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### Current Literacy Interventions for AAC Users

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CURRENT LITERACY INTERVENTIONS FOR AAC USERS

by

Payton Proud

A THESIS

Presented to the Faculty of  
The Graduate College at the University of Nebraska  
In Partial Fulfillment of Requirements  
For the Degree of Master of Science

Major: Speech-Language Pathology and Audiology

Under the Supervision of Professor Kristy Weissling

Lincoln, Nebraska

November 2021

# CURRENT LITERACY INTERVENTIONS FOR AAC USERS

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University of Nebraska, 2021

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**Purpose:** Literacy provides individuals who use augmentative and alternative communication (AAC) with an avenue to share their original thoughts through generative communication. There is limited research regarding literacy intervention for AAC users, particularly in high school. This study sought to (a) identify literacy interventions used with high school AAC users, (b) determine the importance placed on literacy by SLPs for high school AAC users, and (c) compare the importance of literacy intervention in high school to other ages of AAC users and other areas of intervention.

**Method:** Ninety-two Nebraska school-based speech-language pathologists (SLPs) completed an online survey to answer the research questions.

**Results:** According to the SLPs surveyed, phonological awareness interventions and adapting literacy materials were used as literacy interventions for all ages of AAC users. Additionally, the importance of literacy remained rated in the range of “very important” across the age span. In contrast, the importance of life skills decreased from “extremely important” in early intervention to “very important” in elementary school, then rose again to “extremely important” in middle and high school. Participants reported the top three reasons SLPs discontinue literacy intervention for AAC users as the “student has gained necessary skills,” “intrinsic client factors (e.g., disability level, vision, motor),” and a “focus on other interventions.” The top three

barriers to literacy intervention were identified as a “lack of training/confidence in literacy instruction,” “lack of AAC materials,” and “caseload size.”

Conclusion: The limited variety of interventions selected for literacy intervention with AAC users across the age span suggests there is not enough research regarding high school literacy intervention. Nebraska school-based SLPs may not be trained in specific strategies to use with different age/developmental groups, or that intervention selection is based on literacy skill-level rather than age. Rather than importance, other factors may be contributing to lower rates of literacy intervention such as other treatments competing with literacy for intervention time (e.g., life skills).

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## CHAPTER 1: INTRODUCTION

Literate individuals may take the ability to read and write for granted as it becomes commonplace to use in nearly every aspect of modern life. The average American uses literacy in their occupation, free time, and when making important life decisions like buying a car or house. However, without the ability to read and write, those who use natural speech are still able to communicate freely. Without literacy, individuals with complex communication needs (CCN) who rely on augmentative and alternative communication (AAC) because they are unable to speak are unable to express their inner, original thoughts with the world. Instead, they rely on others to provide words and create messages for their use. Acquiring literacy as someone with CCN may be more difficult, but it is possible and essential for generative communication, increased employment opportunities, social belonging, and improved quality of life.

### **Overview of AAC**

AAC is a method or device that allows for communication without the use of speech for those who do not have the physical or neurological ability to develop such skills (ASHA, n.d.). AAC serves to add to or replace natural speech. There are a number of reasons a person may not develop speech as a communication mode. This lack of speech acquisition may be due to diagnoses including cerebral palsy, autism spectrum disorders, or other developmental disabilities. AAC interventions can range from approaches that use no technology (no-tech) to low- or high-technology approaches. No tech options include strategies that require no tools outside the physical body of the client and require only the person's natural ability; examples include gestures and facial expressions. AAC strategies that require materials outside the body but which do not require batteries are known as low technology strategies (e.g., paper communication boards, paper and pencil, tactile symbols). High technology devices can range

from devices that produce a single-phrase to speech-generating devices with dynamic or hybrid screens that contain large amounts of computing power.

### **Overview of Literacy**

Literacy is the ability to read and write with traditional orthography. While there are numerous other ways the term literacy can be used, such as financial literacy (i.e., understanding how to use money) or technological literacy (i.e., ability to navigate the digital world), traditional, print-based literacy is the focus of this project. Traditional literacy develops in stages. First, emergent literacy skills, or the skills the preceding reading and writing develop (Sulzby et al., 1993). These include skills such as understanding that letters on a page are words, the words flow left-to-right, and the way one manipulates a book. Second, shared reading and writing occurs — an adult interactively reading or co-constructing messages with a child (Ezell & Justice, 2005). While these sets of experiences combine to expose children to reading and writing, instruction in alphabet knowledge and phonological awareness begins. Additionally, opportunities for independent reading are provided (Owocki & Goodman, 2002). Then, students can use the skills gained from reading and writing instruction to engage in independent writing (Owocki & Goodman, 2002). From there, the two facets of literacy grow concurrently in complexity while reducing outside support needed.

Reading, writing, speaking, and listening are all components of language, however they can occur independently of one another; there is no pre-requisite for one of these components to exist before you can work on another (i.e., one does not need to be able to speak to learn to read). Initial AAC intervention in speech-language pathology traditionally focuses on the fulfilling needs of in-person communication which would typically be met through speaking. Individuals who cannot use spoken means of communication may meet these purposes through literacy-

driven AAC. The communication requirements of literacy differ from spoken communication in many ways. For example, everyday spoken communication exchanges are often less formal than written communication allowing for potential incomplete syntax (Light & McNaughton, 2013). Additionally, the collaborative, back-and-forth nature of in-person communication allows for the co-creation of messages, assisting the individual using AAC to express themselves and efficiently resolve communication breakdowns (Light & McNaughton, 2013). Further, the modes of literacy place different demands on the cognitive system as opposed to speaking. Individuals are responsible for the integration of attention of auditory and visual content, visual processing of orthographic components, and working, short-term, and long-term memory. The contrasts in cognitive demands combine with changes from in-person communication such as the use of formal syntactic structures, wider ranges of semantic components, and lack of access to the author when a communication breakdown occurs, to create a communicative environment requiring new skills (Light & McNaughton, 2013).

### **Generative Communication**

The power of literacy cannot be underestimated because it provides an opportunity for true generative communication. Generative communication occurs when an individual is able to create novel messages without pre-programmed words or phrases. Literacy is one way to eliminate the barrier to novel, individualized communication that occurs when a person with CCN has a message to send but pre-programmed vocabulary is not available. Almost all of the AAC systems mentioned above can be modified to allow for generative communication (e.g., alphabet paper communication page or keyboard on a speech-generating device). Without generative communication, the person with CCN is entirely dependent on others to provide them with a set of vocabulary to use. The vocabulary selected for them, as opposed to selected *by*

*them*, may never truly represent their own internal lexicon. Due in part to their lack of generative communication, it is estimated that up to 90% of students with CCN will leave school without the necessary literacy skills to enter into meaningful work or life activities (Foley & Wolter, 2010). Thus, inadequate literacy education contributes to this lack of generative communication. With the development of literacy skills and generative communication, opportunities are created for safety, employment, and personal connections.

Personal safety is heightened when an individual with CCN is able to generatively communicate through literacy. According to a survey by Bryen et al. (2003), 45% of adult participants with CCN reported being victims of a crime or abuse. Only 28% of those surveyed reported crimes to the police, compared to 37% of victims in the general population reporting abuse or crime against them. Although the statistics may have changed since the survey was conducted in 2003, the contrast in rate of reporting between those with CCN and the general population is potentially due to inability or resistance to reporting those crimes for fear of not being believed (Bryen et al., 2003). Of the cases reported within the survey, the perpetrator against someone with CCN was found guilty in trial in once out of 16 instances. Bryen et al. (2003) hypothesize that individuals with CCN encounter barriers in accessing the legal system and reporting the abuse to the appropriate sources due in part to their unmet AAC needs or lack of literacy-based generative communication. Furthermore, their ability to clearly communicate their resistance to abuse using generative communication could prevent crimes from occurring. With literacy-based generative communication, the individual using AAC is not reliant on others to supply them with words to object to or report pain, abuse, or crime because they have the skills to create their own messages. Literacy can also increase an individual's appearance of communicative competence in the eyes of others. Developing appropriate generative

communication skills through literacy education would break down access barriers in the legal system through increased perception of communicative competence.

Literacy-based generative communication also provides access to vocation. Most jobs available today require some degree of written communication and generative communication. In a systematic review of literacy interventions for students with physical and developmental disabilities, Machalicek et al. (2010) found that individuals with developmental disabilities, especially those who use AAC, are at a higher risk for delayed or no acquisition of literacy skills, meaning no acquisition of generative communication abilities. Further confirmed in McNaughton and Bryen's (2007) systematic review on participation in meaningful societal roles, adults with CCN may be unable to obtain a job simply due to the absence of literacy skills. Communicating one's own ideas through generative communication also contributes to social inclusion in the workplace with peers and supervisors. The relationship between working, belonging, and quality of life was identified by Lysaght et al. (2017) in a qualitative study utilizing semi-structured interviews of individuals with intellectual and developmental disabilities and their families about work experience. The results of this study demonstrated that productivity in the form of employment or volunteering could increase the sense of belonging and social inclusion in addition to increased self-esteem, added structure to the day, and improved access to professional and social networks for individuals with intellectual and developmental disabilities (Lysaght et al., 2017).

Overall improvement in quality of life through creation of social belonging can be accomplished through appropriate support of literacy development and generative communication. Literacy and generative communication allow those with CCN access to a wide range of technologies (e.g., phones, computers) and platforms (e.g., texting, social media) that

can create additional opportunities for peer engagement and inclusion (Toews & Kurth, 2019; Light & McNaughton, 2013). This is especially important for students entering high school, as their same-age peers will be using those technologies and platforms more frequently than younger students. Given access to the generative communication needed for these platforms, the individual with CCN can engage in intentional and meaningful interactions with their peers more frequently utilizing a shared frame of reference, which adds to their sense of belonging. As a result, the combination of expanded social networks, opportunities for employment, and increased socio-emotional safety heightens quality of life for individuals with CCN. The research reviewed above points to the extreme benefits of the ability to generatively communicate through literacy instruction for students who use AAC.

### **Literacy Interventions in the Literature**

Although evidence is available on literacy intervention best practices for those who do not use AAC, there is a general lack of research regarding the frequency, type, and best practices for literacy instruction for those who do rely on AAC (Barker et al., 2012; Stauter et al., 2017). Of the available evidence, most is focused on literacy acquisition in preschool and early school-age children. For the purposes of this project, preschool and early elementary school techniques for literacy training were identified and presented to speech-language pathologists (SLPs) to determine which of these interventions are being used with older students. These intervention techniques were identified through a review of the literature discussed in the methods section: phonological awareness approaches, sight words, subvocal rehearsal, adapting materials, and shared book reading.

Phonological awareness and sight word approaches are the most commonly referenced literacy interventions in the literature as implemented with students with CCN (e.g., Barker et al.,

2012; Mandak et al., 2018; Ahlgrim-Delzell, et al., 2016). Phonological awareness approaches target understanding and manipulating the sounds of words. They include targeting letter-sound correspondence, blending sounds, and rhyming. Sight word approaches increase the confidence and speed of reading, aiding reading comprehension, by targeting immediate recognition of high frequency and irregular words (Light & Mandak, 2013). Often, both decoding and sight word skills are implemented together in reading instruction (e.g., Barker et al., 2012; Mandak et al., 2018). Additionally, subvocal rehearsal is used to allow those who do not have the ability to manipulate sounds out loud to do so in their head (Stauter et al., 2017; McCarthy et al., 2017). Subvocal rehearsal is frequently utilized simultaneously with phonological approaches.

Several articles (Stauter et al., 2017; Johnston et al., 2009; Barker et al., 2012; Mandak et al., 2018) have shown that adapting materials to increase engagement and accommodate atypical motor skills is effective in facilitating literacy instruction. Researchers have accomplished this through multisensory learning (Stauter et al., 2017), environmental/instructional changes (Johnston et al., 2009), and response modifications (Barker et al., 2012; Mandak et al., 2018). Multisensory learning involves adding elements into instruction to increase attention to material components such as props or increased visual stimuli for key components (Stauter et al., 2017). Environmental changes can be achieved by increasing the frequency with which written words appear in natural contexts (e.g., incidental learning) (Johnston et al., 2019). Response modifications are especially important for students who use AAC who do not use speech. Examples of altered response options include multiple-choice visuals for pointing, speech-generating device output, or eye gaze. Adapting materials can be incorporated into shared book reading, which is another literacy intervention. Shared book reading has been shown to increase student engagement and allow SLPs to individualize instruction in both small group and one-on-

one settings (Bailey et al., 2011; Light & McNaughton, 2013). Shared book reading also serves as a model for advanced literacy skills and can result in increased excitement about reading.

The above literature highlights the literacy interventions available for preschool and early elementary school students. What is missing from the literature is evidence of literacy intervention implemented with older students, specifically those that use AAC. Various articles suggest potential literacy interventions to be used with high school AAC users (Barker et al., 2012; Mandak et al., 2018; Caron et al., 2017), but further research is needed to identify what is currently occurring and which techniques are best indicated for this population.

