higher AAC competency of those students who the participants work with within the school setting. Although student outcomes were not measured in this study, it is anticipated that communication outcomes for the students served by the participants will increase as a result of higher participant self-efficacy levels.

Online Professional Development AAC Program

Novice special education teachers are often challenged with the tasks of working across multiple content areas with numerous students with varying disabilities (Gehrke, & McCoy, 2007). Too often in these situations, school districts do not have adequate training activities related to training in content-related knowledge for special education professionals. Billinsley, Israel, and Smith (2011) explained this content-related knowledge concern for novice teachers and reported that it would be beneficial educational institutions to provide web-based resources for teachers to access professional development activities related to building content-related knowledge. They further explain that finding up-to-date evidence-based resources can be very time consuming which most teachers do not have with the increase in class size and other responsibilities and duties. As a result, teachers do not implement the caliber and frequency of evidence-based practices compared to teachers who have open access to professional development.

The independent variable of the study was the online professional development program focused on specific AAC-related content. Participants completed three units combined in an overall professional development module package that focused on targeted AAC specific implementation strategies and practices. The online professional development program was titled AACmodules.com.

Profession

Although the researcher could not control the assignment of participants' professions, it should be noted that profession was considered an independent variable. There were two professions represented in the study, special education teachers and speech and language pathologists. It was anticipated that profession may have had an effect on the outcomes of the

dependent variables depending on the participants' prior knowledge and experience with AAC content and implementation. Again, the research was unable to use random assignment for this independent variable due to the participants already having their professions.

Materials

The modules selected for inclusion in this study were chosen from two criteria. The first criterion was initially identified through a previous study conducted by the researcher, which included a survey of 99 speech and language pathologists and 26 special education teachers. The survey was used as a preliminary needs assessment and was created to assess and determine professional development needs for special education teachers in the areas of AAC implementation, and included an extensive self-evaluation for special education participants on their self-efficacy level of implementing various aspects of AAC systems. At the same time, the speech and language pathologists were asked to assess the level of knowledge and skill that a special educator should have to effectively collaborate and implement AAC systems with the speech and language pathologist. The responses were evaluated using an independent samples t-test and several areas of professional development need were identified. These areas included: (a) implementing high-tech AAC systems; (b) assessing communication levels; (c) creating and making adaptations to AAC systems; (d) training partner to assist with AAC facilitation; (e) vocabulary selection; (f) characteristics of voice-output communication aids; and (g) positioning techniques for AAC systems.

As these areas were identified as a need of further training for special education teachers, the researcher further wanted to determine what internet-based training resources were already readily available for teachers seeking training in one of these identified areas of need. Therefore, the second criteria of selecting the modules included in this study was to identify what training

need areas in which there was not currently a sufficient amount of high-quality, internet-based training resources available to special education teachers and speech and language pathologists without the cost of teacher or speech therapist purchasing or costs for enrollment or registration. Through an extensive search of the internet for resources in the identified areas of need, it was identified that the area of "Training Partners to Assist with AAC Facilitation" was the largest deficit area of available training resources that did not require teachers or speech and language pathologists to purchase access to the website/program. Appendix A provides an outline of the websites identified for potential AAC professional development, which is sorted according to training need areas addressed. Appendix B provides an outline of the topics to be discussed in each module included in this study related to the subject matter.

The set of modules in this study was created using the Adobe Captivate software program, which is one of the more cost efficient modes of creating online training materials, while still allowing for the embedding of all necessary media and presentation options. Additionally, Adobe Captivate is a program that is more user friendly than other web-based software programs. This ease of use and cost efficiency assists in the potential replication of this study in the future with a potentially larger scale online professional development program and larger sample size. Additionally, due to lower cost for the software it provides more potential for school districts to potentially create professional development programs that do not require extensive financial commitments. This study included a total of three units, and was posted online to a website created by the researcher specifically for this research study.

Procedures

Human Subjects Approval Process

Prior to contacting any organizations to request participants, the researcher obtained approval from the University of Kansas' Human Subjects Committee-Lawrence (HSC-L) to conduct the research study. All details of the study were described in the application, including the outline of components of the online module and professional development process. Participants were not compensated for participation other than the potential acquisition of new knowledge and skills, and access to the professional development modules for future reference. The review board approved this research without reservation as there did not appear to be any detrimental effects to the participants, or inclusion of participants with cognitive or other disabilities.

Instruments

Instruments that were used in this study included three assessment surveys. As stated previously, the online professional development program was composed of three interrelated units that were presented as a professional development module package. The questions were the same on each of the assessments in order to evaluate participant change in knowledge or self-efficacy levels, although the order of questions were switched address testing bias and maturation. Each assessment contained 40 knowledge-based questions and 20 self-efficacy-related questions.

The assessment was created using the Quality Indicators for Assistive Technology (QIAT) standards and the American Speech and Hearing Association (ASHA) AAC Division official statement on AAC implementation and training (ASHA, 2002). This is a national group of educational researchers and leaders dedicated providing support for school districts, families,

universities, and policy makers. The standards have been recognized by the field and are commonly used by school districts and policy makers to guide decision making. The QIAT has compiled a comprehensive list of standards for professional development and implementation of AAC. This list of standards will be used to create the assessments to ensure that the assessments are valid with what is the current emphasis and best practices in the field. ASHA is the national organization providing training, guidance, and research in the areas of speech, language, and hearing. It is recognized as the leading organization for providing research in these areas and specifically in the area of AAC training and competency. The 2002 document provided an outline of the knowledge and skills that are necessary for speech and language pathologists to work with students with AAC support needs. The assessment that was created for this study addresses the standards related to AAC and partner training.

In addition to creating the assessments based on the QIAT and ASHA standards, the assessments were also reviewed by two researchers in the field of AAC. These reviewers evaluated the assessments to ensure that questions were phrased in an appropriate way and that the information contained in the questions was clear and straightforward. This review process also helped to provide more validity and reliability of the assessment instruction for each of the modules. Appendix C contains the list of knowledge questions and Appendix D contains the list of self-efficacy questions that were included on the assessments.

After the review conducted by the AAC researchers, a focus group reviewed the instruments to discuss several key issues related to instruments: (a) Phrasing of questions; (b) Average time to complete the instrument; and (c) Evaluate terminology used within instruments. The focus group consisted of two speech and language pathologists, four special education

teachers, and two assistive technology specialists. The instruments were modified to address the minor issues that were identified by the focus group.

It should be noted that there are currently no standard instruments in the field for evaluating AAC knowledge or self-efficacy. Therefore, the researcher created the assessment instruments with the greatest amount of consideration and care for ensuring that the instrument is both valid and reliable.

The knowledge-based portion of the assessment was graded for accuracy in responses, and each participant received a total accuracy score for all three assessments. These total accuracy scores were used to evaluate participant progress. The scores on the self-efficacy questions for the assessment were also totaled together to determine an overall self-efficacy score for the assessments.

The overall self-efficacy score was used to determine participant growth in self-efficacy levels from the initial assessment. In more detail, the self-efficacy questions on the assessments addressed areas of both: (a) efficacy expectation; and (b) outcome expectancy. Efficacy expectation is the first step to developing higher self-efficacy (Bandura, 1977), and consists of the belief that the person has that they can effectively execute a behavior that is needed to produce an expected outcome. It was anticipated in this study that if the modules were effective at teaching new skills then participants would have more positive beliefs that they could execute the interventions and strategies taught in professional development module units. In addition, outcome expectancy was also used to determine whether participants anticipated whether or not their application of the interventions and strategies taught in the modules would assist them in achieving the targeted outcomes for their students. The scale used on each self-efficacy assessment item, was one (Not Confident at All), five (Neutral), and nine (Very Confident). The

self-efficacy section of the assessments contained 10 efficacy expectation questions and 10 outcome expectancy questions. Having an equal number of efficacy expectation and outcome expectancy questions led to a higher level of reliability.

Once the review of the assessments was complete, the instruments were posted online to the survey site, www.esurveycreator.com. Participants were sent links to the various assessments and were able to access the assessments using a private, personal identification number. The personal identification number was only known by that researcher and individual participant. The researcher used the identification number to link each completed assessment to the correct participant.

Professional Development Module Creation and Review Process. The researcher created the online units that were viewed and completed by each participant. There were three units that were created and piloted in this study as part of a professional development module package, called AACmodules.com. The modules followed the topics outlined in Appendix B.

The researcher created an initial version of all the units and had several experts in the area of AAC review the modules. This review was for the purpose of increasing reliability and validity of the modules and for enhancing the quality of presentation. After the experts provided feedback regarding all aspects of the units, the researcher made edits and revisions. The modules were then presented to the same focus group that reviewed the assessment instruments. The focus group was presented with the units for the purpose of receiving feedback on the usability and clarity of content. After the feedback of the focus group the researcher made the final revisions and the complete professional development module was published to a researcher created website in preparation for access by participants. The website was used specifically for

the research study and accessible by invitation. The title of the online professional development program was titled AACmodules.com.

Research Design

A quasi-experimental, switching replication research design (Shadish, Cook, & Campbell, 2002) was used to evaluate the effectiveness of the online professional development program on the increase of teachers'/speech and language pathologists' knowledge and self-efficacy levels. Within this design there was a control and treatment group, with a nested group of special education teachers and speech and language pathologists within each group. The switching replication design typically provides a much higher rate of participation and retention in the study by those in the control group since the control group does receive the treatment, unlike many other research designs where the control group does not actually receive the potentially positive effects of the intervention.

Once the modules were created and posted online, the potential participants were contacted to provide them details on the expectations of completing the surveys and modules. Appendix E provides a sample of the recruitment email that was sent to the listservs and organizations requesting interested participants. During the recruitment process participants were randomly assigned to either the control or treatment group (refer to Participants-Sampling Plan for further details). Participant consent was obtained through an online information statement at the beginning of each the assessment. Each participant in the study was first sent the link to the pre-assessment covering the content of the professional development program (assessing knowledge and self-efficacy of the content included in all the modules). Appendix F provides the sample email that was sent to each participant upon their consent to participate in the study.

After participants completed the pre-assessment, the participants in the treatment group were provided the link to the module and units. Participants in the treatment group then proceeded through the units at a self-directed pace, and at the conclusion of the third unit there was a link to a second assessment. Within a week of completing the second assessment, participants in the treatment group were sent a link to the final assessment.

After completing the pre-assessment, the control group was not given the link to the module and units. A week after completing the pre-assessment, the link to the second-assessment was sent to the control group. After a participant in the control group had completed the second-assessment, that participant was sent the link to the module and units. As with the treatment group, the conclusion of the third unit contained a link to the third-assessment. It should also be noted that if a participant had not had any activity within the study (i.e., completion of assessment) within a three week time period, the researcher sent an email to the participant to remind them of what their next step was within the study. After four reminder emails the researcher assumed that the participant was no longer interested in participating or completing the study. Table 6 shows a graphic depiction of the study comparison between the control and treatment group.

Table 6.

Switching Replication Design

Sample (N = 33 / Special Educators [SPED]: 12 & Speech Language Pathologists[SLP]: 21)					
R n_1 = 6 SPED 11 SLP	(O_1)	(X_1)	(O_2)		(O_3)
R n_2 = 6 SPED 10 SLP	(O_1)		(O_2)	(X_2)	(O_3)
Research Activity: O_1 – Pre-assessment (both treatment and control group) X_1 – Treatment (AAC training modules) for treatment group O_2 – Second-assessment (both treatment and control group) X_2 – Treatment (AAC Training Modules) for control group O_3 – Third-assessment (both treatment and control group)					

CHAPTER IV

RESULTS

The purpose of this study was to evaluate the effects of online speech and language pathologists for the training of special education teachers and speech language pathologists. To this point there has been little research on the effects of online professional development in the area of special education, although school districts are adopting it as a method of training teachers (Nagy, & Wang, 2007). It is important that school districts use the most effective teacher training methods to assist with the development, induction, and retention of high quality special education teachers (Desimone, 2009).

For this research study an online professional development program (AACmodules.com) was developed to potentially address the training needs of special educators and speech and language pathologists. A pilot survey of special education teachers and speech and language pathologists prior to this study identified several key areas in the area of augmentative and alternative communication (AAC) implementation, strategies, and interventions. The online professional development program, AACmodules.com, used in this study was developed to address the areas identified in the pilot survey and included three modules which took an average of 20-30 minutes per module to complete. Each module included an interactive presentation (similar to an interactive Microsoft Powerpoint presentation) and several video clips demonstrating and modeling the strategies and interventions addressed in the presentation.

There were two research questions for evaluating the effects of the online professional development program on both knowledge and self-efficacy related to the concepts, principles, and strategies outlined in the online professional development program, AACmodules.com:

1. Does participation in an online professional development program including three modules related to AAC instructional content increase the participant's knowledge of the content matter, as measured by pre- and post-assessment measures of the participant's AAC content-related knowledge?
2. Does participation in an online professional development program including three modules related to AAC instructional content increase the participant's self-efficacy level in their ability to effectively implement AAC systems with students, as measured by pre- and post-assessment measures of the participant's self-efficacy level regarding the content?

