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The Efficacy of a Key Word Signing Workshop

A Dissertation by

Krista L. McMorrان-Maus

Chapman University

Orange, CA

Attallah College of Educational Studies

Submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy in Education

December 2022

Committee in charge:

Scot Danforth, Ph.D., Chair

Dawn Hunter, Ph.D.

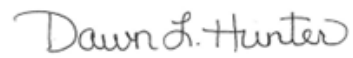
Carlos Lopez, Ph.D.

Andy Smidt, Ph.D.

The dissertation of Krista L. McMorrان-Maus is approved.



Scot Danforth, Ph.D., Chair



Dawn Hunter, Ph.D.



Carlos Lopez, Ph.D.



Andy Smidt, Ph.D.

July, 2022

The Efficacy of a Key Word Signing Workshop

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ABSTRACT

The Efficacy of a Key Word Signing Workshop

by Krista L. McMorran-Maus

This study examined the effect of a 1-day, 6-hour key word signing (KWS) workshop on in-service special education teachers' and speech-language pathologists' (SLPs) (a) skill identifying American Sign Language (ASL) signs; (b) skill producing ASL signs; (c) use of KWS in the classroom or therapy room; and (d) perceived changes from taking part in a KWS workshop. Participants included five special education teachers, three SLPs, and four students with complex communication needs (aged 3 to 14 years) participated in the study. All eight adult participants participated in a pretest-posttest design with repeated posttest measures over time, survey design, and phenomenological research to examine the effect of a KWS workshop on their skill identifying and producing manual signs as well as their perceived changes from taking part in the KWS workshop. Three of the eight adult participants and four students participated in an A-B single-case design, which was used to determine the effect of the KWS workshop on the in-service staff's use of KWS in their classrooms or therapy rooms. The adult participants demonstrated an immediate increase in their ability to identify and produce the ASL signs taught during the KWS workshop, and they exhibited an increasing trend over the six postworkshop assessment sessions (across 11 or 12 weeks) in their ASL sign identification and production skills. The adult participants' percentage of nonoverlapping data (PND) for the number of signed utterances, signs, and different signs they used in their classrooms or therapy rooms indicated a large effect. Two of the four students did not produce signed utterances during the classroom activities throughout the three preworkshop observations and five postworkshop observations.

The PND for one student, who produced signed utterances, suggested a large effect and the PND for the other student, who used signed utterances, suggested a small effect. A majority of the participants reported that students, who relied on AAC and used natural speech, as well as classroom staff increased their production (i.e., imitation and spontaneous production) of ASL signs after the adult participants attended a workshop and began to use KWS in their classrooms and therapy rooms.

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LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Meaning</u>
AAC	Augmentative and Alternative Communication
ADA	American With Disabilities Act
ALgS	Aided Language Stimulation
ASD	Autism Spectrum Disorder
ASL	American Sign Language
AT	Assistive Technology
ATP	Adult Transition Program
CBI	Community-Based Instruction
CCN	Complex Communication Needs
CI	Cochlear Implant
CPI	Communication Partner Instruction
D/HH	Deaf and Hard of Hearing
DLM	Dynamic Learning Maps
ID	Intellectual Disability
IDEA	Individuals With Disabilities Education Act
KWS	Key Word Signing
LTM	Least-to-Most
MT	Milieu Teaching
PACE	Practicing Academic Concepts & Enrichment
PAL	Peer Assistance Leadership

PCS	Picture Communication Symbols
PDD-NOS	Pervasive Developmental Disorder Not Otherwise Specified
PECS	Picture Exchange Communication System
PMT	Prelinguistic Milieu Teaching
PND	Percentage of Nonoverlapping Data
SGD	Speech Generating Device
SEE	Signing Exact English
SLP	Speech-Language Pathologist

Chapter 1: Introduction

Chapter 1 begins with explanations of augmentative and alternative communication (AAC) systems, AAC forms, and communication partner strategies. It will then discuss (a) opportunity barriers, which limit participation opportunities for individuals who rely on AAC, as described by Beukelman and Mirenda (2013); (b) Subpart E of Title II of the Americans With Disabilities Act of 1990 (ADA), which requires public entities to take the appropriate measures to make sure communications with individuals with impairments are as effective as communications with individuals without impairments; (c) school-based speech-language pathologists' (SLPs') responsibility to provide AAC-related staff trainings while lacking operational competency; and (d) the lack of, or limited, AAC-related training provided by preprofessional training or preparation programs for special education teachers. Lastly, Chapter 1 ends with introductions of the problem statement, purpose statement, and research questions, as well as a presentation of the researcher's subjectivity statement for the present study.

Augmentative and Alternative Communication Systems

According to the 2009–2010 National Survey of Children with Special Health Care Needs, approximately 15.1% of children, or 11.2 million, in the United States have special health care needs (U.S. Department of Health and Human Services, 2013). Approximately 2.5% of the children, or 280,000, with special health care needs (aged 3 to 17 years) in the United States need communication aids (U.S. Department of Health and Human Services, 2013). Communication aids are “physical object[s] or device[s] used to transmit or receive messages (e.g., a communication book, board, chart, mechanical or electronic device, or computer)” (American Speech-Language-Hearing Association, 1991, p. 10).

Communication aids are one component of AAC systems. AAC systems are multi-component systems in which groups of components are integrated so that individuals may use them to supplement or replace oral speech and/or writing (American Speech-Language-Hearing Association, 1991; American Speech-Language-Hearing Association, 2018; Lloyd et al., 1997). The groups of components may include AAC forms, symbols, aids, selection techniques, and strategies (American Speech-Language-Hearing Association, 1991, 2018). Furthermore, multiple AAC systems, or modalities, may be used in combination so that individuals with complex communication needs (CCN) may change their communication mode based on the content, communication partner, and communicative intent (American Speech-Language-Hearing Association, 2018).

Augmentative and Alternative Communication Forms

Another component of AAC systems is symbols or forms. There are two AAC forms—aided and unaided (American Speech-Language-Hearing Association, 2018). Aided forms require an external device for production (i.e., a communication aid), and unaided forms do not require an external device for production (American Speech-Language-Hearing Association, 2018; Beukelman & Mirenda, 2013; Lloyd et al., 1997). Examples of aided forms are tangible symbols (e.g., real, miniature, and partial objects), representational symbols (e.g., photographs, line-drawings [rebus, picture communication symbols]), orthography and orthographic symbols (e.g., Braille and fingerspelling [visual and tactile]), and digitized and synthetic speech (Beukelman & Mirenda, 2013; Lloyd et al., 1997). Examples of unaided forms are gestures (e.g., fine and gross motor body movements and facial expressions), gestural codes (e.g., Amer-Ind and Tadoma method), natural sign languages (e.g., American Sign Language [ASL]), manually

coded languages (e.g., Signing Exact English [SEE]), hand-cued speech (e.g., cued speech), vocalizations, and oral speech (Beukelman & Mirenda, 2013; Lloyd et al., 1997).

Key Word Signing (KWS)

Students who have CCN and rely on AAC (e.g., children with autism spectrum disorder [ASD] or intellectual disabilities [ID]) may use manual signs (an unaided symbol set) from natural sign languages with spoken language and/or representational symbols (Sheehy & Duffy, 2009). A manually coded sign system developed for hearing individuals with CCN (e.g., little or no functional speech) is key word signing (KWS; Lloyd et al., 1997). KWS may be used to (a) aid a child's comprehension, (b) supplement speech if a child's speech develops slowly or spoken words are unintelligible, and (c) replace speech if speech does not develop (Bloomberg, 2013).

For KWS, spoken language and manual signs are used simultaneously. The manual signs are used to code the content words in spoken sentences. Content words include base nouns, base verbs, prepositions, adjectives, and adverbs (Beukelman & Mirenda, 2013; Lloyd et al., 1997). Moreover, body language and facial expressions are used as sentences are spoken, and key words are signed (Bloomberg, 2013). For instance, an individual may sign GET RED CAR PUT IN BOX while they say, "Go get the red car and put it in the box." Because manual signs are used simultaneously with spoken language, KWS is also known as a simultaneous or total communication approach (Beukelman & Mirenda, 2013).

As previously stated, KWS is a manually coded sign system created for hearing individuals with CCN (Lloyd et al., 1997). It is not a natural sign language, for example, ASL. ASL differs from KWS because ASL is a natural sign language or visual language used by deaf and hard of hearing individuals in the United States (Warner, 2001). It employs manual signs

composed of specific sign parameters (i.e., handshape, location, orientation, movement, and nonmanual expression; Meuris et al., 2014; Warner, 2001). In addition, ASL has a distinguishable grammatical structure (i.e., grammar or inflection and syntax; Warner, 2001). Lastly, spoken language is not produced with the manual signs when ASL is used to communicate (Beukelman & Mirenda, 2013). In comparison, KWS uses manual signs and spoken language simultaneously, as well as the word order of the community's spoken language, to convey information (Bloomberg, 2013; Meuris et al., 2015).

Picture Communication Symbols (PCS)

Students who use AAC may also use line-drawings such as Picture Communication Symbols (PCS; Beukelman & Mirenda, 2013; Lloyd et al., 1997). PCS are clear, simple line-drawings available in black-and-white or color as well as with or without labels in multiple languages (Beukelman & Mirenda, 1998). The line-drawings or pictures depict concrete and abstract vocabulary from several categories such as generic face and head symbols, common phrases, restaurant logos and food items, brand-name products, nursery rhymes and songs, story characters, alphabet letters, numerals, and themes (e.g., shopping and watching television; Lloyd et al., 1997). PCS are used to create communication displays (e.g., communication boards and books; Beukelman & Mirenda, 1998, 2013). The pictures are highly iconic (i.e., a symbol's referent is easily identified) and transparent (i.e., a symbol's meaning is easily guessed when the referent is not visible); therefore, they are easily learned and recalled (and successfully used) by individuals with ID, cerebral palsy, ASD, deaf-blindness, and other impairments (e.g., aphasia, apraxia, and postoperative conditions; Beukelman & Mirenda, 2013; Lloyd et al., 1997).

Unaided and aided AAC forms may be used in isolation or combination. The form(s) used is determined by the student's "needs and abilities and the communication context"

(American Speech-Language-Hearing Association, 2018, p. 3). A well-designed AAC system uses a student's existing communication mode(s) (e.g., vocalizations, verbalizations, and gestures) with unaided and/or aided forms (e.g., KWS, PCS, and speech generating devices [SGDs]) to maximize their communication abilities (American Speech-Language-Hearing Association, 2018). Also, a well-planned AAC system is flexible and readily adapts to different environments and communication partners (e.g., special education teachers) so that the student may communicate effectively and efficiently (American Speech-Language-Hearing Association, 2018).

Communication Partner Strategies

To facilitate students' effective and efficient communication using an AAC system, communication partners must create a communication environment that promotes expressive and receptive language growth in individuals who rely on AAC (Sennott et al., 2016; Spragale & Micucci, 1990). To create this communication (or signing) environment, communication partners must provide consistent and appropriate models of AAC forms (e.g., manual signs) in natural environments, which support the receptive language abilities of individuals who rely on AAC (Kevan, 2003; Sennott et al., 2016; Spragale & Micucci, 1990). They must also use AAC strategies that facilitate communicative responses or the use of expressive language skills by individuals who rely on AAC (Kent-Walsh et al., 2015; Sennott et al., 2016). AAC strategies that may be used are (a) milieu teaching (b) aided language stimulation (ALgS) and/or augmented input, (c) language response strategies, and (d) least-to-most (LTM) prompting (Ault & Griffen, 2013; Beukelman & Mirenda, 1998; Bruce & Borders, 2015; DesJardin, 2006; Fey et al., 2006; Finke et al., 2017; Meuris et al., 2015; Smidt et al., 2019).

Milieu Teaching

Milieu teaching interventions include prelinguistic milieu teaching (PMT) and milieu teaching (MT). PMT is used to increase intentional communication through direct instruction in naturalistic environments; for example, the child is taught specific gestures, vocalizations, and coordinated eye gaze behavior (Bruce & Borders, 2015; Fey et al., 2006). The strategies for PMT involve “carefully arranging the physical environment, following the child’s interests, and creating opportunities for self-expression for the child” (Bruce & Borders, 2015, p. 374). Furthermore, adults (e.g., parents) are taught to be responsive to the child’s nonverbal and verbal acts, which is known as responsivity education (Fey et al., 2006).

MT is used to teach functional language skills (e.g., basic requesting) through naturalistic strategies. The teaching trials occur in natural contexts and are dispersed. They are also initiated by the child and based on their interests. Adults identify teaching trial opportunities (i.e., communication opportunities) during the child’s daily living activities, and then uses “setup” strategies to create the communication opportunities (Beukelman & Mirenda, 1998). The “setup” strategies may include:

- 1) placing a needed or desired item out of the individual’s reach, 2) passively blocking access to a desired item, 3) intentionally giving the individual materials that are inappropriate to the context (e.g., providing a cup when it is time to put on a coat), or 4) presenting two or more options so the individual can make a choice. (Beukelman & Mirenda, 1998, p. 309)

The adults also provide consequences (e.g., responses) that are functionally related to the child’s responses or derived from the natural environment (Beukelman & Mirenda, 1998).

The strategies for MT include mand-model, incidental teaching, and time-delay procedure. They may be used in isolation or in combination (Beukelman & Mirenda, 1998; Bruce & Borders, 2015). Mand-model teaches elicited requesting (i.e., with models and/or physical prompts for imitation) to a child who has not demonstrated the ability to request. Incidental teaching encourages a child who communicates with simple gestures given verbal prompts to initiate communication and develop more advanced communication skills using verbal prompts and models (as needed). The time-delay procedure teaches a child who has demonstrated the ability to request given verbal prompts to independently initiate requests using visual prompts and models as needed (Beukelman & Mirenda, 1998).

Aided Language Stimulation (ALgS)

ALgS is a strategy that communication partners may use to develop receptive and expressive communication skills in children with ID (American Speech-Language-Hearing Association, 2018). Based on milieu teaching, ALgS teaches students who rely on AAC to understand and use representational symbols (i.e., graphic symbols; Beukelman & Mirenda, 1998; Binger & Light, 2007). In advance, communication partners place key symbols on communication displays and organize environments so that the displays are readily available and the symbols may be appropriately applied (Beukelman & Mirenda, 1998; Goossens', 1989). Once in the environments, the communication partners provide students or learners with models and opportunities for combining the symbols (i.e., using more than one symbol) during activities (Beukelman & Mirenda, 1998; Goossens', 1989). In return, "the [learner] can begin to establish a mental template of how symbols can be combined and recombined generatively to mediate communication during the activity" (Goossens' et al., 1992, as cited in Beukelman & Mirenda, 1998, p. 349).

When providing models for ALgS, a communication partner highlights (e.g., points with their index finger or a small flashlight [shadow light cuing]) key graphic symbols on a communication display as the communication partner speaks to the student (Allen et al., 2017; Beukelman & Mirenda, 2013; Goossens', 1989). For instance, during a sand play activity, a communication partner may say, "Scoop sand into the bucket," while they point to the symbols for SHOVEL/SCOOP, SAND, IN/PUT IN, and BUCKET on a communication board (Beukelman & Mirenda, 1998).

The communication display or AAC system used for ALgS may be the student's system, a system similar to the student's system, or visual support materials that provide a visual reference for the graphic symbols in the student's system (Van Tatenhove, 2009). When the communication partner speaks to the student, the communication partner uses short, simple phrases at a reduced rate of speech (Allen et al., 2017; Goossens', 1989). When the communication partner provides AAC models, the communication partner highlights key graphic symbols at a rate that allows the student to see the highlighted symbols and process the information (Van Tatenhove, 2009). In general, the communication partner models at least one symbol more than the student's current mean length of utterance (MLU; Van Tatenhove, 2009). Lastly, an ALgS communication partner is encouraged to expand the student's productions and provide numerous opportunities for communication during daily activities (Allen et al., 2017; Beukelman & Mirenda, 1998; Goossens', 1989).

Least-to-Most (LTM) Prompting

ALgS with LTM prompting and language response strategies (e.g., recast and open questions) may also be used by communication partners to facilitate effective communication and language development (American Speech-Language-Hearing Association, 2018; Clarke et

at., 2017; Van Tatenhoven, 2009). LTM prompting “involves defining a hierarchy of prompts and then systematically delivering those prompts in order from the least amount of assistance required to the most amount of assistance until the student is able to perform the behavior independently” (Ault & Griffen, 2013, p. 46). The prompts are faded gradually until the student performs the behavior independently (Ault & Griffen, 2013). When defining an LTM prompt hierarchy, at least three prompt levels (with prompts predetermined to assist the student with performing a behavior independently) are selected to teach a desired behavior or skill (Finke et al., 2017). Table 1 shows the definitions and examples of prompts for LTM prompting.

Table 1-1

Definitions and Examples of Prompts for LTM Prompting

Prompt	Definition	Example
Expectant delay	Gives the student 3 to 5 seconds to perform the behavior.	NA
Direct verbal	Tells the student what to do for the behavior.	“Turn on the water.”
Indirect verbal	Asks the student what they should do for the behavior.	“What should you do now?”
Verbal cue	Tells the student to produce the behavior.	“Now you try.”
Visual model	Shows the student what to do for the behavior.	“Watch me.”
Verbal model	Tells the student what to say for the behavior.	NA
Full physical guidance	Provides the student hand-over-hand assistance to perform the behavior.	NA

Note. Information taken from “Teaching With the System of Least Prompts: An Easy Method for Monitoring Progress,” by M. J. Ault and A. K. Griffen, 2013, *TEACHING Exceptional Children*, 45(3), p. 46-53, and “Effects of Least-to-Most Prompting Procedure on Multisymbol Message Production in Children with Autism Spectrum Disorder Who Use Augmentative and Alternative Communication,” by E. H. Finke, J. M. Davis, M. Benedict, L. Goga, J. Kelly, L. Palumbo, T Peart, and S. Waters, 2017, *American Journal of Speech-Language Pathology*, 26, p. 81-98;

NA = not applicable.

Finke et al. (2017) defined a hierarchy of prompts that effectively taught school-age children with ASD who use AAC to produce multi-symbol utterances during a storybook reading activity. The hierarchy or levels of prompts were as follows:

1. Expectant delay (independent level).
2. Verbal prompt (i.e., “What’s happening?”) + expectant delay (first level).
3. Verbal prompt + verbal model (e.g., “I see Froggy sleeping; second level).
4. Verbal prompt + verbal model + visual model (i.e., point to the corresponding graphic symbols [e.g., FROGGY SLEEPING]; third level).
5. Verbal prompt + verbal model + visual/graphic model + verbal cue (i.e., “Now you try.”; fourth level).
6. Verbal prompt + verbal model + visual/graphic model + verbal cue + hand-over-hand prompt (i.e., to point to the corresponding graphic symbols; fifth level).

Although not indicated, an expectant delay was provided before a prompt was delivered (Finke et al., 2017).

Language Response Strategies

Communication partners may use language response strategies such as open-ended questions and recasts to respond to utterances produced by students who use AAC (Clarke et al., 2017; Van Tatenhove, 2009). Open-ended questions are phrases or questions “in which the child can answer using more than one word” (e.g., “What is happening?”; Cruz et al., 2013, p. 549). Recasts are communication partner responses that appear to “facilitate the acquisition of new words and grammatical structures” (Clarke et al., 2017, p. 43).

There is no universally reported definition for recasts; however, there are universally reported features (Clarke et al., 2017). The features are (a) the responses immediately follow the child's utterance, (b) the responses contain words or parts from the child's utterance, and (c) the responses provide an enhanced (grammatically correct) and/or expanded (grammatically more complex) version of the child's utterance by changing one or more sentence parts while maintaining its basic meaning. Recasts more effectively increase children's expressive vocabulary and grammatical skills when they are "developmentally appropriate, short, and similar to the [child's] original utterance" (Clarke et al., 2017, p. 45).

The American Speech-Language-Hearing Association (2008) defined responsive interaction strategies that share features with recasts. The strategies were expansions and extensions. Expansions are communication partner responses that provide a grammatically correct form of the child's grammatically incorrect utterance without changing the word order or intended meaning (American Speech-Language-Hearing Association, 2008; Cruz et al., 2013). For example, the child says, "fish swim," and the communication partner says, "The fish is swimming." Extensions or expatiations are similar to expansion, but the communication partner adds semantic information to the child's utterance (American Speech-Language-Hearing Association, 2008; Cruz et al., 2013). For instance, the child says, "fish swim," and the communication partner says, "The fish is swimming in the pond."

DesJardin (2006) described four higher-level and six lower-level facilitative language techniques that may be used to enhance children's language development during interactions that naturally take place throughout day-to-day routines and activities. The higher-level facilitative language techniques are used to enhance language learning in children at the two- to three-word utterance level (DesJardin & Eisenberg, 2007). In addition, they are "used more frequently after

children achieve a more advanced level of lexical and grammatical understanding” (DesJardin & Eisenberg, 2007, p. 465). The lower-level facilitative language techniques enhance language learning in children at the prelinguistic or one-word utterance level.

The four higher-level techniques DesJardin (2006) detailed included open-ended question, expansion, recast, and parallel talk. Recast is the immediate repetition of the child’s utterance approximation or verbalization in a question format, which is different from the definition provided above. For example, the child says, “Squirrel climbing up the tree!” and the communication partner says, “Why is the squirrel climbing up the tree?” or “The squirrel is climbing the tree?” Parallel talk is the provision of linguistic input about what the child or communication partner is doing. For instance, the child is playing with a doll, and the communication partner says, “You’re brushing the baby’s hair.”

The six lower-level facilitative language techniques DesJardin (2006) defined included label, close-ended question, imitation, comment, directive, and linguistic mapping. Label is naming a real or pictured object at which the child may or may not be looking. Close-ended question is asking a question that the child can answer using a one-word utterance (e.g., yes/no question). Imitation is immediately repeating the child’s vocalization or verbalization either verbatim or with less words - not more words. Comment is expressing a reaction or opinion to maintain the conversation or positively reinforce the child. For instance, the communication partner may say, “Wow!” “Uh oh!” “That’s right.” or “Let’s see.” (DesJardin, 2006). Directive is “telling the child to do something or commanding a behavior” (DesJardin, 2006, p. 286). Lastly, linguistic mapping is using context clues to interpret the child’s intended message and put words to their vocalizations. For example, the child pushes the cup away and vocalizes, and the communication partner says, “All done.”

These detailed descriptions of unaided (e.g., manual signs or KWS) and aided (e.g., PCS) symbols and strategies (i.e., milieu teaching, ALgS, LTM prompting, and language response strategies/facilitative language techniques) illustrate the numerous technical and interaction skills that are necessary to assist children who use AAC with becoming competent communicators (Beukelman & Mirenda, 1998).

Opportunity Barriers

Providing an appropriate communication aid or AAC system does not ensure successful communication (Kent-Walsh et al., 2015). Beukelman and Mirenda (2013) described the Participation Model, which identified two barriers that may affect the participation of individuals with CCN. The two barriers are related to access (i.e., the individual's capabilities, attitudes, and resource limitations) and opportunity. Opportunity barriers, which cannot be removed by providing an AAC system or intervention, may be imposed on a student with CCN (Beukelman & Mirenda, 2013). The opportunity barriers are (a) policy barriers, (b) practice barriers, (c) knowledge barriers, (d) attitude barriers, and (e) skill barriers.

Policy barriers are imposed on individuals with CCN by official written laws, standards, or regulations “that govern the situations in which many individuals with CCN find themselves” (Beukelman & Mirenda, 2013, p. 114). Practice barriers are imposed on individuals with CCN by unofficial “procedures or conventions that have become common in a family, school, or work-place but are not actual policies” (Beukelman & Mirenda, 2013, pp. 114–115). Knowledge barriers occur when people's lack of information (e.g., AAC intervention options, technology, and instructional strategies) limits participation opportunities for an individual with CCN. At first, knowledge barriers may appear to be attitude barriers because people may have difficulty admitting they lack knowledge (Beukelman & Mirenda, 1998). Attitude barriers refer to

participation barriers that are present due to people’s beliefs (e.g., reduced expectations for individuals with CCN; Beukelman & Mirenda, 1998). Skill barriers occur when people have difficulty implementing AAC techniques or strategies even though they have extensive knowledge because “numerous technical and interaction skills are often necessary to assist someone to become a competent communicator” (Beukelman & Mirenda, 2013, p. 115). Among the technical and interaction skills needed are AAC operation skills (e.g., high-tech devices), active listening skills (e.g., language response strategies), and AAC modeling skills (e.g., ALgS; American Speech-Language-Hearing Association, 2018; Light & McNaughton, 2014).