### **High School Literacy Intervention**

As previously explained, literature exists to provide evidence-based literacy interventions for preschool and early elementary school students, yet there are still students entering and exiting high school without adequate literacy skills developed (Foley & Wolter, 2010). High school is a critical time to explore literacy intervention for AAC users through continued research, as its components have not yet been exclusively studied and as it is a unique transitional period in students' social and academic lives. By high school, the initial focus during the early intervention and elementary school time period on finding and implementing an effective communication system has become a less prominent focus of the treatment plan. The high school years may provide an opportunity to reevaluate the potential of achieving improved proficiency in literacy. As neurotypical high schoolers approach graduation, transition planning occurs around topics such as vocational opportunities and continued education. Transition planning meetings also occur for students with CCN, as required by Nebraska law (school district; provide transition services; enumerated, 2021) starting at age 14, although the focus of the meeting differs. Transition planning recommendations and decisions are frequently made by

caregivers and teachers as opposed to the students themselves. These transition planning conversations often excluded the student with CCN due to a presumed lack of prerequisites to meaningfully fulfill adult societal roles (Caron et al., 2017). This presumption may be caused by the students' lack of literacy skills and generative communication, which are necessary for many occupations or work programs.

Although there is a paucity of research studies regarding high school literacy development for AAC users, some authoritative evidence exists to provide suggestions for literacy intervention with high school AAC users. In a series of presentations, Caron et al. (2017) provided some guidance about the application of preschool and early elementary school literacy instruction to adults with AAC needs. This guidance included making intervention meaningful (e.g., applicable to the individual's life), modifying activities to increase client participation (e.g., interesting, personalized content to read), implementing instructional hierarchies (e.g., feedback type and rate, promoting independence by fading support), and providing multiple opportunities to practice. Within this presentation, Caron et al. also reported case studies highlighting examples of adults who use AAC, including those of high school age, acquiring early literacy skills (e.g., sound blending/segmenting, sight words) through intervention following the above suggestions. Along with providing guidance for intervention, this presentation emphasizes the need to eliminate the idea that individuals with CCN cannot learn to read, which is an important principle to emphasize to encourage instructor buy-in

### **Importance of Literacy Intervention for AAC Users**

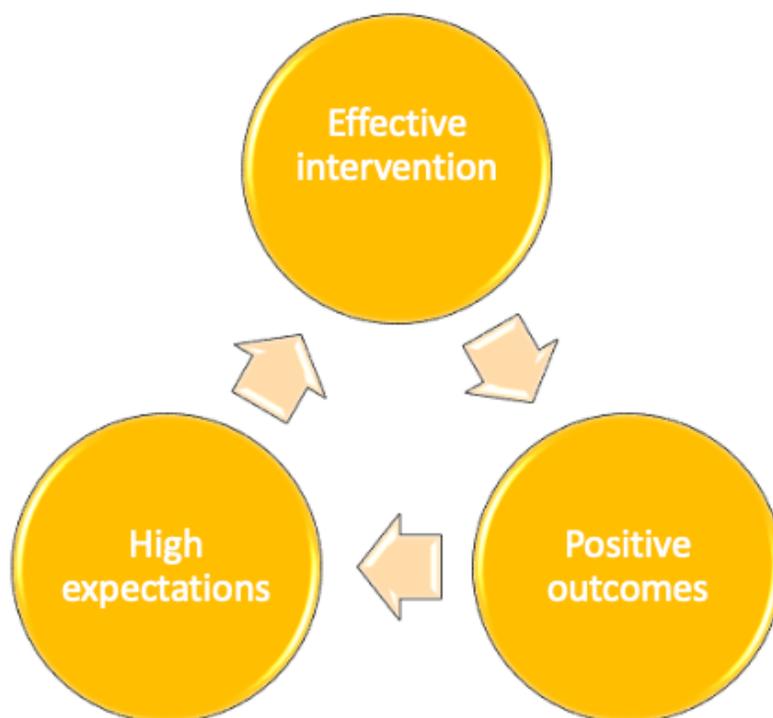
Another construct addressed through this project is the importance of literacy intervention for high school AAC users as determined by SLPs. Federal legislation mandates literacy intervention for all individuals, including those with special education needs, through the

Individuals with Disabilities Education Act (IDEA, 2004) and the Every Student Succeeds Act (ESSA, 2015) (Toews & Kurth, 2019). However, SLPs and multidisciplinary teams are able to use their own discretion to decide when a student no longer benefits from direct literacy instruction as a function of their individualized education plan. According to the *Andrew F. v. Douglas County School District* decision (*Andrew F*, 2017), all students are required to progress toward grade-level standards or other reasonable goals in addition to simply receiving services. Setting reasonable goals is the job of the multidisciplinary team, of which SLPs are a part; therefore, SLP attitudes (e.g., importance, necessity, expectation in making progress) regarding literacy intervention can influence the inclusion of literacy as an intervention target.

The role provider attitudes play in intervention, is an additional area emphasized by Caron et al. (2017). Caron et al. provided a cycle, shown below in Figure 1, of high provider expectations pushing SLPs to provide effective intervention which increases positive outcomes. Those positive outcomes then serve to maintain or increase the high expectations of providers. The inverse is also true, with low expectations leading to potentially ineffective intervention and negative outcomes. Although grade-level curriculum standards and expectations should utilize literacy at all ages of education, through high school, this often does not occur, as demonstrated by the high rates of students who use AAC graduating without basic literacy skills (Machalicek et al., 2010). For this reason, the importance of literacy intervention to SLPs should be identified.

Figure 1

*Effect of Attitudes on Intervention (Caron et al., 2017)*



### **Supplemental Constructs**

In addition to the two key constructs of interventions and importance, the author considered three supplemental constructs: reasons literacy intervention is discontinued, barriers to literacy intervention, and the effects of the COVID-19 pandemic on literacy intervention. The first explores the reasons SLPs may choose to discontinue literacy intervention. In their call to action, Toews and Kurth (2019) list reasons for the potential discontinuation of literacy instruction. These include a lack of or decline in progress or a collaborator/team decision to focus on other interventions. Additionally, Strum et al. (2006) reported that the student's setting (e.g., general education classroom vs. self-contained classroom) and classroom teacher

preference affected the literacy skills taught or discontinued. The second supplemental construct probed what barriers to literacy intervention for AAC users are in place in Nebraska. Barriers may include a lack of training/confidence in literacy intervention, low teacher/parent interest, or conflicting administrative/caseload requirements. Finally, because this project occurred during the height of the COVID-19 pandemic, affecting schools around the state, it was important the effects of the pandemic were considered.

### **Research Questions**

This project was granted a Certification of Exemption from the University of Nebraska-Lincoln's (UNL) Institutional Review Board (IRB). It continues the research effort in the area of high school literacy and AAC to ensure the most effective literacy interventions are being provided to all students, specifically elucidating the current literacy practices of Nebraska SLPs with and without students who use AAC on their caseloads via descriptive survey methodology. Specifically, the author asked three main research questions:

1. What are the current literacy interventions provided by school-based SLPs in Nebraska for high school AAC users (14-21 years old)?
2. How important do school-based SLPs in Nebraska feel literacy instruction is for high school AAC users (14-21 years old)?
3. How important do these SLPs feel literacy intervention is compared to other areas of interventions (e.g., AAC system, life skills, etc.) for students across different age levels (i.e., early intervention, elementary, middle, high school)?

## Hypotheses

1. SLPs will report adapting interventions across age span. Due to the exploratory nature of this project, it is unclear which interventions should be expected for each age group.
2. The results of the survey will indicate that Nebraska SLPs rate literacy intervention for high school AAC users as slightly-moderately important (1-2 out of 4 points).
3. The survey will reveal that SLPs rate literacy instruction as less important as the student ages (decreasing from 4 to 1-2 out of 4 points) and literacy skills will not be a focal point of high school intervention. Meanwhile, life skills will increase to extremely important (4 out of 4 points) in high school.

## CHAPTER 2: METHODS

Survey methodology was used to evaluate the research questions (1) What are the current literacy interventions provided by school-based SLPs in Nebraska for high school AAC users (14-21 years old)? (2) How important do school-based SLPs in Nebraska feel literacy instruction is for high school AAC users (14-21 years old)? and (3) How important do these SLPs feel literacy intervention is compared to other areas of interventions (e.g., AAC system, life skills, etc.) for students across different age levels (i.e., early intervention, elementary, middle, high school)? No available survey tool was found in the literature therefore a tool had to be created. To achieve that, a review of the literature was completed to extract the main ideas and concepts found in the survey. This chapter will provide the reader with an overview of the research design, literature reviews conducted, survey design and validation, recruitment strategies, and data analysis. The Checklist for Reporting Results of Internet E-Surveys (CHERRIES) (Eysenbach, 2004) was used in reporting the methods of this survey to accurately convey the differences this internet-based survey may have from a representative population-based survey. Areas of the checklist highlighted in this project include design, IRB approval, survey development, recruitment, survey administration, response rates, and analysis.

### **Research Design**

This project used a cross-sectional study design, which utilized survey methodology to answer the research questions. Due to the paucity of research in this area, a general poll of current literacy interventions and the importance of literacy was needed to determine a starting place for future research. A survey methodology was chosen to allow data collection on multiple constructs (i.e., interventions and importance) at once as well as to allow data collection from many participants at once. A survey also allowed for quantifiable data regarding the research

questions to be collected. Additionally, a cross-sectional study design allowed data collection of Nebraska school-based SLPs and provided insight into their perceptions at one point in time. The advantage of this approach was that it could be conducted in a quick and inexpensive manner while accurately reflecting the perceived state of literacy intervention for high school AAC users at this point in time. The survey was administered online through the Qualtrics platform and included multiple question types including binary choice, multiple-choice, rating scale, ranking, and open-ended questions.

The target population of this survey was Nebraska school-based SLPs. Due to the limits of time and resources, a national survey was not considered. The containment of the survey to only Nebraska allows the results to be representative of Nebraska, without outlying data distorted by state education differences (e.g., curriculum, budget, etc.). The information gathered through this survey may also apply to other rural midwestern states with similar education and funding systems (e.g., Iowa), but that was not the intent of the survey. The survey could be repeated in the future to identify any differences in the literacy interventions and attitudes of Nebraska school-based SLPs after further research is conducted. The survey could also be used in other states or nationally to identify regional differences.

## **Materials**

### ***Literature Reviews***

Two reviews of the literature were conducted. The first review was conducted to identify existing surveys and questions that could be used for the project. A second review was completed when no useable surveys were identified and there was a need for evidence-based information to formulate survey questions specifically for this project. For the initial search, databases searched included Academic Search Premier, ERIC, Medline, and PsychINFO. Search

terms included “augmentative and alternative communication” or “AAC” and “literacy” and “survey.” The sum of articles found from these databases was nine. Article inclusion criteria were that the article must include information regarding a survey conducted about (a) current literacy interventions provided for AAC users by SLPs or (b) the attitudes of SLPs on literacy intervention for AAC users. After exclusion based on those parameters, no surveys were found that directly related to SLPs providing literacy intervention for AAC users. One adjacent survey of both primary and secondary special education teachers was found that evaluated those teachers’ perceptions of literacy instruction for AAC users (Strum et al., 2006). No questions were used or revised from that survey because the survey addressed the perspective of special education classroom teachers, not SLPs. However, general information from this article guided the development of questions about barriers to literacy intervention and the timeline of when literacy services should be discontinued by providing response options for multiple-choice selection. Because the first literature review did not reveal any viable surveys or survey questions previously created that focused on literacy intervention for high school AAC users, the researcher developed questions for use for this project to answer the research questions. These questions were created based on information gathered during an additional literature review, discussed below.

The second search informed survey development by providing the content for multiple-choice responses to questions regarding literacy interventions currently being used by SLPs for AAC users. Databases searched included Academic Search Premier, ERIC, Medline, and PsychINFO. Search terms included “augmentative and alternative communication” or “AAC” and “literacy.” The sum of articles from these databases was 1,161. Article inclusion criteria were that the article must include a) information about AAC and literacy, b) literacy

interventions with school-age participants, and c) articles published in peer-reviewed journals during or after 2010. After excluding duplicates and additional exclusion through title screening and abstract screening utilizing the criteria listed above, the total number of articles identified was 27. Those 27 articles were read to completion to assure they met all inclusion criteria. Once all 27 articles were read, the final number of which met search criteria was 11. Table 1 below lists the 11 articles, participant ages, and intervention techniques found from the second literature review, identifying current literacy interventions for AAC users. From these articles, the following intervention themes were extracted and used to formulate response options to survey questions: adapting literacy materials, subvocal rehearsal, sight word approaches, phonological approaches, and shared book reading.