The dependent variables were the participants' levels of knowledge and self-efficacy in various skills related to AAC implementation. These levels of knowledge and self-efficacy were measured across three time periods for all participants in order to monitor changes in relation to random assignment to the control and treatment groups. It was hypothesized that when participants were given access to the online professional development program (AACmodules.com) they would have increases in their levels of knowledge and self-efficacy.

There were two independent variables in the study: (a) access to online professional development program (AACmodules.com); and (b) participant profession. The first independent variable was access to a three module online professional development program, called AACmodules.com. This program was created for this study and was available by invitation to those in the study. During the first phase of the study the treatment group was given access to AACmodules.com and had the opportunity to go through it independently. Following their completion of the program, they completed an online post-assessment over the content. The second phase of the study gave the control group access to AACmodules.com. They followed

the same procedures as the treatment group and completed a post-assessment after their independent completion of the program. Participants were able to go back to the website as many times as they wished during the study once they had been given access.

The second independent variable was each participant's profession, although this was not under the control of the researcher. Participants were from two different professions, special education and speech language pathology. It was anticipated that these could have had an impact on the knowledge and self-efficacy levels of participants depending on their previous experience and knowledge of the content. Again, it should be noted that the researcher was unable to randomly assign participants to a profession since each participant indicated during the recruitment phase of the study which profession they were employed as in their current employment position.

To evaluate each of the research questions, the researcher performed the following steps of analysis: (a) conduct a reliability analysis on assessment measure (knowledge and self-efficacy); (b) conduct a repeated measures, between-subjects analysis of variance (ANOVA) with the independent variable factors of control vs. treatment groups and profession (speech and language pathologists vs. special education teachers); and (c) perform post-hoc analysis with paired samples ANOVAs to probe further for group differences between speech and language pathologists and special education teachers.

Findings Pertaining to Question 1

The first research question in this study was, "Does participation in an online professional development program including three modules related to AAC instructional content increase the participant's knowledge of the content matter, as measured by pre- and post-assessment measures of the participant's AAC content-related knowledge?" The dependent measure used to

evaluate this question was a 40-item knowledge assessment developed specifically for this the study.

Each participant completed a 40-item knowledge assessment to assess their level of knowledge in the targeted AAC content and implementation methods. This assessment was administered using an online survey site (www.esurveycreator.com) where all participant responses would be recorded. Each participant was sent an email with the link to the assessment and they independently went onto the website to complete the assessment. The questions on the assessment were presented in two different methods: (a) multiple choice; and (b) choose all appropriate responses. The assessment can be found in Appendices C and D.

Reliability Analysis of Knowledge Assessment

A reliability analysis was conducted on the compilation of participant knowledge scores on the initial assessment of knowledge that all participants completed. The reliability analysis was conducted using the SPSS statistical software. After removing assessment items that did not correlate sufficiently with other items, the final assessment had a total of 25 items. The final knowledge portion of the assessment can be found in Appendix C. After the removal of the items that did not correlate sufficiently the assessment had a coefficient alpha of .70. It should be noted that items that were removed were items that were spread across the three modules as to not compromise the reliability and validity of measuring the effectiveness of the professional development program as a whole. Appendix G displays the percent correct for each item on the pre-test of knowledge skills. In summary, the percentage correct on the final 25 questions of the knowledge assessment ranged from an average of 6% - 100% correct.

ANOVA Results for AAC Knowledge

To determine the answer to research question one the researcher used a two-way repeated measures, between-subjects ANOVA to compare the scores of the control and treatment groups on the knowledge assessments. There was a within subjects factor of the access to AACmodules.com condition with a between subjects factor of profession (speech and language pathology vs. special education teacher). This ANOVA was conducted to determine if significant differences existed and also to determine if there were possible interaction effects between the two independent variables (profession and control/treatment conditions [treatment group access to AACmodules.com]).

In evaluating the effects on the knowledge level with the factor of control vs. treatment conditions there was a significant difference between the control and treatment groups, Wilks' Lambda=.670, $F(2, 29) = 14.27$, $p = .001$. In analyzing the group means for the pre- and post-assessment scores, it was determined that participants in the treatment group had a significantly higher average on the knowledge portion of the assessment. Table 7 provides a summary of the mean scores on the pre- and post-assessments for the knowledge portion of assessments for the control v. treatment groups.

Table 7.

Mean Scores on the Pre- and Post-Assessments for the Knowledge Portion of Assessments for Control vs. Treatment Groups

	Control Group (N = 16)	Treatment Group (N = 17)
Pre-Assessment Scores (First Assessment)	Mean = 16.06 SD = 3.26	Mean = 17.41 SD = 2.85
Post-Assessment Scores (Second Assessment)	Mean = 17.31 SD = 2.41	Mean = 21.53 SD = 1.91
Mean Difference from Pre- to Post-Assessment	Mean Difference = 1.25	Mean Difference = 4.12

After conducting an analysis to determine group differences in knowledge level with the factor of profession (speech and language pathology vs. special education teacher) it was determined that there were not a significant difference between the two groups, Wilks' Lambda=..879, F (2, 29) = 3.98, p= .055. It should be noted that with a significance level of .055 there is the potential to have a significant difference if there had been a greater number of participants in each group. In analyzing the group means for the pre- and post-assessment scores, it was determined that although special education teachers made more gains in their knowledge levels than did speech and language pathologists, the difference was not at a significant level. Table 8 provides a summary of the mean scores on the pre- and post-assessments for the knowledge portion of assessments by profession.

Table 8.

Mean Scores on the Pre- and Post-Assessments for the Knowledge Portion of Assessments by Profession.

	Speech Language Pathologists (N = 16)	Special Education Teachers (N = 17)
Pre-Assessment Scores (First Assessment)	Mean = 17.76 SD = 2.41	Mean = 15.00 SD = 3.44
Post-Assessment Scores (Second Assessment)	Mean = 19.95 SD = 2.54	Mean = 18.67 SD = 3.701
Mean Difference from Pre- to Post-Assessment	Mean Difference = 2.19	Mean Difference = 3.67

Following the results of the two-way, repeated measures ANOVA, the researcher was interested in examining the level of significance for the speech and language pathology and special education teacher groups on the various assessments. The researcher used an additional two repeated measures ANOVAs for each group (speech and language pathology group and special education teacher group) to analyze the results of the control and treatment groups within

each group. To run the first follow up repeated measures ANOVAs, the researcher included the scores of the first two assessments of knowledge skills for the control and treatment groups. The treatment group completed the pre-assessment (first assessment) and then was given access to the online professional development modules. After independently completing the modules, each participant independently went online to complete a post-assessment (second assessment). The control group completed the pre-assessment (first assessment) and then two weeks later completed a second assessment. The control group participants were not given access to the modules. In summary, this first repeated measures ANOVA compared the group scores for the first two assessments on the knowledge portion of the assessments.

After the first follow up ANOVA was completed, the researcher then conducted an additional repeated measures ANOVAs to compare the second and third assessment scores for each group (speech and language pathology group and special education teacher group) and the control and treatment group within each group. The second assessment score for the treatment group is the score of the assessment immediately following their completion of the online modules, while the third assessment score is the score on a maintenance assessment that each participant completed approximately two weeks following their completion of the second assessment. The second assessment score for the control group is the score of their second time to take the pre-assessment, while the third assessment score is the score they received following their completion of the online modules. This second repeated measures ANOVA served primarily to demonstrate a replication of the results of the impact of the online professional development program since it demonstrates the effects of the online professional development program on the knowledge level of the control group and also addressed issues of maintenance of knowledge in the treatment group.

Speech language pathologists' knowledge outcomes. The researcher first analyzed the results of the speech and language pathology control and treatment groups. Table 9 provides the descriptive statistic results of the speech and language pathology control and treatment groups on the first two assessment measures for knowledge.

Table 9.

Descriptive Statistics of Pre- and Post-Assessment Measures for Knowledge by Speech Language Pathology Group

	Speech Language Pathologist Control Group (N = 10)	Speech Language Pathologist Treatment Group (N = 11)
Pre-Assessment Scores (First Assessment)	Mean = 17.40 SD = 2.63	Mean = 18.09 SD = 2.26
Post-Assessment Scores (Second Assessment)	Mean = 18.10 SD = 2.23	Mean = 21.64 SD = 1.36
Mean Differences between First and Second Assessments	Mean Difference = 0.70	Mean Difference = 3.55

As can be seen in figure 1, the control group's average knowledge scores remained near the same between the pre- and post-assessment, while the treatment group's average score had an increase of over 3.5 points.

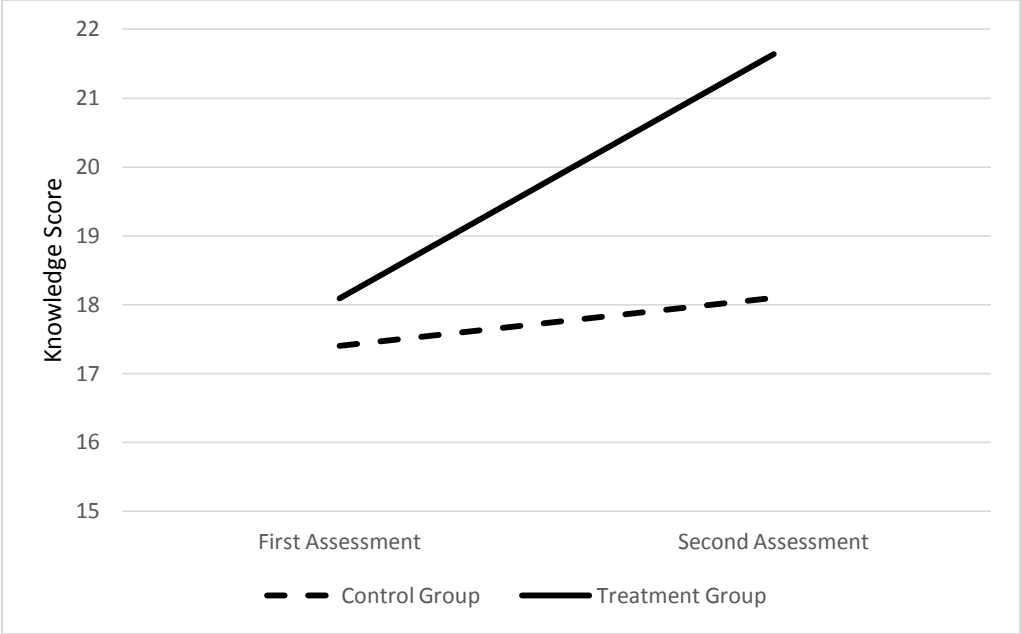

Figure 1. Graphic depiction of speech and language pathology pre- and post-assessment scores on knowledge portion.

The repeated measures, between subjects ANOVA showed that there was a significant effect on knowledge scores, Wilks' Lambda=.700, F (2, 19) = 8.15, p= .010. From these results it can be concluded that in this research study there were significant differences between the knowledge scores of speech and language pathology participants in the control versus treatment groups for the first two assessments. In reviewing the analysis the significant difference is shown from a significant increase in the knowledge scores of those in the treatment group when compared to the control group. These results indicate that access to the online professional development modules for the treatment group led to a significantly higher outcome on the knowledge portion of the assessments. Those who had access to the modules and reported that they completed the modules scored significantly higher on the second assessment as opposed to those who did not have access to the modules.

After analyzing the first and second assessments for differences between the control and treatment groups, the researcher then analyzed the results of the speech and language pathology control and treatment groups for the second and third assessments. Table 10 provides the descriptive statistic results of the speech and language pathology control and treatment groups on the second and third assessment measures for knowledge.

Table 10.

Descriptive Statistics of Second and Third Assessment Measures for Knowledge by Speech Language Pathologist Groups

	Speech Language Pathologist Control Group (N = 10)	Speech Language Pathologist Treatment Group (N = 11)
Second Assessment Scores	Mean = 18.10 SD = 2.23	Mean = 21.64 SD = 1.36
Third Assessment Scores	Mean = 21.90 SD = 1.52	Mean = 21.45 SD = 1.197
Mean Differences between First and Second Assessments	Mean Difference = 3.80	Mean Difference = -0.19

Figure 2 shows the replication of effects of the AACmodules.com for the control group that were similar to the effects seen when the treatment group was given access to the program.