Americans With Disabilities Act

Subpart E of Title II of the Americans With Disabilities Act of 1990 (ADA) states, “[A] public entity shall take appropriate steps to ensure that communications with applicants, participants, members of the public, and companions with disabilities are as effective as communications with others.” Thus, one goal of subpart E of Title II of the ADA (1990) is to make sure that public schools take the appropriate steps to ensure that staff’s (e.g., special education teachers’ and speech-language pathologists’ [SLPs’]) communications with students with visual, hearing, or speech impairments (i.e., communication impairments) are as effective as communications with students without these impairments. In other words, public schools must take the appropriate steps to ensure that students with communication impairments who need communication aids (i.e., students with CCN who rely on AAC) “can communicate with [staff], receive information from [staff], and convey information to [staff]” (U.S. Department of Justice, 2014, p. 1). Therefore, comprehensive, ongoing training is necessary to make sure that staff know the ADA requirements and how to implement them so that communications with people, such as students with CCN who rely on AAC, are effective.

Speech-Language Pathologists as Trainers

Even though public entities, such as public schools, often take the appropriate steps to provide auxiliary aids and services (i.e., ways to communicate with students with CCN), these entities often do not undertake the proper measures to provide the auxiliary service staff training (U.S. Department of Justice, 2014). Therefore, SLPs who work in public schools are generally responsible for providing initial and ongoing staff training about AAC and the needs of students with CCN who rely on AAC (American-Speech-Language-Hearing Association, 2018; Chung & Stoner, 2016). However, school-based SLPs typically have difficulty scheduling time to provide training to staff or communication partners (American-Speech-Language-Hearing Association, 2018b; Kent-Walsh et al., 2015).

According to the 2020 ASHA Schools Survey, the median monthly caseload size of ASHA-certified SLPs who worked full-time in school settings was 47 (American-Speech-Language-Hearing Association, 2020). The smallest caseload sizes ranged from 30 to 40, and the largest caseload sizes ranged from 53-61 (American-Speech-Language-Hearing Association, 2020). These larger caseload sizes limit the time that school-based SLPs have to provide communication partner training. Chung and Stoner (2016) found that staff training was not provided (e.g., by SLPs) or the training provided was haphazard if time was not designated for training. Andzik, Schaefer, Nichols, and Chung (2018) reported that 11.7% (473 of 4,031) of the special education teachers surveyed did not receive training from an SLP to teach them how to support students with CCN in their classrooms.

In addition to larger caseloads limiting the time that school-based SLPs have to provide communication partner training, larger classes, and a lack of access to high-tech AAC forms (e.g., SGDs) are restricting the ability that graduate programs have to require operational

competency (e.g., competency operating aided AAC forms; Johnson & Prebor, 2019). Although the percentage of graduate programs offering at least one AAC course has increased 13% over 10 years (i.e., from 73% to 86% from 2008 to 2018, respectively), the percentage of graduate programs requiring students to demonstrate operational competency has decreased (Johnson & Prebor, 2019; Ratcliff et al., 2008). Forty-seven percent (29 of 62) of U.S. speech-language pathology/communication disorders preprofessional training programs reported that students get hands-on practice during laboratory activities, but they are not required to demonstrate operational competency (Johnson & Prebor, 2019).

Moreover, even though 98% (65 of 66) of U.S. speech-language pathology/communication disorders preprofessional training programs surveyed reported that students completed clock hours in AAC during their supervised clinical experiences, 49% (32 of 65) reported that half of the students were not fully prepared to provide services to individuals with AAC needs by graduation and 12% (8 of 65) reported that they were not certain about the percentage of students prepared to provide services to individuals with AAC needs (Johnson & Prebor, 2019). Thus, the amount of hands-on practice and/or clinical experiences in AAC needs to increase so that services provided to people with AAC needs are not adversely affected by “the continued contribution to the knowledge and skill barriers that limit services to people who could benefit from AAC” (Johnson & Prebor, 2019, p. 545).

Therefore, until policy and practice barriers are removed, school-based SLPs will continue to have larger caseloads and difficulty scheduling staff trainings to adequately prepare special education teachers to effectively communicate with students with CCN who rely on AAC (Beukelman & Mirenda, 2013; Kent-Walsh et al., 2015). Furthermore, preservice SLPs (i.e., graduate students) will continue to have larger classes and limited hands-on practice and/or

clinical experiences in AAC during their speech-language pathology/communication disorders preprofessional training programs, which will continue to result in preservice SLPs lacking the operational competence and preparedness to provide services to students who rely on AAC and staff trainings to special education teachers.

Special Education Teacher Training

In addition to SLPs, special education teachers often “report inadequate knowledge and training for providing optimal AAC interventions” (Bailey et al., 2006, pp. 140–141). The preprofessional training programs for special education teachers may not have included AAC decision-making and classroom integration. Michaels and McDermott (2003) surveyed 143 directors or coordinators of graduate special education teacher preparation programs in the United States (i.e., approximately 25% of the graduate special education teacher preparation programs). Based on the surveys’ results, 45.5% of the graduate special education teacher preparation programs offered a separate or dedicated assistive technology (AT) course. Further, the degree to which graduate special education teacher preparation programs infused AT competencies (i.e., AT knowledge, skills, and dispositions) into coursework was fair, meaning there was some level of inclusion or attainment. However, the directors and coordinators indicated that the level of importance for preservice special education teachers to develop AT competencies was critical to extremely critical. Therefore, the differences between the attainment and importance levels suggested that many special education teachers completed or are completing graduate special education teacher preparation programs without acquiring critical AT competencies.

When Andzik, Schaefer, Nichols, and Chung (2018) surveyed special education teachers in the United States, 67.5% (2,720 of 4,031) reported that they received “training related to

supporting student communication needs” during a university course (p. 44). Of these special education teachers, 28.6% (1,151 of 4,031) reported 15 or more hours of communication-related training during a university course, 7.8% (314) reported 10 to 15 hours, 14.9% (601) reported 4 to 10 hours, and 16.2% (654) reported 1 to 3 hours.

Additionally, 61% (2,454 of 4,031) of the special education teachers Andzik, Schaefer, Nichols, and Chung (2018) surveyed reported that they received communication-related professional development provided by schools. Of these special education teachers, 19.4% (780 of 4,031) reported 15 or more hours of communication-related professional development provided by schools, 7.7% (309) reported 10 to 15 hours, 12.9% (518) reported 4 to 10 hours, and 21% (847) reported 1 to 3 hours. Furthermore, 68.5% (2,757 of 4,031) of the special education teachers surveyed reported that they received communication-related training provided by SLPs directly. Of these special education teachers, 22.6% (910 of 4,031) reported 15 or more hours of communication-related training provided by SLPs directly, 7% (282) reported 10 to 15 hours, 13.2% (531) reported 4 to 10 hours, and 25.7% (1,034) reported 1 to 3 hours.

Although the special education teachers surveyed by Andzik, Schaefer, Nichols, and Chung (2018) received communication-related training from university courses, professional development, and SLPs, the total amount of training hours that they reported varied, and they needed to search for trainings that taught them how to provide communication supports to students who do not proficiently use oral speech. Although students who used oral speech as their primary communication mode were more proficient than students who used AAC as their primary communication mode, 42% of the students who used oral speech as their primary communication mode did not use oral speech proficiently. Thus, the special education teachers needed to be taught how to use multiple communication modes (i.e., multimodal

communication) so that the students who did not proficiently use oral speech could be taught how to use different communication modes to support their oral speech. If these students are not taught how to use different communication modes (i.e., AAC) to support their oral speech, then they will not have an effective way to communicate and they will not become proficient communicators.

Students' successful use of AAC is directly related to special education teachers' AAC knowledge, skills, and dispositions (Michaels & McDermott, 2003). Students who rely on AAC require ongoing support from appropriately trained staff to maintain and generalize AAC use across educational environments (Andzik, Schaefer, Nichols, & Cannella-Malone, 2018; Beukleman & Mirenda, 2013). Special education teachers are the "primary daily managers of AAC systems" (Bailey et al., 2006, p. 140), and they are responsible for the successful integration of AAC systems into academic environments. Specifically, special education teachers are responsible for effectively supporting and facilitating AAC use across educational activities so that students who rely on AAC may meet academic and social demands (Bailey et al., 2006; Michaels & McDermott, 2003).

Special education teachers with a greater amount of AAC-related training were found to use a greater number of support strategies in their classrooms, such as working with an SLP, planning activities dedicated to communication, embedding communication instruction throughout the day, and working with a consultant (Andzik, Schaefer, Nichols, & Cannella-Malone, 2018). Further, teachers with positive perceptions about their ability and responsibility to improve the communication skills of students who rely on AAC were found to have positive perceptions about the students' ability to learn to communicate more effectively, and teachers who had positive perceptions about the students' ability to learn to communicate more

effectively were found to be more willing to use AAC techniques in classrooms (Soto, 1997). “In other words, teachers who believe that they can influence their students’ performance have better perceptions of their students’ abilities to learn and, therefore, have higher expectations toward their students’ achievement” (Soto, 1997, p. 196).

Problem Statement

In the literature, a lack of formal communication/AAC-related training from university courses and professional development for SLPs and special education teachers was identified as a barrier to AAC use (Bailey et al., 2006; Chung & Stoner, 2016; Soto et al., 2001a). Namely, without formal AAC-related training, these staff members may not be prepared to convey information to or receive information from students who rely on AAC and opportunity barriers (i.e., knowledge and skill barriers) may be imposed on these students (Beukelman & Mirenda, 2013; U.S. Department of Justice, 2014).

Due to the lack of formal training for special education teachers, school-based SLPs are often responsible for providing informal, initial, and ongoing AAC training to these staff members (American-Speech-Language-Hearing Association, 2018; Chung & Stoner, 2016). However, SLPs typically do not have the time, operational competence, and/or preparedness to provide training to special education teachers and paraprofessionals, the primary support staff for students who rely on AAC (American-Speech-Language-Hearing Association, 2018b; Johnson & Prebor, 2019; Kent-Walsh et al., 2015).

Without appropriate training for staff who implement AAC systems (i.e., SLPs and special education teachers), AAC use may be limited or abandoned (Johnson et al., 2006); and with limited or no AAC use by staff, students who rely on AAC may not be able to access the curriculum (Andzik, Schaefer, Nichols, & Cannella-Malone, 2018). AAC systems must be

appropriately incorporated into the curriculum, and students who rely on AAC must be taught how to use their AAC systems (Andzik, Schaefer, Nichols, & Cannella-Malone, 2018; Beukleman & Mirenda, 2013; Johnson et al., 2006). Without adequate support and intervention for students who rely on AAC, these students may experience poor, long-term outcomes in educational access, functional communication, speech, language, cognition, literacy, social participation, and overall quality of life (Andzik, Schaefer, Nichols, & Cannella-Malone, 2018). Unfortunately, students who rely on AAC “are not being effectively taught how to use AAC,” and they “are not always getting the support they require to ensure functional and independent communication” (Andzik, Schaefer, Nichols, & Cannella-Malone, 2018, p. 33).

Purpose Statement

Given that Subpart E of Title II of the Americans With Disabilities Act of 1990 (ADA) requires public schools to take the appropriate steps to ensure that staff’s communications with students who rely on AAC are as effective as communications with students without CCN (American-Speech-Language-Hearing Association, 2018b; U.S. Department of Justice, 2014); and given the lack of appropriate, AAC-related training opportunities for staff who implement AAC systems and operational competence and preparedness to provide service to students who rely on AAC, staff need more comprehensive, ongoing training opportunities for multiple communication modes with hands-on practice. Staff must acquire AAC-related knowledge and skills (e.g., AAC support strategies) to understand and meet students’ AAC needs so that students who rely on AAC may access the curriculum and become more proficient communicators (Andzik, Schaefer, Nichols, & Chung, 2018; Andzik, Schaefer, Nichols, & Cannella-Malone, 2018; Bailey et al., 2006; DeBortoli et al., 2010; Michaels & McDermott, 2003; Soto et al., 2001a).

By making sure that staff receive appropriate, AAC-related training and provide adequate support, “[these] students will be more successful making relationships with others, becoming independent, and having a better quality of life” (Andzik, Schaefer, Nichols, & Chung, 2018, p. 47). Therefore, the purpose of this study was to provide AAC-related training, with hands-on practice, to staff who implemented AAC systems, then examine the effect of the training on the staff’s AAC-related knowledge and skills as well as their ability to incorporate an AAC system into the curriculum and teach students who relied on AAC how to use the AAC system. Specifically, the study investigated the effect of a KWS workshop on in-service special education teachers’ and SLPs’ manual sign skill and use of KWS with students who relied on AAC.

Research Questions

To determine the effect of the KWS workshop on in-service special education teachers’ and SLPs’ manual sign skill and use of KWS with students with CCN, the following research questions were asked and answered:

1. What is the effect of a KWS workshop on in-service special education teachers’ and speech-language pathologists’ skill identifying manual signs?
2. What is the effect of a KWS workshop on in-service special education teachers’ and speech-language pathologists’ skill producing manual signs?
3. What is the effect of a KWS workshop on in-service special education teachers’ and speech-language pathologists’ use of KWS in the classroom or therapy room?
4. What are in-service special education teachers’ and speech-language pathologists’ perceived changes from taking part in a KWS workshop?

Subjectivity Statement

In 1979, in Olathe, Kansas, I became friends with a fellow third-grade student named Linda, who lived with her grandparents, who were Deaf. With her grandmother's encouragement, Linda and I learned to sign "Home on the Range" using ASL; and, before long, we stood in front of our music class interpreting the song. It was then that I became captivated by Deaf culture and ASL. After graduating from high school in southern California, I enrolled in ASL courses at a local community college and was granted a Certificate of Achievement for Interpreter in May 1993.

While completing coursework for the certificate, I took the course titled "Deaf People in the Community", which frequently had guest speakers who discussed careers working with people who are deaf or hard of hearing. One guest speaker was an administrator from a school for deaf and hard of hearing children in Los Angeles. During the administrator's presentation, he spoke about the staff at the school. That was when I first heard the title "speech-language pathologist" and became intrigued with the profession of speech-language pathology. In June 2004, I graduated from college with a Master of Arts in Communication Disorders.

I was hired by a public school district in September 2003 and provided speech and language services (either direct and/or on a collaborative or consultative basis) for students with mild-to-severe articulation/phonological, language, fluency, and/or voice disorders in preschool and elementary general and special education classrooms. However, in 2006, per my request, I began specializing in the evaluation and treatment of deaf and hard of hearing (D/HH) students and was assigned to the Deaf and Hard of Hearing Program (a total communication program) at an elementary school in September 2007.

Currently, I am assigned to the Home and School Based Early Intervention Program in the school district. I evaluate and provide speech, language, and aural habilitation services to D/HH children ages birth to three years. My responsibilities also include consultations with the district's SLPs to provide information on appropriate auditory skill assessments and treatments for D/HH children.

At times, to provide the correct information for auditory skill assessments when consulting, I observe the D/HH students in the classroom. Five years ago, I observed a deaf student with an intellectual disability. The student was sequentially implanted with cochlear implants (CIs). However, the student rarely wore the CIs; without the CIs, they had no functional hearing.

An SGD was made available for the student, but they did not use it to communicate with the staff. Based on my observations, there were two possible explanations for the student not using the SGD. The first was that the SGD had a static display and did not provide visual feedback for the student; and the second was that the auditory feedback provided by the SGD was not audible to the student because they were deaf without the CIs. Furthermore, Bruce and Borders (2015) stated that “teams should carefully consider the acoustic environment when using SGDs with students who are DWD [D/deaf with disabilities]” due to the possibility that the speech produced by SGDs may not be audible in noisy environments (p. 373). Therefore, with the CIs, the auditory feedback provided by the SGD may not be audible to the student because of background noise.

The student demonstrated the ability to understand and use sign language, but the staff (e.g., classroom teacher and paraprofessionals) only demonstrated the ability to understand and use a limited number of signs. For instance, during an observation (with two paraprofessionals

present), the student signed DOG; however, neither paraprofessional recognized the ASL sign for DOG. When I told the paraprofessionals that the student signed DOG, one paraprofessional told me that the student arbitrarily produced signs, and the other paraprofessional told me that they had a picture of a dog on their phone that the student liked to see. The student did not randomly produce the sign for DOG. The student signed DOG because they wanted to see the dog's picture on the paraprofessional's phone.

It was this observation that brought me to this project. The SGD only provided the student with a way to communicate with the staff. It did not provide the staff with a way to communicate with the student because of her deafness and the speech not being audible. Therefore, I wanted to know the effect of a KWS workshop on in-service special education teachers' and SLPs' manual sign skills and use of KWS with students who relied on AAC in their classrooms or therapy rooms.

According to Winefield (1987), during the development of formal educational programs for deaf children, teachers, linguists, parents, and policymakers debated which communication method should be used – oral or combined. The oral method taught deaf children to use their residual hearing with hearing aids and communicate using speech and speechreading. The use of formalized gestures or sign language was not allowed. In contrast, the combined method (e.g., total communication) taught deaf children to communicate using residual hearing, speech, speechreading, and formalized sign language.

As an early intervention professional and a speech-language pathologist, I must present all communication options (i.e., spoken language, signed language [ASL], and Cued Speech) and available hearing technologies (e.g., hearing aids, cochlear implants, and other appropriate assistive devices) to families in an unbiased manner. Families must have access to information

about all intervention and treatment options for their D/HH children so that they can make informed choices and share in the decision-making process (American Academy of Pediatrics, 2007). However, students who are D/HH with ID, and no significant visual impairments, would most likely benefit from visual communication interventions, which include AAC, because most D/HH students are visual learners (Bruce and Borders, 2015).

Like the combined method and Total Communication, AAC interventions are multimodal “...to enhance effective communication that is culturally and linguistically appropriate” (American Speech-Language-Hearing Association, 2005). They must use “the individual’s full communication abilities and may include existing speech, vocalizations, gestures, and/or some form of the external system (e.g., SGD)” (American Speech-Language-Hearing Association, 2018). In other words, one communication method cannot meet all the needs of all individuals, including those who are D/HH with ID and those who are hearing with CCN. To reduce opportunity barriers, communication partners must learn to interact with individuals who use AAC using their communication modes (e.g., manual signs and PCS). This ideology, combined with my experiences and positioning, will inform and influence my research interests, concerns, questions, relationships, perspective, and analysis.

Summary

This dissertation contains five chapters. Chapter 1 explained AAC systems, AAC forms (i.e., unaided and aided forms), KWS (an unaided AAC form), and PCS (an aided AAC form), as well as the communication partner strategies, milieu teaching, ALgS, LTM Prompting, and language response strategies or facilitative language techniques. Further, it discussed the opportunity barriers (i.e., policy, practice, knowledge, attitude, and skill barriers) that can limit participation opportunities for individuals with CCN who rely on AAC (Beukelman & Mirenda,

2013), and the ADA requirement for public schools to take the appropriate steps to ensure that staff's communications with students with visual, hearing, or speech impairments are as effective as communications with students without these impairments. Furthermore, Chapter 1 discussed that students' successful use of AAC is directly related to special education teachers' AAC knowledge, skills, and dispositions (Michaels & McDermott, 2003); however, special education teachers often report inadequate AAC knowledge and training (Bailey et al., 2006).

Consequently, SLPs are often responsible for providing AAC training to staff (American-Speech-Language-Hearing Association, 2018a; Chung & Stoner, 2016), but they have limited time due to large caseloads and lack the operational competence and preparedness to provide AAC services and staff trainings (American-Speech-Language-Hearing Association, 2018b; Johnson & Prebor, 2019; Kent-Walsh et al., 2015; Ratcliff et al., 2008). Lastly, Chapter 1 introduced the present study's problem statement, purpose statement, and research questions, which were based on the discussions mentioned above, and presented the researcher's subjectivity statement.

Chapter 2 reviews the literature and discusses (a) operational and linguistic competence, (b) a narrative and systematic review of AAC comparison studies, (c) benefits of aided language stimulation and augmented input, (d) methods and outcomes of studies that appraised the efficacy of manual sign or KWS training programs for communication partners, (e) Kirkpatrick's (1996) four-level training evaluation model, (f) the strength of the results from the studies that assessed the efficacy of manual sign or KWS training programs using Kirkpatrick's evaluation model, and (g) a meta-analysis and systematic review of studies that examined the efficacy of teaching communication partners AAC interventions and strategies.

Chapter 3 reviews the research purpose and questions and introduces the research hypothesis. It also discusses the methodology, research designs, participants and sampling, instruments, research procedures, and data analysis.

Chapter 4 reviews the research purpose, questions, and participants. In addition, it reports the results from the instruments which were yielded by the data analyses.

Chapter 5 considers the strength of the results from this study and answers the research questions. It also discusses relevant preexisting studies, research limitations, and research and practice implications.

Chapter 2: Literature Review

Chapter 2 will, first, discuss operational and linguistic competence. Second, it will discuss a narrative and systematic review (i.e., Gevarter et al., 2013; Schlosser & Sigafos, 2006) of AAC comparison studies that compared (a) unaided forms or approaches (i.e., simultaneous communication, sign-alone, oral-alone); (b) aided approaches (e.g., communication or picture exchange board, Picture Exchange Communication System [PECS], switch, SGD); and (c) aided and unaided approaches (e.g., manual signing, oral, graphic symbols, picture cards, communication books, picture exchange, PECS, Switch, SGD). Third, Chapter 2 will discuss the benefits of aided language stimulation and augmented input. Fourth, it will review the methods and outcomes of studies that appraised the efficacy of manual sign or KWS training programs for communication partners (i.e., Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984; Meuris et al., 2015; Smidt et al., 2019; Spragale & Micucci, 1990). Fifth, Chapter 2 will discuss Kirkpatrick's (1996) four-level training evaluation model, and then it will consider the results' strength from the studies that assessed the efficacy of manual sign or KWS training programs using Kirkpatrick's model. Lastly, Chapter 2 will discuss a meta-analysis and systematic review (i.e., Kent-Walsh et al., 2015; van der Meer et al., 2017) of studies that examined the efficacy of teaching communication partners AAC interventions and strategies.

Operational and Linguistic Competence

Staff (i.e., SLPs, classroom teachers, inclusion support teachers/specialists, and instructional assistants) surveyed by Soto et al. (2001a) indicated that strategies for supporting students' AAC use to access the curriculum were necessary. Specifically, the staff indicated that practical skills for operating, maintaining, and integrating all AAC system components were needed (Soto et al., 2001a, 2001b). Even though they did not think that staff needed to know all

skills, they did believe that staff needed to know “how to get technical help or access additional resources when necessary” (Soto et al., 2001b, p. 54).

Light (1989) defined communicative competence as “a relative and dynamic interpersonal construct based on the functionality of communication, adequacy of communication, and sufficiency of knowledge, judgment, and skill in four interrelated areas: linguistic competence, operational competence, social competence, and strategic competence” (p. 137). Linguistic competence involves developing receptive and expressive communication skills in the individual’s native language and the AAC system’s linguistic code (Light & McNaughton, 2014). Social competence involves acquiring social interaction skills so that individuals can appropriately and functionally use the AAC systems to accomplish their communication goals. Strategic competence involves developing compensatory strategies so that individuals can overcome limitations (e.g., linguistic, social, and/or operational competence limitations) that may be encountered when using AAC systems (Beukelman & Mirenda, 2013; Light & McNaughton, 2014).

The practical or technical skills required to accurately and efficiently produce unaided communication modes (e.g., manual signs) and operate aided AAC systems (e.g., SGDs) are known as operational competence (Beukelman & Mirenda, 2013; Light & McNaughton, 2014). Both facilitators (i.e., people who support AAC communications) and individuals who rely on AAC to communicate must acquire operational competence directly and quickly after an AAC system is introduced (Beukelman & Mirenda, 2013). However, frequently, facilitators (e.g., educational staff) assume primary responsibility for receiving instruction and learning the operational and maintenance skills needed to develop operational competence (Beukelman & Mirenda, 2013).