Table 1

*Literature Review*

Article Name	Author(s), Year	Research Design	Participant Age	Interventions Used	Outcomes
Literacy instruction for young children with severe speech and physical impairments: A systematic review	Stauter, D. W., Myers, S. R., & Classen, A. I. (2017)	Systematic Review	3-12 years old	Modeling AAC use, using adapted materials, subvocal rehearsal of words/phonemes, contextual learning	Improvement in emergent literacy skills and child participation; evaluated by researcher specific reading and writing measures.
Reading instruction for children who use AAC: Considerations in the pursuit of generalizable results	Barker, R. M., Saunders, K. J., & Brady, N. C. (2012)	Systematic Review	5-23 years old	Response modifications (spoken response to pointing), subvocal rehearsal, sound matching, phoneme blending, letter-sound knowledge, word segmentation, spelling, word identification	Evaluated by intervention effect (e.g., increase from baseline in target and novel words read) and categorized into strong evidence, moderate evidence or no evidence; 5 studies had strong evidence of intervention success, 1 study had no evidence, and 2 were not able to be determined due to small sample size.
The effects of literacy interventions on single-word reading for individuals who use aided AAC: A systematic review	Mandak, K., Light, J., & Boyle, S. (2018)	Systematic Review	6-22 years old	Phonological approach (i.e., letter-sound correspondence, blending sounds, decoding, phoneme segmentation, and reading connected text), sight word approach (i.e., sight words in isolated and connected text contexts), stimuli adaptations	Comparing baseline to ending performance, 7 studies were in the highly effective range, one study was in the effective range and one study was in the questionable effect range of single-word reading as a result of intervention.

Systematic instruction of phonics skills using an iPad for students with developmental disabilities who are AAC users	Ahlgrim-Delzell, L., Browder, D. M., Wood, L., Stanger, C., Preston, A. I., & Kemp-Inman, A. (2016)	Randomized control trial	5-13 years old	Phonics-based reading curriculum (i.e., segmenting, decoding, sight words, and comprehension of short passages), adapted response method (iPad)	Students who received the iPad-based phonics curriculum outperformed the control group; Evaluated by repeated measures ANOVA.
Influence of computerized sounding out on spelling performance for children who do and do not rely on AAC	McCarthy, J. H., Hogan, T. P., Beukelman, D. R., & Schwarz, I. E. (2015)	Single-subject experimental	5-11 years old	Computerized sounding out (i.e., elongation of words), subvocal rehearsal of pseudo-words	Increased phonological accuracy (i.e., percentage of correct consonants) of the pseudo-words produced from baseline.
Effects of dynamic text in an AAC app on sight word reading for individuals with autism spectrum disorder	Caron, J., Light, J., Holyfield, C., & McNaughton, D. (2018)	Single-subject multiple baseline	6-14 years old	Transition to Literacy (T2L) features (i.e., dynamic text and speech output upon selection of a symbol within a grid display), sight words	Increased number of sight words identified from baseline. Emphasizes importance of incorporating literacy into everyday life.
Improving literacy skills in students with complex communication needs who use augmentative/alternative communication systems	Bailey, R. L., Angell, M. E., & Stoner, J. B. (2011)	Single-subject multiple baseline	12-15 years old	Group shared reading experiences with picture books focused on different phonemes accompanied, individual scaffolded phoneme lessons	Some improvement in letter-sound correspondence skills from baseline. Half of the participants made improvements from baseline in single-word decoding while the other half saw no consistent or lasting changes.
Teaching sound letter correspondence and consonant-vowel-	Johnston, S. S., Davenport,	Single-subject	4-5 years old	Naturalistic and adapted instruction, letter-sound correspondence,	Increase in number of letter-sound combinations identified and spelling of CVC words from

consonant combinations to young children who use augmentative and alternative communication	L., Kanarowski, B., Rhodehouse, S., & McDonnell, A. P. (2009)	multiple baseline		consonant-vowel-consonant spelling	baseline maintained after intervention stopped. Some generalization to non-trained targets noted.
An enriched writer's workshop for beginning writers with developmental disabilities	Sturm, J. M. (2012)	Multiple case studies	8-13 years old	Writer's workshop group instruction, individual instruction, social communication and cognitive strategy instruction, assistive literacy software, sentence starters, tip sheet about the writer, modeling strategies	Progress monitoring of reading and writing skills dictates progression through the program which indicates increased writing and communication skills (e.g., increased initiation of comments/questions, on-topic responses, diversity of comments).
Effects of systematic instruction and an augmentative communication device on phonics skills acquisition of students with moderate intellectual disability who are nonverbal	Ahlgrim-Dezell, L., Browder, D., & Wood, L. (2014)	Multiple case studies	7-10 years old	Phonics approach (e.g., teaching letter-sound correspondences, segmenting and blending CVC words, sight words, and text comprehension) with a speech-output AAC device	Phonemes identified, word identification, and blending words to identify pictures all increased from baseline with intervention. Some slow, increasing trends indicate need for intensive instruction in each area.
Evidence-based literacy instruction for individuals who require augmentative and alternative communication: A case study of a student with multiple disabilities	Light, J., McNaughton, D., Weyer, M., & Karg, L. (2008)	Case study	8 years old	Phonologic awareness activities, sound blending, phoneme segmentation, adapted letter-sound correspondence, decoding, sight words, shared reading activities	Increase in decoding, sight-word skills, and early writing skills from baseline with individualized adaptation and instruction.

### *Survey Design*

To increase content validity, the author used the literature found in table 1 to align the survey questions with the current external evidence. Survey questions were created to answer the three research questions and supplemental constructs. These questions pertained to demographics, including caseload size, years of experience, and pre-service training in AAC, as well as questions regarding (a) current literacy interventions with individuals who use AAC across the school-age span (i.e., early intervention, elementary, middle, and high school), (b) importance of different areas of intervention (e.g., articulation, expressive language, etc.), (c) barriers to literacy intervention, and (d) reasons for discontinuation of literacy intervention. A question was also created to determine if the COVID-19 pandemic affected participant responses to any other questions.

Because the author had to develop the survey instrument, validation of that instrument in some way was required. To achieve this, the author conducted two cognitive interviews via Zoom to establish construct validity and ensure the survey questions were clear and participants would understand the questions as intended. The cognitive interviews also served to test the usability and technical functionality (e.g., changing answers, progressing through the survey) of the survey. The researcher asked the interviewees to repeat questions in their own words and explain their thought process behind their answers. In response to the thought processes evoked by the survey during the cognitive interviews, minor changes were made in wording and format including adding a comments option for each question to allow participants to express additional thoughts and fixing technical difficulties in ranking questions.

The final survey consisted of 27 questions. See appendix A for full survey. Within Qualtrics, the survey ranged from 10-14 sections with one to four questions per section to allow

for adaptive questioning based on participant responses. For example, all survey questions were presented in a set order, however, if a participant answered that they did not serve students who used AAC, they would not be asked what percentage of their caseload used AAC. This functioned to limit the number of inapplicable questions requiring responses. Participants were offered a back button to change previous answers. Incomplete survey responses were logged after one week of inactivity without submission (i.e., standard Qualtrics cut-off).

### **Participants**

Eligible participants included SLPs, age 19-80, who were employed at the time of the survey in a Nebraska school in one of 10 ESUs or school districts who agreed to participate or had worked in a school in Nebraska in the past three years. The author identified 12 out of 17 ESUs, located throughout the state. The author contacted the SLP supervisors or special education directors in these Nebraska ESUs and four large school districts throughout the state for permission to share the survey link with the SLPs working in that ESU or school district. Out of 12 ESUs and four school districts contacted, seven ESUs and three school districts responded and agreed to forward an email containing the survey link to their SLPs. Of the ten groups, five were located in eastern Nebraska, three in central Nebraska, and one in western Nebraska. After approval from UNL's IRB, emails containing the survey link were sent to SLP supervisors in those pre-identified ESUs and school districts, who forwarded the email to the SLPs in their ESU or district. A total of 178 SLPs received the survey link. No identifying information (e.g., names, email addresses, IP addresses) was collected from participants.

Participants were recruited and the survey was distributed through email with a link to the Qualtrics platform. After SLPs had been contacted through their ESU or school district and the initial set of participants had been contacted with a follow up email, personal connections and

UNL's Department of Special Education and Communication Disorders social media accounts were used to recruit additional participants. No participants were recruited from social media.

### **Setting**

The online survey was live on Qualtrics from March 1, 2021 to May 15, 2021. Participants completed the survey on their personal or work computers at a time of their choosing. The survey required approximately 10 minutes to complete for each individual.

### **Data Analysis**

Data was stored on a secure UNL server available to access only by project personnel. The data were analyzed using descriptive and nonparametric statistics in relation to the research questions. The researcher used the Statistical Package for the Social Sciences (SPSS)® software to conduct nonparametric statistical analyses such as the Friedman and Wilcoxon signed-rank tests for related samples. The level of significance was adjusted within each data set according to the number of pairwise comparisons conducted to reduce the probability of Type I errors (i.e., mistaken rejection of null hypothesis). Effect sizes were calculated for all analyses. Survey questions 1-8 (see Appendix A for full survey) provided information regarding the demographics of participants.

To answer research question one, regarding the current interventions of high school literacy instruction for AAC users, the nominal data from survey question 9 was analyzed with frequency counts and percentages to identify current interventions. The data were grouped based on pre-hoc hypotheses of potential differences between the following demographics: SLPs working in rural vs. urban areas and SLPs serving high school students currently or in the past vs. never serving high school students. Wilcoxon signed-rank test was conducted to determine if the differences between the two sets of groups were statistically significant. Survey questions 10-

12i identified current literacy interventions used for AAC users at other ages, and was analyzed with frequency counts and percentages. To answer research question two regarding the importance of literacy intervention for high school AAC users, the mean and mode of data from survey question 19d provided information regarding attitudes on high school literacy intervention.

To answer research question three, comparing the importance of literacy intervention in high school to that of other ages and areas of intervention, descriptive statistics such as frequency count, mean, and mode were used to rank the importance of each area of intervention (i.e., survey questions 13, 15, 17, 19) and the three most important areas of intervention (i.e., survey questions 14, 16, 18, 20) for each age group. Friedman analyses were conducted within and across age groups on each area of intervention. Wilcoxon signed-rank tests were conducted to compare items suspected to contain statistically significant differences, upon visual inspection of the data, of statistical significance including comparing literacy to all other areas of intervention, life skills to all other areas of intervention, and expressive language, receptive language, and articulation. Data were compared between SLPs that have provided AAC services for greater than five years vs. less than five years based on researcher hypotheses of potential differences in responses. A Wilcoxon signed-rank test was conducted to determine if the differences between the groups were statistically significant.

Finally, the results from survey questions 21-23 focused on the supplemental constructs of discontinuing literacy intervention, barriers to literacy intervention, and effects of the COVID-19 pandemic. Descriptive statistics such as frequency counts and percentages were used for questions 21 and 22 to identify the reasons Nebraska SLPs chose to discontinue literacy intervention for AAC users and reported barriers to literacy intervention for AAC users. The

percentage of SLPs who reported the COVID-19 pandemic affected literacy intervention was found for survey question 23. The common themes across the open-ended responses explaining how the COVID-19 pandemic were grouped.

This chapter provided a summary of the methodology used to evaluate the stated research questions. The next chapter will provide the reader with the specific results obtained from these methodologies.

## CHAPTER 3: RESULTS

This chapter reviews the results of the survey presented to Nebraska school-based SLPs regarding literacy intervention for AAC users. It will discuss participant demographics, current high school literacy interventions, the importance of high school literacy, and a comparison of the importance of literacy intervention to other areas of intervention within and across age groups along with analysis of reasons SLPs discontinue literacy intervention, barriers to literacy intervention, and the impact of the COVID-19 pandemic.

### **Participant Demographics**

After development of an online survey to answer the research questions, an email containing the Qualtrics survey link was sent to 178 school based SLPs through their respective ESUs or school districts across Nebraska. The survey was available to participants for 11 weeks, three weeks longer than anticipated due to the low initial response rate (63 participants, completion rate=36/63, 57%). With the addition of follow-up emails and personal connections, 92 individuals opened the Qualtrics link containing the developed survey and consented to participation. Of the 92 total participants, 56 individuals answered all survey questions (survey completion rate=61%). For data analysis, all responses were included in the analysis including those from incomplete surveys. The data set was determined to be non-normal based on the smaller number of respondents and unknown distribution across the state of Nebraska. Due to this, nonparametric statistics, such as Friedman, Wilcoxon signed-rank, and Mann-Whitney U analyses, were used in addition to descriptive statistics such as mean, mode, frequency count, and percentages. These methods were chosen due to the exploratory nature of the study and lack of previous research on literacy intervention for high school AAC users.