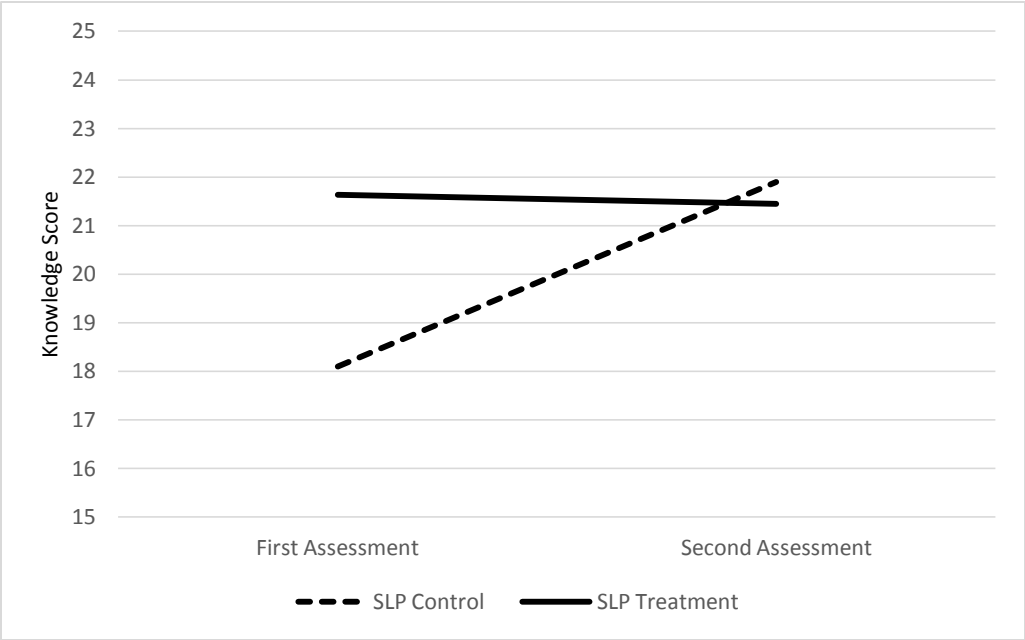

Figure 2. Graphic depiction of speech language pathologist second and third assessment scores on knowledge portion.

The repeated measures, between subjects ANOVA showed that there was a significant effect on knowledge scores, Wilks' Lambda=.447, F (2, 19) = 23.47, p= < .001. From these results it can be concluded that in this research study there were significant differences between the knowledge scores of speech and language pathology participants in the control versus treatment groups for the second and third assessments. In reviewing the analysis the significant difference is shown from a significant increase in the knowledge scores of those in the control group when compared to the treatment group. The knowledge scores of those in the treatment group essentially maintained their scores from the second assessment over a period of approximately two weeks between the assessment times. These results provide a replication of the effects found in the first and second assessments for the treatment group. It is further evidence that access to the online professional development modules led to a significantly higher

outcome on the knowledge portion of the assessments. A replication of two difference groups leads to the assumption that those who had access to the modules and reported that they completed the modules scored significantly higher on the knowledge assessments.

Special education teacher knowledge outcomes. Special education teachers were the second group that was analyzed for knowledge score differences between the first two assessment measures. Table 11 provides the descriptive statistic results of the special education teacher control and treatment groups on the first two assessment measures for knowledge.

Table 11.

Descriptive Statistics of Pre- and Post-Assessment Measures for Knowledge by Special Education Teacher Groups

	Control Group	Treatment Group
Pre-Assessment Scores (First Assessment)	Mean = 13.83 SD = 3.13	Mean = 16.17 SD = 3.60
Post-Assessment Scores (Second Assessment)	Mean = 16.00 SD = 2.28	Mean = 21.33 SD = 2.81
Mean Differences between First and Second Assessments	Mean Difference = 2.17	Mean Difference = 5.16

Similar to the speech and language parthologists control group, Figure 3 shows that the special education teacher control group averaged a smaller increase in scores compared to the treatment group.

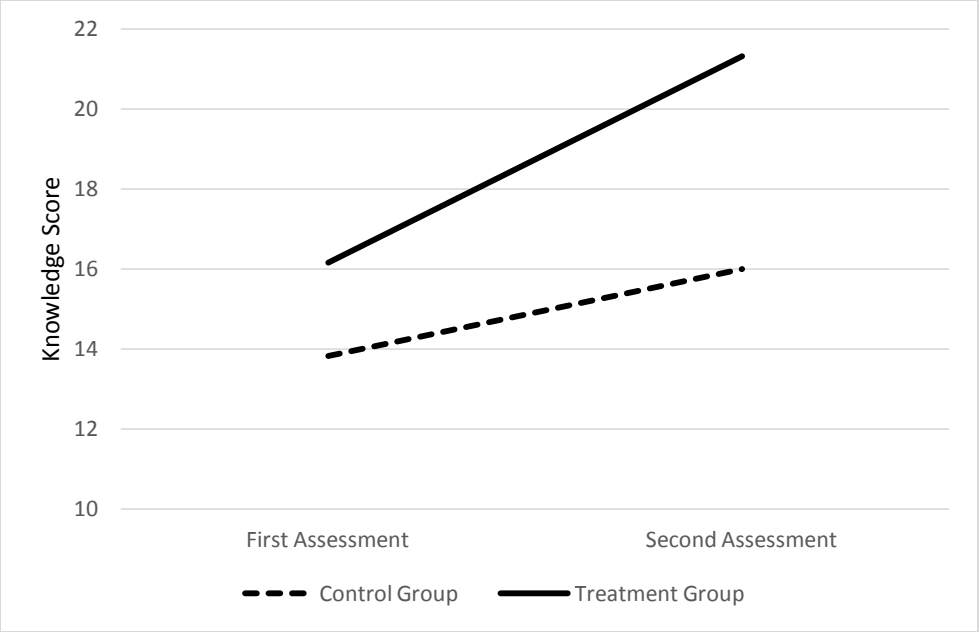

Figure 3. Graphic depiction of special education teacher pre- and post-assessment scores on knowledge portion.

The repeated measures, between subjects ANOVA showed that there was a significant effect on knowledge scores, Wilks' Lambda=.555, F (2, 10) = 8.02, p=.018. From these results it can be concluded that in this research study there were also significant differences between the knowledge scores of special education teacher participants in the control versus treatment groups. In reviewing the analysis the significant difference is shown from a significant increase in the knowledge scores of those in the treatment group when compared to the control group. This information is consistent with that of the speech and language pathology groups for the first and second assessments. These results indicate that access to the online professional development modules for the treatment group led to a significantly higher outcome on the knowledge portion of the assessments.

Following the analysis of the first and second assessments to evaluate differences between the control and treatment groups, the researcher then analyzed the results of the special education teacher control and treatment groups for the second and third assessments. Table 12 provides the descriptive statistic results of the special education teacher control and treatment groups on the second and third assessment measures for knowledge.

Table 12.

Descriptive Statistics of Second and Third Assessment Measures for Knowledge by Special Education Teacher Group

	SPED Control Group (N = 10)	SPED Treatment Group (N = 11)
Second Assessment Scores	Mean = 16.00 SD = 2.28	Mean = 21.33 SD = 2.81
Third Assessment Scores	Mean = 21.5 SD = 12.26	Mean = 21.67 SD = 2.66
Mean Differences between First and Second Assessments	Mean Difference = 5.50	Mean Difference = 0.34

Figure 4 shows the graphic depiction of the control group average increase of 5.50 correct responses, while the treatment group increased only by 0.34 correct responses.

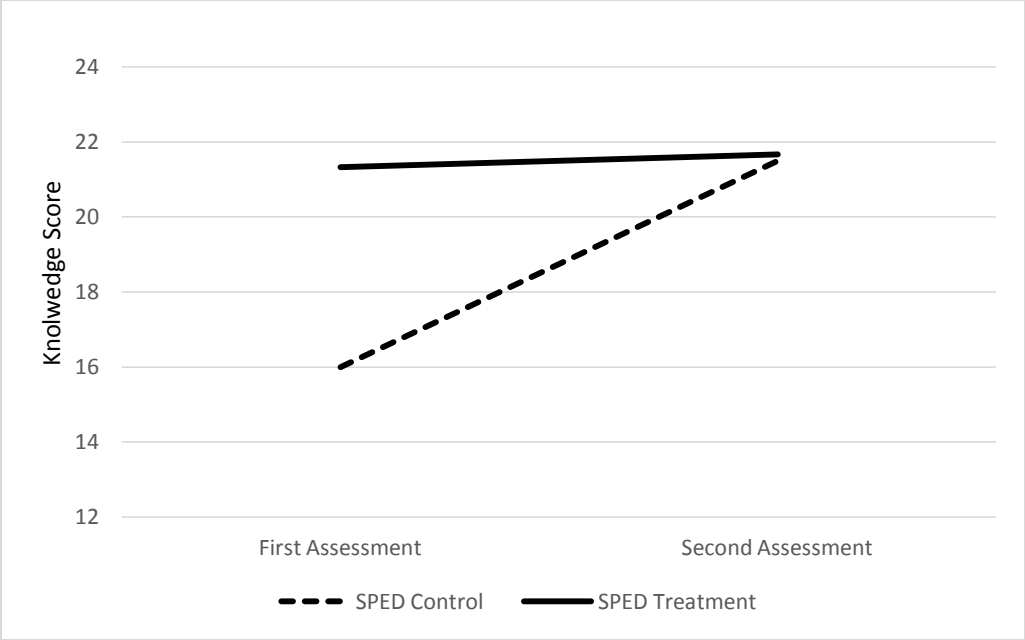

Figure 4. Graphic depiction of special education teacher second and third assessment scores on knowledge portion.

The repeated measures, between subjects ANOVA showed that there was a significant effect on knowledge scores, Wilks' Lambda=.359, F (2, 10) = 17.86, p= .002. From these results it can be concluded that in this research study there were significant differences between the knowledge scores of special education teacher participants in the control versus treatment groups for the second and third assessments. In reviewing the analysis the significant difference is shown from a significant increase in the knowledge scores of those in the control group when compared to the treatment group. The knowledge scores of those in the treatment group essentially maintained their scores from the second assessment over a period of approximately two weeks between the assessment times. These results provide an additional replication of the effects found in the first and second assessments for the treatment group and an additional replication of the results found in the speech and language pathology groups. This provides

further evidence that access to the online professional development modules led to a significantly higher outcome on the knowledge portion of the assessments.

Findings Pertaining to Question 2

The second research question in this study was, "Does participation in an online professional development program including three modules related to AAC instructional content increase the participant's self-efficacy level in their ability to effectively implement AAC systems with students, as measured by pre- and post-assessment measures of the participant's self-efficacy level regarding the content?" To evaluate this research question, a 20-item self-efficacy assessment was used throughout the study.

The knowledge and self-efficacy portions of the assessment were combined into one large assessment to decrease the confusion of participants by requiring them to only go to one assessment, rather than two separate assessments. For the self-efficacy portion each participant completed a 20-item self-efficacy assessment to assess their level of confidence in the implementation of targeted AAC content and methods. Each assessment item contained a statement and the participant had to rate their confidence level on a scale of 1-9 (1-Not Confident at All, 5-Neutral, and 9-Very Confident). This assessment was administered using an online survey site (www.esurveycreator.com) where all participant responses would be recorded. Each participant was sent an email with the link to the assessment and they independently went onto the website to complete the assessment. The researcher would then compute the self-efficacy score on the assessment by adding the self-ratings for all assessment items together to get a total self-efficacy score for each participant. The self-efficacy portion of the assessment can be found in Appendix D.

Reliability Analysis of Self-Efficacy Assessment

A reliability analysis was conducted on the compilation of participant self-efficacy scores on the initial assessment of self-efficacy that all participants completed. The reliability analysis was conducted using the SPSS statistical software, Version 22. After conducting the analysis it was determined that no modifications were necessary and that all assessment items demonstrated a sufficient level of reliability. The self-efficacy assessment held a coefficient alpha of .96. Appendix G displays the average ratings of all participants on the pre-test of the self-efficacy assessment items. The self-ratings on are a scale of one to nine, with one being "Not Confident at All", five "Neutral", and nine "Very Confident". The assessment item averages ranged from 5.03 – 7.67, but Appendix G contains a more detailed presentation of the average ratings and SD for each self-efficacy assessment item.

ANOVA Results for Self-Efficacy

To determine the answer to research question two the researcher used the same methods as used in research question one. A two-way repeated measures, between-subjects ANOVAs was used to compare the scores of the control and treatment groups in connection with the participants' profession (speech and language pathology vs. special education teacher) on the self-efficacy assessments. There was a within subjects factor of the self-efficacy assessments with a between subjects factor of profession (speech and language pathology vs. special education teacher). This ANOVA was conducted to determine significant differences and also to determine possible interaction effects between the two independent variables (profession and control/treatment conditions).

The effects on the self-efficacy level were evaluated with the factor of control v. treatment conditions and it was determined that there was a significant difference between the

control and treatment groups, Wilks' Lambda=.539, F (2, 29) = 24.81, p = < 0.001. After analyzing the group means for the pre- and post-assessment scores, it was determined that those in the treatment group had a significantly higher average on the self-efficacy portion of the assessment. Table 13 provides a summary of the mean scores on the pre- and post-assessments for the self-efficacy portion of assessments for the control v. treatment groups.

Table 13.