When facilitators acquire operational competence, they can teach individuals who rely on AAC how to operate AAC systems; and, while facilitators assist individuals who rely on AAC with developing operational competence, they can also help them acquire linguistic competence (Beukelman & Mirenda, 2013). To develop linguistic competence, individuals who rely on AAC must acquire expressive and receptive knowledge of their native language and AAC form (e.g., line-drawings and manual signs; Beukelman & Mirenda, 2013; Light & McNaughton, 2014); and, for facilitators to assist individuals who rely on AAC with becoming proficient in their native language and AAC form(s), they must also learn the AAC forms used by individuals who rely on AAC.

AAC Comparison Studies

Schlosser and Sigafoos (2006) conducted a narrative review of 23 AAC-related, comparative single-subject experimental design studies, published between 1977 and 2004. The studies compared the effectiveness and/or efficacy of at least two treatments, which involved at least one AAC approach, for individuals with developmental disabilities (e.g., ASD, ID, and cerebral palsy). Specifically, the studies compared unaided approaches (i.e., simultaneous communication, sign-alone, oral), aided approaches (i.e., graphic symbol sets and systems), and aided and unaided approaches. In the review, the authors made recommendations based on the findings of studies that were rated as suggestive, preponderant, or conclusive (Schlosser & Sigafoos, 2006).

The studies (e.g., Clarke et al., 1988; Remington & Clarke, 1983) that compared simultaneous communication and sign-alone treatment approaches (i.e., unaided approaches) indicated that simultaneous communication was as effective as sign-alone; however, simultaneous communication (i.e., sign and spoken language) was more effective eliciting

expressive signing than sign-alone. Furthermore, the studies (e.g., Brady & Smouse, 1978; Wells, 1981) that compared simultaneous communication and oral treatment approaches suggested that simultaneous communication was more effective eliciting oral speech and increasing receptive language (i.e., oral or spoken language) than oral alone. Thus, simultaneous communication may be used to improve expressive signing, oral speech, and receptive language in individuals with severe ID or ASD (Schlosser & Sigafoos, 2006).

Next, the studies (e.g., Anderson, 2002; Chambers & Rehfeldt, 2003) that compared unaided and aided approaches (i.e., manual signing and PECS) suggested that manual signing or PECS can be introduced to minimize challenging behaviors demonstrated by individuals with ASD during communication instruction. Moreover, to facilitate the use of two-word semantic relationships in young children with ID, unaided or combined aided and unaided approaches may need to be introduced to determine the best communication mode of communication for that individual (Schlosser & Sigafoos, 2006).

In addition, the studies (i.e., Anderson, 2002) that compared unaided and aided approaches indicated that individuals who used manual signing made more eye contact with their communication partners than individuals who used PECS. An individual who uses PECS does not need to make eye contact, when putting a picture into a communication partner's hand, because the individual who uses PECS knows that the communication partner received the picture or message (Schlosser & Sigafoos, 2006). Whereas an individual who uses manual signing does need to make eye contact with a communication partner, when signing, to make sure that the communication partner was looking and saw the sign(s) or message.

Gevarter et al. (2013) extended Schlosser and Sigafoos's (2006) review by examining 28 AAC-related, single-subject design studies, published between 2004 and 2012, that compared at

least two communication systems with at least one AAC form for individuals with developmental disabilities. The studies included 77 participants (56 males and 21 females), aged 2 to 52 years, diagnosed with ASD (e.g., ASD and pervasive developmental disorder not otherwise specified [PDD-NOS]), Down Syndrome, ID (including multiple disabilities), developmental delays, and other developmental disabilities. “[The] studies compared non-electric picture systems to SGDs [speech generating devices] ($n = 10$), aided AAC to unaided AAC ($n = 10$), and AAC versus vocal speech interventions ($n = 10$)” (Gevarter et al., 2013, p. 4419).

The systematic review completed by Gevarter et al. (2013) indicated that a variety of AAC systems can be effectively used with individuals with ASD and developmental disorders. Although the review suggested that aided AAC systems were learned faster and liked better (compared to manual sign) by individuals who use AAC, the studies which compared aided and unaided (i.e., manual sign) AAC systems demonstrated that the unaided AAC form, manual sign, can be effectively and viably used with individuals with developmental disabilities. The reasons for the acquisition and preference differences between aided and unaided (i.e., manual sign) AAC systems are not understood, but the studies suggested that manual sign learning relied on motor imitation skills. Therefore, aided AAC forms or systems may need to be considered over the unaided form, manual sign, for individuals who have difficulty with motor imitation.

Concerning simultaneous communication instruction (i.e., combined manual sign and vocal instruction), two studies (i.e., Kurt, 2011; Valentino et al., 2012) reviewed by Gevarter et al. (2013) indicated that teaching, which used simultaneous communication, was more effective than teaching that used vocal instruction only for developing receptive and expressive language

skills. “However, there were a small number of participants in these two studies, which limits the generality of this finding” (Gevarter et al., 2013, p. 4429).

Regarding communication system preference, the review completed by Gevarter et al. (2013) demonstrated that individuals with developmental disabilities would often use one communication system (e.g., manual sign) more than another. The review also indicated that individuals with developmental disabilities learned and maintained skills more effectively when their preferred communication system was used. Therefore, even though aided AAC systems (i.e., SGDs) were liked better or preferred by individuals (in this review) who used AAC, it is important to provide these individuals with opportunities to use different communication systems (i.e., aided and unaided AAC systems [including manual sign]) so that their preferred communication system may be determined.

Aided Language Stimulation and Augmented Input Benefits

It is theorized that novice communicators acquire language during social interactions with advanced communicators; therefore, individuals who rely on AAC (e.g., individuals with ID) can learn language, through observation, in an environment in which their communication partners model the language and AAC forms that are relevant to, or preferred by, them (Meuris et al., 2015; Shire & Jones, 2015). However, often, during AAC interventions, the language input of the communication partner (i.e., spoken language) is different from the language output of the individual who relies on AAC (i.e., graphic symbols and/or manual signs), which is problematic (Chadwick & Jolliffe, 2008; Meuris et al., 2015). Communication partners must model the communication mode(s) used by individuals who rely on AAC by responding to their messages using the same language input or communication mode(s) (Shire & Jones, 2015; Smidt et al., 2019).

Modeling the communication mode(s) used by individuals who rely on AAC is known as aided language stimulation for aided AAC forms and augmented input (or total communication) for unaided AAC forms (Meuris et al., 2015; Smidt et al., 2019). Aided language stimulation has been shown to positively affect receptive and expressive vocabulary (i.e., symbol comprehension and production), pragmatics (i.e., communication turns or turn-taking), and expressive syntax (i.e., multi-symbol productions or combining words or grammatical morphemes) in individuals with ID or ASD (Allen et al., 2017; Sennott et al., 2016). Augmented input can be used to model vocabulary expansion and AAC system use as well as the power, utility, and acceptability of AAC systems (Meuris et al., 2015). Therefore, communication strategies such as aided language stimulation and augmented input must be made an integral part of the natural environments of individuals who rely on AAC (Kashinath et al., 2006; Wright et al., 2013).

In addition to spoken language production, many individuals who rely on AAC (e.g., individuals with ID) have difficulty with language comprehension and need assistance understanding language (Meuris et al., 2015). Augmented input (or total communication) may improve spoken language comprehension by providing input using multiple communication modes (i.e., multimodal input; Loncke et al., 2009). Thus, if communication partners use manual signs and spoken language simultaneously (i.e., KWS) when communicating with individuals with ID, then the spoken language comprehension of individuals with ID may be enhanced. As a result, the conversational interactions between individuals with ID and their communication partners and the events within the environments of individuals with ID may be made more understandable (Bradshaw, 2001; Chadwick & Jolliffe, 2008).

Furthermore, if communication partners use KWS when communicating with individuals with ID in natural environments, then the comprehension, as well as the production of manual

signs by individuals with ID, may be heightened because they received the input or modeling needed to learn language (Meuris et al., 2015; Smidt et al., 2019). Communication partners who functionally and consistently use KWS in the natural environments of individuals with developmental disabilities provide the models, and thereby the extensive exposure, needed for these novice communicators to learn the manual signs (i.e., AAC symbols) and use them as a functional and effective means of communication (Fitzgerald et al., 1984; Spragale & Micucci, 1990). Individuals with developmental disabilities require sufficient, ongoing opportunities to practice manual signs in their daily environments so that they learn to functionally use manual signs as well as generalize their manual sign use (Beukelman & Mirenda, 2013; Duker & Moonen, 1985; Fitzgerald et al., 1984; Spragale & Micucci, 1990)

Along with using and modeling communication modes, communication partners must understand the communication modes used by individuals who rely on AAC. These communication modes may include verbal and nonverbal communication and unaided and aided AAC forms (Shire & Jones, 2015). For instance, if communication partners do not understand the unaided AAC form manual signs, then they may not comprehend the communications (i.e., communicative intent) of individuals who rely on AAC (or manual signs; Chadwick & Jolliffe, 2008). In addition, if people in the environments of individuals who rely on manual signing do not understand manual signs, then the communications of individuals who rely on manual signing will be restricted to those who do understand the sign system (Loeding et al., 1990).

To avoid individuals who rely on manual signing having limited communication partners, communication partners (or staff) who frequently interact with these individuals should be taught about AAC and related sign systems such as KWS; that is, these staff members should be trained to comprehend and produce a base vocabulary of manual signs (Chadwick & Jolliffe, 2008;

Loeding et al., 1990). If these staff members effectively learn to understand and use manual signs (or KWS), then individuals who rely on manual signing can be immersed in KWS and see manual signs in their daily environments, which is similar to how individuals (i.e., novice communicators) acquire language (Meuris et al., 2015; Smidt et al., 2019). Moreover, if staff members use KWS, individuals who rely on manual signing can receive language input that is the same as the language output they are expected to produce (Meuris et al., 2015). Staff members who provide direct instruction and services (e.g., special education teachers and SLPS) have a significant role in the communication programming for individuals who rely on manual signing; therefore, it is important for these staff members to be effectively trained in KWS (Spragale & Micucci, 1990).

Communication Partner Manual Sign/KWS Trainings

Six studies were conducted to examine the efficacy of manual sign or KWS training programs for communication partners. Specifically, Chadwick and Jolliffe (2008), Duker and Moonen (1985), Fitzgerald et al. (1984), Meuris et al. (2015), Smidt et al. (2019), and Spragale and Micucci (1990) examined the effects produced by teaching communication partners manual signs from natural sign languages (an unaided symbol set) and/or KWS (See Appendix A for the number of participants in the manual sign and KWS studies' groups, participants' group assignment, participants' type, and participants' age and gender).

The size of the training groups ranged from 3 to 47 participants. Most training group participants were employed by transitional, residential, and day care facilities for individuals with developmental or intellectual disabilities (Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984; Meuris et al., 2015; Spragale & Micucci, 1990); and most training group participants provided services to adolescents (aged 11 to 17 years) and adults (age 18

years or greater; Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Meuris et al., 2015; Spragale & Micucci, 1990). Smidt et al. (2019) reported that parents ($n = 3$), teachers ($n = 17$), and an SLP participated in the KWS training, but the facilities at which the teachers and SLP were employed were not reported. Further, Smidt et al. (2019) indicated that the parents, teachers, and SLP parented or provided services to children and adults with developmental disabilities, but the ages of the children and adults were not stated. Lastly, Fitzgerald et al. (1984) did not report demographic information for the individuals to whom the training group participants provided services (See Appendix B for the number of manual signs taught, sign language/system used, training/format, and training length).

All six studies provided participants with formal manual sign or KWS training. In addition to formal training, participants were given training materials. The materials included pictures of manual signs, a sign language reference card, video clips of signs, visual cues (i.e., names of signs learned by students attached to classroom tables), and a training video (Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Meuris et al., 2015; Spragale & Micucci, 1990). Participants were also given written instructions on the signing programs (Duker & Moonen, 1985; Fitzgerald et al., 1984; Meuris et al., 2015). Fitzgerald et al. (1984) gave participants a signing manual, which contained an introduction that explained “the value of signing skills,” illustrations of the signs, descriptions of the signs’ components, and instructions for learning the signs (p. 454). Meuris et al. (2015) gave participants a booklet with photographs of handshapes and the signs as well as written instructions (i.e., descriptions of the signs’ parameters [handshape, orientation, movement, and direction]). Smidt et al. (2018) did not report whether the participants were given training materials; however, the researchers reported that participants

stated that they used websites and iPhone applications to look up signs they forgot how to produce.

Chadwick and Jolliffe (2008) asked participants to rank the components of their manual sign training program from most to least effective or useful. The results of the rankings suggested that the training program or direct instruction was more effective than the training video and sign language reference card (with the card more effective than the video); the direct instruction and reference card were clearer than the training video; and the direct instruction, training video, and sign language reference card were useful training methods. Thus, the training video, which showed adults with ID with different impairments and levels of physical disability using the target signs as well as staff and adults with ID using signs in common community settings and conversations, was ranked least effective or useful.

During the manual sign or KWS trainings, the participants were taught signs from British Sign Language (BSL), Flemish KWS system, Australian Sign Language (Auslan), and Signed English (Chadwick & Jolliffe, 2008; Meuris et al., 2015; Smidt et al., 2019; Spragale & Micucci, 1990). Fitzgerald et al. (1984) reported that “a simultaneous vocalization and manual signing approach” (p. 455; i.e., simultaneous communication) was used; however, the researchers did not state from which language or system the signs were borrowed. Likewise, Duker and Moonen (1985) did not report from which language or system the signs used were borrowed. The number of manual signs taught ranged from 20 to 100 (Chadwick & Jolliffe, 2008; Fitzgerald et al., 1984; Meuris et al., 2015; Smidt et al., 2019). Duker and Moonen (1985) and Spragale and Micucci (1990) did not report the number of signs taught or used for the studies.

The number and length of the manual sign or KWS training sessions varied across the studies. For Experiment I, Fitzgerald et al. (1984) conducted four 30- to 40-minute group manual

sign training sessions and four 5- to 10-minute individual manual sign training sessions. For Experiments II and III, Fitzgerald et al. (1984) conducted two group manual sign training sessions for no more than 1 hour on two separate days. Smidt et al. (2019) conducted one full-day KWS workshop for the participants. For the Signs of the Week program developed by Spragale and Micucci (1990), an SLP held a 1- to 2-hour group meeting (or training session) to introduce and describe the program. Meuris et al. (2015) conducted four 2-hour workshops over two months to teach the attendees KWS. Chadwick and Jolliffe (2008) reported that a series of half-day core signs training sessions were conducted, but the researchers did not state the number of sessions in the series. Duker and Moonen (1985) did not report the number or length of the individual and group signing program instructional session(s).

In addition to a formal manual sign or KWS training, two of the six studies (i.e., Meuris et al., 2015; Spragale & Micucci, 1990) implemented a sign-of-the-week program. After the four 2-hour workshops were presented to the participants to teach them KWS, Meuris et al. (2015) instructed the workshop attendees to teach their colleagues two manual signs a week for 12 months so that adults with ID could learn KWS through functional communication with the colleagues (i.e., support staff). Along with a 1 to 2-hour group meeting to introduce and describe the sign-of-the-week program, Spragale and Micucci (1990) held subsequent monthly meetings for 9 months, during which the participants chose no more than eight signs (i.e., one to two signs for each week for a 1-month period) and the SLP demonstrated the signs they selected.

Similar to the number and length of the manual sign or KWS training sessions, the outcome measures, or independent variables, varied across the studies. Three of the six studies assessed the participants' expressive sign knowledge or skill, that is, their ability to produce manual signs (Chadwick & Jolliffe, 2008; Fitzgerald et al., 1984 [Experiments I, II, III]; Smidt et

al., 2019). In addition to testing the participants' expressive sign skills, Smidt et al. (2019) measured the participants' ability to understand manual signs or receptive sign skills.

Five of the six studies evaluated the participants' manual sign use (i.e., Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984 [Experiments I, II]; Meuris et al., 2015; Spragale & Micucci, 1990); however, two different types of measures were used (i.e., participant questionnaires and/or observations). Using a questionnaire, Chadwick and Jolliffe (2008) asked the participants to rate how often they used manual signs with a 7-point Likert scale (Never–Often). Spragale and Micucci (1990) requested participants to report the number of signs they consistently used and rate their own and their peers' signing consistency compared to the previous month using a 3-point Likert scale (Worse–Better). Furthermore, during observations, an SLP rated the participants' frequency of sign use, peer correction, and self-correction with a 5-point Likert scale (Always–Never; Spragale & Micucci, 1990). Fitzgerald et al. (Experiment II; 1984) used an acceptability questionnaire with a written question(s) that asked the participants about the frequency with which they signed.

Using observations, Fitzgerald et al. (Experiment I; 1984) determined the occurrence or nonoccurrence of staff signing and verbalizing during interactions with residents. Meuris et al. (2015) calculated the number of signed utterances, number of signs, and number of different signs, as well as the number of verbal utterances, number of words, and number of different words produced by staff. In addition to calculating the staff's utterances, signs, and words, Meuris et al. (2015) calculated the number of signed utterances, signs, and different signs produced by adults with ID during conversations and story retelling tasks with staff. Lastly, Duker and Moonen (1985) determined the number of opportunities for sign use provided to

students by staff, the number of signs elicited from students by staff, and the number of signs spontaneously produced by students.

The results of the manual sign or KWS training studies (i.e., Chadwick & Jolliffe, 2008; Fitzgerald et al., 1984 [Experiments I, II, III]; Smidt et al., 2019) suggested that the training programs effectively increased the communication partners' comprehension and production of manual signs. Specifically, the participants in the studies conducted by Fitzgerald et al. (1984) and Chadwick and Joliffe (2008) were able to correctly, or more accurately, produce most of the target signs 6 to 12 months after the trainings. The participants in the study conducted by Smidt et al. (2019) recognized and produced a statistically significant number of signs immediately after the workshop and 6 and 12 weeks after the workshop compared to the number of signs they recognized and produced before the workshop. However, there was a statistically significant decrease in the number of signs the participants recognized six weeks after the workshop and a statistically insignificant decrease in the number of signs they produced six weeks after the workshop.

These results suggested that communication partners of children and adults with developmental disabilities can learn and retain signs taught during group trainings or workshops that range from 2 hours (for a smaller number of signs) to 8 hours (for a larger number of signs), but they may lose some of their understanding of signs. The data from the interviews completed by Smidt et al. (2019) revealed that collaboration and regular practice with colleagues were important for learning and retaining the signs at the 6th- and 12th-week assessments and motivated the participants to practice the signs after the workshop.

Concerning manual sign or KWS use, the studies' findings also indicated that the training programs effectively increased the communication partners' use of manual signs during

interactions with individuals with ID (Duker & Moonen, 1985; Fitzgerald et al., 1984; Meuris et al., 2015; Spragale & Micucci, 1990). During the Signs of the Week program implemented by Spragale and Micucci (1990), staff members reported that the number of signs they consistently used as well as their own and their peers' signing consistency increased, albeit with periodic plateaus or slight decreases. Further, the SLP who observed the staff weekly indicated that the staff's sign use frequency increased over a 9-month evaluation period.

After the manual sign training conducted by Fitzgerald et al. (1984) for Experiment II, the staff members reported that they “used the signs at least several days per week when interacting with residents” (p. 464). However, the manual sign training program carried out by Chadwick and Joliffe (2008) did not appear to increase communicative exchanges between staff and adults with ID. Most of the staff (i.e., 50%) reported: “that they rarely used the signs when communicating with adults with intellectual disabilities” (Chadwick & Joliffe, 2008, p. 39). Chadwick and Joliffe (2008) stated that the staff may have infrequently used signs because members reported that, at the time of the study, they did not work with individuals who used signs to communicate.

The generalization observations conducted by Fitzgerald et al. (1984) indicated that the rapid manual sign training program effectively increased the sign use of multidisciplinary institutional staff during interactions with residents. The results from Meuris et al. (2015) showed that support staff and adults with ID, who participated in the KWS program, spontaneously produced significantly more signs, sign utterances, and different signs during conversations and narrative tasks. Further, Meuris et al. (2015) noted that “all but one [adult with ID] learned to use KWS in spontaneous communication” (p. 556).

Additionally, the observation data from Duker and Moonen (1985) indicated that (a) the average number of opportunities for the students to use signs given by the teacher and staff increased across situations (i.e., instructional time, leisure time, and time on wards); (b) the average the number of signs elicited from the students by the teacher and staff increased across situations; and (c) the students increased their spontaneous use of sign. Duker and Moonen (1985) reported that the manual signs were elicited by providing models and/or full physical guidance, asking the question, “What do you want?” and labeling or pointing to the object, or asking the question, “What do you want?” only. Duker & Moonen (1985) also reported that the teacher or staff were able to gradually fade the prompts, and the “...students increased their spontaneous use of manual signs” (p. 156). Lastly, the acceptability questionnaire data from Duker and Moonen (1985) indicated that the program improved the staff’s communication with the students.

These findings and data suggested that communication partners of children and adults with ID can use manual signs or KWS, taught during group trainings that ranged from 2 hours (for a smaller number of signs) to 8 hours (for a larger number of signs), when interacting with individuals with ID (Duker & Moonen, 1985; Fitzgerald et al., 1984; Meuris et al., 2015; Spragale & Micucci, 1990). Meuris et al. (2015) found that not only can a small group of support workers successfully learn KWS during an 8-hr training, but they can also successfully teach it to coworkers (after the training) through a “signs of the week” approach. Furthermore, the support workers and coworkers can then successfully teach KWS to adults with mild to severe ID during functional communication.

In addition, data from Meuris et al. (2015; i.e., significant increases in the story grammar scores) suggested that the support workers’ KWS use helped some of the adults with ID

understand the story. Moreover, the data indicated that KWS use helped the adults with ID express themselves because most of the adults began using KWS (i.e., manual signs and spoken words) spontaneously during conversations and narratives, and the number of words and different words produced during narratives increased significantly. In other words, the support workers' KWS use assisted the adults with ID with receptive and expressive language or communication.

Kirkpatrick's Four Level Training Evaluation Model

Smidt et al. (2009) evaluated the effectiveness of communication (i.e., staff-resident interactions) and behavior management training programs for staff who worked with adults with ID. To determine the strength of the evidence presented in favor of the training programs, Smidt et al. (2009) appraised the studies using Kirkpatrick's four-level training evaluation model. Kirkpatrick's four-level training evaluation model promoted "gathering data related to effective training and training effectiveness" (Kirkpatrick & Kirkpatrick, 2016, p. 7). Kirkpatrick and Kirkpatrick (2016) defined training effectiveness as "training and follow-up leading to improved job performance that positively contributes to key organizational results" (p. 5) and effective training as "well-received training that provides relevant knowledge and skills to the participants and the confidence to apply them on the job" (p. 6). By collecting this data or evidence, the training's value may be demonstrated by showing measurable increases in on-the-job performance that contribute to measurable improvements in organizational results (Kirkpatrick & Kirkpatrick, 2016).

The four levels in Kirkpatrick's model are Reaction, Learning, Behavior, and Results. The first level, Level 1 Reaction, determines the participant's satisfaction with a training by measuring the participant's feelings about the training's aspects (e.g., topic, speaker, and

schedule; Kirkpatrick, 1996). The participants' feelings may be measured using an anonymous, post-training survey that contains closed and open-ended questions and gauges their motivation and interest (Kirkpatrick, 1996; Smidt et al., 2009). Kirkpatrick (1996) recommended that the survey be created in a way that allows the questions to obtain the desired reactions, the responses to be tabulated and quantified, and the participants to write additional comments.

The second level, Level 2 Learning, assesses the knowledge or skills gained during a training or changes in attitudes due to the training (Kirkpatrick, 1996). Kirkpatrick (1996) suggested that the measure be administered before and after the training and designed in a manner that allows the results to be quantified. Kirkpatrick (1996) also suggested that, when possible, a control group be used and the results be analyzed statistically.

The third level, Level 3 Behavior, systematically measures "...the extent to which participants change their on-the-job behavior because of training" (i.e., the transfer of training; Kirkpatrick, 1996, p. 56). Kirkpatrick (1996) recommended that the participants' on-the-job performance be measured before and after a training. The post-training measurement should be conducted three or more months after the training (to allow for changes in behavior), and one or more groups of people familiar with the participants' on-the-job performance (e.g., trainees, supervisors, subordinates, and peers) should be surveyed or interviewed (Kirkpatrick, 1996). Similar to Level 2 Learning, Kirkpatrick (1996) recommended that, when possible, a control group be used and the results be analyzed statistically.