Various survey questions collected data on participant demographics. All valid data from unfinished surveys were analyzed alongside the data from the finished surveys. Forty-nine percent of SLPs who took this survey practiced for over 10 years ( $n=44$ ). The majority of SLPs received AAC instruction in their graduate coursework or through continuing education ( $n=87$ , 97%). Seven percent of the SLPs did not provide AAC services ( $n=6$ ). Those that provided AAC services ( $n=84$ , 93%) reported their years of experience as one of the following: less than one year ( $n=7$ , 8%), one to five years ( $n=16$ , 18%), five to ten years ( $n=23$ , 26%), or greater than ten years ( $n=26$ , 46%) of experience with AAC. The majority of SLPs reported that 0-10% of their caseload were AAC users ( $n=71$ , 85%) with the remainder reporting AAC users as 11-30% of their caseload ( $n=13$ , 15%). Forty-two SLPs worked at one point in their career in a high school (46%), while 50 had never served students in high school (54%). The majority of SLPs worked in a rural setting ( $n=35$ , 63%).

Table 3

*Participant Demographics*

Characteristics	<i>n</i>	%
Years Practiced		
> 1 Year	6	11%
1-5 Years	9	16%
5-10 Years	15	27%
> 10 Years	26	46%
Years providing AAC services		
Does not provide AAC services	4	7%
> 1 Year	9	16%
1-5 Years	15	27%
5-10 Years	15	27%
> 10 Years	13	23%
Percentage of students using AAC on caseload		
0-10%	43	83%
11-30%	9	17%

## Current Literacy Interventions for High School AAC Users

One survey question was developed to assess research question one: *What are the current literacy interventions provided by school-based SLPs in Nebraska for high school AAC users (14-21 years old)?* Survey question 9 (see appendix A for full survey) allowed participants to select the literacy interventions they currently use or would use with high school AAC users from a list of literacy interventions identified in the literature review. Group comparisons were then made using Wilcoxon signed-rank tests based on demographic information. These data are described in more detail below.

Table 4 below displays the literacy interventions used by survey participants with AAC users at the high school level. The two most selected interventions by the participants were “adapting literacy materials” ( $n=63$ , 80%) followed by “shared book reading” ( $n=45$ , 56%). There was a large difference between the next most selected intervention of “phonological awareness” ( $n=18$ , 23%). A sight word approach was used by 20% ( $n=16$ ) of participants and subvocal rehearsal was used by 10% ( $n=8$ ) of participants. Six percent ( $n=5$ ) of the participants used other interventions, described as literacy within the context of other interventions (e.g., within buttons on high-tech AAC system). Thirteen percent ( $n=10$ ) of participants did not use any of the listed interventions, meaning they did not provide literacy intervention or selected “other” interventions.

Table 4

*Reported Literacy Interventions in High School*

Intervention	<i>n</i>	Overall Percentage (n/80)
Adapting literacy materials	63	80%
Shared book reading	45	56%
Phonological awareness	18	23%
Sight word approach	16	20%
Subvocal rehearsal	8	10%
Other	5	6%
None of these	10	13%

The author also used the Mann-Whitney U test to compare the literacy interventions selected for high school AAC users between groups based on demographic information, including SLPs working in rural vs. urban areas and SLPs serving high school students currently or in the past vs. never serving high school students. A p-value of less than 0.05 was considered statistically significant; no values met this criterion. Effect sizes were also calculated using the formula  $r = (z/\sqrt{N})$  to provide further information regarding the magnitude of the differences found. Table 5 lists the effect sizes of those analyses where 0.01-<0.3 indicates a small effect, 0.3-<0.5 indicates a moderate effect, and >0.5 indicates a large effect.

Table 5

*Reported Literacy Interventions in High School*

Intervention	Served high school vs. Did not Effect Size ( $r=$ )	Rural vs. Urban schools Effect Size ( $r=$ )
Adapting literacy materials	0.885	0.240
Shared book reading	0.318	0.104
Phonological awareness	1.223	0.008
Sight word approach	0.601	0.224
Subvocal rehearsal	1.028	0.142
Other	0.691	0.066
None of these	1.230	0.203

### ***Literacy Interventions at Other Ages***

Additional data were collected on literacy interventions used for students in middle school, elementary school, and early intervention. This information can be used to compare the literacy interventions reported for high school AAC users to the literacy interventions reported for younger AAC users. Survey questions 10-12i collected data regarding literacy interventions implemented for younger students (i.e., middle, elementary, and early intervention). Seventy-three percent ( $n=58$ ) of participants reported they would use the same interventions for middle school as they reported using with high school students (survey question 10). The “same interventions” were defined as the literacy interventions each participant selected they used in high school which differed for each participant. The percentage of SLPs who used the same interventions as high schools for other ages decreased as the age of the students decreased; the same interventions as high school were utilized by 18% of SLPs in elementary school (question 11,  $n=14$ ) and 14% of SLPs in early intervention (question 12,  $n=11$ ). Although SLPs reported using different interventions than high school for younger age groups, adapting literacy material, shared book reading, and phonological processes remained the interventions reported most frequently for all age groups. Please see Appendix B for complete data from additional age groups.

### **Literacy Importance for High School AAC Users**

A survey question was designed to answer the second research question: *How important do school-based SLPs in Nebraska feel literacy instruction is for high school AAC users (14-21 years old)?* Survey question 19d asked participants to rate the importance of literacy intervention on a scale from “0 - not at all important,” “1 - slightly important,” “2 - moderately important,” “3

- very important,” to “4 - extremely important.” Participants rated the importance of literacy with a mean of 2.86 and a mode of 3, classified as very important. This will be compared in the next section to other areas of intervention and literacy intervention at other ages in research question 3.

### **Literacy Importance Compared to Other Areas of Intervention Across Ages**

A set of survey questions (13-20) served to answer research question three: *How important do these SLPs feel literacy intervention is compared to other areas of intervention (e.g., AAC systems, life skills, etc.) being provided to students across different age levels (i.e., early intervention, elementary, middle, high school)?* Survey questions 13, 15, 17, and 19 allowed participants to rank the importance of different areas of intervention including AAC system, articulation, expressive language, literacy, receptive language, social communication, and life skills in early intervention, elementary school, middle school, and high school. The author used descriptive statistics including both mean and mode to visually inspect differences between areas of intervention at each age range. As a follow up, Friedman analyses were used to determine if statistically significant differences were present within and across age groups. When statistical significance was present, Wilcoxon-signed rank analyses were conducted between areas of interest to the project (e.g., focusing on comparing literacy and life skills with other areas of intervention). Additionally, survey questions 14, 16, 18, and 20 provided further data to answer research question two, allowing participants to identify the three most important areas of intervention at each age group. Frequency counts and percentages were extracted from these questions.

Table 6 below presents the data by age group from questions 13, 15, 17, and 19 asking participants to rank the importance of different areas of intervention (e.g., AAC system,

articulation, etc.) on a scale from “0 - not at all important,” “1 - slightly important,” “2 - moderately important,” “3 - very important,” to “4 - extremely important.” Figure 2 shows the mean of each area of intervention for each age. For these data, the mean displays change more acutely compared to the reporting of the mode. Expressive language (mean = 3.57, mode = 4), receptive language (mean = 3.55, mode = 4), and social communication (mean = 3.57, mode = 4) remained amongst the most highly rated across the age span. This indicates that participants view these three areas of intervention as the most important. Articulation was consistently rated as the least important area of intervention for a student who uses AAC across the age range (mean = 1.93, 1.95, 1.77, 1.54, mode = 1, 2, 2, 2). Participants rated literacy as a mode of “3 - very important,” for all ages; however, visual inspection of the means in the data demonstrated variation around the 3.00 rating. The importance of literacy peaked in elementary school (mean = 3.12) and decreased in middle and high school (means = 3.08 and 2.86 respectively), however, this decrease was not statistically significant according to Wilcoxon signed-rank analyses comparing the age groups, discussed in further detail further below. Meanwhile, life skills intervention increased from “3 - very important” in early intervention (mean = 2.88, mode = 4) and elementary school (mean = 3.15, mode = 3) to “4 - extremely important” in middle school (mean = 3.56, mode = 4) and high school (mean = 3.86, mode = 4).

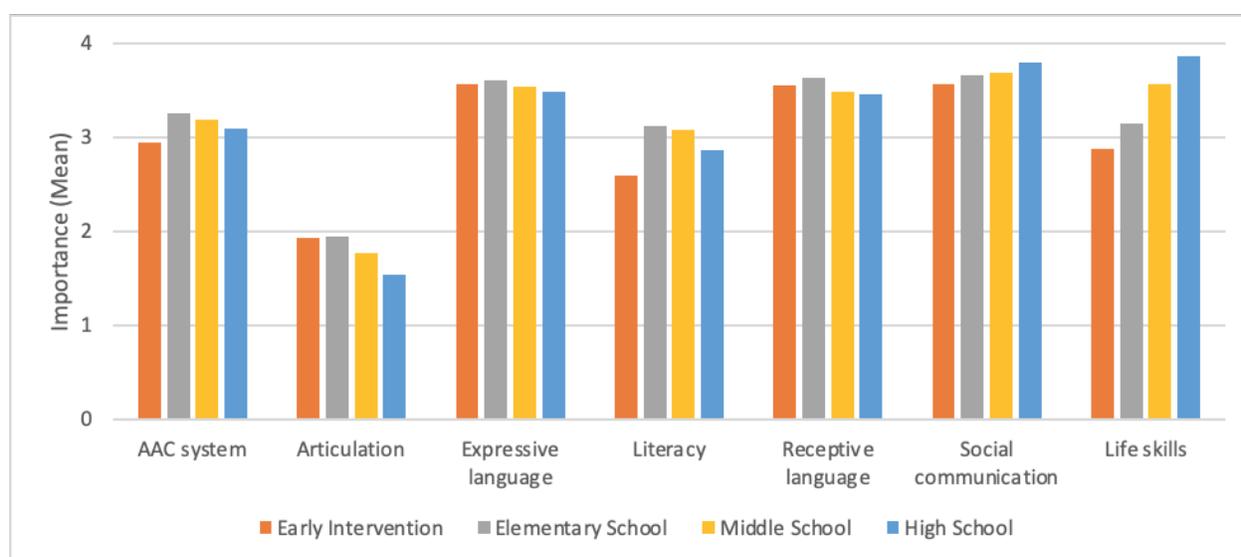
Table 6

*Importance of Intervention Areas*

Intervention Area	Early Intervention	Elementary School	Middle School	High School
AAC System	Mean = 2.95 Mode = 3	Mean = 3.25 Mode = 4	Mean = 3.19 Mode = 4	Mean = 3.10 Mode = 4
Articulation	Mean = 1.93 Mode = 1	Mean = 1.95 Mode = 2	Mean = 1.77 Mode = 2	Mean = 1.54 Mode = 2
Expressive Lang.	Mean = 3.57 Mode = 4	Mean = 3.61 Mode = 4	Mean = 3.54 Mode = 4	Mean = 3.49 Mode = 4

Literacy	Mean = 2.60 Mode = 3	Mean = 3.12 Mode = 3	Mean = 3.08 Mode = 3	Mean = 2.86 Mode = 3
Receptive Lang.	Mean = 3.55 Mode = 4	Mean = 3.64 Mode = 4	Mean = 3.49 Mode = 4	Mean = 3.46 Mode = 4
Social Comm.	Mean = 3.57 Mode = 4	Mean = 3.66 Mode = 4	Mean = 3.69 Mode = 4	Mean = 3.80 Mode = 4
Life Skills	Mean = 2.88 Mode = 4	Mean = 3.15 Mode = 3	Mean = 3.56 Mode = 4	Mean = 3.86 Mode = 4

Figure 2

*Importance of Intervention Areas (Mean)**Comparison of Importance of Intervention Areas Within Age Groups*

The author conducted Friedman analyses to compare the importance of each area of intervention within each age group (e.g., comparing all areas of intervention in early intervention with each other) to continue research question three analyses. All four Friedman analyses conducted were statistically significant indicating significant differences in the importance of different areas of intervention. The pairwise comparisons important to the project were then identified and Wilcoxon signed-rank analyses were conducted within each age group totaling 15 analyses per group. These analyses sets included (1) literacy compared to AAC system, articulation, expressive language, receptive language, social communication, and life skills, and

(2) life skills compared to AAC system, articulation, expressive language, literacy, receptive language, and social communication in addition to (3) expressive language compared to articulation, receptive language compared to articulation, and expressive language compared to receptive language. The level of significance was adjusted for each set of Friedman analyses according to the number of Wilcoxon signed-rank analyses completed to reduce the potential for type I errors, therefore the level of significance within each age group was set at 0.003. Effect sizes were calculated for each Wilcoxon signed-rank analysis conducted.