Mean Scores on the Pre- and Post-Assessments for the Self-Efficacy Portion of Assessments for Control v. Treatment Groups

	Control Group (N = 16)	Treatment Group (N = 17)
Pre-Assessment Scores (First Assessment)	Mean = 110.69 SD = 26.80	Mean = 119.06 SD = 25.03
Post-Assessment Scores (Second Assessment)	Mean = 113.69 SD = 27.89	Mean = 143.94 SD = 16.36
Mean Difference from Pre- to Post-Assessment	Mean Difference = 3.00	Mean Difference = 24.88

When evaluating the effects on the self-efficacy level with the factor of profession (Speech and Language Pathology vs. Special Education Teacher) there was not a significant difference between the speech and language pathology and special education teacher groups, Wilks' Lambda=.947, F (2, 29) = 1.62, p = 0.214. This result was not close and therefore it does not appear that belonging to a certain profession (either speech and language pathology or special education teacher) makes a difference in the level of change in self-efficacy outcomes. In analyzing the group means for the pre- and post-assessment scores, it was determined that special educators actually made a slightly higher gain in their self-efficacy levels than speech and language pathologists, but the difference was not at a significant level. Table 14 provides a

summary of the mean scores on the pre- and post-assessments for the self-efficacy portion of assessments by profession.

Table 14.

Mean Scores on the Pre- and Post-Assessments for the Self-Efficacy Portion of Assessments by Profession.

	Speech Language Pathologists (N = 16)	Special Education Teachers (N = 17)
Pre-Assessment Scores (First Assessment)	Mean = 122.76 SD = 22.26	Mean = 101.42 SD = 26.93
Post-Assessment Scores (Second Assessment)	Mean = 135.00 SD = 26.74	Mean = 119.25 SD = 25.76
Mean Difference from Pre- to Post-Assessment	Mean Difference = 12.24	Mean Difference = 17.83

After the results of the two-way, repeated measures ANOVA, the researcher was interested in seeing the level of significance for the speech and language pathology and special education teacher groups on the various assessments. Similar to the knowledge portion of the assessments, the researcher used an additional two repeated measures ANOVAs for speech and language pathologists and special education teachers to analyze the results of the control and treatment groups within each group. To review, the first of the follow up repeated measures ANOVAs included the scores of the first two assessments of self-efficacy skills for the control and treatment groups. The treatment group completed the pre-assessment and then been given access to the online professional development modules. After independently completing the modules each participant independently went online to complete the post-assessment. The control group completed the pre-assessment and then two weeks later completed a second assessment. The control group participants were not given access to the modules. Essentially,

this repeated measures ANOVA compared the group scores for the first two assessments on the self-efficacy portion of the assessments.

Following the first follow up ANOVA was completed, the research then conducted an additional repeated measures ANOVA to compare the second and third assessment scores for each group (speech and language pathology group and special education teacher group) and the control and treatment group within each group. The second assessment score for the treatment group is the score of the assessment immediately following their completion of the online modules, while the third assessment score is the score on a maintenance assessment that each participant completed approximately two weeks following their completion of the second assessment. The second assessment score for the control group is the score of their second time to take the pre-assessment, while the third assessment score is the score they received following their completion of the online modules. This second repeated measures ANOVA serves primarily to demonstrate a replication of the results of the impact of the online professional development program since it demonstrates the effects of the online professional development program on the self-efficacy level of the control group and also addresses issues of maintenance of self-efficacy in the treatment group.

Speech language pathologists' self-efficacy outcomes. The researcher first analyzed the results of the speech and language pathology control and treatment groups. Table 15 provides the descriptive statistic results of the speech and language pathology control and treatment groups on the first and second assessment measures for self-efficacy.

Table 15.

Descriptive Statistics of First Two Assessment Measures for Self-Efficacy by Speech Language Pathologist Group

	Speech Language Pathologist Control Group (N = 10)	Speech Language Pathologist Treatment Group (N = 11)
Pre-Assessment Scores (First Assessment)	Mean = 116.10 SD = 26.62	Mean = 128.82 SD = 16.40
Post-Assessment Scores (Second Assessment)	Mean = 119.00 SD = 27.94	Mean = 149.55 SD = 15.44
Mean Differences between First and Second Assessments	Mean Difference = 2.90	Mean Difference = 20.73

Figure 5 shows the comparison of the speech and language pathology control and treatment groups on the pre- and post-assessment measures for self-efficacy, and graphically shows the treatment group increasing at a higher rate than the control group.

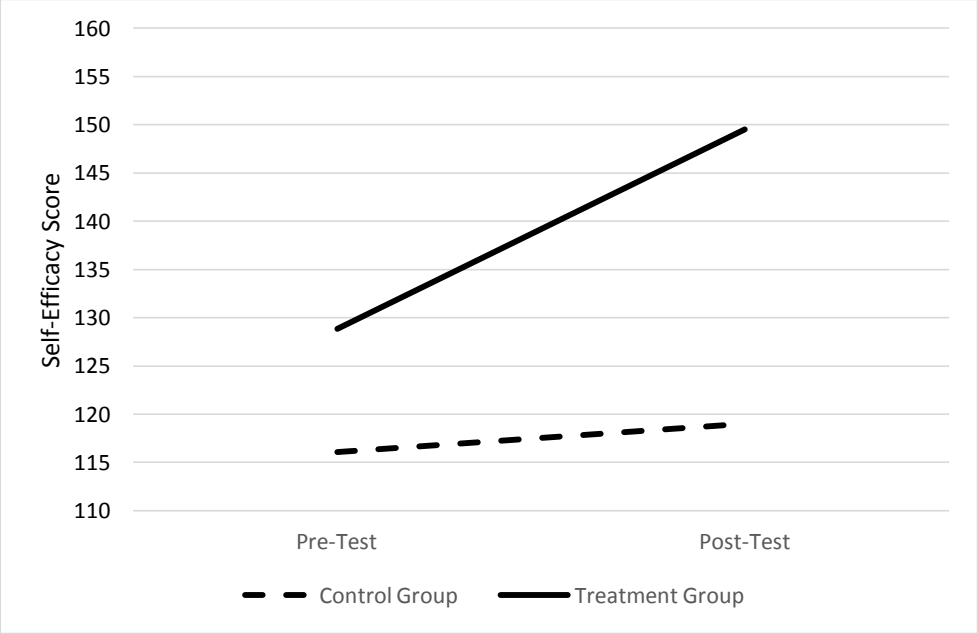

Figure 5. Graphic depiction of speech language pathologists' pre- and post-assessment scores on self-efficacy portion.

The repeated measures, between subjects ANOVA showed that there was a significant effect on self-efficacy scores, Wilks' Lambda=.392, F (2, 19) = 29.48, p = < .001. From these results it can be concluded that in this research study there were significant differences between the self-efficacy scores of speech and language pathology participants in the control versus treatment groups. In reviewing the analysis the significant difference is shown from a significant increase in the self-efficacy scores of those in the treatment group when compared to the control group. These results indicate that access to the online professional development modules for the treatment group led to a significantly higher outcome on the self-efficacy portion of the assessments. Those who had access to the modules and reported that they completed the modules scored significantly higher on the second assessment as opposed to those who did not have access to the modules.

After the analysis of the first and second assessments for differences between the control and treatment groups, the researcher then evaluated the results of the speech and language pathology control and treatment groups for the second and third assessments. Table 16 provides the descriptive statistic results of the speech and language pathology control and treatment groups on the second and third assessment measures for self-efficacy.

Table 16.

Descriptive Statistics of Second and Third Assessment Measures for Self-Efficacy by Speech Language Pathologist Group

	Speech Language Pathologist Control Group (N = 10)	Speech Language Pathologist Treatment Group (N = 11)
Second Assessment Scores	Mean = 119.00 SD = 27.94	Mean = 149.55 SD = 15.44
Third Assessment Scores	Mean = 132.40 SD = 25.40	Mean = 149.91 SD = 15.92
Mean Differences between First and Second Assessments	Mean Difference = 13.40	Mean Difference = 0.36

It should be noted that although the control group did not did not have the same average score on the final self-efficacy assessment as the treatment group, the control group's original self-efficacy average was nearly 12 points less than the treatment group. The control group did make a significant gain in self-efficacy scores from the second to the final assessment. Figure 6 provides a graphic depiction showing increases in the speech and language pathology control group scores while the treatment group remained nearly the same on the second and third assessment measures.

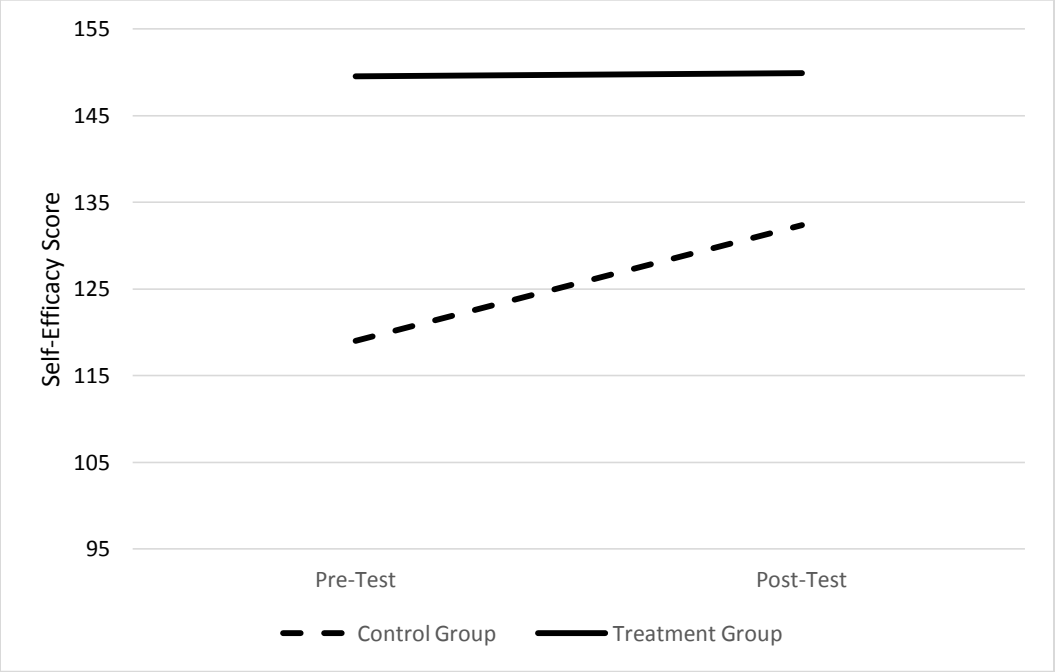

Figure 6. Graphic depiction of speech language pathologist second and third assessment scores on self-efficacy.

The repeated measures, between subjects ANOVA showed that there was a significant effect on self-efficacy scores, Wilks' Lambda=.782, $F(2, 19) = 5.30$, $p = 0.033$. From these results it can be concluded that in this research study there were significant differences between

the self-efficacy scores of speech and language pathology participants in the control versus treatment groups for the second and third assessments. In reviewing the analysis the significant difference is shown from a significant increase in the self-efficacy scores of those in the control group when compared to the treatment group, while the treatment group average essentially remained the same over a period of approximately two weeks between assessment times. These results provide a replication of the effects found in the first and second assessments for the treatment group. This is continued evidence that access to the online professional development modules led to significantly higher levels of self-efficacy as measured by the assessments.

Special education teacher self-efficacy outcomes. Special education teachers were also analyzed for self-efficacy score differences between the first two assessment measures. Table 17 provides the descriptive statistic results of the special education teacher control and treatment groups on the first two assessment measures for self-efficacy.

Table 17.

Descriptive Statistics of First Two Assessment Measures for Self-Efficacy by Special Education Teacher Groups

	Control Group (N = 6)	Treatment Group (N = 6)
Pre-Assessment Scores (First Assessment)	Mean = 101.67 SD = 26.88	Mean = 101.17 SD = 29.55
Post-Assessment Scores (Second Assessment)	Mean = 104.83 SD = 27.87	Mean = 133.67 SD = 13.56
Mean Differences between First and Second Assessments	Mean Difference = 3.16	Mean Difference = 32.5

Figure 7 shows a visual comparison of the treatment group demonstrating significant gains in self-efficacy while the control group making minimal gains on the first two assessment measures for self-efficacy.

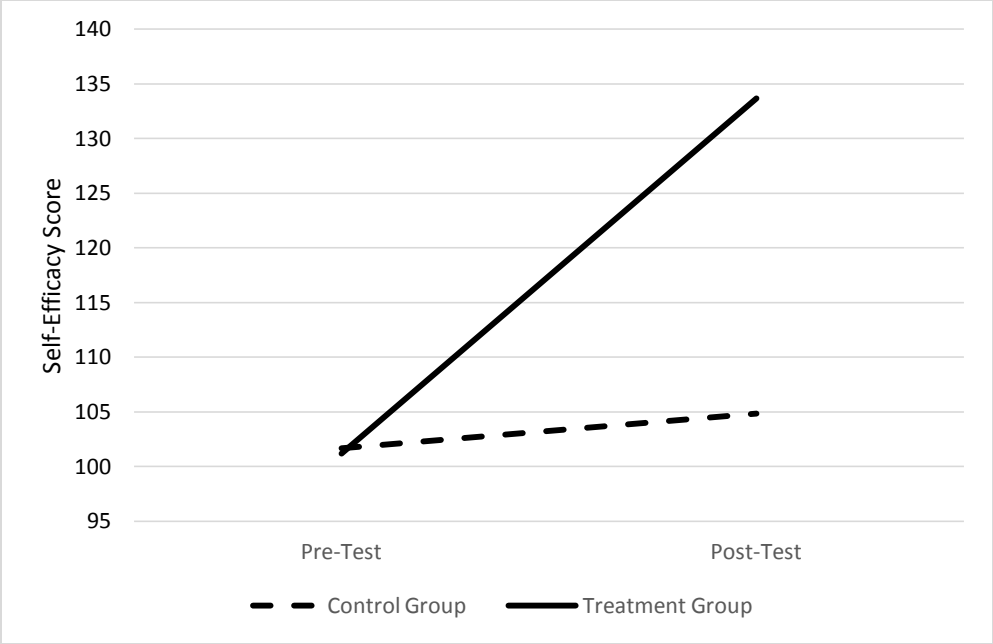

Figure 7. Graphic depiction of special education teacher first two assessment scores on self-efficacy portion.