The fourth level, Level 4 Results, evaluates a training's final desired results; for example, higher productivity, reduced costs, less employee turnover, and improved quality. The results should be evaluated with the criteria set for Levels 1 (Reaction), 2 (Learning), and 3 (Behavior). Further, when possible, a control group should be used, and the results should be measured

before and after a training at an appropriate time so that enough time was allowed for results to be achieved (Kirkpatrick, 1996).

Communication Partner Manual Sign/KWS Trainings Evaluation

To consider the strength of the outcomes or results from the studies conducted to examine the efficacy of manual sign or KWS training programs (i.e., Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984; Meuris et al., 2015; Smidt et al., 2019; Spragale & Micucci, 1990), Kirkpatrick's four-level training evaluation model was used. Concerning Level 1 Reaction, five of the six studies (i.e., Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984 [Experiment II]; Smidt et al., 2019; and Spragale & Micucci, 1990) measured the participants' feelings about the training's aspects with post-training interviews or questionnaires (see Appendix C for the design, evaluation methods, analysis methods, and Kirkpatrick levels of efficacy studies for manual sign or key word signing training programs). Kirkpatrick (1996) recommended that an anonymous survey be created in a way that allows the responses to be tabulated and quantified and the participants to write additional comments.

Chadwick and Jolliffe (2008) and Spragale and Micucci (1990) created an interview, and a questionnaire, respectively, that allowed the responses to be tabulated and quantified and the participants to state or write additional comments; Duker and Moonen (1985) used an anonymous questionnaire (Schepis et al., 1982) that allowed the responses to be tabulated and quantified; Fitzgerald et al. (1984) used an anonymous acceptability questionnaire to evaluate the acceptability and usefulness of the manual sign training program, and Smidt et al. (2019) created an interview that allowed the participants to make additional comments. Meuris et al. (2015) evaluated the participants' attitudes informally; for instance, during the posttest conversations, participants stated that they enjoyed the KWS immersion program and considered KWS very

useful, whereas other participants indicated that they were embarrassed to use signs and not convinced that KWS would benefit their clients. Therefore, Meuris et al. (2015) suggested that future KWS training research include systematic attitude measures because staff attitude may affect results.

Three of the six manual sign or KWS training studies (i.e., Chadwick & Jolliffe, 2008; Fitzgerald et al., 1984 [Experiment I, II, III]; Smidt et al., 2019) assessed the knowledge or skills gained during the trainings with pre- and/or posttest expressive sign assessments (Level 2 Learning). Meuris et al. (2015) suggested that precise sign knowledge, which was not assessed in their study, could affect results in terms of the number of signs produced during conversation. Chadwick and Jolliffe (2008) assessed sign knowledge post-training only. To substantiate the training's effectiveness (or the study's findings), Chadwick and Jolliffe (2008) recommended replication with pre- and post-training sign knowledge assessments and a control group for within- and between-group comparisons.

All six manual sign or KWS training studies (i.e., Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984 [Experiment I, II]; Meuris et al., 2015; Smidt et al., 2019; and Spragale & Micucci, 1990) measured the transfer of training by evaluating the participants' on-the-job performance (Level 3 Behavior). Chadwick and Jolliffe (2008) and Smidt et al. (2019) measured the participants' on-the-job performance with participant interviews. Chadwick and Jolliffe (2008) interviewed participants 6 to 12 months post-training, and Smidt et al. (2019) interviewed participants six to 12 weeks post-training.

Duker and Moonen (1985), Fitzgerald et al. (Experiment I; 1984), and Meuris et al. (2015) evaluated the participants' on-the-job performance with participant observations pre- and post-training. Spragale and Micucci (1990) evaluated the participants' performance with

participant observations post-training only. Duker and Moonen (1985) observed participants' performance three times a week in an experimental classroom and two times a week on the residents' wards for the baseline and signing program data collection, Fitzgerald et al. (Experiment I; 1984) observed the participants' on-the-job performance at least once a week for 27 weeks when the baseline assessments began, Meuris et al. (2015) observed the participants' performance before and 12 months after the training, and Spragale and Micucci (1990) observed the participants' performance weekly over nine months. Fitzgerald et al. (Experiment II; 1984) and Spragale and Micucci (1990) measured the participants' on-the-job performance with questionnaires. For Fitzgerald et al. (Experiment II; 1984), the participants completed an anonymous questionnaire 2 to 11 weeks after the last post-training assessment; and, for Spragale and Micucci (1990), the participants completed questionnaires monthly over nine months.

These studies showed variability in terms of who measured the transfer of training and how and when the transfer of training was measured (Level 3 Behavior). The transfer of training was measured by examiners and participants using interviews, observations, and questionnaires from immediately to 12 months after the training. However, Kirkpatrick (1996) recommended that the participants' on-the-job performance be measured before and after a training, the post-training measurement be conducted three or more months after the training, and one or more groups of people familiar with the participants' on-the-job performance be surveyed or interviewed (Level 3 Behavior). Fitzgerald et al. (Experiment I; 1984), Meuris et al. (2015), and Spragale and Micucci (1990) evaluated the participants' on-the-job performance pre- and post-training; Chadwick and Jolliffe (2008) and Meuris et al. (2015) conducted the post-training measurement three or more months after the training, and no studies surveyed or interviewed one or more groups of people familiar with the participants' on-the-job performance. However,

Meuris et al. (2015) reported that the facility's psychologist (i.e., a person familiar with the participants' on-the-job performance) "indicated that KWS had become an evident part of everyday life for many support workers and adults with ID" (p. 555).

Two of the six manual sign or KWS training studies (i.e., Meuris et al., 2015; Duker and Moonen, 1985) evaluated a training's final, desired results (Level 4 Results). Meuris et al. (2015) evaluated the training's final, desired results by assessing the KWS use of adults with ID before and after (i.e., across 12 months) the facility-wide implementation of the KWS immersion program with a narrative (or story retelling) task to determine their ability to use words and signs "to recall and express communicative functions" (p. 547). The program's purpose was for support staff to learn signs through a "signs of the week" approach and for adults with ID to learn KWS through functional communication with support staff. Duker and Moonen (1985) evaluated the training's final, desired results by appraising students' manual sign use before, and after the teacher or staff employed a signing program, they were trained to use. The researchers recorded the number of signs evoked (or elicited) by the teacher or staff during 70 baseline and 121 intervention sessions across each student for each situation (i.e., instructional time, leisure time, and time on wards) to assess the students' manual signing ability. They also recorded the number of signs the students spontaneously used.

Lastly, Kirkpatrick (1996) recommended that, when possible, a control group be used and the results be analyzed statistically. Chadwick and Jolliffe (2008) used a control group (for between-group comparisons) and analyzed the results statistically; however, no pretesting was conducted for within-group comparisons. Further, Meuris et al. (2015) and Smidt et al. (2019) analyzed their results statistically, but the researchers did not use a control group.

Overall, the manual sign or KWS training studies reviewed (i.e., Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984; Meuris et al., 2015; Smidt et al., 2019; Spragale & Micucci, 1990) demonstrated that communication partners could learn to understand and produce signs, use signs or KWS during daily routines and spontaneous conversations, teach children and adults with ID to use signs, provide opportunities for children with ID to use signs, and elicit signs from children and adults with ID. Furthermore, the review of the manual sign or KWS training studies showed that most participants were employed by transitional, residential, and day care facilities for individuals with developmental or intellectual disabilities and provided services to adolescents (aged 11 to 17 years) and adults (age 18 years or greater; Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984; Meuris et al., 2015; Spragale & Micucci, 1990). No studies specifically recruited participants whom local educational agencies employed (e.g., public elementary schools) and provided services to preschool or school-age children.

Additionally, the participants were taught signs from British Sign Language (BSL), the Flemish KWS system, Australian Sign Language (Auslan), and Signed English during the trainings (Chadwick & Jolliffe, 2008; Meuris et al., 2015; Smidt et al., 2019; Spragale & Micucci, 1990). No efficacy studies taught the participants manual signs from American Sign Language (ASL). KWS uses manual signs from natural sign languages (not sign systems) with spoken language and/or representational symbols. Loeding et al. (1990) planned and conducted manual sign in-service workshops for elementary school staff who provided services to children with severe disabilities that used signs from ASL (mostly), Signed English, and SEE; however, the researchers did not measure the effectiveness of the program. Instead, the researchers used

pre and post in-service evaluations or questionnaires “to revise the multi-component training package for use in other settings” (Loeding et al., 1990, p. 39).

Regarding Kirkpatrick’s four-level model, all six manual sign or KWS training studies reviewed measured at least one level (i.e., Level 1 Reaction, Level 2 Learning, Level 3 Behavior, and Level 4 Results). Four studies or experiments (i.e., Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984 [Experiment II]; Smidt et al., 2019) measured three levels. Chadwick and Jolliffe (2008), Fitzgerald et al. (1984; Experiment II), and Smidt et al. (2019) measured reaction, learning, and behavior, and Duker and Moonen (1985) measured reaction, behavior, and results. Moreover, three studies or experiments (i.e., Fitzgerald et al., 1984 [Experiment I]; Meuris et al., 2015; Spragale & Micucci, 1990) measured two levels. Fitzgerald et al. (1984; Experiment I) measured learning and behavior, Meuris et al. (2015) measured behavior and results, and Spragale and Micucci (1990) measured reaction and behavior. Lastly, one study or experiment (i.e., Fitzgerald et al., 1984 [Experiment III]) measured one level. Fitzgerald et al. (1984; Experiment III) measured learning. No manual sign or KWS training study reviewed measured all four of Kirkpatrick’s levels.

This review of the manual sign or KWS training efficacy studies demonstrated the need for studies that evaluate the effectiveness of manual sign or KWS trainings that (a) recruit participants who are employed by local educational agencies (e.g., public elementary schools) and provide services to preschool or school-age children, (b) teach the participants manual signs from ASL, and (c) measure all four of Kirkpatrick’s levels.

Communication Partner AAC Intervention and Strategy Training

To date, it appears that no studies have been conducted to evaluate the effectiveness of teaching school-based communication partners of preschool- or school-age children (e.g., SLPs

and special education teachers) manual signs or KWS and communication partner strategies; however, studies have been conducted to examine the efficacy of teaching communication partners, such as special education teachers, AAC interventions and strategies. Kent-Walsh et al. (2015) conducted a systematic review and meta-analysis to determine the overall effects (i.e., effect sizes) of communication partner interventions on the communication of individuals who use AAC and whether the effects differed for specific characteristics of the participants, interventions, and/or outcomes. The systematic review and meta-analysis included 17 single-case design studies. Fifty-three children and adults who use AAC participated in the studies. The ages of the participants who used AAC ranged from 2 years, 5 months to 26 years, with a mean age of 7 years, 6 months. The participants used “high tech, low-tech, and no-tech aided communication systems with and without voice output” (Kent-Walsh et al., 2015, p. 274). The communication partners who participated in the studies were parents, caregivers, teachers, instructional assistants, and peers. Their ages ranged from 11 years to 64 years.

The studies reviewed by Kent-Walsh et al. (2015) consistently indicated that communication partner instruction positively affected the communication outcomes for children and adults who use AAC. The communication partners positively affected the communication outcomes by “modifying their communication patterns to better support functional communication with and the expressive language of” (Kent-Walsh et al., 2015, p. 280) children and adults who use AAC. The communication partners modified their communication patterns by using (a) aided AAC modeling, (b) expectant delay, (c) open-ended question asking, (d) general environment arrangement (e.g., “physical proximity of partners, making eye contact, and/or access/positioning of AAC device”), (e) generally described provision of communication opportunities, (f) generally referenced partner interaction training, (g) prompting (e.g., verbal,

gestural, and/or physical prompting), (h) manding, and (i) contingent responding (Kent-Walsh et al., 2015, p. 277).

Likewise, van der Meer et al. (2017) conducted a systematic review to determine the effectiveness of staff training for improving (a) staff knowledge, beliefs, and communication intervention delivery; and (b) communication outcomes for adults with ID. The systematic review included 22 studies conducted in residential facilities or group homes (16 studies), day programs (10 studies), university campuses (two studies), a restaurant (one study), a classroom (one study), and a hospital (one study). The studies included 437 staff participants (aged 18 to 80 years [12 studies; 259 staff]) and 254 adult participants with ID and additional disabilities such as visual impairment, hearing impairment, deaf-blindness, and ASD (aged 18 to 74 years [17 studies; 113 adults]; van der Meer et al., 2017). Two studies included participants with ID who were not adults; therefore, the participants who were not adults were not included in the total (van der Meer et al., 2017). Three hundred ninety staff participants received training and 47 did not receive training; and 216 adult participants received intervention, and 38 did not receive intervention. “The mode of communication for the adults [participants] could include speech or any type of AAC mode (e.g., natural gestures, manual signing, picture exchange, and/or speech-generating devices)” (van der Meer et al., 2017, p. 1281).

The studies reviewed by van der Meer et al. (2017) suggested that direct-care staff can be sufficiently trained to provide effective communication intervention to adults with ID. The staff acquired the knowledge and skills to successfully use intervention techniques such as offering choices and prompting choice-making responses, teaching manual signing, implementing behavior chain interruption strategies, using AAC devices, and implementing Phase 1 of PECS (Frost & Bondy, 1994; van der Meer et al., 2017).

Summary

The literature reviewed in this Chapter indicated that a variety of AAC systems could be effectively used with individuals with developmental disabilities and ASD (Gevarter et al., 2013). However, individuals with developmental disabilities will often use one communication system (e.g., manual sign) more than another, and they learned and maintained skills more effectively when their preferred communication system was used.

The literature reviewed in this Chapter also indicated that aided language stimulation may positively affect receptive and expressive vocabulary, pragmatics, and expressive syntax in individuals with ID or ASD (Allen et al., 2017; Sennott et al., 2016); and augmented input (e.g., KWS) may be used to model vocabulary expansion and AAC system use as well as the power, utility, and acceptability of AAC systems (Meuris et al., 2015). In addition, simultaneous communication (i.e., manual signing and spoken language combined) was suggested to improve expressive signing, oral speech, and receptive language; increase eye contact; and decrease challenging behaviors in individuals with ID or ASD (Anderson, 2002; Chambers & Rehfeldt, 2003; Schlosser & Sigafos, 2006).

Further, the review of the manual sign or KWS training efficacy studies (i.e., Chadwick & Jolliffe, 2008; Duker & Moonen, 1985; Fitzgerald et al., 1984; Meuris et al., 2015; Smidt et al., 2019; Spragale & Micucci, 1990) suggested that communication partners (i.e., staff at transitional, residential, and day care facilities) can learn to understand and produce signs, use signs or KWS during daily routines and spontaneous conversations, teach children and adults with ID to use signs, provide opportunities for children with ID to use signs, and elicit signs from children and adults with ID. The systematic reviews that examined the efficacy of teaching communication partners communication interventions and strategies (i.e., Kent-Walsh et al.,

2015; van der Meer et al., 2017) indicated that communication partners can learn the interventions and strategies (e.g., elements of milieu teaching, ALgS/augmented input, language response strategies, and LTM prompting); provide communication intervention to children and adults who use AAC; and modify their communication patterns to support functional communication and expressive language in children and adults who use AAC.

To conclude, the literature reviewed in this Chapter indicated that it is essential to provide individuals with developmental disabilities and ASD opportunities to use different communication systems (i.e., aided and unaided AAC systems [including manual sign]) so that their preferred communication system may be determined (Gevarter et al. (2013). The literature reviewed in this Chapter also demonstrated the need for studies that evaluate the effectiveness of manual sign or KWS trainings that (a) recruit participants who are employed by local educational agencies (e.g., public elementary schools) and provide services to preschool or school-age children, (b) teach the participants manual signs from ASL, (c) teach the participants communication partner strategies (i.e., milieu teaching, ALgS/augmented input, language response strategies, and LTM prompting), and (d) measure all four of Kirkpatrick's levels.

Next, Chapter 3 will review the research purpose and questions and introduce the research hypothesis. Further, it will discuss the research method and designs as well as the participants, settings, intervention method, and instruction models. Chapter 3 will also discuss the procedures for (a) recruiting participants, (b) selecting the KWS vocabulary, (c) administering the assessments, (d) distributing the surveys, (e) conducting the semi-structured interviews, and (f) analyzing the data.

Chapter 3: Methods

Chapter 3 reviews the research purpose and questions and introduces the research hypothesis. Moreover, it discusses the research method and four research designs as well as the participants, settings, intervention method (i.e., KWS workshop), and instruction models (i.e., for the workshop). Chapter 3 also discusses the procedures for (a) recruiting participants; (b) selecting and assessing the KWS vocabulary; (c) administering the receptive sign, expressive sign, and expressive KWS assessments; (d) distributing the surveys (i.e., supplemental questions and acceptability questionnaire); (e) conducting the semi-structured interviews; and (f) analyzing the data from the assessments, surveys, and semi-structured interviews.

Research Purpose

The intent of the research study was to examine the effect of a KWS workshop on in-service special education teachers' and SLPs' manual sign skill and use of KWS with students who relied on AAC in their classrooms or therapy rooms.

Research Questions

To determine the effect of a KWS workshop on in-service special education teachers' and SLPs' manual sign skill and use of KWS with students with CCN, the following research questions were answered:

1. What is the effect of a KWS workshop on in-service special education teachers' and speech-language pathologists' skill identifying manual signs?
2. What is the effect of a KWS workshop on in-service special education teachers' and speech-language pathologists' skill producing manual signs?
3. What is the effect of a KWS workshop on in-service special education teachers' and speech-language pathologists' use of KWS in the classroom or therapy room?

4. What are in-service special education teachers' and speech-language pathologists' perceived changes from taking part in a KWS workshop?

Research Hypothesis

It was hypothesized that in-service special education teachers and SLPs, who participated in a KWS workshop, would demonstrate an increase in their skill identifying and producing manual signs and using KWS in the classroom or therapy room with preschool and school-age students who relied on AAC. It was also hypothesized that the preschool and school-age students who relied on AAC, with whom the special education teachers and SLPs used KWS, would increase their use of manual signs.

Methodology

Convergent mixed methods were used to answer the research questions. The four methodologies or research designs used were a pretest-posttest design with repeated posttest measures over time, A-B single-case design, a survey design, and phenomenological research.

To determine the effect of a KWS workshop on in-service special education teachers' and SLPs' skill identifying (Research Question 1; Level 2 Learning) and producing (Research Question 2; Level 2 Learning) manual signs, a pretest-posttest design with repeated posttest measures over time was used. A pretest-posttest design with repeated posttest measures over time was used because two groups (i.e., experimental groups) were trained and no control groups (i.e., untrained groups) were compared to the experimental groups. Further, a pretest-posttest design with repeated posttest measures over time was used because the experimental group (i.e., the staff) was pretested one time before the workshop and posttested six times after the workshop (Creswell & Creswell, 2018). The independent variable was the KWS workshop. The dependent variables were (a) the number of manual signs accurately produced by in-service special

education teachers and SLPs, and (b) the number of manual signs accurately identified by in-service special education teachers and SLPs.

To discover the effect of a KWS workshop on in-service special education teachers' and SLPs' use of KWS in the classroom or therapy room (Research Question 3; Level 3 Behavior), an A-B single-case design was used. An A-B single-case design was used because three staff (i.e., special education teacher or SLP) and four students were observed three times before the workshop and five times after the workshop (Creswell & Creswell, 2018). The independent variable was the KWS workshop. The dependent variables were (a) the number of signed utterances, (b) the number of signs, and (c) the number of different signs produced by the participants (i.e., staff and students).

To learn the in-service special education teachers' and SLPs' perceived changes from taking part in the KWS workshop (Research Question 4), a survey design and phenomenological research was used (Kirkpatrick & Kirkpatrick, 2016; Schlosser, 1999). A survey design was used because the survey provided a "standardized measurement that [was] consistent across all respondents" (Fowler, 2014, p. 3); that is, the survey (or standardized measurement) ensured that the information obtained from the respondents was comparable (Fowler, 2014).

Phenomenological research was used so that the participants' experience using KWS in their classrooms or therapy rooms with students who relied on AAC could be explored.

Lastly, a survey design was used to find out how many signs the participants use consistently during classroom or therapy room activities as well as the consistency of the sign use as compared to before the KWS workshop and the previous sign assessment. The survey design also provided the participants with the opportunity to share their experiences and/or thoughts on using signs in their classroom or therapy room.

Research Methods

Please note that the terms used to describe the students' disabilities, the severity of their disabilities, and their educational placements were the ones used by the participants. Section 300.8 of the Individuals With Disabilities Education Act (IDEA) of 2004 described a child with a disability and defined 13 disability terms. The disability terms included ASD, deaf-blindness, deafness, emotional disturbance, hearing impairment, intellectual disability, multiple disabilities, orthopedic impairment, other health impairment, specific learning disability, speech or language impairment, traumatic brain injury, and visual impairment. According to the U.S. Department of Education (n.d.), the IDEA (2004) governs how special education and related services (e.g., speech and language therapy) are provided by public agencies (i.e., public school districts) to eligible children with disabilities. Thus, these were the disability terms used by the participants and, subsequently, reported by the researcher. Additionally, the descriptors used to represent the severity of the students' disabilities and identify their educational placements (i.e., mild, moderate, and severe) were the ones used by the public school districts that employed the participants. Therefore, these were the disability severity and educational placement descriptors used by the participants and, subsequently, reported by the researcher.

Research Participants

Four secondary special education teachers, one preschool special education teacher, three SLPs, and four students participated in the study. Of the four secondary special education teachers, three teachers (Participants 1, 6, and 8) taught students with moderate or severe disabilities at public high schools (i.e., Grades 9 to 12) and one (Participant 7) taught students with moderate or severe disabilities at a public middle school (Grades 6 to 8). The one preschool teacher (Participant 2) taught students (aged 3 to 5 years) with ASD with moderate or severe

disabilities at a public elementary school. With respect to the three SLPs, one SLP (Participant 5) treated students (aged 3 to 5 years) with mild or moderate disabilities, in a preschool program, at a public elementary school; one (Participant 4) treated students with mild or moderate disabilities at a public elementary school; and one (Participant 3) treated adults (aged 18 to 22 years) with intellectual or developmental disabilities at an adult transition program (ATP) in a public school district (see Table 3-1 for a description of the eight adult participants' position, school/program, and population taught/treated).

Table 3-1

Adult Participants' Position, School/Program, and Population Taught/Treated

Participant #	Position	School or program	Population taught or treated
1	Teacher	High school	Students with moderate or severe disabilities
2	Teacher	Preschool	Students with ASD with moderate or severe disabilities
3	SLP	Adult transition	Adults with intellectual or developmental disabilities
4	SLP	Elementary	Students with mild or moderate disabilities
5	SLP	Preschool	Students with mild or moderate disabilities
6	Teacher	High school	Students with moderate or severe disabilities
7	Teacher	Middle school	Students with moderate or severe disabilities
8	Teacher	High school	Students with moderate or severe disabilities

In regard to the four students, one student (Student 1) attended a preschool program for students with ASD with moderate or severe disabilities (taught by Participant 2), one (Student 2) attended a preschool program for students with mild or moderate disabilities (treated by Participant 5), and two (Students 3 and 4) attended a high school program for students with moderate or severe disabilities (taught by Participant 6; see Table 3-2 for a description of the four student participants' school, program, and teacher/SLP).

Table 3-2*Student Participants' School, Program, and Teacher/SLP*

Student #	School	Program	Teacher/SLP
1	Preschool	ASD with moderate or severe disabilities	Participant 2
2	Preschool	Mild or moderate disabilities	Participant 5
3	High School	Moderate or severe disabilities	Participant 6
4	High School	Moderate or severe disabilities	Participant 6

Student 1 was a preschool student with ASD aged 4 years, 2 months. Participant 2, who taught Student 1, reported that Student 1 did not “have much communication”; therefore, Participant 2 used PCS and the ASL sign MORE with full physical guidance (i.e., hand-over-hand assistance) to assist Student 2 with communicating their wants and needs. During the preworkshop classroom observations, the researcher also observed Student 2 using vocalizations and body language or movements to communicate.

Student 2 was a preschool student with Kabuki syndrome aged 3 years, 2 months. Participant 5, who treated Student 2, stated that Student 2 was preverbal and used some ASL signs to communicate. Participant 5 said that Student 2 produced approximations of the ASL signs ALL DONE, BREAD, BYE(-BYE), EAT, CAR, COOKIE, HELLO, KETCHUP, and MORE before Participant 5 attended a KWS workshop. Participant 5 also stated that Student 2 started to “verbalize a little bit more” (i.e., produce approximations of English words) and learn to use an SGD.