***Importance of Areas of Intervention in Early Intervention.*** First, table 12a in appendix B shows the effect sizes calculated utilizing the formula  $r = (z/\sqrt{N})$  and significant p-values for each analysis conducted in early intervention. The author conducted Wilcoxon signed-rank analyses to compare literacy to all other areas of intervention listed above. An effect size of 0.01- <0.3 was considered a small effect, 0.3-<0.5 considered a moderate effect, and >0.5 considered a large effect. There was no statistically significant difference between literacy and AAC ( $p=0.062$ ) or life skills ( $p=0.107$ ) in early intervention. The difference between literacy and articulation ( $p=0.001$ ,  $r=0.4544$ ) shows literacy was rated as more important than articulation by the surveyed SLPs with a moderate effect size. The difference between literacy and expressive language ( $p<0.001$ ,  $r=0.6795$ ), receptive language ( $p<0.001$ ,  $r=0.6930$ ), and social communication ( $p<0.001$ ,  $r=0.6966$ ) indicates those areas of intervention were rated as more important than literacy according to the surveyed SLPs. A large effect size was found for all three comparisons. As listed in table 12b in appendix B, Wilcoxon signed-rank analyses were conducted and effect sizes calculated utilizing the formula  $r = (z/\sqrt{N})$  between life skills and the other areas of intervention listed above. There was no statistically significant difference between life skills and AAC ( $p=0.919$ ) or literacy ( $p=0.107$ ). Participants rated life skills as more

important than articulation ( $p < 0.001$ ,  $r = 0.5620$ ) while expressive language ( $p < 0.001$ ,  $r = 0.5704$ ), receptive language ( $p < 0.001$ ,  $r = 0.5232$ ), and social communication ( $p < 0.001$ ,  $r = 0.5812$ ) were rated as more important than life skills in early intervention by participating SLPs, all comparisons with large effect sizes. Table 12c in appendix B lists the effect sizes calculated using the formula  $r = (z/\sqrt{N})$  and significant p-values of other Wilcoxon signed-rank analyses conducted. There was no statistical significance expressive and receptive language ( $p = 0.822$ ), however there were statistically significant differences and large effect sizes between expressive language and articulation ( $p < 0.001$ ,  $r = 0.8208$ ) and receptive language and articulation ( $p < 0.001$ ,  $r = 0.8196$ ) suggesting participating SLPs rated both expressive and receptive language as more important than articulation in early intervention.

***Importance of Areas of Intervention in Elementary School.*** Second, Wilcoxon signed-rank analyses were conducted and effect sizes calculated between the areas of intervention implemented in elementary school to compare importance of intervention area for research question three. Effect sizes were calculated using the formula  $r = (z/\sqrt{N})$  to provide further information regarding the magnitude of the differences found. For this statistic,  $0.01 < 0.3$  indicates a small effect,  $0.3 < 0.5$  indicates a moderate effect, and  $> 0.5$  indicates a large effect. Table 13a in appendix B lists the significant p-values and effect sizes of comparisons made between literacy and all other areas of intervention. There was no statistically significant difference between literacy and AAC systems ( $p = 0.359$ ) or life skills ( $p = 0.852$ ). The difference between literacy and articulation ( $p < 0.001$ ,  $r = 0.6564$ ) and large effect size indicate these SLPs rated literacy as more important than articulation in elementary school. Literacy and expressive language ( $p < 0.001$ ,  $r = 0.4450$ ), receptive language ( $p < 0.001$ ,  $r = 0.5032$ ), and social communication ( $p < 0.001$ ,  $r = 0.5404$ ) were rated as more important than literacy by participating

SLPs. The effect sizes found between literacy and expressive language were moderate, while the effect sizes found between literacy and receptive language and literacy and social communication were large. Table 13b in appendix B shows the significant p-values and effect sizes, calculated using the formula  $r = (z/\sqrt{N})$ , for comparisons of life skills to all other areas of intervention. There was no statistically significant difference between life skills and AAC systems ( $p=0.416$ ) or literacy ( $p=0.852$ ). A statistically significant difference and large effect size found between life skills and articulation ( $p<0.001$ ,  $r=0.7088$ ) indicates that life skills was rated as more important than articulation in elementary school to participating SLPs. The moderate effect sizes and difference between life skills and expressive language ( $p=0.001$ ,  $r=0.4244$ ) and and life skills and receptive language ( $p<0.001$ ,  $r=0.4747$ ), and the large effect size and difference between life skills and social communication ( $p<0.001$ ,  $r=0.5348$ ) shows these interventions were rated as more important than life skills in elementary school. Table 13c in appendix B lists the significant p-values and effect sizes from other comparisons. There was no statistically significant difference between expressive and receptive language ( $p=0.480$ ). Meanwhile, articulation was rated as less important than expressive language ( $p<0.001$ ,  $r=0.7898$ ) or receptive language ( $p<0.001$ ,  $r=0.8058$ ), with large effect sizes found for both analyses.

***Importance of Areas of Intervention in Middle School.*** Next, Wilcoxon signed-rank analyses were conducted within the middle school areas of intervention. To identify the magnitude of differences found, the effect size was calculated using the formula  $r = (z/\sqrt{N})$ . These effects sizes were categorized into  $0.01-<0.3$  showing a small effect,  $0.3-<0.5$  showing a moderate effect, and  $>0.5$  showing a large effect. Table 14a in appendix B lists the effect sizes and significant p-values of comparisons of literacy with all other areas of intervention. There was

no statistically significant difference between literacy and AAC ( $p=0.508$ ). Literacy was rated as more important than articulation ( $p<0.001$ ,  $r=0.7536$ ) in middle school and a large effect size was found. Yet, the statistical significance of expressive language ( $p<0.001$ ,  $r=0.4459$ ) and life skills ( $p=0.001$ ,  $r=0.4176$ ) compared with literacy yielded a moderate effect size and social communication ( $p<0.001$ ,  $r=0.6036$ ) and literacy yielded a large effect size showing these areas were rated as more important than literacy. Table 14b in appendix B lists the effect sizes and significant p-values of Wilcoxon signed-rank analyses conducted between life skills and all other areas of intervention. There was no statistically significant difference between life skills and AAC ( $p=0.006$ ), expressive language ( $p=0.832$ ), receptive language ( $p=0.588$ ), and social communication ( $p=0.120$ ). There was a large effect size for the statistically significant difference between life skills and articulation ( $p<0.001$ ,  $r=0.8264$ ) and a moderate effect size for the comparison of life skills and literacy ( $p=0.001$ ,  $r=0.4178$ ) indicating life skills was rated as more important than articulation and literacy in middle school by these SLPs. Table 14c in appendix B lists the effect sizes and significant p-values of other comparisons made within middle school. There was no statistically significant difference between expressive and receptive language ( $p=0.480$ ) however both expressive ( $p<0.001$ ,  $r=0.8216$ ) and receptive language ( $p<0.001$ ,  $r=0.8335$ ) were rated as more important than articulation in middle school to surveyed SLPs with large effect sizes.

***Importance of Areas of Intervention in High School.*** Finally, the importance of each area of intervention within high school were compared with Wilcoxon signed-rank analyses to help answer research question three. Table 15a in appendix B lists the effect sizes of analyses conducted using the formula  $r = (z/\sqrt{N})$ , and identified significant p-values between literacy and all other areas of intervention. These effects sizes can be interpreted as  $0.01-<0.3$  indicating a

small effect, 0.3-<0.5 indicating a moderate effect, and >0.5 indicating a large effect. There was no statistically significant difference between literacy and AAC systems ( $p=0.162$ ). The difference and large effect size between literacy and articulation ( $p<0.001$ ,  $r=0.7237$ ) suggests these SLPs rated literacy as more important than articulation. Wilcoxon signed-rank analyses conducted between literacy and expressive language ( $p<0.001$ ,  $r=0.5413$ ), receptive language ( $p<0.001$ ,  $r=0.5723$ ), social communication ( $p<0.001$ ,  $r=0.6978$ ), and life skills ( $p<0.001$ ) revealed statistical significance with large effect sizes indicating these areas of intervention were rated as more important than literacy in high school. Table 15b in appendix B lists the effect sizes, calculated using the formula  $r = (z/\sqrt{N})$ , and significant p-values of Wilcoxon signed-rank analyses conducted between life skills and all other areas of intervention. There was no statistically significant difference between life skills and social communication ( $p=0.346$ ) indicating these areas of intervention were of similar importance in high school to participants. Life skills was rated as more important than AAC systems ( $p<0.001$ ,  $r=0.5793$ ), articulation ( $p<0.001$ ,  $r=0.8619$ ), expressive language ( $p=0.002$ ,  $r=0.3976$ ), literacy ( $p<0.001$ ,  $r=0.7101$ ), and receptive language ( $p<0.001$ ,  $r=0.4522$ ) in high school as demonstrated by their statistically significant differences and medium-large effect sizes. Table 15c in appendix B lists the significant p-values and effect sizes of other Wilcoxon signed-rank analyses conducted between areas of intervention in high school. There was no statistically significant difference between expressive and receptive language ( $p=0.539$ ). The difference and large effect size between expressive language and articulation ( $p<0.001$ ,  $r=0.8210$ ) and receptive language and articulation ( $p<0.001$ ,  $r=0.8229$ ) revealed expressive and receptive language are viewed as more important than articulation in high school by participating SLPs.

### ***Comparison of Importance of Intervention Areas Across Age Groups***

As analyses were completed to answer research question three within each age group to compare the importance of each area of intervention, it was important to also compare how the importance of each area of intervention changed across the age span. Friedman analyses were conducted to compare the importance of each area of intervention across the age groups (e.g., comparing the importance of AAC systems in early intervention, elementary school, middle school, and high school). Kendall's W analyses were conducted to find the magnitude of these differences. A value between 0.01- $<0.3$  demonstrates a small effect, 0.3- $<0.5$  demonstrates a moderate effect, and  $>0.5$  demonstrates a large effect. Literacy ( $p > 0.001$ ,  $W = 0.094$ ) and life skills ( $p < 0.001$ ,  $W = 0.367$ ) were the only areas of intervention found to have statistically significant differences across the age span, with small and moderate effect sizes found respectively, meaning their reported importance changed from one age group to another (see Kendall's W analyses for effect size in table 7a). When Wilcoxon signed-rank analyses were conducted and effect sizes calculated using the formula  $r = (z/\sqrt{N})$ , between each age group for literacy (see effect sizes and significant p-values in table 7b), the increase in importance of literacy from early intervention to elementary school ( $p < 0.001$ ,  $r = 0.4447$ ) and from early intervention to middle school ( $p = 0.008$ ,  $r = 0.3480$ ) was found to be statistically significant with moderate effect sizes. Wilcoxon signed-rank analyses were conducted between each age group for life skills. Each increase in importance as the student ages was statistically significant with moderate-large effect sizes except for the difference between early intervention and elementary school.

Table 7

*Participant Rankings of Importance Across Age Groups*\*=*significant p-values*

Table 7a

*Importance of Intervention Types Across Age Groups (significance level 0.05)*

Area of Intervention	Kendall's W Analyses ( <i>W</i> =)
AAC System	0.035
Articulation	0.048
Expressive Language	0.011
Literacy	0.094*
Receptive Language	0.035
Social Communication	0.048
Life Skills	0.367*

Table 7b

*Importance of Literacy and Life Skills Across Age Groups – Wilcoxon Signed-Rank Analyses Effect Sizes (sig level .008)*

	EI – E	EI – M	EI – H	E – M	E – H	M – H
Literacy	0.4447*	0.3480*	0.2375	0.0642	0.2415	0.2009
Life Skills	0.2733	0.5231*	0.6497*	0.4870*	0.6452*	0.5571*

EI = Early Intervention, E = Elementary School, M = Middle School, H = High School

***Ranking Priority Intervention Areas***

As a continuation of research question three, comparing the importance of different areas of intervention, survey questions 14, 16, 18, and 20 participants were asked to rank the top three areas of intervention in order of priority for each age group (i.e., early intervention, elementary school, middle school, and high school). Expressive language remained among the top three intervention areas across all age groups ( $n=50, 46, 42, 32$  respectively) as shown in Figures 3-6 below. Literacy was not consistently rated among the top three intervention areas ( $n=3, 15, 10, 8$  across the age groups). The inclusion of life skills in the top three priority interventions for high school AAC users but not literacy provides further evidence that life skills intervention is viewed as more important than literacy intervention for AAC users to the Nebraska SLPs surveyed. To

provide further context for selections made, the author conducted Mann-Whitney U analyses (with an adjusted level of significance set to 0.002) to compare the rankings of SLPs who have served students who use AAC for greater than 5 years vs. less than five years. Effect sizes were calculated using the formula  $r = (z/\sqrt{N})$  to find the magnitude between each differences and can be interpreted using the following ranges: 0.01-<0.3 shows a small effect, 0.3-<0.5 shows a moderate effect, and >0.5 shows a large effect SLPs who served students who use AAC for less than 5 years ranked receptive language as more important than those who have served greater than 5 years as shown in the significant value from the Mann-Whitney U analysis ( $p=0.002$ ,  $r=0.4175$ ) and moderate effect size. No other comparisons were statistically significant (see Appendix B, Table 8 for effect sizes and significant p-values).