The repeated measures, between subjects ANOVA showed that there was a significant effect on self-efficacy scores, Wilks' Lambda=.601, F (2, 10) = 6.65, p = 0.028. From these results it can be concluded that in this research study there were also significant differences between the self-efficacy scores of special education teacher participants in the control versus treatment groups. In reviewing the analysis the significant difference is shown from a significant increase in the self-efficacy scores of those in the treatment group when compared to the control group. These results are similar to the speech and language pathology group self-efficacy results and indicate that access to the online professional development modules for the treatment group led to a significantly higher outcome on the self-efficacy portion of the assessments. Those who had access to the modules and reported that they completed the modules scored significantly higher on the second assessment as opposed to those who did not have access to the modules.

As with the speech and language pathology groups, the researcher also analyzed the results of the special education teacher control and treatment groups for the second and third assessments. Table 18 provides the descriptive statistic results of the special education teacher control and treatment groups on the second and third assessment measures for self-efficacy.

Table 18.

Descriptive Statistics of Second and Third Assessment Measures for Self-Efficacy by Special Education Teacher Group

	SPED Control Group (N = 6)	SPED Treatment Group (N = 6)
Second Assessment Scores	Mean = 104.83 SD = 27.87	Mean = 133.67 SD = 13.56
Third Assessment Scores	Mean = 139.17 SD = 20.45	Mean = 134.00 SD = 13.40
Mean Differences between First and Second Assessments	Mean Difference = 34.34	Mean Difference = 0.33

Figure 8 displays how the special education teacher control group made significant increases in self-efficacy scores while the treatment group maintained their self-efficacy level on the second and third measures for self-efficacy.

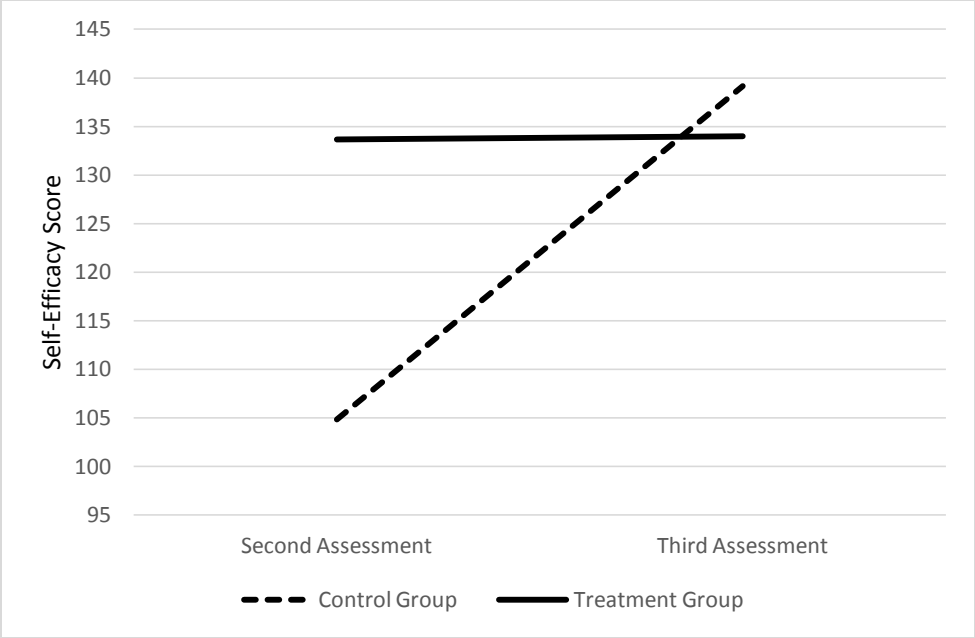

Figure 8. Graphic depiction of special education teacher second and third assessment scores on self-efficacy portion.

The repeated measures, between subjects ANOVA showed that there was a significant effect on self-efficacy scores, Wilks' Lambda=.305, $F(2, 10) = 22.75$, $p = 0.001$. These results are consistent with the results of the speech and language pathology groups on the second and third assessments in self-efficacy and that there are significant differences between the self-efficacy scores of special education teacher participants in the control versus treatment groups for the second and third assessments. Similar to the speech and language pathology group results, the significant difference is shown from a significant increase in the self-efficacy scores of those in the control group when compared to the treatment group, while the treatment group average essentially remained the same over a period of approximately two weeks between assessment times. These results provide a replication of the effects found in the first and second assessments for the treatment group. From the multiple replications of results it can be assumed

that participation in the online professional development program had significant effects upon the self-efficacy levels of participants.

Findings from Participant Feedback

The final assessment that each participant completed included three participant feedback questions that were used to evaluate the qualitative nature of the online professional development program. Each these questions addressed issues such the benefits of the online professional development program, challenges or barriers during the program, and recommended changes. Participants were not required to complete these questions and provide feedback but had the opportunity. The responses for each question were categorized into themes for each individual question. Appendix H contains the actual list of participant responses sorted by theme according to each question.

The first question asked, "What aspects of the professional development modules did you feel were the most beneficial?" There were four themes in response to this question: (a) use of video clips; (b) examples of how to use and embed within school programming; (c) technology and usability components (not including video clip comments); and (d) affirmation of current practices. There were a total of eight participant comments that centered on the benefit of including video clips, and especially focused on the idea of the videos providing modeling of skills. Other comments included the benefit of providing examples, emphasis on various AAC topics, and how to increase the use of the AAC system in the school setting.

The second question asked, "What aspects of the professional development modules did you feel were not as beneficial, frustrating, or not as effective?" There were four themes in response to this question: (a) the need to provide more examples and information; (b) technology and usability issues; (c) the need for more interactive engagement; and (d) components not

linked to learning. Multiple people reported that it would have been beneficial to have more examples and information on various AAC topics (i.e., implementation within the classroom, inclusion of peers, and peer strategies, and more information on coaching). This feedback provided information on topics for potential online professional development modules in the future. Some people had technology or usability issues surrounding navigation, narration, and accessing video clips. Throughout the modules there were various slides that provided interactive activities for participants to engage with regarding specific topics. Multiple participants indicated that the interactive slides were the most engaging and that slides with just text were not as beneficial.

The third question asked, "If you could change anything about the overall program, what would you recommend?" There were three themes response to this question: (a) technology and usability; (b) more examples and interactivity; and (c) other content for future training. The technology and usability issues that were brought up were increasing the usability of navigation through the modules, and one participant indicated that they were confused on the wording of some survey questions. It should be noted that only one participant indicated a concern with the wording on the survey, and therefore this did not appear to be a major concern or issue of reliability or validity. Multiple people expressed an interest in having more videos and interactive multimedia throughout the modules. Some of the identified needs for future trainings included more information on various AAC devices, introduction to picture exchange communication systems (PECS), methods of training others, more information on aided AAC modeling, and general information, tips, and strategies in AAC.

CHAPTER V

DISCUSSION

Overview of Study

This study investigated the implementation of an online professional development program designed for speech language pathologists and special education teachers. The online professional development program, AACmodules.com, consisted of three modules that were created by the researcher and implemented for the purposed of training practitioners in the area of AAC and partner training. Participants were randomly assigned to treatment or control groups within participant categories (speech language pathologists and special education teachers). All participants completed a pre-assessment that included knowledge-based questions and self-efficacy questions.

Following the pre-assessment the participants in the treatment group were given access to the online professional development program. Following their completion of the modules they completed a post-assessment that consisted of the same questions as the pre-assessment. Two weeks after taking the post-assessment participants in the treatment group completed an additional post-assessment to determine whether skills were maintained after the completion of the program.

The control group, two weeks after taking the pre-assessment, took an additional pre-assessment for the purpose of having a comparison group to the treatment group who did have access to the online professional development program. After taking the second pre-assessment participants in the control group were given access to the online professional development modules as well. Upon the completion of the program modules the participants in the control group were directed online to complete the final post-assessment.

The results of the study were divided into knowledge outcomes and self-efficacy outcomes. When comparing the knowledge outcomes for the control and treatment groups within the study, it was determined that there was a significant increase in knowledge between the pre- and post-assessments. It should also be noted that the research design used by the researcher (switching replication design) allowed for this significant increase to be observed two times, serving as a replication of results. It was also determined that the effects were not specific to a certain profession (speech language pathology vs. special education teacher). There were significantly positive results for both the speech language pathology and special education teacher groups and the group knowledge outcomes were close enough to one another to indicate that the AACmodules.com program was not necessarily more effective with one group over the other. Both the groups (speech language pathology and special education teacher) had significant increases in knowledge.

The results for the self-efficacy outcomes were similar to that of the knowledge outcomes. There were significant increases in the self-efficacy scores of participants in the treatment groups compared to that of the control group. Treatment group participants rated themselves significantly higher than that of the control group participants after having access to the AACmodules.com program. Similar to the monitoring of the knowledge outcomes, it should be noted that with the switching replication design the significantly positive effects on self-efficacy outcomes was also replicated with the control group increasing their scores after having access to the AACmodules.com program. When comparing the outcomes according to profession (speech language pathology vs. special education teacher) there was not a significant difference between the speech language pathologists and the special education teachers, although it should be noted that the speech and language pathologists had a higher starting self-efficacy

level compared to the average special education teacher self-efficacy level. Despite this, the special educators actually had a slightly higher self-efficacy increase compared to the speech and language pathologists.

Limitations of Study

After conducting the study and evaluating its implementation and effects, three limitations were identified: (a) limitations with statistical power; (b) lack of monitoring of participants' engagement; (c) lack of teacher/ speech language pathologist observations; and (d) fidelity to treatment.

Limitations with Statistical Power

A power analysis was conducted prior to starting the research to determine how many participants would be sought for recruitment. The power analysis was conducted using the software program , G*Power (Version 3.1.5), and it was determined using an alpha level of .05 and a power of .95, with a medium effect size of .25, that a total of approximately 36 special education teacher participants and 36 speech and language pathology participants would be needed to conduct these analyses. Therefore, due to the nesting of two groups (speech and language pathology and special education teacher) within each group, that there would be approximately 18 speech and language pathologists and 18 special education teachers in both the treatment and control groups (resulting in a total of 36 speech and language pathologists and 36 special education teachers). Although it was anticipated that the researcher would be able to recruit that many participants for each group, only 33 participants completed all components of the study. It should be noted that a total of 87 speech and language pathologists and special education teachers expressed an interest in participating, but only 33 completed all components.

Lack of Monitoring of Participants' Engagement and Fidelity to Treatment

As this was an online professional development program, participants were instructed to go through the modules independently and then complete the post-assessment. With the software that was used for the website there was no ability for the researcher to monitor the level of engagement that each participant put forth when going through the modules. It is anticipated that some participants spent far more time than others going through the modules and most likely visited the website multiple times. The researcher did use a counter at the bottom of each module to monitor the number of times that modules had been viewed. The data revealed that participants viewed Module 1: Introduction to Partner Training a total of 229 times, Module 2: Peer Training a total of 120 times, and Module 3: Working with Families a total of 224 times. Further investigation would need to occur with participants to determine why the Peer Training module was only viewed 120 times while the other two modules were viewed over an average of 226.5 times each. It is anticipated that without this monitoring some participants may not have gone through the online components to the same level or depth as other participants. The researcher did urge participants to actively engage in the program and view all components, but without any technology to actually monitor such engagement levels, there is the possibility that some participants did not complete all components to the same level as other participants.

Lack of Teacher/ Speech Language Pathologist Observations

The assessments used in this study focused primarily on the increase in knowledge and self-efficacy regarding the implementation of AAC systems. Although it is beneficial to note that there was a significant increase in knowledge and self-efficacy levels, there was no information obtained during this study to determining whether the increase in knowledge and self-efficacy actually led to increase use of the AAC system by the students that the participants

served in their respective schools. It is reasonable to expect that the students' use of the AAC systems increase, yet without further research this inference cannot be assumed. Future research should focus on furthering the investigation of additional effects of online professional development, including appropriate implementation of targeted skills, increases in student achievement, and classroom/therapy session observations.