Student 3 was a high school student with developmental disabilities, aged 14 years, 8 months, who primarily used gestures (e.g., pointing) to get their needs met. Participant 6, who taught Student 3, reported that Student 3 also used approximately five ASL signs (e.g., HELLO), vocalizations, and an SGD. Student 3 had the SGD since they were age 4 years, but it was “still

not being functionally used that much day-to-day.” Participant 6 also reported that Student 3 did not enjoy using the SGD or “talker” and “the talker creates more behaviors for [Student 3].”

Student 4 was a high school student with developmental disabilities, aged 14 years, 5 months, who primarily used eye-gaze (or eye contact) to communicate. Participant 6, who taught Student 4, reported that Student 4 also smiled and laughed as well as used vocalizations (e.g., when upset) and a rocking motion to communicate, but not consistently in response to questions. Lastly, Participant 6 reported that Student 4 had a “BIGmack button that [they had] been using for a long time” so that they could learn cause and effect for “prelanguage learning.”

All eight adult participants took part in the pretest-posttest design with repeated posttest measures over time, survey design, and phenomenological research to examine the effect of a KWS workshop on their skill identifying and producing manual signs as well as their perceived changes from taking part in the KWS workshop (Research Questions 1, 2, and 4). Three of the eight adult participants and four students participated in the A-B single-case design, which was used to determine the effect of the KWS workshop on the in-service staff’s use of KWS in their classrooms or therapy rooms (Research Question 3).

Recruitment Procedures

The special education teachers, SLPs, and students were actively recruited from two local school districts using electronic mail. Thus, a nonprobability sample (or convenience sample) was used because the participants were “chosen based on their convenience and availability” (Creswell & Creswell, 2018, p. 150).

Before the end of the academic year, the researcher sent an email, which contained the recruitment letter, to the administrators in two local school districts (See Appendix D for the first contact recruitment letter). The administrators then forwarded the email/recruitment letter to

special education teachers and SLPs, who taught or treated students with CCN, during the summer recess or vacation.

At the start of the following academic year, the researcher and/or administrators emailed four follow-up recruitment letters (See Appendices E, F, G, and H for the first, second, third, and fourth follow-up recruitment emails). In one school district, the follow-up letters were emailed or forwarded to the special education teachers and SLPs at the beginning of the 2nd, 3rd, 5th, and 7th week of work. Additionally, the researcher directly recruited SLPs from the school district in the 2nd week of work, during a job-alike meeting (See Appendix I for the verbal script for direct [face-to-face] contact or recruitment). Lastly, in the week before the second workshop, the researcher emailed a flyer to the participants to inform them of the new incentives and ask them to share the flyer with their colleagues who may be eligible and/or interested in participating in the research study (See Appendix J for the KWS study recruitment flyer).

In the other school district, one follow-up letter was forwarded to the special education teachers and SLPs, beginning the 2nd week of work, for 3 consecutive weeks at the start of each week (i.e., the 2nd, 3rd, and 4th weeks of work). The final recruitment letter was forwarded to the special education teachers and SLPs in the 6th week of work.

Interested staff members contacted the researcher, and the researcher discussed the research study with them via email and/or telephone. The researcher also asked the staff members three questions (via email) to decide whether they met the inclusion criteria. The questions were as follows:

- Do you work as a special education teacher or speech-language pathologist in [school district's name]?

- Do you teach or treat students with complex communication needs (i.e., students with little to no functional speech due to speech that is developing slowly, spoken words that are unintelligible, or speech that is not developing)?
- Do you have little to no American Sign Language (ASL) and key word signing (KWS) knowledge and skill?

If the potential participants responded, “yes,” to the questions, thereby meeting the inclusion criteria to participate in the study, and were willing to participate in the study, the researcher emailed them the appropriate Adult Informed Consent to Participate in Research form (determined by the participant’s willingness to be observed) to review, sign, and return (see Appendix K for the Adult Informed Consent to Participate in Research form).

To recruit students for the study, the staff members, who returned the signed informed consent forms, were asked to identify potential minor participants. The inclusion criteria for the minor participants or students were (a) they attended a school in one of the participating school districts; (b) they were taught or treated by a special education teacher or SLP who attended a KWS workshop presented for the study; (c) they had little to no functional speech due to speech that was developing slowly, spoken words that were unintelligible, or speech that was not developing; and (d) they had little to no ASL and KWS knowledge and skill.

Once the potential students were identified, the researcher emailed the recruitment letter, Adult Informed Consent to Participate in Research form, and Assent to Participate in Research form to the staff members. The staff members then forwarded the email and/or documents to the potential students’ parent(s) or guardian(s) so that they could review, sign, and return the consent and assent forms. Given that a minor participant must be age 3 to 17 years and have CCN to participate, a witness (e.g., staff member or family friend) also signed a minor participant’s (who

was age 7 to 17 years) assent form because the minor participants had the decision-making capacity, but could not read, write, and/or talk.

As an incentive to participate in the study, all adult participants were provided a continental breakfast and lunch at the workshops. Further, all SLPs were offered ASHA certification maintenance hours and continuing professional development (CPD) credit for their California Department of Consumer Affairs (DCA) License for attending a workshop.

Additionally, the participants from one school district were given column advancement hours (if needed) and gift bags from the business owner who allowed the researcher to present the workshops at their corporate office. Lastly, each adult participant from the one school district was given a \$20 gift card after they completed all the procedures for the research study. The researcher was not permitted to give the adult participants from the other school district gift bags and/or gift cards.

Research Settings

The participants attended the KWS workshops in a conference room at a local business. They were evaluated virtually using a web-based platform (i.e., Zoom video conferencing) and in-person at their school sites.

Intervention Method

The intervention method or training program involved two 1-day, 6-hour KWS workshops. Four adult participants were trained in person during each workshop.

KWS Vocabulary Selection

The target vocabulary for the KWS workshop was compiled using the suggested initial and core vocabularies from Fristoe and Lloyd (1980); Dennis, Erickson, and Hatch (2013; i.e., Dynamic Learning Maps [DLM] core vocabulary); and van Tilborg and Deckers (2016). A core

vocabulary is a relatively small set of words, that is, 20 to 50 words for young children and 200 to 400 words for adults, which makes up 75 to 80% of their expressive vocabulary. The words are combinable and generative as well as used consistently (or with little variation) across individuals, environments, and time. The vocabulary consists of high-frequency words from various word classes (or parts of speech) such as nouns, pronouns, verbs, auxiliary verbs, adjectives, adverbs, conjunctions, prepositions, modals, determiners, interjections, and question words (Boenisch & Soto, 2015; Deckers et al., 2017; Dennis et al., 2013; van Tilborg & Deckers, 2016).

Fristoe and Lloyd (1980) examined the vocabularies in 20 sign manuals intended for individuals with ASD and ID learning to communicate with manual signs to produce an initial expressive sign lexicon for individuals “with essentially normal hearing who have not been able to learn spoken communication” (p. 172). To examine the vocabularies, the researchers listed the signs from the manuals, calculated a frequency count for more than 850 signs that were in two or more lists, and selected a basic lexicon of 68 signs. Next, Fristoe and Lloyd (1980) used the guidelines for teaching spoken language to children as well as the sample or core initial spoken lexicons presented by Holland (1975) and Lahey and Bloom (1977) to adjust the basic sign lexicon, which resulted in 12 signs being removed and 25 signs being added (as recommended additions) for a total of 82 signs being suggested for the initial expressive sign lexicon (Fristoe & Lloyd, 1980).

For the DLM Core Vocabulary Project, Dennis et al. (2013) identified a core vocabulary that represented core vocabulary research in AAC and permitted students with ID to participate, learn, and communicate (e.g., knowledge) in academic settings where the Common Core Essential Elements are taught. To identify the core vocabulary, Dennis et al. (2013) identified the

words that the Common Core State Standards (kindergarten through Grade 12) indicated students must express for English language arts and mathematics as well as the words from closed-set word categories (e.g., pronouns and prepositions) that the Common Core State Standards indicated students must express. In addition, Dennis et al. (2013) compiled the core vocabulary lists from 23 sources. Four of 23 sources were studies that involved children and provided vocabulary lists (i.e., Banajee et al., 2003; Beukelman et al., 1989; Marvin et al., 1994; Trembath et al., 2007); and 19 sources were commercial and public domain core vocabulary lists made available by commercial AAC systems, school systems, and AAC specialists. An examination of the Common Core State Standards and the 23 sources revealed 596 unique words. The rank scores (calculated for each word to indicate its importance) indicated that 36 words should be included in the DLM Core Vocabulary to support the expressive communication of students with significant cognitive disabilities.

van Tilborg and Deckers (2016) reviewed 12 studies (i.e., Ball et al., 1999; Banajee et al., 2003; Boenisch, 2014; Boenisch & Sachse, 2007; Boenisch & Soto, 2015; Chen et al., 2011, 2013; Clendon et al., 2013; Dark & Balandin, 2007; Marvin, 1994; Robillard et al., 2014; Stuart et al., 1997) that described the spontaneous spoken and written language and narratives of children and adults with or without disabilities. The language samples “were collected in various settings and with various communication partners” (van Tilborg & Deckers, 2016, p. 128). The studies’ participants included typically developing toddlers, preschool-aged children, school-aged children, adults, and elderly; children with language impairments; children with ASD; children and adults with physical disabilities; and children and adults with ID. Further, the participants included child and adults who were monolingual, bilingual, second language (i.e., English) learners, or AAC users.

Each study reviewed provided at least one core word list; however, three studies provided core word lists for two groups of participants (van Tilborg & Deckers, 2016). Therefore, 15 core word lists, with 1,852 total core words, were available for examination. A close inspection of the total core words revealed that 637 words were unique and 51 words (out of the 637 unique words) were in at least half of the studies' core word lists. The 51 words that were in at least half of the studies' word lists were used to generate "a core word list based on commonality of word use in [the studies]" (van Tilborg & Deckers, 2016, p. 132).

To compose the KWS workshop vocabulary for the present study, four lists of the words and signs in the suggested vocabularies from Fristoe and Lloyd (1980), Dennis et al. (2013), and van Tilborg and Deckers (2016) were made. One list was formed for each of the suggested vocabularies (i.e., three lists total), and one list was made with the three vocabularies combined. In the lists that were formed, a word and its derivatives (e.g., can, can't) or its synonym(s) (e.g., BATHROOM/TOILET) were counted as one word. Negative forms (i.e., NO, NOT), which were counted as one word in the suggested vocabulary from van Tilborg and Deckers (2016), were counted as two words in the lists made because NO is produced using a natural gesture and NOT is produced using an ASL sign. Words represented by the same or similar ASL sign (e.g., EAT/FOOD) and name signs were counted as one word. As a result, the combined vocabulary list revealed 131 unique words or signs.

Next, the three separate vocabulary lists were examined to determine which words and signs were in all three lists as well as in two of the three lists. The examination revealed that nine words/signs were on all three vocabulary lists, and 24 words/signs were on two of the three vocabulary lists. These 33 words/signs were then added to the KWS workshop vocabulary (see Appendix L for the words/signs in three and two lists).

Five of the 33 words/signs were substantive words, and 28 were relational words. “Substantive words refer to particular objects (as person and place names) or to categories of objects (such as *chair* and *dog*)” (Lahey & Bloom, 1977, p. 342). The substantive words in an individual’s vocabulary are specific to the individual’s environments and the people or objects they frequently encounter in those environments. “Relational words are words which refer to a relationship between objects and include parts of speech such as verbs, adjectives, and prepositions” (Lahey & Bloom, 1977, p. 342). The relational words in an individual’s vocabulary are less specific and may be used with many different objects and events. Further, words that may be widely used may facilitate an individual’s attempt to communicate more often and provide more opportunities for language input from communication partners.

Given that selecting relational words for vocabularies (for individuals learning language) is strongly recommended (Fristoe & Lloyd, 1980; Lahey & Bloom, 1977; Lederer & Battaglia, 2015), relational words/signs that were in one of the three lists from Fristoe and Lloyd (1980), Dennis et al. (2013), and van Tilborg and Deckers (2016) were then added to the KWS workshop vocabulary. First, the eight words that remained in the list from Dennis et al. (2013), which were all relational, were added to the KWS vocabulary. Second, 13 of the remaining 27 words in the list from van Tilborg and Deckers (2016) were added to the vocabulary. Nine of the words were relational and four of the words were substantive. It was decided to add the four substantive words (i.e., MY/MINE, PEOPLE, THEY, WE) because they were less specific.

In regard to the 15 words that were not added, for KWS, manual signs are simultaneously produced with spoken language to code the content words, such as base nouns, base verbs, prepositions, adjectives, and adverbs, in the spoken sentences (Beukelman & Mirenda, 2013; Lloyd et al., 1997). Thus, two articles (i.e., a, the), four conjunctions (i.e., but, and, because so),

and one interjection (i.e., oh) were excluded. Moreover, copulas and auxiliary verbs, which were listed as “to be” verbs and included as one word, as well as three adverbs (i.e., then, just, still), two prepositions (i.e., for, to), and one noun (i.e., two) were omitted. Lastly, the adverbs and prepositions were determined to be more difficult to demonstrate in a nonlinguistic context (Lahey & Bloom, 1977); and the noun, two, was decided not to be a target word/sign along with other number words.

With respect to the third separate vocabulary list, 38 of the remaining 63 signs in the list from Fristoe and Lloyd (1980) were added to the KWS vocabulary. Twenty-seven of the remaining signs were relational signs and 36 were substantive signs. Twenty-three of the 27 remaining relational signs were added to the KWS vocabulary. The adjectives AFRAID, ANGRY/MAD, HAPPY, and SAD were added due to the need for individuals to linguistically express their feelings and the use of facial expressions to demonstrate emotions in nonlinguistic contexts (Fristoe & Lloyd, 1977; Holland, 1975). The adjectives BIG, BROKEN, DIRTY, HEAVY, and HOT were added due to the need to code semantic relationships between objects using attributes or descriptions (i.e., attribution or attribute + entity; Brown, 1973; Fristoe & Lloyd, 1980; Lahey & Bloom, 1977). The adjective BAD was not added because it is an antonym for GOOD, which was added to the KWS vocabulary. Antonyms, such as BAD, may be coded as nonexistence and attribution (e.g., NOT + GOOD) or negation and an adjective (e.g., NO [head shake] + GOOD; Fristoe & Lloyd, 1980; Lahey & Bloom, 1977).

Next, the prepositions DOWN and UNDER were added to the KWS vocabulary so that actions involved in locating objects or self may be coded (Fristoe & Lloyd, 1980; Lahey & Bloom, 1977). Furthermore, the verbs CRY, DRINK, FALL, GIVE, PLAY, RUN, SIT/CHAIR, SLEEP, STAND, THROW, WALK, and WASH were added so that actions on objects and

agents may be coded (i.e., agent + action, action + object, action + locative; Brown, 1973; Fristoe & Lloyd, 1980; Lahey & Bloom, 1977). The verb BRING was not added because it is an alternative word for GET, which was added to the KWS vocabulary (Fristoe & Lloyd, 1980). The verb KISS was not added because it most likely will not be frequently encountered in educational environments; and the adverb NOW was not added because it will be more difficult to demonstrate in a nonlinguistic context.

Last, 15 of the 36 remaining substantive signs from Fristoe and Lloyd (1980) were added to the KWS vocabulary. The nouns BALL, BATHROOM/TOILET/POTTY, BOOK, BOY, COAT, CUP, FATHER/DADDY, GIRL, HOUSE, MOTHER/MOMMY, SCHOOL, SPOON, TABLE, and WATER were added due to the need to code relationships between an individual and an object or event (e.g., recurrence, rejection, nonexistence/disappearance, identification/existence) as well as relationships between objects (e.g., action, attribution, possession; Fristoe & Lloyd, 1980; Lahey & Bloom, 1977). BOY and GIRL were added (instead of MAN and WOMAN) due to the ASL signs for the pronouns HE and SHE being produced by, first, signing BOY or GIRL and then pointing (Sternberg, 1998).

The nouns APPLE, BABY, BED, BIRD, CANDY, CAR, CAT, COMB, COOKIE, DOG, DOOR, HAT, MAN, MILK, PANTS, SHIRT, SHOE(S), SOCK, T.V., and WOMAN were not added because they may be used less frequently in academic settings; and the pronoun THOSE was not added because the pronoun THESE was not in the lists. Therefore, the participants were taught the singular pronouns THIS and THAT, but not the plural pronouns THESE and THOSE. Lastly, name signs were not added because they incorporate the first letter of an individual's name and are based on the individual's appearance or personality (Holcomb, 2013). Thus, the

participants were instructed on how to create name signs for their students' communication partners (see Appendix M for the words/signs in one list).

In total, 91 (i.e., 69 relational and 22 substantive) of the 131 unique words or signs from Fristoe and Lloyd (1980), Dennis et al. (2013), and van Tilborg and Deckers (2016) were added to the KWS workshop vocabulary (see Appendices D and E for the words/signs in the KWS workshop vocabulary). However, one of the signs (i.e., THIS) is produced using a sign or gesture; and 12 of the signs (i.e., DOWN, HE, HELLO, I, IT, NO, SHE, THERE, THEY, UP, YOU, YES) are produced using gestures (e.g., pointing, shaking or nodding head, waving). Therefore, the participants were taught 79 ASL manual signs during the KWS workshop. The ASL signs used to teach the 79 target signs were verified or chosen using six resources (a) *Signing: How to Speak with Your Hands* (Costello, 1983), (b) *A Basic Course in American Sign Language* (Humphries et al., 1980), (c) *The Joy of Signing: A Dictionary of American Signs* (Riekehof, 2014), (d) *American Sign Language Dictionary* (Sternberg, 1998), (e) *The Gallaudet Dictionary of American Sign Language* (Valli, 2005), and (f) *ASL Sign Language Video Dictionary* (Signing Savvy, n.d.).

KWS Instruction Models

The participants were taught the manual signs during the KWS workshops using components from the direct instruction model, which is used to teach basic skills, facts, and knowledge (Gunter et al., 1995) as well as the communication partner instruction (CPI) model suggested by Kent-Walsh and Naughton (2005). The direct instruction model involves (a) stating a lesson objective, (b) presenting new material, (c) guiding practice with corrective feedback, (d) assigning independent practice with corrective feedback, and (e) reviewing with corrective feedback (Gunter et al., 1995). The CPI model includes (a) pretest and commitment to

instructional program, (b) strategy description, (c) strategy demonstration, (d) verbal practice of strategy steps, (e) controlled practice and feedback, (f) advanced practice and feedback, (g) posttest and commitment to long-term strategy use, and (h) generalization of targeted strategy use (Kent-Walsh & Naughton, 2005). For this study, seven of the eight CPI stages were implemented. Stage 8: Generalization of Targeted Strategy Use was not carried out. In Stage 8, the communication partners practice using the strategy in many different contexts with the instructors' assistance (e.g., feedback) and plan for long-term strategy use. The intent of the study was to examine the participants' KWS use in the classroom or therapy room (i.e., instructional settings).

For Stage 1: Pretest and Commitment to Instructional Program, the instructor tested three participants' spontaneous use of the target strategy, KWS, and the communicative participation of individuals with CCN in natural environments using observations (or expressive KWS assessments). The instructor also tested all the participants' expressive and receptive sign knowledge using expressive and receptive sign assessments. Next, during the workshop, the instructor introduced KWS and the instructional program to the participants; and based on the expressive and receptive sign pretest results, the instructor discussed the participants' strengths and weaknesses in sign knowledge and the effect(s) on the communicative participation of individuals with CCN. Last, after the KWS introduction, the participants committed to participating in the instructional program and acquiring the target strategy. Specifically, the participants completed a personal commitment statement form titled, "You Can Make a Difference" (Bornman & Louw, 2019; see Appendix N for the personal commitment statement form). The participants' completed personal commitment statement form was emailed to them after the KWS workshop.

In Stage 2: Strategy Description, the instructor described KWS and its principles, the contexts in which KWS may be used, and the positive effect(s) KWS use can have for individuals with CCN and their families or caregivers. The instructor also described methods, or mnemonic cues, for remembering the primary KWS principles (i.e., “Say it. Sign it. Show it”) and ASL manual signs (i.e., the rationale for, or origin of, the signs; Riekehof, 2014; Sternberg, 1998); however, the mnemonic cues for remembering the manual signs were described during Stage 3: Strategy Demonstration.

To expand on the purpose of KWS, the manner in which to create a communication or signing environment was described. In particular, the communication partner strategies, ALgS/augmented input, language response strategies/facilitative language techniques, and LTM prompting, were detailed (Ault & Griffen, 2013; Beukelman & Mirenda, 1998; DesJardin, 2006; Finke et al., 2017; Meuris et al., 2015; Smidt et al., 2019). To help the participants memorize the communication partner strategies, the instructor taught them to “Give it ALL” when communicating with students who rely on AAC. ALL in the mnemonic code, “Give it ALL,” represented ALgS/augmented input, language response strategies/facilitative language techniques, and LTM prompting.

Additionally, to assist the participants with remembering the steps for ALgS and augmented input (Beukelman & Mirenda, 1998), the instructor taught them the mnemonic device, DEMO. For ALgS, DEMO symbolized the actions of preparing displays, organizing environments, providing models, and providing opportunities. For augmented input, using KWS (Meuris et al., 2015; Smidt et al., 2019), DEMO represented the acts of preparing with a dictionary, organizing environments, providing models, and providing opportunities.

Lastly, the instructor taught the participants the mnemonic cues, PORE, and “Daily Language Learning In Child’s Context” to help them memorize the higher and lower-level facilitative language techniques (DesJardin, 2006). For the higher-level facilitative language techniques, PORE symbolized the strategies, parallel talk, open-ended questions, recast, and expansion. For the lower-level facilitative language techniques, “Daily Language Learning In Child’s Context” represented the strategies, directive, label, linguistic mapping, imitation, closed-ended questions, and comment.

In Stage 3: Strategy Demonstration, the instructor reviewed KWS as well as modeled and described the ASL manual alphabet, ASL manual signs with their mnemonic cues, and coding or signing the content words in spoken phrases. After the instructor presented each manual letter and sign in isolation or combinations (i.e., phrases), the participants imitated the letters and signs, and the instructor provided feedback as needed. Further, as the ASL manual alphabet, ASL signs, and KWS were modeled, the instructor thought aloud and modeled self-cueing, problem-solving, and progress monitoring.

For Stage 4: Verbal Practice of Strategy Steps, the participants named, described, and explained the importance of KWS’s steps or principles. Then, the communication partners used rote rehearsal to memorize the primary KWS principles (i.e., the mnemonic cue, “Say it. Sign it. Show it”). Please note that this stage was completed between Stage 2: Strategy Description and Stage 3: Strategy Demonstration.

In Stage 5: Controlled Practice and Feedback, the participants practiced using ASL signs and KWS in a controlled environment (i.e., whole group instruction during the workshop) while the instructor gradually faded prompts, cues, and feedback. To provide controlled or guided practice for ASL signs in isolation (Gunter et al., 1995), the instructor named or produced a

target sign so that the participants could either produce the sign named or name the sign produced (Fitzgerald et al., 1984). The instructor provided feedback, and the participants practiced the signs until all the signs were produced or named accurately. To provide guided practice for ASL signs in combinations (i.e., sentences), the instructor showed the participants sentences and asked them for new sentences containing words (or signs) taught. The instructor also asked the participants to identify the keywords in the sentences, modeled simultaneously speaking and signing the sentences (i.e., using KWS), and asked them to imitate simultaneously speaking and signing the sentences. The instructor provided feedback as well as reinforced speaking, signing, and using facial expressions and an emotive voice (Scope, 2019).

In Stage 6: Advanced Practice and Feedback, the participants independently practiced producing ASL signs and using KWS while the instructor gradually faded support and guidance (Kent-Walsh & Naughton, 2005; Ogletree et al., 2016). Kent-Walsh and Naughton (2005) suggested that communication partners practice using the strategy in natural environments for Stage 6: Advanced Practice and Feedback; however, for this study, the instructor provided the participants with assistance while they independently practiced using KWS in small groups during the workshop. To provide independent practice (Gunter et al., 1995), first, the instructor paired the participants and gave them word cards or a word list with the signs taught. Then, the participants practiced the target signs by giving one another a turn to name or producing a sign so that the other could produce the sign named or name the sign produced (Fitzgerald et al., 1984; Meuris et al., 2015b). Moreover, the participants generated phrases and sentences containing two to four signs taught; identified the keywords in the sentences; practiced saying and signing the sentences in pairs; shared (i.e., say and sign) a sentence with the group; and practiced saying and signing the sentences shared as a group (Meuris et al., 2015b; Scope, 2019).