Figure 3

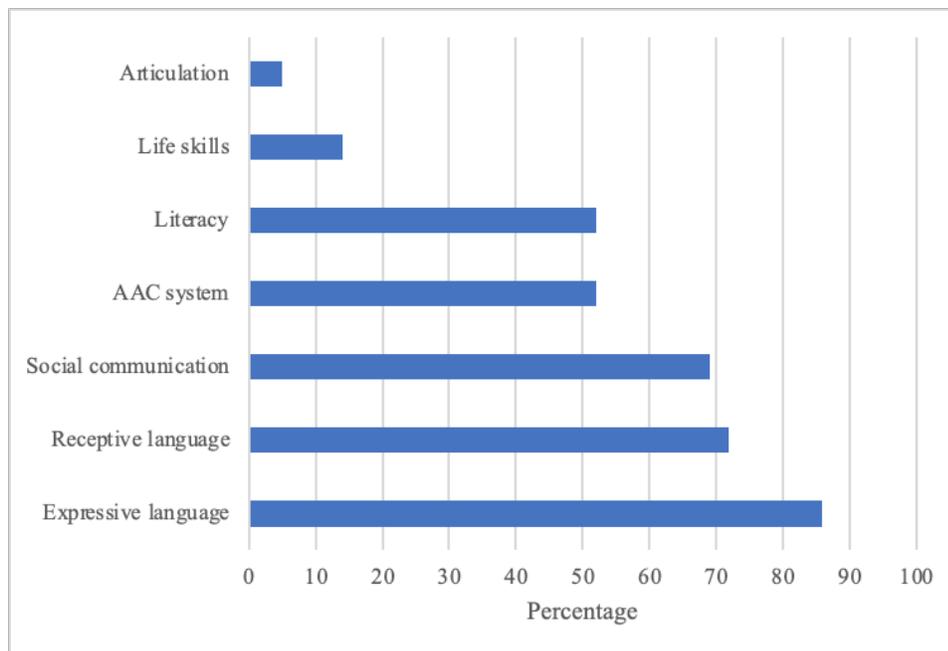
*Priority Interventions in Early Intervention*

Figure 4

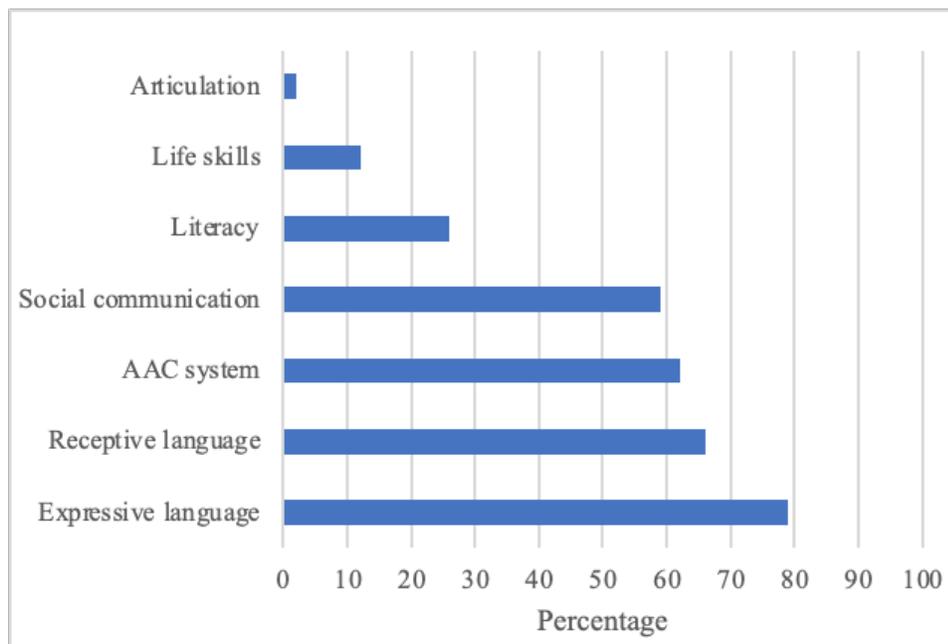
*Priority Interventions in Elementary School*

Figure 5

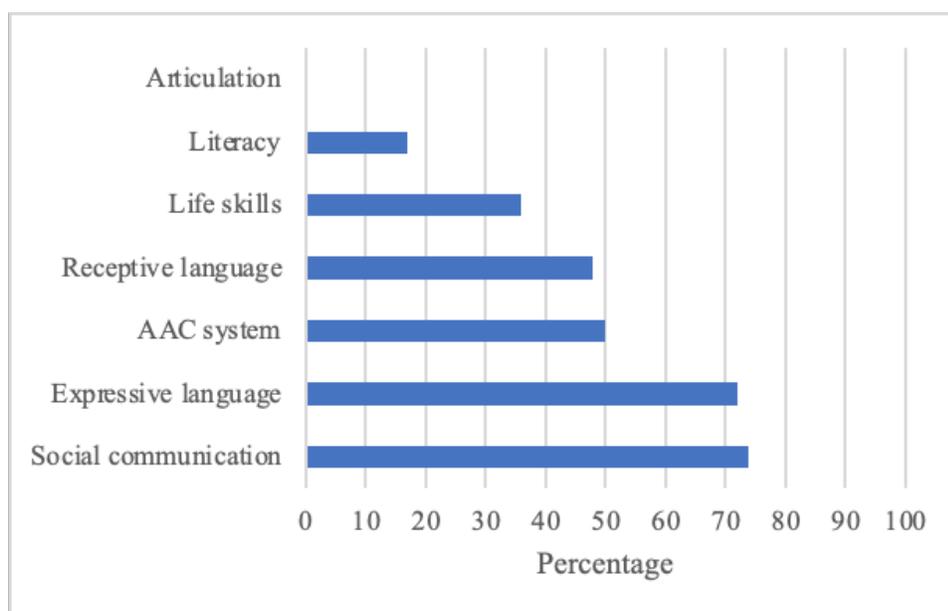
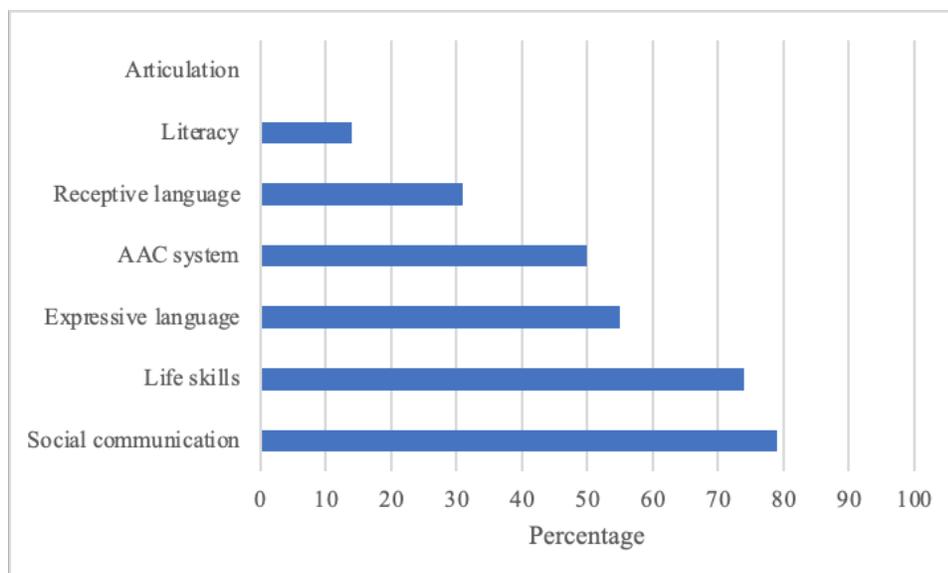
*Priority Interventions in Middle School*

Figure 6

*Priority Interventions in High School***Supplemental Constructs**

Survey methodology allowed the author to collect data on multiple constructs at one time to provide a complete picture of literacy intervention for AAC users. In addition to the two

research questions, data on three supplemental constructs were collected. Survey questions 21-23 addressed the constructs of factors in the decision Nebraska SLPs discontinue literacy intervention for AAC users, reported barriers to literacy intervention for AAC users, and the effects of the COVID-19 pandemic on literacy intervention.

Participants reported the top three reasons SLPs discontinue literacy intervention for AAC users were the “student has gained necessary skills” ( $n=45$ ), “intrinsic client factors (e.g., disability level, vision, motor)” ( $n=36$ ), and a “focus on other interventions” ( $n=36$ ). See Figure 7 for full results. Participants also reported the top three barriers to literacy intervention as a “lack of training/confidence in literacy instruction” ( $n=43$ ), “lack of AAC materials” ( $n=42$ ), and “caseload size” ( $n=38$ ). See Figure 8 for full results.

Figure 7

*Discontinuing Literacy Intervention*

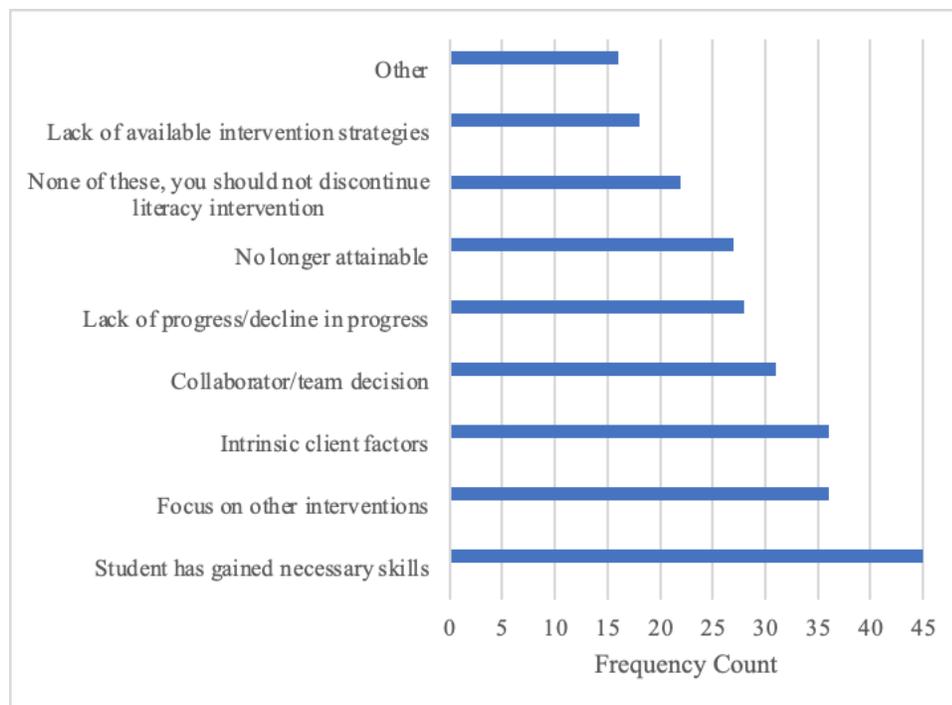
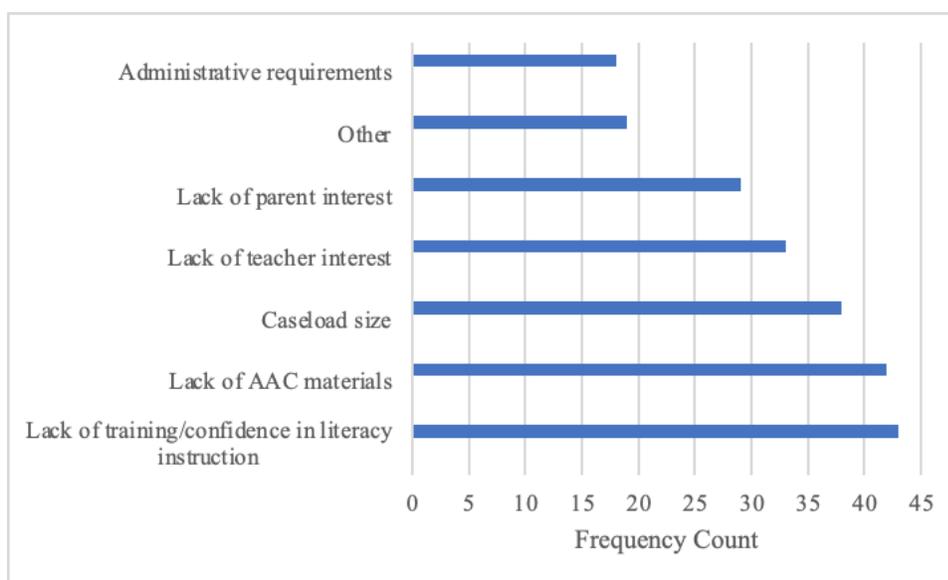


Figure 8

*Barriers to Literacy Intervention*

As the COVID-19 pandemic was affecting schools around the country at the time of survey distribution, the survey asked about the effect of the COVID-19 pandemic on their current practices. Eighty-six percent ( $n=48$ ) of SLPs reported that the COVID-19 pandemic did not affect their responses to this survey. Of those who felt the pandemic affected services, the common themes across open-ended responses included change in parent support/buy in, difficulty in engagement or service delivery via online platforms, difference in group structure, inability to provide 1:1 intervention, disruption in services with student and staff quarantine resulting in regression, and changes to mental health.