Implications of Findings for Practice and Future Research

From the results of this study and the identification of the limitations there were several implications for current practice and future research in investigating the effects of online professional development for special educators and related service providers. Some of these implications include: (a) Online professional development methodology; (b) Fiscally responsible professional development; (c) On-demand professional development resources; (d) Implications of online professional development without participant interaction; (e) Social validity; (f) New teacher/therapist mentor programming and continuing education. (g) More participants for further research; (h) Online professional development without the collaboration component; and (i) Need for teacher/therapist observation.

Online Professional Development Methodology

Ross (2011) outlined the key areas that contributed to effective online professional development framework: (a) Needs assessment; (b) Determining desired outcomes; (c) Taking inventory; (d) Develop instructional content; (e) Develop system components; and (f) Evaluate effectiveness. This study sought to address these key areas in multiple ways. Prior to the study the researcher used a survey of speech and language pathologists and special education teachers to identify the needs for each profession. This survey was completed by 99 speech and language pathologists and 25 special education teachers and led to the identification of training needs. The

research determined the desired outcomes by using the ASHA and QIAT standards which are widely accepted as the national standards for AAC and assistive technology implementation. A list of competencies was created and the assessment measures were created. The researcher took inventory of the training needs, what was already available online, and what technology needs the participants in the study would need. After identifying these needs, the researcher outlined the topics for each professional development module within the AACmodules.com and brought together the various resources that were available. The online modules were then created with the Adobe Captivate software and posted online to the website that had been created for the study. The participants then completed the assessments and AACmodules.com modules as directed by the researcher. The researcher was then able to evaluate the program effectiveness.

The results and outcomes of this study support the findings presented by Ross (2011). The key areas presented by Ross were followed and the results of the participants were found to be significant. It is hypothesized that if future professional development practices follow these guiding principles and steps then there will be positive results as well. Future research should focus on further investigation of how to more effectively address each of these key areas within online professional development creation and implementation.

Fiscally Responsible Professional Development

The first implication is that school districts could potentially invest in and provide relatively inexpensive professional development through the use of online resources and modules. The software program used in this study to create the modules is relatively inexpensive ($299.00) and would ensure that school districts could replicate the module process in a financially responsible method. Many school districts are providing ongoing professional development through one time instructional sessions or coaching. Although these instructional

methods are often effective, they reach only a limited number of attendees and are only accessible during that one time presentation. Online professional development provides on-demand availability of training whenever a teacher or speech therapist needs training. Coaching is often the most effective means of training teachers and speech and language pathologists, yet is one of the more expensive methods of training and professional development. The online components of this study lead to indicate that special educators and speech therapists can also benefit significantly from specially designed online professional development programs.

It should be noted that the model used in this study did not include a collaboration component with either other participants or the researcher. Previous research has shown that collaboration during online professional development does have a positive impact. Therefore, it is recommended that further research be conducted to determine the overall effects of the collaboration component. It should further noted and recommended that school districts spend a significant amount of money on professional development each year. Typically this professional development is provided through inservices or conference presentations. Although this is commonly accepted as an appropriate method of professional development, the use of online professional development could save school districts some funds which could potentially be used to hire curriculum and instructional coaches who could then go into actual classrooms and provide special education staff with coaching regarding the skills that were targeted in the online professional development. Coaching is widely accepted as one of the most effective methods of increasing teacher performance and increasing student outcomes, and therefore if used in combination with the online professional development there may be great gains in teacher skill development.

On-Demand Professional Development Resources

The second implication is that teachers and related service staff in special education could potentially have access to on-demand resources for training in specialized topics. This type of training is not typically needed every year, and therefore a school district could have a collection of online resources for a variety of specialized topics or skills that could be accessed when needed by teachers and staff. These resources could also easily be updated as new educational practices emerge in the specific training areas. An additional solution would possibly be having state educational agencies invest in the creation modules on specialized topics which could be accessible for any educational professional in the state. This method of on-demand training could assist states who are working under technical assistance grants as well.

Implications of Online Professional Development without Participant Interaction

There is also the potential conclusion that online professional development could still be effective without the use of high rates of collaboration. In the past, research has indicated that online professional development often lacks the common collaboration with other teachers or staff (Dede, et al., 2009). Dede, et al. indicate that collaboration must be a part of the online professional development program in order for it to be considered effective. This research has shown that collaboration can add to the support of teachers, yet little research has been conducted regarding online professional development that does not involve collaboration with a moderator. The results of this study indicate that despite the absence of collaboration the participants still gained a significant amount of knowledge and self-efficacy. Although this study indicates positive results, it should be noted that further research would need to be conducted to ensure that this implication is valid and reliable.

Social Validity

The majority of those who did not complete all components of the study expressed that they simply felt overwhelmed with work demands from the employment and did not have additional time to put forth in order to complete the professional development modules and assessments. They indicated that if their school district had provided them time for the professional development activities then they would have been more likely to complete the components. Both speech and language pathology and special education teacher participants did indicate that they did see a need for professional development in AAC systems but many expressed that they did not feel they have the time due to high caseload numbers and needing to serve such a large number of students. It is anticipated that if participants were compensated in some way for their time outside of school hours then they would be more willing to complete the components of a similar online professional development program.

New Teacher/Therapist Mentor Programming and Continuing Education

An additional implication is that school districts may need to look at far more comprehensive professional development programs for the speech and language pathologists and special education teachers who are working with students who use AAC systems. Districts may need to create programs that instruct or work with teachers and staff who are new to the field or the use of AAC systems with their students. With the advances in technology the AAC field is changing very quickly and it is important that teachers and staff stay updated on the new evidence-based practices that can be used with their students. Online resources can be beneficial for new practitioners who are seeking additional training and knowledge. School districts could determine the key needs of professional development of incoming practitioners and could seek to develop online resources (i.e., websites, professional development modules) that address the

identified needs. These resources are easily updated and can be accessed in an on-demand method when the issue of concern arises. One particular issue may not arise until the second year of someone's career and they may not another person available at the time of their concern or question. Online resources can provide the needed assistance for a variety of issues of concern without the need of meeting face-to-face with a curriculum coach or other specialized personnel member.

More Participants for Further Research

Although it was anticipated that there would be more participants in the study, the researcher was only able to recruit a relatively small number of participants. As there were a limited number of participants recruited for this research study, it is vital that more research study investigate the implementation of online professional development programs with speech and language pathologists and special education teachers. Future research should specifically focus on the following components of online professional development: (a) the need for collaboration with the online facilitator or other online participants; (b) the number of modules included in the professional development program; (c) what components of the online professional development program are the most beneficial; (d) different methods of school districts organizing and facilitating online professional development activities; and (e) the identification of barriers to the implementation, participation, and completion of online professional development programs.

Online Professional Development without the Collaboration Component

Ross (2011) concluded that online professional development programs must include collaboration and interaction with either other participants or a professional development facilitator. The research results from this study serve as a potential foundation of research that

indicates that there can still be positive impact of participation in online professional development programs without the collaboration component. Further research must be conducted to determine if these results can be replicated to lead to further evidence that online professional development does not necessarily require collaboration with others to still receive positive results. Specifically research should look into investigating the difference in results of participants who do engage in collaboration with others and participants who do not engage in collaboration. This type of study would determine any potential significant differences between the two groups as a result of the collaboration component.

Need for Teacher/Therapist Observation

As the researcher in this study did not investigate the application of the targeted skills and strategies highlighted in the online professional development modules, future research should focus on the observation of participants and their ability to apply the strategies and principles. It is hypothesized that an increase in knowledge and self-efficacy would lead to the successful application of the training but without actual participant observation with individuals who use AAC systems, this assumption cannot be made. This study did involve participants from several states across the United States, in addition to Australia and Canada. It would be difficult to conduct a research study with participants in such a wide geographic range, but smaller studies could be conducted in various regions that included the opportunity to observe participants in classrooms utilizing the targeted strategies and skills.

Conclusion

The results of this study support the previous research that online professional development for educators is an effective practice, and builds the research-based supporting this practice with special education staff specifically. The evidence supports the practice of online

professional development as a potential method of building teacher knowledge and self-efficacy, while further research is required to determine whether participants are able to generalize and apply these techniques, skills, and strategies into the school environment. Further research should focus on the application of information presented in the online professional development program. It should be noted that online professional development is not recommended as a cure all solution to professional development and that further research should be conducted to determine methods of identifying more comprehensive professional development programs that include all possible resources (e.g., coaching, district inservice, conferences, administrative supervision, professional learning communities).

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Appendix A

Websites included in review of free AAC training websites available to teachers and speech and language pathologists

Website	*Hi-tech AAC skills*	*Assessing communication level*	*Creating Adaptations to AAC*	*Training Partners*	*Vocab Selection*	*Characteristics of Speech Generating Devices*	*AAC Positioning Techniques*
AAC-RERC			Moderately Addressed				Sufficiently Addressed
IRIS (No specific AAC Training)							
PRC AAC Language Lab		Indirectly, more language based			Language Based Vocabulary	Company Specific	
Google Search	Adequate # of Websites						
UW AugComm	Sufficiently Addressed	Sufficiently Addressed	Minimally addressed		Adequately Addressed		
Dynavox				Moderately Addressed			
AT Internet Modules		Indirect, Very Minimal					

Appendix B

Summary of the units included in online professional development module, including topics and subtopics covered in each module.

Module 1	***Module 2***	***Module 3***
- Comprehensive needs assessment and discrepancy assessment	- Authentic assessment methods (observing the communication of peers)	- Reasons for choosing a specific device/system (key features, level of user abilities)
- Assessment of language skills (form, content, use) & Data collection methods	- Seating and positioning	- Best method for teaching AAC use to new users (in natural environments)
- Who should be trained on the AAC system	- Peer v. teacher/SLP responsibilities	- Data collection on interactions
- Communication levels (Non-Symbolic, Transitional, & Symbolic)	- Methods of engaging peers in interactions (allowing peers to complete the interaction and provide feedback afterwards)	- Mand-modeling
- How partners impact effectiveness of AAC use	- Peer coaching	- Role release by SLP/Teacher
- Typical concerns with AAC user communication skills (initiating and maintaining)	- Modify AAC system to meet the needs and abilities of peers	- Generalization of skills
- Mand-Modeling	- Generalization to general education setting by training peers	- AAC abandoning issues (meet with AAC user)
- AAC modeling	- Attitudes of peers	- Who is responsible for the AAC implementation
- Increasing the # of communication partners	- Engineering environments for setting up opportunities	- Where should the AAC system be implemented
- Reasons for AAC user participation is restricted	- Reasons for AAC user participation is restricted (lack of appropriate communication system, & needs/discrepancy assessment)	- Training for the family
- Consideration of choosing a device or system	- Teachers/Speech Language Pathologist's observing peers' communication methods	- Engineering the environment
- Dynamic v. static devices	- Authentic assessment with peers	

Appendix C

Corresponding Knowledge Assessment Questions with ASHA & QIAT Standards

ASHA Training Standards	***Knowledge Assessment Questions***	***Module Addressing Question***
1.3 Conducting a comprehensive needs assessment and/or a discrepancy analysis to identify why an individual's level of participation in a particular activity might be restricted due to his/her lack of access to an effective means of communication.	1. When seeking to determine why an AAC user's level of participation in a class activity is restricted, which of the following would be the most effective means of making the determination? a) Conduct an analysis of support provided by staff b) Conducting a comprehensive needs assessment and discrepancy assessment c) Taking note of peer supports d) Conducting a functional behavior analysis Correct Answer: B	1 & 2
1.4 Using authentic assessment procedures to assess and determine individuals' communication skills and needs in relation to the communication skills of other persons the same age.	2. When using authentic assessment procedures to determine an AAC user's communication skills and needs, what is an effective measure of their overall communication skills? a) Their progress over the past year b) Their comparison to others with similar communication related disabilities c) Their comparison to others their same age d) The level of understanding and comprehension of those who regularly interact with the AAC user Correct Answer: C	2
1.w Ability to assess AAC users' language skills, both production and comprehension, including form (different modes of communication and their relative effectiveness, alone and in combination with one another; phonology; and syntax), content (semantics), and use (pragmatics).	3. Which one of the following is not one of the three key areas of assessing an individual's language skills? a) Form b) Level of independence c) Content d) Use Correct Answer: B	1