For Stage 7: Posttest and Commitment to Long-Term Strategy Use, the instructor helped the participants create communication action plans for maintaining and generalizing the strategy; that is, the participants completed a KWS workshop communication action plan, which asked the participants to identify (a) teaching/learning and nonteaching/nonlearning activities during which they will sign, (b) signs taught during the workshop that they will use throughout these activities, (c) other signs that they need to learn for these activities, and (d) language response strategies/facilitative language techniques that they will use during these activities (Bonvillian et al.; Scope, 2019; see Appendix O for the KWS workshop communication action plan). Next, after the workshop, the instructor retested the three participants' spontaneous use of KWS and the communicative participation of individuals with CCN in natural environments using observations (or expressive KWS assessments). The instructor also retested all the participants' expressive and receptive sign knowledge using expressive and receptive sign assessments. Lastly, the instructor compared the expressive KWS, expressive sign, and receptive sign assessment posttest results with the corresponding pretest results.

Each participant was given three handouts in a folder. The first handout contained an outline listing the steps for KWS, ALgS, augmented input, language response strategies/facilitative language techniques, LTM prompting, and vocabulary selection, as well as resources for semantic, syntactic, and pragmatic functions and ASL (see Appendix P for the introduction to key word signing [KWS] handout). The second handout listed the KWS vocabulary by word class (i.e., nouns, verbs, adjectives, adverbs, pronouns, and prepositions). The second handout also identified vocabulary or ASL signs that were like natural gestures (e.g., DOWN, I, THERE) and vocabulary that was produced using natural gestures (i.e., HELLO, NO, YES; See Appendix Q for the KWS Workshop Vocabulary handout). Lastly, the third handout contained the memory

aids (i.e., sign parameters [location, handshape, orientation, and movement] and sign-referent relationships) for the ASL signs in the KWS vocabulary (see Appendix R for the KWS vocabulary memory aids handout).

Please note that an ASL instructor from a local community college reviewed the parameter descriptions (for the 79 ASL signs delineated on the memory aids handout) for accuracy and provided the researcher with feedback. The ASL instructor then verified the accuracy of the sign parameter descriptions after the researcher made the recommended corrections.

Evaluation and Analysis Methods

As mentioned above, for Stages 1 and 7 of the CPI model, the instructor pretested and posttested all of the participants' receptive and expressive sign knowledge using receptive and expressive sign assessments. The instructor also pretested and posttested the three participants' spontaneous use of KWS and the communicative participation of individuals with CCN in natural environments using observations or expressive KWS assessments. However, not mentioned above, the instructor evaluated the participants' reaction to the workshop as well as their learning and application of the knowledge and skills that they acquired during the workshop using surveys (i.e., acceptability questionnaire and supplemental questions) and semi-structured interviews.

Therefore, six evaluation methods were used to collect data. The methods included a receptive sign assessment, an expressive sign assessment, supplemental questions, an expressive KWS assessment (or observation), an acceptability questionnaire, and semi-structured interviews. The receptive sign assessment was used to determine the number of manual signs accurately identified by the participants. The expressive sign assessment was used to determine

the number of manual signs accurately produced by the participants. The supplemental questions were used to determine the number of signs consistently used, the consistency of sign use, and the participants' experiences and/or thoughts on using signs in their classroom or therapy room. The expressive KWS assessment was used to evaluate the participant's functional use of KWS in their classroom or therapy room. The acceptability questionnaire and semi-structured interviews measured the social validity of the KWS workshop.

KWS Vocabulary Assessment

A KWS vocabulary assessment was created to determine which of the 79 ASL signs in the KWS workshop vocabulary were guessable so that balanced lists of signs (i.e., similar in difficulty) could be created for the expressive and receptive sign assessments. Eleven adults (i.e., age 18 years or older) with no ASL manual sign knowledge or skill were recruited due to their convenience and availability; therefore, a nonprobability or convenience sample was used based on the definition provided by Creswell & Creswell (2018).

The KWS vocabulary assessment was developed and distributed via the Internet using Qualtrics. The adults completed the assessment by watching videos of the ASL signs, guessing the meaning of the signs, and typing their guesses in the text boxes under the videos and questions (i.e., "What is this sign?"). The researcher created the ASL sign videos with the assistance of a videographer. In each video, the researcher produced one target sign one time.

The researcher and a rater separately scored the assessments by assigning one point for a correct guess and zero points for an incorrect guess. A correct guess included the referent (i.e., the word/phrase the manual sign represents), a derivative, or synonym in isolation, or an unambiguous phrase/sentence context. Next, the researcher and the rater added the points for correct guesses to calculate a score (i.e., the total number of correct guesses) for each ASL sign.

At first, 10 ASL sign scores were different; however, after the researcher and rater discussed the differences and the adult's responses, one score was changed, which resulted in nine ASL sign scores being different. The researcher's and rater's discussions also resulted in a list of correct responses for each ASL sign (i.e., an answer key for the expressive-receptive sign assessments) being developed and a change in the wording of the instructions for the receptive section of the expressive-receptive sign assessments. On the KWS vocabulary assessment, the participants used one to 12 words to tell the meanings of the signs; therefore, for the receptive section of the expressive-receptive sign assessments, the participants were instructed to tell the researcher the one or two words that tell the meaning of the signs.

To calculate the interrater agreement for the KWS vocabulary assessment, the researcher counted the number of ASL sign scores that were in agreement, which was 70. Then, the number of scores in agreement (70) was divided by the total number of scores or ASL signs (79). Last, the quotient was multiplied by 100 to calculate the percentage of scores in agreement, which yielded an interrater agreement of 88.61%.

To determine which of the 79 ASL signs would be labeled guessable, the researcher decided that the signs with a score equal to or greater than seven (i.e., seven or more participants correctly guessed the sign's meaning) could be correctly identified by chance and, thereby, were designated as guessable. An ASL sign score of seven or greater was chosen because it was one point above the median number of participants, which was six. Given the cut-off score of seven, eight ASL signs were labeled guessable. The signs were BREAK, DRINK, EAT/FOOD, GIVE, HOUSE, OPEN, THROW, and TIME.

To create the balanced lists of signs (i.e., similar in difficulty) for the expressive-receptive sign assessments, the ASL signs were divided into four lists (i.e., List 1, List 2, List 3,

and List 4) and numbered. The signs were separated according to the number of participants who correctly guessed the sign's meaning. List 1 contained 39 signs, that no participants correctly guessed the signs' meanings. List 2 consisted of 21 signs, that one or two participants correctly guessed the signs' meanings. List 3 contained 11 signs that three to six participants correctly guessed the signs' meanings. List 4 consisted of eight signs that seven to 11 participants correctly guessed the signs' meanings (i.e., the guessable signs).

An online research randomizer (Urbaniak & Plous, n.d.) was used to generate two sets of numbers in random order for each sign list, so eight sets (or four pairs) of random numbers were produced. The signs on each list were then placed in the order suggested in the corresponding sets of random numbers; therefore, eight lists of signs were created (i.e., List 1-E, List 1-R, List 2-E, List 2-R, List 3-E, List 3-R, List 4-E, and List 4-R). One set in each pair was used to make the expressive (E) sign assessments, and the other set was used to create the receptive (R) sign assessments.

After the eight expressive and receptive sign lists were made, each sign list was divided into six equal parts (i.e., Part 1, Part 2, Part 3, Part 4, Part 5, and Part 6). Then, the same numbered parts from the receptive sign lists were put together to create six receptive sign assessments; for example, Part 1 from Lists 1-R, 2-R, 3-R, and 4-R were combined to make one receptive sign assessment. This step was repeated for the expressive sign lists to make six expressive sign assessments. The remaining signs on each sign list (i.e., three signs on Lists 1-E and 1-R, three signs on Lists 2-E and 2-R, five signs on Lists 3-E and 3-R, and two signs on List 4-E and 4-R) were evenly distributed onto the expressive and receptive sign assessments. This resulted in five expressive and receptive sign assessments containing 13 signs each and one expressive and receptive sign assessment having 14 signs each.

To randomize the order of the signs in the expressive and receptive sign assessments (i.e., List 1-E, List 1-R, List 2-E, List 2-R, List 3-E, List 3-R, List 4-E, List 4-R, List 5-E, List 5-R, List 6-E, and List 6-R), 10 sets of random numbers, ranging from one to 13, and two sets of random numbers, ranging from one to 14, were generated. The signs on each list were then placed in the order recommended in the corresponding sets of random numbers. Next, the randomized or balanced expressive and receptive sign lists (12 total) were paired to produce six expressive-receptive sign assessments; that is, List 6-E and List 1-R became E/R Test 1, List 2-E and List 2-R became E/R Test 2, List 3-E and List 3-R became E/R Test 3, List 4-E and List 4-R became E/R Test 4, List 5-E and List 5-R became E/R Test 5, and List 1-E and List 6-R became E/R Test 6. Four of the expressive-receptive sign assessments (i.e., E/R Test 2, E/R Test 3, E/R Test 4, and E/R Test 5) had 26 signs total, and two of the expressive-receptive sign assessments (i.e., E/R Test 1 and E/R Test 6) had 27 signs total.

Last, the expressive-receptive sign assessments were reviewed to make sure that the words in the expressive section were not identical to the words in the receptive section. If the same word was in the expressive and receptive sections of an expressive-receptive sign assessment, then the duplicate word was removed from the expressive section, placed in the expressive section of another expressive-receptive sign assessment with a duplicate word, and then replaced with the duplicate word from the expressive section of the other expressive-receptive sign assessment.

With respect to the receptive and expressive sign assessments, the adult participants were randomly assigned one of the six expressive-receptive sign assessments (i.e., E/R Test 1, E/R Test 2, E/R Test 3, E/R Test 4, E/R Test 5, and E/R Test 6) for the pretest using the online research randomizer (Urbaniak & Plous, n.d.). They were then given all six expressive-receptive

sign assessments one at a time in random order (as decided by the online research randomizer) over 12 weeks for the posttests.

Receptive Sign Assessment

Following a pretest-posttest design with repeated posttest measures over time to determine the effect of a KWS workshop on the participants' skill identifying the 79 ASL signs taught during the KWS workshop (Research Question 1; Level 2 Learning), the participants' manual sign identification skills were tested one time before a workshop and six times after the workshop. Specifically, the pretest receptive sign assessment data were collected within one week before the workshop(s); and the posttest receptive sign assessment data were collected within 1, 3, 5, 7, 9, and 11 work weeks after the workshop(s) using Zoom video conferencing. Please note that the staff's nonwork days or weeks (i.e., Thanksgiving and winter break) were not counted when the weeks during which the receptive sign assessments would be given were decided.

For the receptive sign assessment, the participants identified manual signs taught, during the workshops, in isolation. To assess the participants' sign identification in isolation, the participants were evaluated individually by the researcher. During the assessments, the participants watched a video recording of 13 or 14 signs produced without speech on a phone or computer. Each sign was presented three times in the video. After the third presentation of a sign, or during the presentation of the sign, the participant told the researcher one or two words that described the sign's meaning. The researcher then wrote the word(s) associated with the signs produced on a Receptive Sign Assessment form (see Appendix S for the receptive sign assessment). Once the assessments were completed, the researcher scored the participants'

assessments by assigning one point for an accurate sign identification and zero points for an inaccurate sign identification (see Appendix T for the receptive sign rubric).

Receptive Sign Analysis

The data collected during the receptive sign assessment for manual signs produced in isolation were ratio based on the definition given by Coladarci and Cobb (2014). The data were ratio because the manual signs identified in isolation were assigned one point for an accurate sign identification and zero points for an inaccurate sign identification. The points assigned were then counted and used to determine the number of manual signs accurately identified by the in-service special education teachers and SLPs before and after the workshop.

As a result of the data being ratio and sample size being small (i.e., $n = 8$), the summarization and analysis strategies for behavioral data described by Riley-Tillman and Burns (2009) were used to evaluate the participants' separate and composite total sign identification scores from the preworkshop and postworkshop receptive sign assessments. First, the participants' seven separate and combined total sign identification scores were summarized using a visual format (i.e., Microsoft Excel A-B line graphs). Next, changes between the preworkshop and postworkshop phases (i.e., the preworkshop receptive sign assessment and the first postworkshop receptive sign assessment) were analyzed using immediacy or latency of change. Last, changes in the postworkshop phase were evaluated using trend (i.e., the slope of their six postworkshop total identification scores), level (i.e., the mean of their six postworkshop total identification scores), and variability (i.e., the range and standard deviation of their six postworkshop total identification scores). The means and standard deviations for the six postworkshop total sign identification scores and the seven composite preworkshop and postworkshop total sign identification scores were calculated using Microsoft Excel.

Expressive Sign Assessment

Adhering to a pretest-posttest design with repeated posttest measures over time to determine the effect of a KWS workshop on the participants' skill in producing the 79 ASL signs taught during the KWS workshop (Research Question 2; Level 2 Learning), the participants' manual sign production skills were tested one time before a workshop and six times after the workshop. Specifically, the pretest expressive sign assessment data were collected within one week before the workshop(s); and the posttest expressive sign assessment data were collected within 1, 3, 5, 7, 9, and 11 work weeks after the workshop(s) using Zoom video conferencing. Please note that, like the receptive sign assessment, the staff's nonwork days or weeks (i.e., Thanksgiving and winter break) were not counted when the weeks during which the expressive sign assessments would be administered were chosen.

For the expressive sign assessment, the participants produced manual signs taught during the workshops in isolation. To assess the participants' sign production in isolation, the participants were evaluated individually by the researcher. During the assessments, the participants produced the sign for a word read aloud from a prepared list by the researcher. Six sign lists (on which the signs differed) were prepared and used for the assessments, and the assessments were video recorded.

The manual signs produced or not produced in isolation were scored on a four-point scale that ranges from 0 to 3, similar to Chadwick and Jolliffe (2008). An accurate sign production was given three points. A partially accurate sign production was given two points. An inaccurate sign production was given one point. No sign production was given zero points if a participant did not attempt, know, or remember a sign. However, Chadwick and Jolliffe (2008) did not define an accurate sign production, a partially accurate sign production, or an inaccurate sign production.

Doherty (1985) described the four critical parameters or components of manual signs, which include the necessary handshape, location (i.e., hand and finger position in relation to the body), orientation (i.e., direction the palm is facing in relation to the body), and movement. Thus, an accurate sign production was defined as a manual sign production that included all four critical components of the target sign. A partially accurate sign production was defined as a manual sign production that included two or three of the four critical components of the target sign. An inaccurate sign production was defined as a manual sign production that included one of the four critical components of the target sign. No sign production was defined as no attempt to produce a manual sign or a manual sign production that included none of the four critical components of the target sign.

To score the expressive sign assessments, or the production and nonproduction of manual signs, the researcher independently reviewed 56 video recordings of the manual signs produced or not produced by the participants (i.e., eight pretest measures and 48 posttest measures). For the interrater agreement, a rater independently reviewed 20% (i.e., 11 of 56) of the expressive sign assessment video recordings as suggested by Kratochwill et al. (2010). The 11 expressive sign assessments were selected using an online research randomizer (Urbaniak & Plous, n.d.).

As the researcher and rater reviewed the video recordings, they independently scored the signs produced as an accurate sign production (3), a partially accurate sign production (2), or an inaccurate (1) sign production. For the signs not produced, the researcher and rater scored the sign as “no sign production” (0; see Appendix U for the expressive sign rubric). Next, the sign production scores recorded by the independent rater were compared to the sign production scores recorded by the researcher. If the sign production scores recorded by the rater and researcher

matched for a sign production, then the rater and researcher were considered in agreement for the sign production.

To calculate the interrater agreement for the production and nonproduction of manual signs (i.e., the expressive sign assessments), the researcher counted the number of sign production scores in agreement and the total number of sign production scores. Next, the number of scores in agreement (102) was divided by the total number of scores (145). Last, the quotient was multiplied by 100 to calculate the percentage of scores in agreement, which yielded an interrater agreement of 70.34%.

The minimum acceptable values for interrater agreement range from 80% to 90%, according to Hartmann et al. (2004). Because 70.34% was not an acceptable value, the researcher and rater reviewed the 11 expressive sign assessments selected for the interrater agreement and discussed the differences between the sign production scores. Consequently, the researcher changed seven scores, and the rater altered 39 scores, which resulted in an interrater agreement of 100%.

The discrepancies in the sign production scores were due to slight differences in handshape (e.g., “flat B” vs. “open B”), location (e.g., right side of face vs. in front of face), orientation (e.g., palm facing left vs. palm facing body), and movement (e.g., repeated movement vs. single movement). Therefore, the research and rater decided that the participants must produce the sign parameters as described in the KWS vocabulary memory aids during the expressive sign assessments to be assigned points, except for the movement parameter for directional verbs (e.g., for TAKE, the right “flat B” or “bent 5” hand may quickly move from the right or left side of the body to the left or right side). As a result, the original descriptions of five ASL signs were modified to improve their accuracy and include acceptable variations (see Table

3-3 for the original and revised descriptions of the location, handshape, or movement parameters for the five ASL signs). Further, the definition of “no sign production” was revised to include two-handed signs produced with one hand, one-handed signs produced with two hands, and sign productions recognized as another ASL sign (e.g., FOOD for EAT). Lastly, the researcher reviewed the 45 expressive sign assessments, which were not scored by the independent rater, and rescored the ASL signs affected by the revisions.

Table 3-3

Original and Revised Descriptions of Sign Parameters for Five ASL Signs in the KWS Vocabulary Memory Aids

ASL sign	Original description(s)	Revised description(s)
COAT	Movement: Arc downward toward waist.	Movement: Arc downward toward waist so that palms face body/waist.
GO	Location: In front of waist. Left hand is closer to body than right hand.	Location: In front of body. Left hand is closer to body than right hand.
KNOW	Handshape: Right “bent B”/“open B” hand.	Handshape: Right “flat B” (fingers may be slightly bent at the base)/“bent B” (gap between thumb and edge of hand may be present [“open B”]) hand.
SIT	Movement: Put right curved “U” hand across top of left curved “U” hand, then move both hands down (together) a few inches. Note: One movement represents the verb SIT, and two movements represent the noun CHAIR.	Movement: Put the right curved “U” hand across the top of the left curved “U” hand. Both hands may be moved down (together) a few inches. Note: SIT may be produced with right curved “U” hand across the top of the left “U” hand. One movement represents the verb SIT, and two movements represent the noun CHAIR.
DIFFERENT	Movement: Move index fingers outward and apart.	Movement: Arc index fingers outward and apart so that palms face outward-downward. Movement may be repeated.

Expressive Sign Analysis

The data collected during the expressive sign assessment for manual signs produced in isolation were ordinal based on the definition provided by Coladarci and Cobb (2014). The data were ordinal because the manual signs produced or not produced in isolation were scored on a four-point scale. The points scored were used to determine the number of manual signs accurately produced by in-service special education teachers and SLPs.

Due to the data being ordinal and the sample size being small (i.e., $n = 8$), the summarization and analysis strategies for behavioral data delineated by Riley-Tillman and Burns (2009) were used to appraise the participants' separate and composite total sign production scores from the preworkshop and postworkshop expressive sign assessments. First, the participants' seven separate and combined total sign production scores were summarized using a visual format (i.e., Microsoft Excel A-B line graphs). Next, changes between the preworkshop and postworkshop phases (i.e., the preworkshop expressive sign assessment and the first postworkshop expressive sign assessment) were analyzed using immediacy or latency of change. Last, changes within the post-workshop phase were evaluated using trend (i.e., the slope of their six postworkshop total production scores), level (i.e., the mean of their six postworkshop total production scores), and variability (i.e., the range and standard deviation of their six postworkshop total production scores). The means and standard deviations for the six postworkshop total sign production scores and the seven composite preworkshop and postworkshop total sign production scores were calculated using Microsoft Excel.

Supplemental Questions

In accordance with the posttest measures of the pretest-posttest design with repeated posttest measures over time, the adult participants completed the supplemental questions for the expressive-receptive sign assessments via the Internet using Qualtrics six times after a KWS workshop; that is, within 1, 3, 5, 7, 9, and 11 work weeks after the workshop they attended. The staff's nonwork days or weeks (i.e., Thanksgiving and winter break) were not counted when the weeks during which the supplemental questions would be distributed were decided. The Internet was used because it was inexpensive, and the participants had Internet access at the schools where they worked. An invitation to complete the survey was emailed, using Qualtrics, to the participants who attended the KWS workshops.

The participants completed one close-ended (i.e., structured/fixed response) and two open-ended (i.e., nonstructured) questions to discover the effect of a KWS workshop on the participants' use of KWS in the classroom or therapy room (Research Question 3; Level 3 Behavior). Questions 1 and 2 were similar to questions asked by Spragale and Micucci (1990) on a participant questionnaire used to assess the effectiveness of a Sign of the Week program.

Question 1 asked, "Approximately how many signs do you use consistently during classroom or therapy room activities?" Question 2 inquired, "How do you rate the consistency of your sign use as compared to before the KWS workshop?" for the first postworkshop measure and, "How do you rate the consistency of your sign use as compared to two weeks ago?" for the second, third, fourth, fifth, and sixth postworkshop measures. Question 3 stated, "Please use the space below to share your experiences and/or thoughts on using signs in your classroom or therapy room."

Supplemental Questions Analysis

The data collected using the supplemental questions were ordinal and descriptive. The Likert-type, close-ended question produced ordinal data, and the descriptive, open-ended questions provided information on the questions' topic or descriptive data based on the definition given by Dillman et al. (2014). Descriptive statistics were used to analyze the participants' responses to the close-ended question, which used a seven-point, continuous scale. The participants' responses to the open-ended questions were analyzed by organizing their answers into categories.

To calculate the descriptive statistics, the participants' responses to, or choice text for, the close-ended/continuous scale questions were converted to numeric values by Qualtrics CSV export; for example, Significantly worse was changed to one, Moderately worse was changed to two, Slightly worse was changed to three, No difference was changed to four, Slightly better was changed to five, Moderately better was changed to six, and Significantly better was changed to seven. Then the means and standard deviations for the responses/choices were calculated using Microsoft Excel.

Expressive KWS Assessment

Following an A-B single case design to find out the effect of a KWS workshop on the participants' use of KWS in the classroom or therapy room (Research Question 3; Level 3 Behavior), three adult participants' (i.e., P2, P5, and P6) and four minor participants' (i.e., S1, S2, S3, and S4) KWS use, or production skills were observed a total of eight times before and after a workshop. Six additional participants (i.e., two adult participants and four minor participants) consented to be observed; but, due to COVID-related and behavioral issues, three preworkshop observations were not completed for one adult, and one minor and five

postworkshop observations were not completed for one adult and three minors, so their observations were excluded from the analysis.

The seven participants (i.e., three adult and four minor participants), who agreed to and completed the observations, formed two dyads and one triad. The dyads consisted of a special education teacher (P2) and a student (S1) and an SLP (P5), and a student (S2). The triad was composed of a special education teacher (P6) and two students (S3 and S4).

The pretest expressive KWS assessment data were collected (i.e., the observations were conducted) three times before the workshops, and the posttest expressive KWS assessment data were collected five times after the workshops. The timing of the preworkshop and postworkshop observations were made known to the adult participants, but the purpose of the observations was not made known to them so that their communication remained as natural as possible like Meuris et al. (2015).

To assess the participants' KWS use in a classroom or therapy room, the participants were individually evaluated by the researcher. During the assessments or observations, the adult participants elicited spontaneous or natural conversation samples by engaging in a 15-minute conversation with their student(s) (i.e., minor participants) in a classroom or therapy room. Specifically, the participants were instructed to interact or converse with their student(s) so that the researcher could observe them and their student(s) communicating with one another. The researcher recorded the observations or conversation samples and then divided the 15-minute videos into 5-minute segments. To control for reactivity, the researcher analyzed the second 5-minute segment of the video recordings similar to Douglas et al. (2013).

A signed utterance was defined as an utterance produced using one or more ASL signs with or without spoken language. The guidelines for the boundaries of a spoken utterance, which

assisted with determining the boundaries of the signed utterances, were outlined by Owens (1991) as follows:

- Sentences and phrases (or partial sentences) are utterances.
- “Run-on sentences with *and* should contain no more than one *and* joining clauses” (p. 81).
- False starts, nonfluencies (or nonfluent units), and fillers are not counted in the utterances.
- “Pauses, voice drops, and/or inhalations mark boundaries” (p. 81).
- Situational and nonlinguistic cues, as well as linguistic context, help determine boundaries.