## CHAPTER 4: DISCUSSION

Literacy is a key factor in developing generative communication in individuals that use AAC systems. Generative communication creates opportunities for employment, expands social networks, aids personal safety, and leads to an overall improved quality of life (Lysaght et al., 2017; Bryen et al., 2003). However, according to Foley and Wolter (2010) ninety percent of individuals who use AAC do not develop adequate literacy skills by the time they age out of the education system. It is important to try to understand the factors that are influencing this trend. Research exists surrounding literacy instruction for AAC users in preschool and early elementary school, however the research base is limited in high school. As many AAC users are not gaining foundational literacy skills when they are young, information needs to be gathered around how literacy instruction can continue through all stages of education to improve literacy rates in individuals with CCN. In this study, SLPs working in Nebraska schools were surveyed to (a) identify literacy interventions used with high school AAC users, (b) determine the importance of literacy intervention for high school AAC users, and (c) compare the importance of literacy intervention in high school to other ages and other areas of intervention. In this chapter, the author will discuss the interpretations of the data for the three research questions, as well as investigate supplemental constructs, clinical implications of the findings, limitations of this study, and future directions.

### **Interpretations**

#### ***Literacy Intervention for High School AAC Users***

To contribute to foundational research in literacy intervention for high school aged individuals with AAC needs the current practices of SLPs were identified and explored through survey methodology. The first research question in this study investigated the literacy

interventions currently being provided to high school AAC users by Nebraska school-based SLPs. Results of the survey showed that adapting literacy materials and phonological awareness were the most frequently named literacy interventions for high school AAC users. Phonological awareness and adapting literacy materials remained among the most frequently selected literacy interventions for all age groups as extrapolated from additional survey questions related to question one. This finding differs from the author's hypothesis that the interventions would evolve based on the age of the student. Stauter et. al (2017) and Barker et. al (2012) provide systematic reviews of the literature on literacy interventions used with children in early intervention and elementary school which consist of phonological awareness and sight word approaches, subvocal rehearsal, and adapting response options. The finding that survey participants selected the same interventions for use with high school aged AAC users as younger AAC users may indicate that there is not enough research around high school literacy intervention, Nebraska school-based SLPs may not be trained in which strategies to use with different age groups, or that intervention selection is based on literacy skill-level rather than age.

### ***Importance of High School Literacy Intervention***

A potential negative factor influencing the literacy skill development of AAC users is SLP's attitudes about the importance of literacy instruction in high school. Research question two evaluated how important Nebraska school-based SLPs felt literacy intervention was for high school AAC users. Results of this survey study determined that participants rated high school literacy as "very important," which was not expected. The author hypothesized the importance of literacy would be lower in high school (i.e., "slightly important" to "moderately important") than at other age levels. When comparing students with CCN to that of typically developing students, it was expected that the importance of foundational literacy intervention would decrease for

typically developing students due to the transition from learning to read to reading to learn. For students with CCN, the importance was hypothesized to decrease because that transition did not occur and literacy as a goal was discontinued. As discussed previously, 90% of students with CCN leave school without learning how to functionally read and write (Foley & Wolter, 2010). However, based on the results of this study, the importance of literacy remained high in high school. This finding demonstrates that the lower rates of literacy in high school AAC users may not be due to SLPs finding literacy as an area of intervention in high school to be unimportant. Other factors may be contributing to lower rates of literacy. One factor contributing to lower literacy rates may be that literacy instruction provided for younger children who use AAC is not sufficient to establish foundational reading and writing skills, resulting in students who use AAC being entrenched in the “learning to read” stage while in high school. Continued research is needed to identify other factors that are contributing to low rates of literacy for high school AAC users.

### ***Comparisons Among Areas of Intervention Across the Age Span***

There is a limited amount of time available to the clinician for intervention, so it is important to understand, across the age span, how SLPs view the importance of other treatments that are competing with literacy for intervention time. The third research question compared the importance of literacy instruction in high school to other areas of intervention across the age span. According to the Nebraska SLPs surveyed, the importance of intervention in expressive language, receptive language, and social communication remained at the highest level, “extremely important,” across the age span. These areas of intervention were expected to be of great importance with all age groups. Receptive language was reported as more important to SLPs who have worked with the AAC population for less than five years. This may be due to

educational changes in the last five years emphasizing the importance of literacy intervention or simply reflect the opinions of the specific SLPs responding in this survey and may not indicate a true difference. Literacy also remained stable and was rated as “very important” across the age span. Interestingly, articulation was rated the least important area of intervention across all age groups despite the literature reporting the benefit of concurrent articulation, language, and AAC training for young children (Walters et. al, 2021). Although the importance of literacy education did not decrease across the age span as expected, it was not frequently ranked in the top three most important areas of intervention for high school. The importance of literacy peaked in elementary school, remaining in the range of “very important” across the age span. This is expected as foundational literacy instruction contributes to a large portion of early elementary curriculum for typically developing students. Conversely, the importance of life skills decreased from “extremely important” in early intervention to “very important” in elementary school, then rose again to “extremely important” in middle and high school. Participating SLPs also reported life skills as one of the three priority areas of intervention for high school AAC users, leaving out literacy. As life skills intervention was rated as more of a priority than literacy, life skills intervention is more likely to be consistently occur than literacy intervention when time is limited.

### ***Supplemental Constructs***

When literacy intervention is ended it is important to understand the thought process behind that decision. Additional constructs were measured in the survey to establish context in the decision-making process regarding the barriers to and reasons for discontinuing literacy intervention. Despite available research showing the importance of individualized instruction adapting to fit client attributes (intrinsic factors), such as a cognitive or motor impairment, rather

than letting traits of the clients be obstacles (Light & McNaughton, 2013), “intrinsic client factors” was the third most selected reason to discontinue literacy intervention. Per the current research available on AAC services not limited to literacy specifically (Light & McNaughton, 2013), intrinsic challenges such as sensory, motor, or cognitive impairments are opportunities to provide comprehensive instruction in many areas, including literacy. In the presence of difficult intrinsic factors, AAC systems and interventions can be modified to best fit the needs of the individual.

The author also asked participants to identify the top three barriers to literacy intervention. Participants selected a lack of training/confidence in literacy intervention, lack of AAC materials, and caseload size as the most common barriers. One reason for the first barrier may be a lack of education in literacy instruction for AAC users during preservice undergraduate or graduate education or lack of experience providing intervention in this area. Administrative barriers within schools and school districts could be contributing to both the lack of AAC materials available to properly adapt intervention and large caseloads. Both of these barriers decrease the amount of time SLPs have available to work with each child on their caseload. Ultimately, the barriers to and reasons for ending literacy intervention can be used to formulate a plan to improve literacy intervention for students with CCN across the age span. This is discussed further within the future directions found below. Next, the clinical implications of the findings from each of the research questions and supplemental constructs are presented below.

### **Clinical Implications**

There are a number of clinical implications that can be derived from the results of this study. First, the survey itself can be used as a tool for SLPs to identify the literacy interventions they use with their AAC students. These SLPs can then assess their use of these interventions

and incorporate additional evidence-based literacy intervention within treatment in other areas of intervention such as within the introduction and modifications to their AAC system. Individual school districts can also determine the current status of literacy interventions across age groups. The districts and SLPs within the district can use this information to critically evaluate their treatment and adapt to meet the needs of their students. The survey also identified barriers to literacy intervention, such as a low confidence in literacy interventions, lack of AAC materials, and large caseload size. These barriers can be addressed at an administrative level to continue the effort in creating an education system conducive to effective instruction. Examples of administrative adjustments can include caseload caps, providing access to free materials for adapting instruction, and professional development regarding literacy instruction. Additionally, selection of “lack of SLP training/confidence in literacy intervention” as a barrier, supports the need for more research to improve knowledge in this area. Once an AAC user develops literacy skills they can become a generative communicator. This will benefit and expand opportunities for all other areas of intervention for AAC users. While educating new SLPs and providing continuing education for current SLPs, the importance of literacy can be emphasized as the basis of other areas of intervention.

### **Limitations**

There are several limitations to this study. First, a common theme across current research and participant comments within the survey was the heterogenous nature of the AAC population. Since AAC users can present with differing motor, language, and cognitive ability, it is difficult to generalize the results of previous studies to all individuals or identify interventions that are applicable to all users. This should be considered when interpreting the findings of this study, understanding that not every SLP has the same experience with literacy instruction for

AAC users because each AAC user is different. For example, the experience of an SLP adapting writing instruction for a student with a motor impairment is different than adapting reading instruction for a student with an intellectual disability. Second, the nature of an online survey is a limitation. The sample obtained is not be representative of school based SLPs outside Nebraska. Conclusions may be drawn regarding the interventions and attitudes of Nebraska school based SLPs. Specifically, one major urban district declined to participate in this study which resulted in the participant pool trending toward rural SLPs, therefore the results may not be fully representative of the entire state of Nebraska. Although the invitation to participate in the study encouraged both participants who serve students who use AAC and those who do not, there were considerably less participants who did not serve AAC users than those that did. With a small sample of SLPs who do not serve AAC users, the results may not be fully reflective of this group of SLPs. Next, the COVID-19 pandemic changed the manner in which intervention was provided, often in a time-consuming way, and contributed to mental health changes in both clinicians and students, as reported by participants. As is common in survey research, participants may skew their own perspective toward rating literacy as more important because they are aware the focus of the study is literacy intervention. The order of questions presented in the survey may have affected responses as well. For example, presenting rating questions in block format may have led to less thought in the selection of ratings and a flattening of the overall ratings. Other limitations of surveys include differences in interpreting questions, inability to capture the full depth of a complex topic, and difficulty quantifying abstract concepts (i.e., importance). Because data was used from incomplete survey, there are slight differences in analytical sample sizes which may have impacted some results. Finally, although the chance of Type I errors was reduced by individually adjusting the level of significance for each analyses

group, there is a chance that the importance of findings may be overinflated due to conducting multiple analyses on the data set.

### **Future Directions**

This study was designed to be a starting point to identify the current interventions used by Nebraska SLPs for high school AAC users, determine the importance of literacy intervention according to those SLPs, and compare literacy to other areas of intervention. Future directions are provided for potential modifications for additional survey research, expanded populations to be surveyed, and other areas of research.

To expand the ideas addressed through a survey, one could evaluate the interventions provided when different stages of literacy skill development are reached (e.g., early literacy skill interventions for AAC users vs. advanced reading comprehension for AAC users) as opposed to at different age groups since AAC users are not following the same literacy development timeline as typically developing students (Foley & Wolter, 2010). The survey could also be adapted to be caseload specific, asking questions about the AAC populations each SLP works with, the levels of literacy among actual AAC users, interventions used based on client characteristics, and the manner of decline in reading intervention (i.e., age of tapering reduction in intervention or complete stop). To address concerns with order affecting participant responses, the order of questions for future surveys could be rotated or rating questions could be split up across the survey.

This survey could be redistributed or distributed to other populations to gather more information. After a period of time, the survey can be redistributed and used to measure any change in interventions used or opinions regarding literacy intervention for AAC users within Nebraska. Additional questions could be added to the survey regarding the frequency and setting

of literacy intervention (e.g., minutes of instruction per week and individual vs. group instruction) at different ages to provide additional context surrounding the interventions provided. The responsibility of providing literacy intervention does not lie solely with the SLP, therefore the ideas regarding literacy intervention for AAC users should be explored among other professionals such as special education teachers and reading interventionists.

Finally, the identified literacy interventions (i.e., adapting literacy materials, shared book reading, phonological awareness) should be used at each age level (i.e., early intervention, elementary school, middle school, high school) to evaluate its effectiveness. Once the best interventions for each age are identified, preservice and continuing education can be provided to SLPs to incorporate into practice. Improved literacy intervention for all AAC users will ultimately increase the rates of literacy in high school AAC users.

By analyzing the current interventions for and importance of literacy for high school AAC users, this project provided a foundation for future research. The current literature available in this area was reviewed, methodology and results explained, and full exploration of the implications of this work investigated. Clinical implications, limitations, and future directions were provided to continue the mission to create AAC users who have the ability to generatively communicate through literacy instruction.