2.2 Matching features of AAC systems to capabilities of individuals being considered for those same systems.	4. Which of the following reasons might best explain why you would choose a speech generating device (previous referred to as a voice-output device or communication device) that is more advanced than the skills of the individual using the device? a) Peers will have the ability to use all the advanced features b) It allows for the individual to complete more assignments in the general education setting c) You feel they might gain more advanced skills once they have more experience with the device d) Youth typically have a greater ability to learn more advanced technology skills than adults trying to learn technology. Correct Answer: C	3
2.e Knowledge about, and skills in, evaluating individuals' symbolic skills, including levels of abstraction (e.g., actual objects, photographs, pictures, line drawings, and words), and complexity of symbols they can use and understand. (Note: no hierarchy has yet been demonstrated with respect to symbol abstraction in relation to ease of learning.)	5. Which of the following are examples of symbolic communication modes (choose all appropriate options): a) PECS b) Line drawings c) Facial Expression d) Braille e) Sign Language f) Eye Gaze g) Spoken Words h) Manipulation of Objects or People Correct Answer: A, B, D, E, G	1
2.e Knowledge about, and skills in, evaluating individuals' symbolic skills, including levels of abstraction (e.g., actual objects, photographs, pictures, line drawings, and words), and complexity of symbols they can use and understand. (Note: no hierarchy has yet been demonstrated with respect to symbol abstraction in relation to ease of learning.)	6. Which of the following are examples of non-symbolic communication modes (choose all appropriate options): a) Facial Expressions b) Line drawings c) Vocalizations d) Braille e) Spoken Words f) Manipulation of Objects or People g) Eye Gaze Correct Answer: A, C, F, G	1

2.g Knowledge of the broad array of dedicated devices that are designed specifically for AAC purposes, and their respective features (e.g., methods of access, durability, types of symbols, organization of items, auditory and visual features, modes of output [spoken and printed], flexibility, portability, and cost).	7. Which of the following is <u>not</u> a key feature that should be considered when choosing a dedicated device for a student with communication needs? a) Method of activation b) Type of symbols used c) Modes of output d) Therapist familiarity Correct Answer: D	3
2.k Knowledge of how seating and positioning affect body tone, reflexes, and controlled movements, all of which influence individuals' abilities to use AAC systems, and ability to collaborate with other professionals to optimize seating and positioning for AAC use.	8. Which of the following is not a way in which seating and positioning affect a student's ability to use their AAC system? a) Control of body awareness and image b) Control of body tone c) Control of body reflexes d) Control of body movements Correct Answer: A	2
2.o Knowledge of the roles of communication partners in contributing to and inhibiting language, communication style, and effectiveness of individuals who use AAC.	9. Which of the following is not an example of how communication partners can impact the effectiveness of AAC use? a) Inhibit reciprocal communication attempts b) Initiate communication interactions c) Reads a text for the AAC user d) Model using the AAC system Correct Answer: C	1
2.p Knowledge and skill assessing and documenting interaction patterns used in conversational exchanges, including conversational roles such as initiator and respondent.	10. AAC users are typically good at initiating and maintaining interactions with communication partners. a) True b) False Correct Answer: B	1

2.p Knowledge and skill assessing and documenting interaction patterns used in conversational exchanges, including conversational roles such as initiator and respondent.	11. It is a peer's responsibility to monitor and document interaction patterns used by their peer who uses and AAC system. a) True b) False Correct Answer B	2
2.t Knowledge about the dynamic nature of AAC systems and the need to modify them over time as individuals and their conversational partners' needs, abilities, and opportunities change.	12. Which of the following is true about peers and their ability to interact with AAC users? a) Peers are effective communicators because there are the same age and have the same interests b) Peers enjoy interacting with AAC users and like to use technology c) Peers typically need coaching to become effective communicators with AAC users d) Peers will let the special education teacher or SLP know if they need assistance with communicating with the AAC user Correct Answer: C	2
3.2 Developing goals and objectives, and expected levels of attainment, relative to: a) individuals' communication needs and desires. b) individuals' abilities to use recommended communication options. c) predetermined functional and meaningful outcomes. d) individuals' interactions with different conversational partners in various situations and environments. e) the need to instruct conversational partners.	13. When collecting data on interactions involving communication partners, what information is most important for monitoring the effectiveness of the AAC system use? a) Training that partners were provided b) Extracurricular activities that partners participate in c) Number of different partners d) Settings/Environments of interactions e) All of the Above f) A, B, D g) A, C, D Correct Answer: G	1 & 3

3.d Knowledge and skill applying different incidental teaching/milieu approaches, and teaching others to use them to foster interactions with individuals who use AAC. These techniques, all evidence-based, include but are not limited to: a) incidental teaching. b) engineering environments to present reasons and opportunities for communication. c) expectant delay. d) mand-model.	14. What is an accurate rationale for engineering an environment for an AAC user to increase communication? a) To increase opportunities for building independence in daily routines b) To present opportunities for peers to build independence in initiating interactions with the AAC user c) To present reasons for the AAC user to engage with others in the environment d) To prompt the general education teacher to engage in more communication engaging activities Correct Answer: C	2
3.e Knowledge and skill in providing environments that support communication, such as: • having high expectations for individuals who use AAC. • Expecting individuals who use AAC to participate actively in activities that do and do not require communication interactions, with a broad array of conversational partners. • applied behavior analysis. • mand-model.	15. It is best to have only a few communication partners for the AAC user to interact with so they can become more effective using their AAC system. a) True b) False Correct Answer: B	1
3.d Knowledge and skill applying different incidental teaching/milieu approaches, and teaching others to use them to foster interactions with individuals who use AAC. These techniques, all evidence-based, include but are not limited to: • incidental teaching. • engineering environments to present reasons and opportunities for communication. • expectant delay. • mand-model.	16. What is one of the key methods for creating opportunities for communication? a) Setting up the environment b) Having a large vocabulary of symbols to use for communicating c) Role playing situations d) Involving families in the collaborative process Correct Answer: A	2

4.c Knowledge and skill regarding the use of role release, including appropriate and effective utilization of families, paraprofessionals, professionals, and laypersons to teach and foster effective, functional communication skills in various natural environments.	17. What must be done prior to a teacher or SLP engaging in role release to another communication partner? a) Conduct a functional behavior assessment b) Meet with an administrator to discuss the AAC process c) Train the family, paraprofessional, and peers d) Make sure the student can complete a variety of school routines independent Correct Answer: C	3
4.e Knowledge about and skill in integrating AAC instruction into natural settings, such as classrooms, work places, and homes to enhance individuals' participation in these and other meaningful environments.	18. Which of the following settings is the best for integrating AAC instruction? a) Special education classroom b) Pull-out SLP session in a small group c) Isolated one-on-one training session d) General education setting Correct Answer: D	2
1.4 Using authentic assessment procedures to assess and determine individuals' communication skills and needs in relation to the communication skills of other persons the same age.	19. Which of the following would be the best authentic assessment of how well a student has generalized their communication skills? a) Working one-on-one with a student in a new environment b) Observing the student working in a small group within a therapy session c) Setting up a structured observation of targeted communication skills d) In a general education setting when communicating with peers Correct Answer: D	3

2.2 Matching features of AAC systems to capabilities of individuals being considered for those same systems.	20. When creating or choosing an AAC system for a student with communication needs, which of the following is the most important consideration? a) Choosing a system that is socially acceptable b) Matching the features of the system with the student's capabilities c) A system that is makes sense financially for the school district d) Meeting the expectations of the parents Correct Answer: B	1
2.e Knowledge about, and skills in, evaluating individuals' symbolic skills, including levels of abstraction (e.g., actual objects, photographs, pictures, line drawings, and words), and complexity of symbols they can use and understand. (Note: no hierarchy has yet been demonstrated with respect to symbol abstraction in relation to ease of learning.)	21. When an AAC user activates an icon on a dynamic display of a speech-generating device, what happens? a) The icon begins flashing until they push it again b) The speech becomes more dynamic or expressive c) Another page is brought up that was linked from the activated icon d) A light on the device lights up so that the communication partner knows the AAC user has something to say Correct Answer: C	1
QIAT Standards	***Knowledge Assessment Question***	
ASSESSMENT- 7. AT needs are reassessed any time changes in the student, the environments and/or the tasks result in the student's needs not being met with current devices and/or services.	22. Once a student has become successful using an AAC system in the special education setting, they will always be successful with its use in the general education settings. a) True b) False Correct Answer: B	2

IMPLEMENTATION- 3. Persons supporting the student across all environments in which the assistive technology is expected to be used share responsibility for implementation of the plan.	23. Which of the following best describes the responsibility that parents have in regards to the implementation of AAC systems? a) Purchase of the AAC system components b) Making sure that they implement the AAC system in the home setting c) Shared responsibility in all aspects d) Attending and giving input into the development of the IEP Correct Answer: C	3
IMPLEMENTATION- 2. AT is integrated into the curriculum and daily activities of the student across environments.	24. The AAC system should be implemented in which of the following settings for the most effective progress to occur? a) Special education setting b) Weekly therapy session c) General education setting d) Home setting e) Community setting f) All of the above g) A, B, C h) A, B, C, D Correct Answer: F	3
IMPLEMENTATION- 5. Learning opportunities for the student, family and staff is an integral part of implementation.	25. Which of the following should schools provide to families regarding AAC systems? a) An AAC device that can be used at home, so the student will not have to transport the device back and forth b) Training on how to use the AAC system c) Unlimited access to the parents observing the AAC user in the school setting d) In home support for using the AAC system Correct Answer: B	3

Appendix D

Corresponding Self-Efficacy Assessment Questions with ASHA & QIAT Standards

ASHA/QIAT Training Standard	***Self-Efficacy Assessment Question***
ASHA 1.a Knowledge of typical speech-language development and ability to apply this information to individuals who rely on AAC.	1. I am knowledgeable in language development and I feel comfortable applying this knowledge to individuals who use AAC. Efficacy Expectation / Outcome Expectancy
ASHA 1.p Skill assessing individuals' current and future communication needs and desires. 1.w Ability to assess AAC users' language skills, both production and comprehension, including form (different modes of communication and their relative effectiveness, alone and in combination with one another; phonology; and syntax), content (semantics), and use (pragmatics).	2. I am able to effectively assess an individual's communication skills and level, and realize what their current and future communication needs should be. Efficacy Expectation / Outcome Expectancy
QIAT Professional Development & Training 2. The education agency has an AT professional development and training plan that identifies the audiences, the purposes, the activities, the expected results, evaluation measures and funding for assistive technology professional development and training.	3. If I have paraprofessionals working with an AAC user in the general education setting, I can confidently provide comprehensive training to the paraprofessional on how to effectively foster the use of the AAC system. Efficacy Expectation / Outcome Expectancy
ASHA 1.1 Identifying and coordinating (when necessary) the participation of other team members throughout the assessment process; recognizing the importance of collaborating with specialists, family members, and other parties as needed.	4. When implementing a new AAC system with a student I am confident in my ability to identify needs and coordinate the participation of other team members. Efficacy Expectation / Outcome Expectancy

ASHA 2.q Knowledge and skill examining individuals' communication skills relative to communication demands posed in different environments.	5. I am capable of examining the communication skills of AAC users in multiple environments, and able to observe the causes of differences in communication effectiveness across the various environments (e.g., special education setting, general education setting, community setting, vocational setting, home setting). Efficacy Expectation / Outcome Expectancy
ASHA 2.r Knowledge and skill in use of techniques and strategies for promoting communication interactions, turn taking, and discourse.	6. I possess a wide array of available strategies and techniques for promoting communication interactions, turn taking, and conversation. Efficacy Expectation / Outcome Expectancy
ASHA 3.e Knowledge and skill in providing environments that support communication, such as: a) having high expectations for individuals who use AAC. b) Expecting individuals who use AAC to participate actively in activities that do and do not require communication interactions, with a broad array of conversational partners. c) applied behavior analysis. d) mand-model.	7. When working with an AAC user, I am able to know what I can reasonably expect of them and can anticipate what the short- and long-term goals might be for that student. Efficacy Expectation / Outcome Expectancy
ASHA 3.d Knowledge and skill applying different incidental teaching/milieu approaches, and teaching others to use them to foster interactions with individuals who use AAC. These techniques, all evidence-based, include but are not limited to: • incidental teaching. • engineering environments to present reasons and opportunities for communication. • expectant delay. • mand-model.	8. I am able to use a variety of incidental teaching methods (i.e., incidental teaching, mand-modeling, and discrete trial training) for teaching the development of AAC use. Efficacy Expectation / Outcome Expectancy

ASHA 3.d Knowledge and skill applying different incidental teaching/milieu approaches, and teaching others to use them to foster interactions with individuals who use AAC. These techniques, all evidence-based, include but are not limited to: • incidental teaching. • engineering environments to present reasons and opportunities for communication. • expectant delay. • mand-model.	9. I can effectively engineer an environment to create a wide array of communication opportunities for AAC users. Efficacy Expectation / Outcome Expectancy
ASHA 2.5 Assessing individuals' and their communication partners' motivations to use, and attitudes toward, AAC.	10. I am able to go into a general education classroom and quickly identify which peers would be the most effective communication partners for an AAC user. Efficacy Expectation / Outcome Expectancy
ASHA 3.d Knowledge and skill applying different incidental teaching/milieu approaches, and teaching others to use them to foster interactions with individuals who use AAC. These techniques, all evidence-based, include but are not limited to: • incidental teaching. • engineering environments to present reasons and opportunities for communication. • expectant delay. • mand-model.	11. If I am in charge of setting up the environment for communication opportunities, the AAC user will increase their ability to use their AAC system Efficacy Expectation / Outcome Expectancy
ASHA 4.c Knowledge and skill regarding the use of role release, including appropriate and effective utilization of families, paraprofessionals, professionals, and laypersons to teach and foster effective, functional communication skills in various natural environments.	12. If I were to fade my presence from the AAC user at any given time during the day, the AAC user would still be supported sufficiently by the other staff I have trained. Efficacy Expectation / Outcome Expectancy