The adult participants’ manual signs were included if the researcher and/or rater recognized them. The minor participants’ manual signs (i.e., correct productions and approximations) were included if they were recognized by the adult participant, researcher, and/or rater. A manual sign was excluded if the ASL sign did not match the spoken word; for example, an adult participant said, “go,” but signed, GET. However, the ASL sign NO was included if it was used for negation (e.g., rejection, nonexistence/disappearance, cessation of action, or prohibition of action) as explained by Fristoe and Lloyd (1980); for instance, an adult participant said, “don’t,” but signed NO. For the minor participants, a sign was included if it was produced without prompting or with verbal cues and/or visual models. Signs were not included if they were produced with full physical guidance. Lastly, spoken and signed repetitions were included because the adult participants used focused stimulation, which involves repeated productions of targets (e.g., words and signs) throughout adults’ and minors’ interactions as described by Fey (1986).

To score the expressive KWS assessments, or observations, the researcher independently reviewed the second 5 minutes of the 24 15-minute video recordings of the conversation samples, with the minor participants, elicited by the adult participants. For the interrater agreement, a rater independently reviewed 20% (i.e., 5 of 24) of the 5-minute expressive KWS assessment video recordings as suggested by Kratochwill et al. (2010). The five expressive KWS assessments were selected using an online research randomizer (Urbaniak & Plous, n.d.).

While the researcher and rater reviewed the video recordings, they independently recorded the number of signed utterances, number of signs, and number of different signs (i.e., KWS measures) produced by the adult and minor, or student, participants (Meuris et al., 2015; see Appendix V for the participant KWS rubric and Appendix W for the student KWS rubric). Next, the number of the signed utterances, signs, and different signs recorded by the examiner and independent rater for each adult and minor participant were compared. If the number of the signed utterances, signs, or different signs recorded by the examiner and rater matched for a participant, then the examiner and rater were considered in agreement for the KWS measure(s).

To calculate the interrater agreement for expressive KWS assessments, the researcher counted the number of signed utterances, signs, and different signs produced by the participants and students that were in agreement and the total number of the number of signed utterances, signs, and different signs produced by the participants and students. Next, the number of signed utterances, signs, and different signs produced by the participants and students that were in agreement were divided by the total number of signed utterances, signs, and different signs produced by the participants and students. Last, the quotient was multiplied by 100 to calculate the percentage of scores in agreement.

As seen in Table 3-4, the total number of scores in agreement for the number of signed utterances was six (out of 12), which yielded an interrater agreement percentage of 50%. As shown in Table 3-5, the total number of scores in agreement for the number of signs was five, which resulted in an interrater agreement of 41.67%. As seen in Table 3-6, the total number of scores in agreement for the number of different signs was seven, which yielded an interrater agreement of 58.33%.

Table 2-4

Expressive KWS Assessment/Observation Interrater Reliability Data for Number of Signed Utterances

Participant and student #	Expressive KWS assessment #	Researcher signed utterance score	Rater signed utterance score	# scores in agreement
P2	1	3	3	1
S1	1	0	0	1
P5	2	18	18	1
S2	2	1	0	0
P5	5	29	28	0
S2	5	1	1	1
P6	1	7	11	0
S3	1	8	4	0
S4	1	0	0	1
P6	6	2	4	0
S3	6	0	4	0
S4	6	0	0	1
Total				6

Table 3-5*Expressive KWS Assessment/Observation Interrater Reliability Data for Number of Signs*

Participant and student #	Expressive KWS assessment #	Researcher signed utterance score	Rater signed utterance score	# scores in agreement
P2	1	4	4	1
S1	1	0	0	1
P5	2	23	26	0
S2	2	1	0	0
P5	5	39	38	0
S2	5	1	1	1
P6	1	7	11	0
S3	1	8	4	0
S4	1	0	0	1
P6	6	2	4	0
S3	6	0	4	0
S4	6	0	0	1
Total				5

Table 3-6*Expressive KWS Assessment/Observation Interrater Reliability Data for Number of Different**Signs*

Participant and student #	Expressive KWS assessment #	Researcher signed utterance score	Rater signed utterance score	# scores in agreement
P2	1	3	3	1
S1	1	0	0	1
P5	2	10	13	0
S2	2	1	0	0
P5	5	23	22	0
S2	5	1	1	1
P6	1	4	8	0
S3	1	4	4	1
S4	1	0	0	1
P6	6	2	2	1
S3	6	0	2	0
S4	6	0	0	1
Total				7

The minimum acceptable values for interrater agreement range from 80% to 90%, according to Hartmann et al. (2004). Because 50% (signed utterances), 41.67% (signs), and 58.33% (different signs) were not acceptable values, the researcher and rater reviewed the five expressive KWS assessments that were selected for the interrater agreement together and discussed the differences between the scores for the KWS measures. Consequently, the researcher changed four scores and the rater altered 17 scores (out of 36), which resulted in an interrater agreement of 100%.

The discrepancies in the scores for the KWS measures (i.e., number of signed utterances, signs, and different signs) were due to the researcher knowing ASL signs and the rater knowing

SEE signs. The adult and minor participants produced ASL signs, so the researcher recognized more manual signs than the rater.

Expressive KWS Analysis

The data collected during the expressive KWS assessments were ratio. The data were ratio because the number of signed utterances, signs, and different signs produced by the adult and minor participants were counted and totaled (Coladarci & Cobb, 2014; Meuris et al., 2015). As a result of the data being ratio and sample size being small (i.e., $n = 7$), the summarization and analysis strategies for behavioral data described by Riley-Tillman and Burns (2009) were used to assess the total number of signed utterances, signs, and different signs produced by each participant throughout the preworkshop and postworkshop expressive KWS assessments, or observations.

First, the total number of signed utterances, signs, and different signs produced by each participant during each observation were summarized using a visual format (i.e., Microsoft Excel A-B line graphs). Then, changes between the preworkshop and postworkshop phases (i.e., the third preworkshop observation and the first postworkshop observation) were analyzed using immediacy or latency of change. Next, changes in the preworkshop and postworkshop phases were evaluated using trend (i.e., the slope of their three preworkshop and five postworkshop totals), level (i.e., the mean of their three preworkshop and five postworkshop totals), and variability (i.e., the range and standard deviation of their three preworkshop and five postworkshop totals). The means and standard deviations of the total number of signed utterances, signs, and different signs for the three preworkshop observations and five postworkshop observations were calculated using Microsoft Excel. Last, the percentage of nonoverlapping data (PND) was calculated for each participant by dividing the total number of

postworkshop data points (i.e., five) by the number of points above the greatest preworkshop (i.e., baseline) data point and then multiplying the quotient by 100.

Social Validity Assessment

A questionnaire (i.e., a subjective evaluation approach) and semi-structured interviews were used to assess the training program's social significance.

Acceptability Questionnaire

The participants (i.e., the direct stakeholders or primary training recipients) completed the questionnaire so that social validation data on proximal outcomes (i.e., outcomes directly related to the training program) were collected. The questionnaire contained seven close-ended (i.e., structured/fixed response) and seven open-ended (i.e., nonstructured) questions that assessed the participants' perceived changes from taking part in the training program using Kirkpatrick's four-level training evaluation model or blended evaluation approach (Kirkpatrick & Kirkpatrick, 2016; Schlosser, 1999).

Question 1 asked about the participants' job title. Questions 2, 3, 4, 8, 9, 10, and 11 evaluated the degree to which the participants were actively involved and interested in the workshop (Level 1 Reaction: Engagement), had the opportunity to apply the workshop material to their work (Level 1 Reaction: Relevance), and were pleased or content with the KWS workshop (Level 1 Reaction: Customer Satisfaction; Kirkpatrick & Kirkpatrick, 2016). Questions 5, 6, and 7 appraised the degree to which the participants believed the workshop material was worthwhile to implement on the job (Level 2 Learning; Attitude), had the ability to apply the workshop material to their work (Level 2 Learning; Confidence), and planned to implement the workshop material on the job (Level 2 Learning; Commitment; Kirkpatrick & Kirkpatrick, 2016; See Appendix X for the acceptability questionnaire).

The acceptability questionnaire data were collected via the Internet using Qualtrics in the 1st week after the workshop. The Internet was used because it is inexpensive, and the participants had Internet access at the schools where they worked. An invitation was emailed to the participants who attended the KWS workshop(s) to distribute the survey.

Acceptability Questionnaire Analysis

The data collected using the acceptability questionnaire were ordinal and descriptive. The Likert-type, close-ended questions produced ordinal data; and the descriptive, open-ended questions provided information on the questions' topic or descriptive data based on the definition provided by Dillman et al. (2014). Descriptive statistics were used to analyze the participants' responses to the close-ended questions, which used six-point, continuous scales. The participants' responses to the open-ended questions were analyzed by organizing their answers into categories.

To calculate the descriptive statistics, the participants' responses to, or choice text for, the close-ended/continuous scale questions were converted to numeric values by Qualtrics CSV export; for example, Strongly disagree was changed to one, Moderately disagree was changed to two, Slightly disagree was changed to three, Slightly agree was changed to four, Moderately agree was changed to five, and Strongly agree was changed to six. Then the means and standard deviations for the responses/choices were calculated, using Microsoft Excel.

Semi-structured Interviews

Each participant was interviewed, individually, four times via Zoom video conferencing. The interviews were conducted immediately after the expressive and receptive manual sign assessments within the 5th, 7th, 9th, and 11th work week (i.e., during Weeks 6, 8, 10, and 12)

after the workshops. A semi-structured interview guide was used, and questions were added to clarify the special education teachers' and SLPs' perspectives on topics.

The interview questions assessed whether the participants had applied the workshop material to their work (Level 3 Behavior; Kirkpatrick & Kirkpatrick, 2016), what assisted them with implementing the workshop material on the job, and what additional support(s) they needed to implement the workshop material on the job (Required Drivers; Level 3 Behavior). The questions also ascertained the positive outcomes that the participants experienced due to implementing the workshop material on the job (Level 4 Results: Leading Indicators).

To discover whether the participants applied the workshop material to their work (Level 3 Behavior), they were asked:

- Have you used KWS in your classroom/therapy room since the workshop?
- How have you used KWS in your classroom/therapy room?
- Tell me about the activities (teaching/nonteaching) during which you have used KWS.
- Tell me about the student(s) with whom you have used KWS.

To determine what assisted them with implementing the workshop material on the job (Required Drivers; Level 3 Behavior), the participants were asked:

- What supports you have received to help you use KWS in your classroom/therapy room?
- What has helped you use KWS during these activities?
- What has helped you use KWS with these students?
- What has helped you get around these obstacles?

To find out what additional support(s) they needed to implement the workshop material on the job (Required Drivers; Level 3 Behavior), they were asked:

- What supports do you need to continue to use KWS in your classroom/therapy room?
- What supports do you need to use KWS in your classroom/therapy room?
- What would help you use KWS in your classroom/therapy room?
- What would help you get around these obstacles?

To learn the positive outcomes that the participants experienced due to implementing the workshop material on the job (Level 4 Results: Leading Indicators), the participants were asked:

- What has resulted from you using KWS in your classroom/therapy room?
- Tell me about the benefits of using KWS in your classroom/therapy room.
- Do others use manual signs or KWS in your classroom or therapy room?
- Tell me about the student's/staff member's use of KWS.
- What has resulted from them using KWS in your classroom/therapy room?

In addition to hearing about the positive outcomes that the participants experienced, the interviewer (i.e., researcher) asked them about the challenges that they experienced due to implementing the workshop material on the job (Level 3 Behavior) as follows:

- Tell me about the challenges of using KWS in your classroom/therapy room.
- What has hindered your use of KWS in your classroom/therapy room?
- Tell me about new obstacles you have encountered.

Lastly, to follow-up on questions, from the acceptability questionnaire, about the participants' opportunity to apply the workshop material to their work (Relevance; Level 1 Reaction), the researcher asked:

- What information would you have wanted to be provided, or topics would you have liked to discuss, during the KWS workshop?
- What information or topics could be improved or removed from the KWS workshop?
- Were the ASL signs taught, during the KWS workshop, appropriate for you and your students?
- What ASL signs, which you were taught during the KWS workshop, do you use most? Are there ASL signs you would have wanted to be taught during the KWS workshop? (see Appendix Y for the semi-structured interview guide).

Semi-structured Interview Analysis

The interviews were videotaped and transcribed verbatim by an online transcription service. The researcher compared the interview transcripts to the interview video recordings to verify the transcripts' accuracy and make corrections if needed. Next, the researcher requested member checks via email. The researcher emailed electronic copies of the interviews to the participants and asked them to review the transcripts and verify their accuracy. The researcher told the participants that, during their review, they may edit, clarify, or elaborate on what they said in the interviews. Carlson (2007) recommended that participants be provided with options for member checking; therefore, the researcher told the participants that hard copies or audio recordings of their interviews could be made available to them. The researcher also told the participants that they could share their corrections by writing their amendments directly on printed transcripts or in an email to the researcher as well as by meeting with the researcher using Zoom video conferencing.

Data from the interviews were analyzed using open and focused coding as well as Kirkpatrick's four levels of training evaluation (Bailey, 2007; Kirkpatrick & Kirkpatrick, 2016).

For open coding, the interview transcripts were repeatedly read line by line and codes were assigned. For focused coding, the data with the same or similar codes were organized into groups. Then, the related groups were combined to form larger categories (e.g., KWS uses, challenges, supports, and results), which provided answers to the questions asked to appraise the KWS workshop according to Kirkpatrick's four levels of training evaluation. Lastly, the data in the larger categories were reread, recoded, and regrouped until the resulting categories adequately represented the participants' experience using KWS in their classrooms or therapy rooms with students who relied on AAC.

Summary

This chapter, Chapter 3, reviewed the research purpose and questions and introduced the research hypothesis. Further, it discussed the 12 participants (i.e., 8 adults and 4 minors), settings, intervention method (i.e., KWS workshop), and instruction models (i.e., direct instruction and CPI).

Furthermore, Chapter 3 discussed the convergent mixed methods (i.e., four research designs) and six instruments used to answer the research questions as well as the independent and dependent variables; that is, the pretest-posttest design with repeated posttest measures over time, with the receptive and expressive sign assessments, were used to answer Research Questions 1 and 2. The independent variable was the KWS workshop, and the dependent variables were the number of ASL signs correctly identified and produced. The A-B single-case and survey designs, with the supplemental questions and expressive KWS assessments (observations), were used to answer Research Question 3. For the A-B single-case design, the independent variable was the KWS workshop, and the dependent variables were the number of signed utterances, signs, and different signs. A survey design and phenomenological research,

with the acceptability questionnaire and semi-structured interviews, were used to answer Research Question 4.

Lastly, Chapter 3 discussed the procedures for (a) recruiting the participants; (b) selecting and assessing the KWS vocabulary for the workshop; (c) administering the receptive and expressive sign assessments; (d) completing the expressive KWS assessments (i.e., observations); (e) distributing the surveys (i.e., supplemental questions and acceptability questionnaire); (f) conducting the semi-structured interviews; and (g) analyzing the data from the assessments, observations, surveys, and semi-structured interviews.

The next chapter, Chapter 4, will review the research purpose, questions, and participants. It will also report the results from the instruments or assessments, which were completed before, during, and after the intervention (i.e., KWS workshop), and yielded by the data analyses.

Chapter 4: Findings

This chapter, Chapter 4, reviews the research purpose, questions, and participants. In addition, it reports the results yielded by the data analyses for the personal commitment statements and communication action plans, which were completed during the KWS workshop to follow the CPI model. Chapter 4 also reports the results for the assessments, surveys, and semi-structured interviews, which were completed before and after the workshop in accordance with the pretest-posttest design with repeated posttest measures over time and A-B single-case design.

Research Purpose

The purpose of the study was to examine the effect of a 1-day, 6-hour KWS workshop on in-service special education teachers' and SLPs' manual sign skill and use of KWS with students who relied on AAC.

Research Questions

To determine the effectiveness of a KWS workshop on in-service special education teachers' and SLPs' manual sign skill and use of KWS with students who relied on AAC, the following questions were answered:

1. What is the effect of a KWS workshop on in-service special education teachers' and speech-language pathologists' skill identifying manual signs?
2. What is the effect of a KWS workshop on in-service special education teachers' and speech-language pathologists' skill producing manual signs?
3. What is the effect of a KWS workshop on in-service special education teachers' and speech-language pathologists' use of KWS in the classroom or therapy room?

4. What are in-service special education teachers' and speech-language pathologists' perceived changes from taking part in a KWS workshop?

Research Participants

Five in-service special education teachers, three in-service SLPs, and four students with CNN (aged 3 to 14 years) participated in the study. Four of the special education teachers taught secondary students with moderate or severe disabilities and one taught preschool students with ASD. Two SLPs treated preschool and elementary students and one treated adults (aged 18 to 22 years) with mild, moderate, or severe disabilities.

Personal Commitment Statements

For Stage 1: Pretest and Commitment to Instructional Program, the adult participants wrote personal commitment statements during the KWS workshop (Bornman & Louw, 2019; Kent-Walsh & Naughton, 2005). All eight participants stated that they would use KWS with their students to, for instance, “teach ways to communicate with their students,” “promote a communication rich environment and help language learners acquire signs,” and “facilitate comprehension of their student’s communicative productions.” Three participants reported that they would teach KWS to or model KWS for the staff members, paraeducators, or classmates of students with CNN with whom they work, for example, by incorporating KWS into lessons. One of the three participants said that they would teach KWS to the parents of students with CNN and use KWS in the school community. Two participants indicated that they would use KWS with their children, at home, to facilitate the learning of manual signs in the community. Lastly, one participant expressed that they would practice signs daily to maintain their KWS skills.

Communication Action Plan

For Stage 7: Posttest and Commitment to Long-Term Strategy Use, each participant created a Communication Action Plan, at the end of the workshops, by answering five questions (Bonvillian et al., 2020; Kent-Walsh & Naughton, 2005; Scope, 2019). The first question asked the participants to choose three teaching/learning activities during which they would sign. The secondary special education teachers reported that they would sign during “good morning” (i.e., morning greetings), calendar, cooking (e.g., reading recipes), gardening, social games, and community-based instruction (CBI; e.g., ordering food). They also wrote that they would sign during math, language, reading, and writing groups as well as class discussions and presentations. The preschool special education teacher reported that they would sign during circle time, centers, and structured and unstructured play.

The SLPs wrote that they would sign during push-in and pull-out services. For example, during pull-out (therapy-room-based) sessions, they would sign while asking wh- questions, conversing, expanding utterances, taking turns, and playing with toys. During push-in (classroom-based) sessions, they would sign while playing with friends and teaching whole class lessons in classrooms with students who have mild/moderate disabilities or ASD as well as students who are medically fragile.

The second question asked the participants to choose two nonteaching/nonlearning activities during which they would sign. The special education teachers reported that they would sign during transitions (e.g., walking to the bus; arriving at or leaving school), share (at the beginning of class), break/snack, lunch, recess, and exercise (e.g., walking the track). They also wrote that they would sign during Practicing Academic Concepts & Enrichment (PACE) and Peer Assistance Leadership (PAL) visits when PAL students go to the special education

classrooms and play games with students with moderate/severe disabilities. The SLPs reported that they would sign during transitions (e.g., walking to the therapy room), greetings (e.g., during transitions), snack, and recess.

The third question asked the participants to choose 12 of the 91 signs and gestures (taught during the workshop) they would use throughout the teaching/learning and nonteaching/nonlearning activities. All but one participant chose 12 signs. One participant selected 30 signs. Combined, the participants chose 52 different signs (see Appendix Z for the signs/gestures taught that participants chose to use during teaching/learning or nonteaching/nonlearning activities).

The fourth question asked the participants to choose other signs they needed to learn for the teaching/learning and nonteaching/nonlearning activities. In particular, the special education teachers and SLPs stated that they needed to learn the ASL signs for cars, friends, kick, Play Doh, stay, thank you, yesterday, today, and tomorrow. In general, they expressed that they needed to learn the signs for dates/numbers, days of the week, colors, shapes, adjectives, foods, places, and comments (e.g., cool, awesome). In addition, the participants stated that they needed to learn signs for math, reading (i.e., book-specific vocabulary), cooking, and watering in the garden as well as name signs.

The fifth question asked the participants which three facilitative language techniques they would use during the teaching/learning and nonteaching/nonlearning activities. The higher-level techniques that the participants stated they would use were parallel talk, open-ended questions, recast, expansion, and extension. The lower-level techniques that they expressed they would use were label, linguistic mapping, and closed-ended questions. Lastly, the participants stated that

they would use additional strategies such as environmental sabotage, cloze sentences, modeling, wait time, expectant look, and commenting on what their students shared.

Acceptability Questionnaire

All the participants completed the acceptability questionnaire within 1 week after the workshops; however, one participant did not answer one question. The participant did not respond to Question 10, “What information from the KWS workshop was NOT relevant to your work?” The results for the participants’ responses to the seven close-ended/continuous scale questions (i.e., Questions 2, 3, 4, 5, 6, 7, and 8) and the three open-ended questions (i.e., Questions 9, 10, and 11) were as follows.

Regarding the close-ended questions, the participants were asked to rate the degree to which they agreed (i.e., strongly disagree [1], moderately disagree [2], slightly disagree [3], slightly agree [4], moderately agree [5], strongly agree [6]) with the statements. In Question 2, the participants were asked to determine the degree to which they agreed with the statement, “I was encouraged to participate throughout the KWS workshop” (Level 1 Reaction: Engagement). As shown in Table 4-1, the participants strongly agreed (6) that they were encouraged to participate throughout the KWS workshop.

Table 4-1

Participants’ Participation Throughout the KWS Workshop

Question 2	<i>M</i>	<i>SD</i>
I was encouraged to participate throughout the KWS workshop.	6	0

In Question 3, the participants were asked to determine the degree to which they agreed with the statement, “The KWS workshop held my interest” (Level 1 Reaction: Engagement). As

shown in Table 4-2, the participants strongly agreed (6) that the KWS workshop held their interest.

Table 4-2

Participants' Interest Throughout the KWS Workshop

Question 3	<i>M</i>	<i>SD</i>
The KWS workshop held my interest.	6	0

In Question 4, the participants were asked to rate the degree to which they agreed with the statement, “The information provided in the KWS workshop was applicable to my job” (Level 1 Reaction: Relevance). As shown in Table 4-3, the participants moderately agreed (5.88) that the information provided in the KWS workshop was applicable to their job.

Table 4-3

Applicability of the KWS Workshop Information to the Participants' Jobs

Question 4	<i>M</i>	<i>SD</i>
The information provided in the KWS workshop was applicable to my job.	5.88	.33

In Question 5, the participants were asked to determine the degree to which they agreed with the statement, “I believe it is worthwhile for me to use manual signs in my classroom or therapy room” (Level 2 Learning: Attitude). As shown in Table 4-4, the participants strongly agreed (6) that it was worthwhile for them to use manual signs in their classroom or therapy room.

Table 4-4*Worthwhileness for Participants to Use Manual Signs*

Question 5	<i>M</i>	<i>SD</i>
I believe it is worthwhile for me to use manual signs in my classroom or therapy room.	6	0

In Question 6, the participants were asked to rate the degree to which they agreed with the statement, “I am confident about using manual signs in my classroom or therapy room” (Level 2 Learning: Confidence). As shown in Table 4-5, the participants moderately agreed (5.25) that they were confident about using manual signs in their classroom or therapy room.

Table 4-5*Participants’ Confidence Using Manual Signs*

Question 6	<i>M</i>	<i>SD</i>
I am confident about using manual signs in my classroom or therapy room.	5.25	.66

In Question 7, the participants were asked to determine the degree to which they agreed with the statement, “I am committed to using manual signs in my classroom or therapy room” (Level 2 Learning: Commitment). As shown in Table 4-6, the participants moderately agreed (5.88) that they were committed to using manual signs in their classroom or therapy room.

Table 4-6*Participants’ Commitment Using Manual Signs*

Question 7	<i>M</i>	<i>SD</i>
I am committed to using manual signs in my classroom or therapy room.	5.88	.33

In Question 8, the participants were asked to rate the degree to which they agreed with the statement, “I will recommend the KWS workshop to my co-workers” (Level 1 Reaction: Customer Satisfaction). As shown in Table 4-7, the participants moderately agreed (5.88) that they would recommend the KWS workshop to their co-workers.