## APPENDIX A

### Survey Questions

#### *Demographics*

1. Do you currently or within the past 3 years have you worked as a school-based speech-language pathologist in Nebraska?
  - a. Yes (continue to survey)
  - b. No (end survey)
2. How many years have you practiced in speech-language pathology?
  - a. <1 year
  - b. 1-5 years
  - c. 5-10 years
  - d. > 10 years
3. In your graduate coursework or continuing education courses have you received training in Augmentative and Alternative Communication (AAC)?
  - a. Yes
  - b. No
4. How many years have you provided AAC services?
  - a. I do not provide AAC services (skip question 5)
  - b. <1 year
  - c. 1-5 years
  - d. 5-10 years
  - e. > 10 years
5. Of your caseload, what percentage of students use AAC?
  - a. 0-10%
  - b. 11-30%
  - c. 31-50%
  - d. >50%
6. What grade levels do you currently serve? (select all that apply)
  - a. Early intervention (approx. birth – 4 years old)
  - b. Elementary (approx. 5 – 10 years old)
  - c. Middle school (approx. 11 – 14 years old)
  - d. High school (approx. 15 – 21 years old)
7. What grade levels have you served in the past? (select all that apply)
  - a. Early intervention (approx. birth – 4 years old)
  - b. Elementary (approx. 5 – 10 years old)
  - c. Middle school (approx. 11 – 14 years old)
  - d. High school (approx. 15 – 21 years old)
  - e. N/A – I have only worked at my current grade level
8. What category of school do you work for?
  - a. Urban
  - b. Rural

#### *Literacy Interventions*

Please respond to the following questions about your practice before the COVID-19 pandemic. If you do not currently serve students who use AAC, imagine you are to have a new child who uses AAC on your caseload.

9. What literacy intervention strategies do you use or would you use for an individual using AAC who is in high school (approx. 15-21 years old)? (select all that apply)
  - a. Adapting literacy materials
  - b. Subvocal rehearsal
  - c. Sight word approach
  - d. Phonological awareness (e.g., letter-sound correspondence, blending sounds)
  - e. Shared book reading
  - f. Other (open response)
  - g. None of these
10. Would you use different intervention strategies for someone in middle school (approx. 11-14 years old) using AAC?
  - a. No, I would use the same intervention strategies as high school
  - b. Yes, I would use different intervention strategies than high school
    - i) What literacy intervention strategies do you use or would you use for an individual using AAC who is in middle school (approx. 11-14 years old)? (select all that apply)
      - (1) Adapting literacy materials
      - (2) Subvocal rehearsal
      - (3) Sight word approach
      - (4) Phonological awareness (e.g., letter-sound correspondence, blending sounds)
      - (5) Shared book reading
      - (6) Other (open response)
      - (7) None of these
11. Would you use different intervention strategies for someone in elementary school (approx. 5-10 years old) using AAC?
  - a. No, I would use the same intervention strategies as high school
  - b. Yes, I would use different intervention strategies than high school
    - i) What literacy intervention strategies do you use or would you use for an individual using AAC who is in elementary school (approx. 5-10 years old)? (select all that apply)
      - (1) Adapting literacy materials
      - (2) Subvocal rehearsal
      - (3) Sight word approach
      - (4) Phonological awareness (e.g., letter-sound correspondence, blending sounds)
      - (5) Shared book reading
      - (6) Other (open response)
      - (7) None of these
12. Would you use different intervention strategies for someone in early intervention (approx. birth-4 years old) using AAC?
  - a. No, I would use the same intervention strategies as high school
  - b. Yes, I would use different intervention strategies than high school

- i. What literacy intervention strategies do you use or would you use for an individual using AAC who is in early intervention (approx. birth-4 years old)? (select all that apply)
  1. Adapting literacy materials
  2. Subvocal rehearsal
  3. Sight word approach
  4. Phonological awareness (e.g., letter-sound correspondence, blending sounds)
  5. Shared book reading
  6. Other (open response)
  7. None of these

***Rank Intervention Importance***

13. For an individual using AAC who is in early intervention (approx. birth-4 years old), how important do you view each of the following areas of intervention? (sliding bar with not important, slightly important, moderately important, very important, and extremely important for each intervention area)
  - a. AAC system (e.g., device training)
  - b. Articulation
  - c. Expressive language
  - d. Literacy
  - e. Receptive language
  - f. Social communication
  - g. Life skills
  - h. Other
14. Please rank the top three areas of intervention in order of priority for an individual using AAC who is in early intervention (approx. birth-4 years old). (1 – highest priority, 2 – second highest priority, 3 – third highest priority)
  - a. AAC system (e.g., device training)
  - b. Articulation
  - c. Expressive language
  - d. Literacy
  - e. Receptive language
  - f. Social communication
  - g. Life skills
  - h. Other
15. For an individual using AAC who is in elementary school (approx. 5-10 years old), how important do you view each of the following areas of intervention? (sliding bar with not important, slightly important, moderately important, very important, and extremely important for each intervention area)
  - a. AAC system (e.g., device training)
  - b. Articulation
  - c. Expressive language
  - d. Literacy
  - e. Receptive language
  - f. Social communication

- g. Life skills
  - h. Other
16. Please rank the top three areas of intervention in order of priority for an individual using AAC who is in elementary school (approx. 5-10 years old). (1 – highest priority, 2 – second highest priority, 3 – third highest priority)
- a. AAC system (e.g., device training)
  - b. Articulation
  - c. Expressive language
  - d. Literacy
  - e. Receptive language
  - f. Social communication
  - g. Life skills
  - h. Other
17. For an individual using AAC who is in middle school (approx. 11-14 years old), how important do you view each of the following areas of intervention? (sliding bar with not important, slightly important, moderately important, very important, and extremely important for each intervention area)
- a. AAC system (e.g., device training)
  - b. Articulation
  - c. Expressive language
  - d. Literacy
  - e. Receptive language
  - f. Social communication
  - g. Life skills
  - h. Other
18. Please rank the top three areas of intervention in order of priority for an individual using AAC who is in middle school (approx. 11-14 years old). (1 – highest priority, 2 – second highest priority, 3 – third highest priority)
- a. AAC system (e.g., device training)
  - b. Articulation
  - c. Expressive language
  - d. Literacy
  - e. Receptive language
  - f. Social communication
  - g. Life skills
  - h. Other
19. For an individual using AAC who is 15-21 years old (high school), how important do you view each of the following areas of intervention? (sliding bar with not important, slightly important, moderately important, very important, and extremely important for each intervention area)
- a. AAC system (e.g., device training)
  - b. Articulation
  - c. Expressive language
  - d. Literacy
  - e. Receptive language
  - f. Social communication

- g. Life skills
  - h. Other
20. Please rank the top three areas of intervention in order of priority for an individual using AAC who is in high school (approx. 15-21 years old). (1 – highest priority, 2 – second highest priority, 3 – third highest priority)
- a. AAC system (e.g., device training)
  - b. Articulation
  - c. Expressive language
  - d. Literacy
  - e. Receptive language
  - f. Social communication
  - g. Life skills
  - h. Other

***Other questions***

21. What factors are most important in your decision to discontinue literacy intervention? (rank all that apply in order of importance; leave out options that are unimportant; 1 – most important)
- a. No longer attainable
  - b. Lack of progress/decline in progress
  - c. Intrinsic client factors (e.g., disability level, vision, motor ability)
  - d. Collaborator/team decision
  - e. Focus on other interventions
  - f. Lack of available intervention strategies
  - g. Student has gained necessary skills
  - h. None of these, you should not discontinue literacy intervention
  - i. Other - open response
22. What barriers have you come across in providing literacy intervention for individuals who use AAC? (rank all that apply in order of the significance of the barrier; leave out options that are not barriers; 1 – most significant)
- a. Caseload size
  - b. Lack of parent interest
  - c. Lack of teacher interest
  - d. Administrative requirements
  - e. Lack of AAC materials
  - f. Lack of training/confidence in literacy instruction
  - g. Other - open response
23. Has the COVID-19 pandemic affected any of your responses?
- a. Yes, how? (open response)
  - b. No

## APPENDIX B

Table 8

*Comparing ranking interventions (>5 years experience vs. <5 years experience)*

*(sig level = 0.006)*

*\*=significant p-value*

Area of Intervention	Effect size (r=)
AAC Systems	0.3363
Articulation	0.000
Expressive language	0.1698
Literacy	0.0827
Receptive language	0.4175*
Social communication	0.1393
Life skills	0.2643

Table 9

*Literacy Interventions for Middle School*

Intervention	<i>n</i>	Overall Percentage (out of 22)
Adapting literacy materials	15	44%
Shared book reading	9	26%
Phonological awareness	5	15%
Sight word approach	3	9%
Subvocal rehearsal	0	0%
Other	0	0%
None of these	2	6%

Table 10

*Literacy Interventions for Elementary School*

Intervention	<i>n</i>	Overall Percentage (out of 63)
Shared book reading	49	25%
Adapting literacy materials	45	23%
Phonological awareness	44	22%
Sight word approach	42	21%
Subvocal rehearsal	10	5%
Other	5	3%
None of these	2	1%

Table 11

*Literacy Interventions for Early Intervention*

Intervention	<i>n</i>	Overall Percentage (out of 64)
Shared book reading	46	27%
Adapting literacy materials	39	23%
Phonological awareness	39	23%
Sight word approach	23	14%
Subvocal rehearsal	8	5%
Other	9	5%
None of these	4	2%

Table 12

*Early Intervention Wilcoxon Signed-Rank Analyses (level of significance = 0.003)*\*=*significant p-value*

Table 12a

*Participant Ratings of Importance Compared to Literacy – Effect Sizes*

AAC	Articulation	Expressive Language	Receptive Language	Social Communication	Life Skills
0.2446	0.4544*	0.6795*	0.6930*	0.6966*	0.2115

Table 12b

*Participant Ratings of Importance Compared to Life Skills – Effect Sizes*

AAC	Articulation	Expressive Language	Literacy	Receptive Language	Social Communication
0.0131	0.5620*	0.5704*	0.2115	0.5232*	0.5812*

Table 12c

*Other Comparisons of Participant Ratings – Effect Sizes*

Expressive Language - Articulation	Receptive Language – Articulation	Expressive Language – Receptive Language
0.8208*	0.8196*	0.0290

Table 13

*Elementary School Wilcoxon Signed-Rank Analyses (level of significance = 0.003)*

*\*=significant p-values*

Table 13a

*Participant Ratings of Importance Compared to Literacy – Effect Sizes*

AAC	Articulation	Expressive Language	Receptive Language	Social Communication	Life Skills
0.1193	0.6564*	0.4450*	0.5032*	0.5404*	0.0242

Table 13b

*Participant Ratings of Importance Compared to Life Skills – Effect Sizes*

AAC	Articulation	Expressive Language	Literacy	Receptive Language	Social Communication
0.1058	0.7088*	0.4244*	0.0242*	0.4747	0.5348*

Table 13c

*Other Comparisons of Participant Ratings – Effect Sizes*

Expressive Language - Articulation	Receptive Language – Articulation	Expressive Language – Receptive Language
0.7898*	0.8058*	0.0920

Table 14

*Middle School Wilcoxon Signed-Rank Analyses (level of significance = 0.003)*

*\*=significant p-values*

Table 14a

*Participant Ratings of Importance Compared to Literacy – Effect Sizes*

AAC	Articulation	Expressive Language	Receptive Language	Social Communication	Life Skills
0.0862	0.7536*	0.4459*	0.4361*	0.6036*	0.4176*

Table 14b

*Participant Ratings of Importance Compared to Life Skills – Effect Sizes*

AAC	Articulation	Expressive Language	Literacy	Receptive Language	Social Communication
0.3591	0.8264*	0.0276	0.4176*	0.0704	0.2026

Table 14c

*Other Comparisons of Participant Ratings – Effect Sizes*

Expressive Language - Articulation	Receptive Language – Articulation	Expressive Language – Receptive Language
0.8216*	0.8335*	0.0948

Table 15

*High School Wilcoxon Signed-Rank Analyses (level of significance = 0.003)*

*\*=significant p-values*

Table 15a

*Participant Ratings of Importance Compared to Literacy – Effect Sizes*

AAC	Articulation	Expressive Language	Receptive Language	Social Communication	Life Skills
0.1819	0.7237*	0.5413*	0.5723*	0.6978*	0.7101*

Table 15b

*Participant Ratings of Importance Compared to Life Skills – Effect Sizes*

AAC	Articulation	Expressive Language	Literacy	Receptive Language	Social Communication
0.5793*	0.8619*	0.3976*	0.7101*	0.4522*	0.1238

Table 15c

*Other Comparisons of Participant Ratings – Effect Sizes*

Expressive Language - Articulation	Receptive Language – Articulation	Expressive Language – Receptive Language
0.8210*	0.8229*	0.0801

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