ASHA 2.10 Teaching other professionals, family members, employers, and others how to support individuals' effective uses of their AAC systems.	13. If I train another teacher to adapt their class to allow for more opportunities for AAC use, then they will more change their instructional methods. Efficacy Expectation / Outcome Expectancy
ASHA 2.10 Teaching other professionals, family members, employers, and others how to support individuals' effective uses of their AAC systems.	14. If I train family members to use the AAC system, then they will be confident in being able to use the system at home. Efficacy Expectation / Outcome Expectancy
ASHA 1.1 Identifying and coordinating (when necessary) the participation of other team members throughout the assessment process; recognizing the importance of collaborating with specialists, family members, and other parties as needed.	15. With my current skills and knowledge, if I train team members (i.e., teachers, peers, family members), they will effectively implement the strategies and interventions when working with AAC users. Efficacy Expectation / Outcome Expectancy
ASHA 2.n Knowledge of how to determine communication demands and opportunities associated with different environments.	16. If I provide information and training to general education teachers they will increase the demands and opportunities for communication to the AAC user in their class. Efficacy Expectation / Outcome Expectancy
ASHA 1.6 Involving consumers (e.g., clients and their families) in all decision making to the greatest extent possible throughout the assessment process.	17. If I involve the AAC user in the decision making process, they will be more willing to use the system with other communication partners. Efficacy Expectation / Outcome Expectancy
ASHA 4.c Knowledge and skill regarding the use of role release, including appropriate and effective utilization of families, paraprofessionals, professionals, and laypersons to teach and foster effective, functional communication skills in various natural environments.	18. When I fade my support with an AAC user, others will still be able to effectively communicate with the AAC user. Efficacy Expectation / Outcome Expectancy

ASHA 1.dd Knowledge of how language is generated on AAC systems during communication.	19. If I become more effective at using an AAC system, then my students will become more effective users. Efficacy Expectation / Outcome Expectancy
ASHA 3.b Knowledge of psychosocial aspects of AAC use, including: • factors that influence others' attitudes toward individuals who use AAC.	20. The level of training that I am able to provide to peers regarding AAC use will result in the AAC user having more success with their AAC system. Efficacy Expectation / Outcome Expectancy

Appendix E
Initial Request for Participants

Seeking Participants for Research Study

University of Kansas
Department of Special Education

The use of augmentative and alternative communication (AAC) systems is an evidence-based practice that is used to address communication needs of individuals with disabilities. Although it is a common practice and need in education, there are many teachers and speech language pathologists who feel they do not have the necessary knowledge and skills to successfully implement such communication systems. Often these teachers and therapists seek out training but are unable find the needed training.

We are seeking participants for a dissertation study that involves the implementation of an online professional development program for training in partner training in AAC. Partner training is a vital part to the successful implementation of AAC systems. The online program includes three modules: 1) Introduction to Partner Training; 2) Peer Training Strategies & Techniques; and 3) Working with Families: Collaboration Techniques and Training Models. Participants will randomly be put into either a control or treatment group, but it should be noted that everyone will be given access to the program (but not necessarily at the same time-control group will be given access to the modules after the treatment group).

Qualification of Participants:
- Special Education Teacher <u>or</u> Speech Language Pathologist

Expectations of all Participants:
- Complete 3 total online assessments of knowledge and self-confidence levels
- Complete the online modules (3 total modules)

Expected Time to Complete all Components:
- Approximately 2 hours or less

If interested, please contact: Jacob Wolf (jaw131@ku.edu)

Appendix F
Emails sent to participants

Initial Control Group Email:

Hello, thank you for your interest in the online AAC study. We are definitely interested in your participation. You have been randomly assigned to the control group, and your personal ID number is: 1436. You will need this ID number for the assessments, and it also serves as a method of maintaining your confidentiality. If you forget this number, just email me and let me know. As part of the control group you will need to:

1) First complete the initial assessment (https://www.esurveycreator.com/s/d3a93f7)
2) Complete the second assessment (the link will be sent to you after you complete the initial assessment)
3) Complete the online modules (link will be sent to you after completion of second assessment). Modules include: Partner Training-Module 1 , Peer Training-Module 2 , Working with Families-2 (Please use the Working with Families-2 because the Working with Families-1 is designed for the treatment group).
4) Complete the final assessment (link located at the end of the third module on the website).

Please feel free to proceed with these steps at your own pace. If you have any questions along the way please let me know. Also, please feel free to let others know that we are still looking for more participants in the study. They can contact me for more information (jaw131@ku.edu). Thank you for your participation and have a great day!

Sincerely,
Jacob Wolf
University of Kansas

Control Group After 1st Assessment Email:

Hello, thank you for completing the first assessment of the AAC research study. Below is the link for the second assessment:

https://www.esurveycreator.com/s/8be431f

As soon as you complete the second assessment I will send you the link to the website with the modules. Thank you so much for your willingness and let me know if you have questions. Have a great day!

Jacob Wolf
University of Kansas
Department of Special Education

Control Group After 2nd Assessment Email:

Thank you for completing the second assessment. The website link to the website with the modules is www.aacmodules.com . Please proceed and go through each of the three modules. The link to the final assessment is found in the final slide of the third module. If you have any questions/concerns please let me know. Thank you and have a great day!

Jacob Wolf
University of Kansas

Initial Treatment Group Email:
Hello, thank you for your interest in the online AAC research study. We are definitely interested in your participation. You have been randomly assigned to the treatment group, and your personal ID number is: **2550**. You will need this number for each of the assessments, and it also serves as a method of maintaining your confidentiality. If you forget this number, just email me and let me know. As part of the treatment group you will need to:

1) First complete the initial assessment (https://www.esurveycreator.com/s/d3a93f7)
2) Next complete the modules (www.aacmodules.com) Modules include: Partner Training-Module 1 , Peer Training-Module 2 , Working with Families-1 (Please use the Working with Families-1, because the Working with Families-2 is designed for the control group).
3) Complete the second assessment (link located at the end of the third module on the website).
4) Complete the third assessment (link will be emailed out after you complete the second assessment).

Please feel free to proceed with these steps at your own pace. If you have any questions along the way please let me know. Also, please feel free to let others know that we are still looking for more participants in the study. They can contact me for more information (jaw131@ku.edu). Thank you for your participation and have a great day!

Sincerely,
Jacob Wolf
University of Kansas

Treatment Group After 2nd Assessment

Thank you for completing the first two assessments and going through the AAC Modules website. I appreciate your participation so far. Here is the link to the final assessment: https://www.esurveycreator.com/s/ef2baf8 . After this is completed you will be finished with all components of the study. Please let me know if you have any other questions, needs, or concerns. Again, thank you for everything and have a great day!

Jacob Wolf
University of Kansas

Appendix G.

Initial Assessment Scores following Reliability Analysis

Percentage of participants responding correctly to test items on the pre-test for knowledge

	Percentage of Participants responding correctly on item
Item 1	63%
Item 2	31%
Item 3	50%
Item 4	91%
Item 5	19%
Item 6	16%
Item 7	97%
Item 8	88%
Item 9	66%
Item 10	6%
Item 11	94%
Item 12	84%
Item 13	72%

	Percentage of Participants responding correctly on item
Item 14	41%
Item 15	81%
Item 16	63%
Item 17	81%
Item 18	47%
Item 19	97%
Item 20	100%
Item 21	72%
Item 22	100%
Item 23	59%
Item 24	94%
Item 25	84%

Average ratings for self-efficacy items

Item 1	Mean = 6.39 SD = 1.75
Item 2	Mean = 6.18 SD = 1.94
Item 3	Mean = 6.00 SD = 1.75
Item 4	Mean = 5.42 SD = 1.80
Item 5	Mean = 5.03 SD = 1.78
Item 6	Mean = 5.94 SD = 1.713
Item 7	Mean = 5.67 SD = 1.92
Item 8	Mean = 5.55 SD = 1.89
Item 9	Mean = 5.88 SD = 1.87
Item 10	Mean = 5.52 SD = 1.87

Item 11	Mean = 5.76 SD = 1.79
Item 12	Mean = 5.39 SD = 1.84
Item 13	Mean = 5.15 SD = 1.66
Item 14	Mean = 5.42 SD = 1.65
Item 15	Mean = 5.27 SD = 1.66
Item 16	Mean = 5.18 SD = 1.61
Item 17	Mean = 6.21 SD = 1.87
Item 18	Mean = 5.55 SD = 1.50
Item 19	Mean = 7.67 SD = 1.05
Item 20	Mean = 6.48 SD = 1.80

Appendix H.

Qualitative Feedback from Participants on Final Assessment

What aspects of the professional development modules did you feel were the most beneficial?

Use of Video Clips-

- Having videos (examples) to illustrate the point you were making within the slide.
- I felt that the videos "ABA Skills Training Request Mand" and "ABA Autism Training-Chapter 5-Incidental Teaching" were the most beneficial. While reading all of the information was very helpful, seeing an actual demonstration of technique by a therapist was extremely helpful.
- Video clips and interactive screens
- Video examples
- Videos helped me to see the the strategies being carried which was informative.
- The supplemental videos
- The links to resources, videos to highlight concepts
- The Youtube videos were also helpful.

Examples of How to Use and Embed within School Programming-

- The various ways of eliciting responses from AAC users was helpful. The importance of peer training was informative.
- I liked the descriptions of the different aspects of communication, how to determine what type of system to use and how to train in the use. I liked learning about the need to have the student use the device in a general education classroom when using the system in addition to 1:1 training.
- Emphasis on need for peers.
- Communication assessment tool identification
- The focus on engineering the environment, modeling the use of the device and peer training

Technology & Usability Components (not including video comments)-

- Power point slides
- The modules were easy to follow and understand. The language was easy to understand and the concepts were short and simple, making it easy to remember.

Affirmation of Current Practices-

- The modules reinforced that what we were and are doing in the classroom were correct.
- Some review of info learned in undergrad and graduate school.
- I thought it was a good basic overview of AAC for classroom teachers.

What aspects of the professional development modules did you feel were not as beneficial, frustrating, or not as effective?

More Examples/Information-

- I would have liked more examples of how to implement some of the techniques in a classroom. The videos were all just in 1:1 settings. I can do that but need more assistance in implementing this in a classroom.
- It would have been nice to see the AAC users device up close to see what kind of display was being used as well as a better idea of what the "peer" was doing during the AAC users message generation.
- Although I feel that peer training/coaching is absolutely necessary, I did not feel that the program went into enough detail on how to do so. Also engineering the classroom environment is crucial for these students to be successful however I felt that the program skimmed over the how to's.

Technology & Usability Issues-

- I had difficulty scrolling down on some of the slides.
- Times with narration would come in too loud or too soft, then it made you wonder if there should be narration on whole clip
- The videos at the bottom on the modules did not play for me.

More Interactive Engagement-

- While I felt all of the information was beneficial, I would have to say that the videos and slides that incorporated more multimedia were more effective. A straight bullet point slide is not as interesting as one where you interact with items as you go along.
- The straight text slides
- It would have been nice if there was verbal explanations throughout the slides.

Some Component not Linked to Learning-

- You Tube videos didn't do much for me to aid in learning
- To really understand the information I felt that I was not engaged by the videos. Overall I did not become interested due possibly to the training strategies and the future use of updated videos.
- Not sure why we had to take the test a third time. When asked to rate our proficiency/confidence in implementing AAC after watching the modules, I didn't really feel that the presentation changed how I answered. As an SLP working with students who use AAC, specific strategies/tips for implementing AAC use with peers, introducing into gen ed setting, training other professionals, etc. would have been helpful rather than just telling us we should involve those people and providing very little guidance about how to do it.

If you could change anything about the overall program, what would you recommend?

Technology & Usability-

- The navigation of the modules I found to be tricky, sometimes I went into the slide to click next and sometimes I used the controls at the bottom. It would be helpful if it was consistent across all slides.
- Some of the wording on the survey

More Examples and Interactivity-

- More videos and detailed examples.
- I guess I would insert even more multimedia. I don't think you can overdo the videos or multimedia. The interactive slides help keep the viewers attention.
- More video of an actual general education classroom setting with the AAC user
- Updated videos, highlighted or emphasis placed on the key elements of the training.
- Program is fine at times the level of instruction varied...
- Attached copies or links to copies of the assessment tools or printable checklists to use with peer training

Other Content for Future Training-

- I am not very familiar with all of the various augmentative communication devices that are available and how to use them. I have had some limited experience with initial introduction of using pictures, PECS, etc. at the ECSE level, but I don't really know a lot about more sophisticated systems and how to use them. My confidence in implementing an augmentative communication program using a voice output device and training others to use it is pretty low. I just haven't experienced enough of them to know what to do.
- Looking for additional strategies for training others...some I train use the systems beautifully, others never model at all....what is the secret
- More info/tips/strategies to apply.