Table 4-7

Participants’ Agreement with Recommending the KWS Workshop

Question 8	<i>M</i>	<i>SD</i>
I will recommend the KWS workshop to my co-workers.	5.88	.33

With respect to the open-ended questions, in response to Question 9, “What information from the KWS workshop was the most relevant to your work?” (Level 1 Reaction, Relevance), four of the participants reported that all the information presented during the KWS workshop was relevant to their work. Participants also expressed that they may use the information in their current and future assignments with preschool age students as well as students who are less verbal or need more communication support (i.e., students with CNN or who rely on AAC). Lastly, participants stated that learning and practicing signs, the signs learned, and using signs with words and pictures was the relevant to their work.

In response to Question 10, “What information from the KWS workshop was NOT relevant to your work?” (Level 1 Reaction, Relevance), seven of the eight participants reported that no information from the KWS workshop was irrelevant to their work. One participant stated that some of the core words were not relevant to their work. They expressed that “many of my students are labeling right now so they need more heavy noun words rather than core words, but of course I will implement based on my students’ skill levels.”

In response to Question 11, “How can the KWS workshop be improved?” (Level 1 Reaction, Customer Satisfaction), six of the eight participants offered suggestions for improving the workshop. One participant suggested longer practice sessions. Another participant indicated all parts of the workshop were important, but they liked learning and practicing the signs because “that was the most fun.” Other participants proposed making the workshop a “multiday workshop with more signing practice,” presenting the workshop to support staff in moderate-severe programs and parents, including sample goals for students with whom KWS would be used. Lastly, one participant commented, “the workshop flowed very well and transitioned smoothly.”

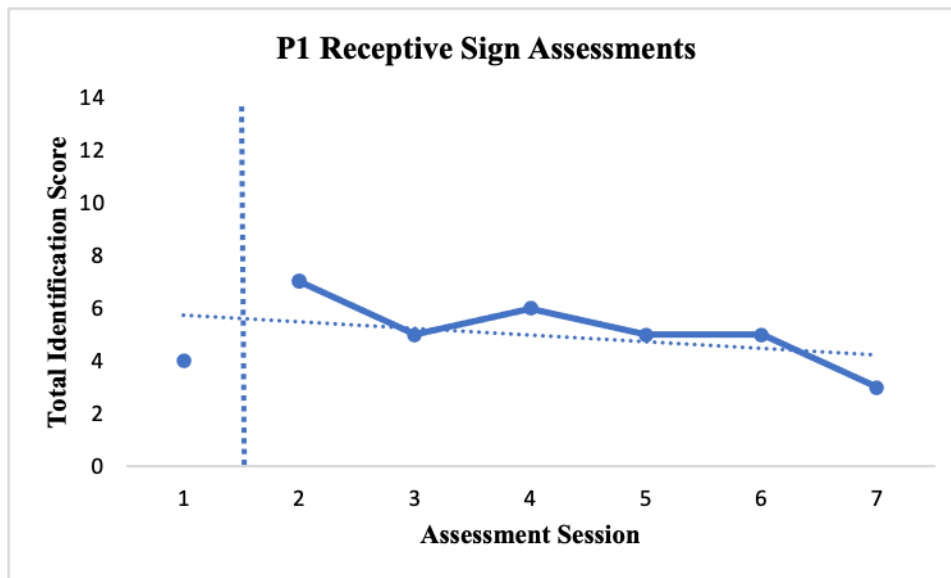
Receptive Sign Assessment

Six of the eight adult participants completed the receptive sign assessments, following the pretest-posttest design with repeated posttest measures over time, to determine the effect of a KWS workshop on the participants’ skill identifying the 79 ASL signs taught during the KWS workshop (Research Question 1; Level 2 Learning). The six participants (i.e., Participants 2, 3, 4, 6, 7, and 8) completed the pretest receptive sign assessment within 1 week before the workshop(s) and the posttest receptive sign assessments within 1, 3, 5, 7, 9, and 11 work weeks after the workshop(s) (i.e., during Weeks 2, 4, 6, 8, 10, and 12). Participant 1 took the pretest receptive sign assessment within 1 week before a workshop and the posttest receptive sign assessments within 1, 4, 5, 8, 10, and 12 work weeks after the workshop (i.e., during Weeks 2, 5, 6, 9, 11, and 13). Participant 5 took the pretest receptive sign assessment within 1 week before a workshop and the posttest receptive sign assessments within 1, 3, 5, 7, 10, and 11 work weeks after the workshop (i.e., during Weeks 2, 4, 6, 8, 11, and 12). See Appendix AA for the expressive and receptive sign assessment and semi-structured interview schedule.

As shown in Figure 4-1, Participant 1 demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop, but they exhibited a decreasing trend over the six postworkshop assessment sessions in their ASL sign identification skills. Participant 1's preworkshop receptive sign assessment score was 4 (out of 14), and their postworkshop receptive sign assessment scores ranged from 3 to 7. The mean of their six postworkshop receptive sign assessments was 5.17, and the standard deviation was 1.33.

Figure 4-1

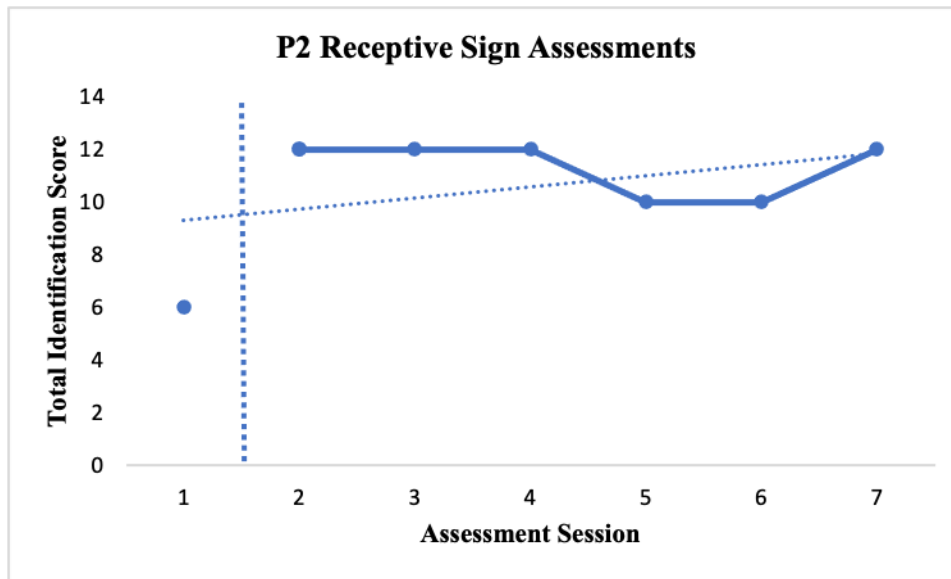
Participant 1's Total Sign Identification Scores From the Receptive Sign Assessments



As shown in Figure 4-2, Participant 2 demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop, and they exhibited an increasing trend over the six postworkshop assessment sessions in their ASL sign identification skills. Participant 2's preworkshop receptive sign assessment score was 6 (out of 13), and their postworkshop receptive sign assessment scores ranged from 10 to 12. The mean of their six postworkshop receptive sign assessments was 11.33, and the standard deviation was 1.03.

Figure 4-2

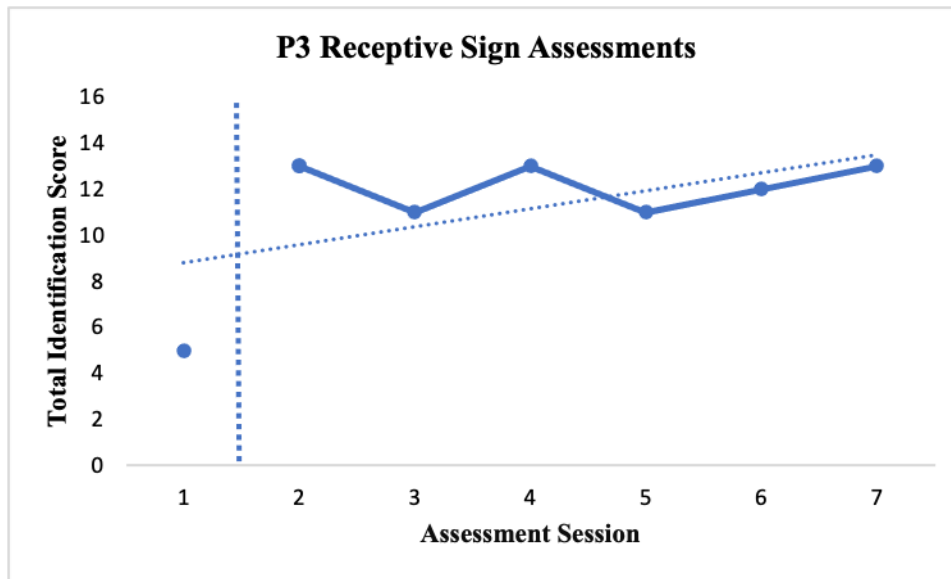
Participant 2's Total Sign Identification Scores From the Receptive Sign Assessments



As shown in Figure 4-3, Participant 3 demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop, and they exhibited an increasing trend over the six postworkshop assessment sessions in their ASL sign identification skills. Participant 3's preworkshop receptive sign assessment score was 5 (out of 13), and their postworkshop receptive sign assessment scores ranged from 11 to 13. The mean of their six postworkshop receptive sign assessments was 12.17, and the standard deviation was .98.

Figure 4-3

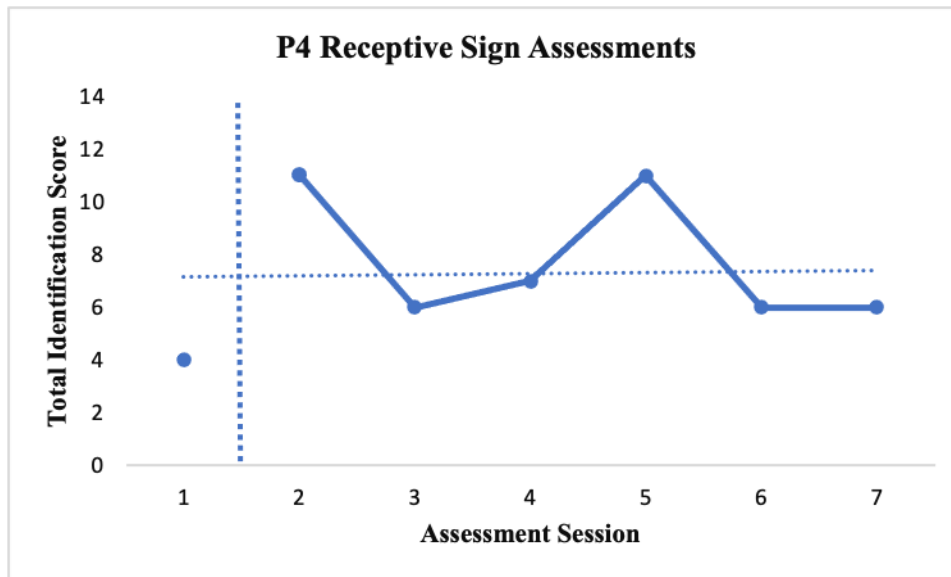
Participant 3's Total Sign Identification Scores From the Receptive Sign Assessments



As shown in Figure 4-4, Participant 4 demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop, but they exhibited no trend over the six postworkshop assessment sessions in their ASL sign identification skills. Participant 4's preworkshop receptive sign assessment score was 4 (out of 13), and their postworkshop receptive sign assessment scores ranged from 6 to 11. The mean of their six postworkshop receptive sign assessments was 7.83, and the standard deviation was 2.48.

Figure 4-4

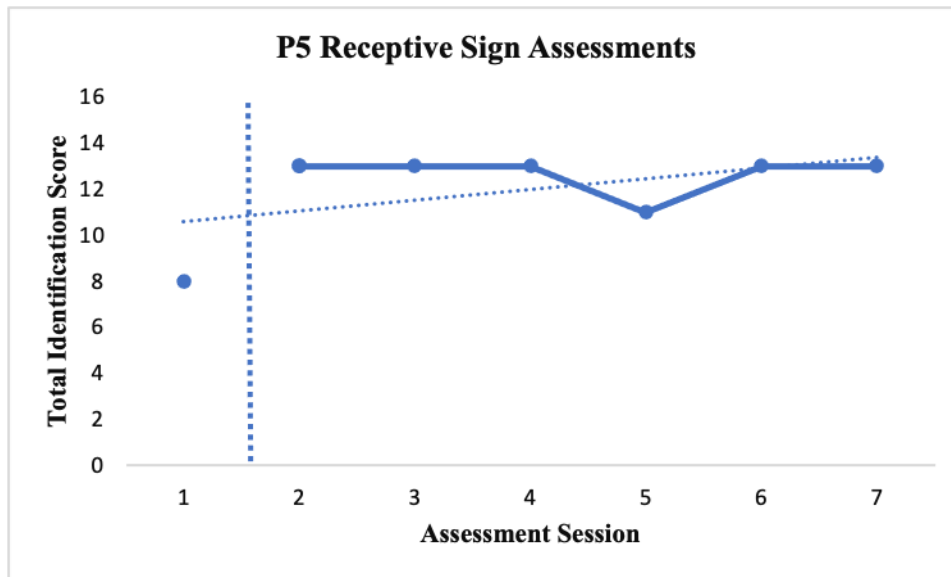
Participant 4's Total Sign Identification Scores From the Receptive Sign Assessments



As shown in Figure 4-5, Participant 5 demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop, and they exhibited an increasing trend over the six postworkshop assessment sessions in their ASL sign identification skills. Participant 5's preworkshop receptive sign assessment score was 8 (out of 13), and their postworkshop receptive sign assessment scores ranged from 11 to 13. The mean of their six postworkshop receptive sign assessments was 12.67, and the standard deviation was .81.

Figure 4-5

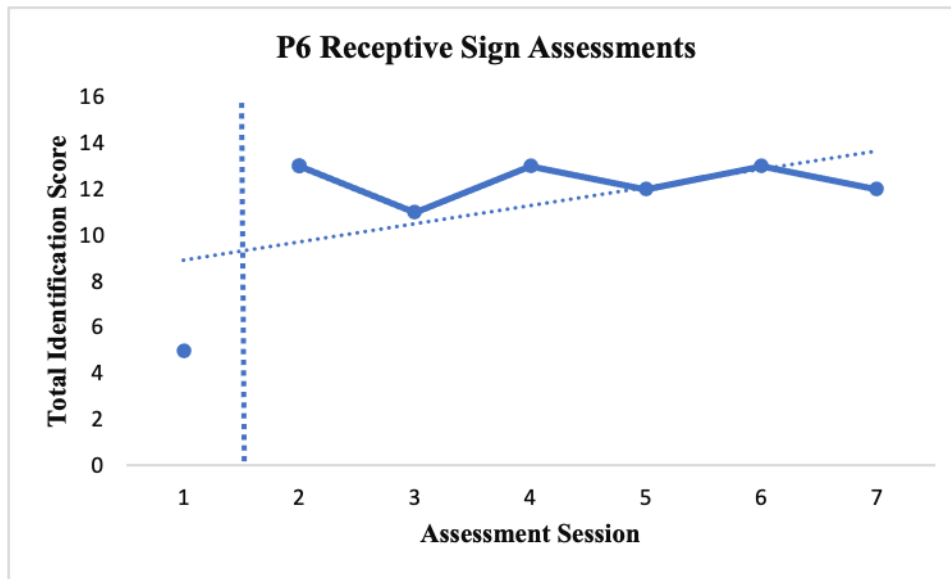
Participant 5's Total Sign Identification Scores From the Receptive Sign Assessments



As shown in Figure 4-6, Participant 6 demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop, and they exhibited an increasing trend over the six postworkshop assessment sessions in their ASL sign identification skills. Participant 6's preworkshop receptive sign assessment score was 5 (out of 13), and their postworkshop receptive sign assessment scores ranged from 11 to 13. The mean of their six postworkshop receptive sign assessments was 12.33, and the standard deviation was .82.

Figure 4-6

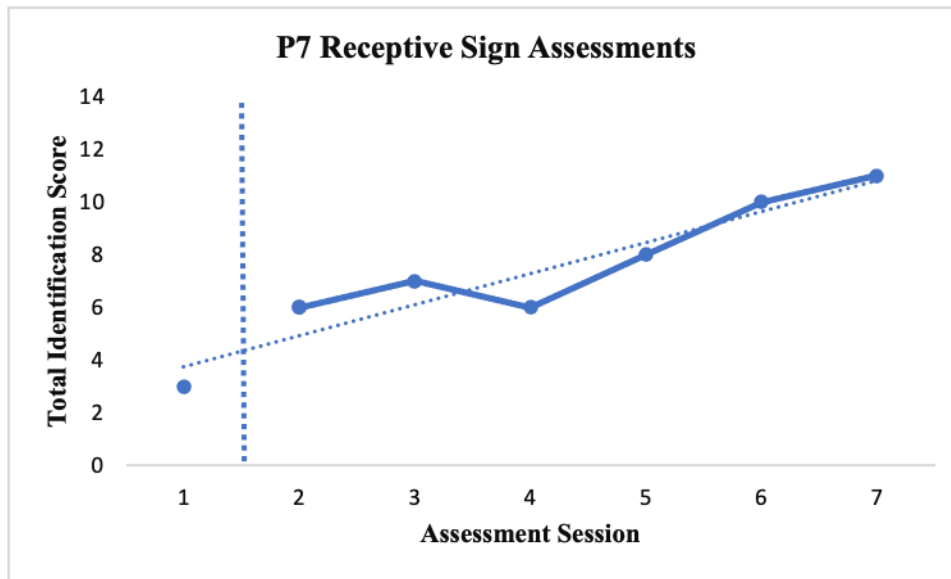
Participant 6's Total Sign Identification Scores From the Receptive Sign Assessments



As shown in Figure 4-7, Participant 7 demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop, and they exhibited an increasing trend over the six postworkshop assessment sessions in their ASL sign identification skills. Participant 7's preworkshop receptive sign assessment score was 3 (out of 13), and their postworkshop receptive sign assessment scores ranged from 6 to 11. The mean of their six postworkshop receptive sign assessments was 8, and the standard deviation was 2.1.

Figure 4-7

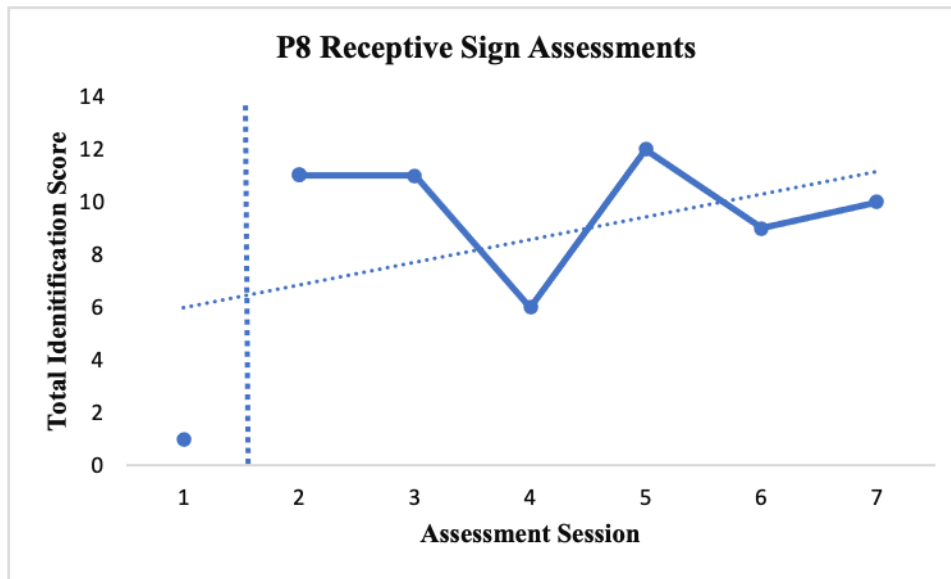
Participant 7's Total Sign Identification Scores From the Receptive Sign Assessments



As shown in Figure 4-8, Participant 8 demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop, and they exhibited an increasing trend over the six postworkshop assessment sessions in their ASL sign identification skills. Participant 8's preworkshop receptive sign assessment score was 1 (out of 13), and their postworkshop receptive sign assessment scores ranged from 6 to 12. The mean of their six postworkshop receptive sign assessments was 9.83, and the standard deviation was 2.14.

Figure 4-8

Participant 8's Total Sign Identification Scores From the Receptive Sign Assessments



As shown in Figure 4-9, combined, the participants demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop, and they exhibited an increasing trend over the six postworkshop assessment sessions in their ASL sign identification skills. The eight adult participants' combined total sign identification scores from the preworkshop receptive sign assessments (Assessment Session 1) ranged from 1 to 8 with a mean of 4.5 (out of 13) and a standard deviation of 2.07. The combined total sign identification scores from the first postworkshop receptive sign assessments (Assessment Session 2) ranged from 6 to 13 with a mean of 10.75 and a standard deviation of 2.76. The combined total sign identification scores from the second postworkshop receptive sign assessments (Assessment Session 3) ranged from 5 to 13 with a mean of 9.5 and a standard deviation of 3.02. The combined total sign identification scores from the third postworkshop receptive sign assessments (Assessment Session 4) ranged from 6 to 13 with a mean of 9.5 and a standard deviation of 3.51. The

combined total sign identification scores from the fourth postworkshop receptive sign assessments (Assessment Session 5) ranged from 5 to 12 with a mean of 10 and a standard deviation of 2.39. The combined total sign identification scores from the fifth postworkshop receptive sign assessments (Assessment Session 6) ranged from 5 to 13 with a mean of 9.75 and a standard deviation of 3.01. The combined total sign identification scores from the sixth postworkshop receptive sign assessments (Assessment Session 7) ranged from 3 to 13 with a mean of 10 and a standard deviation of 3.63. Table 4-8 shows the ranges, means, and standard deviations for the combined or composite preworkshop and postworkshop total sign identification scores from the receptive sign assessments.

Figure 4-9

Mean Composite Total Sign Identification Scores From the Receptive Sign Assessments

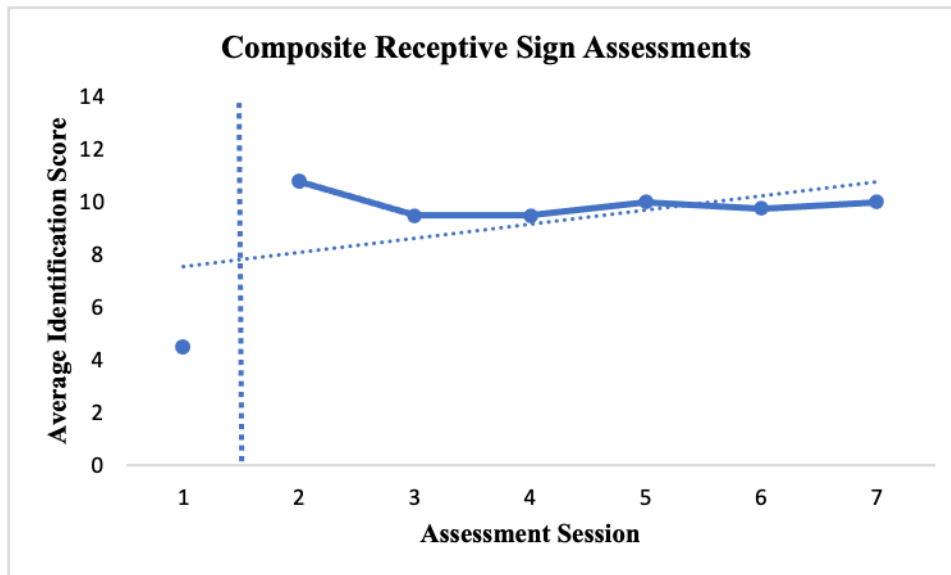


Table 4-8*Ranges, Means, and Standard Deviations for the Composite Total Sign Identification Scores**From the Receptive Sign Assessments*

Assessment session	Range	<i>M</i>	<i>SD</i>
1 (Preworkshop)	1–8	4.5	2.07
2 (Postworkshop)	6–13	10.75	2.76
3	5–13	9.5	3.02
4	6–13	9.5	3.51
5	5–12	10	2.39
6	5–13	9.75	3.01
7	3–13	10	3.63

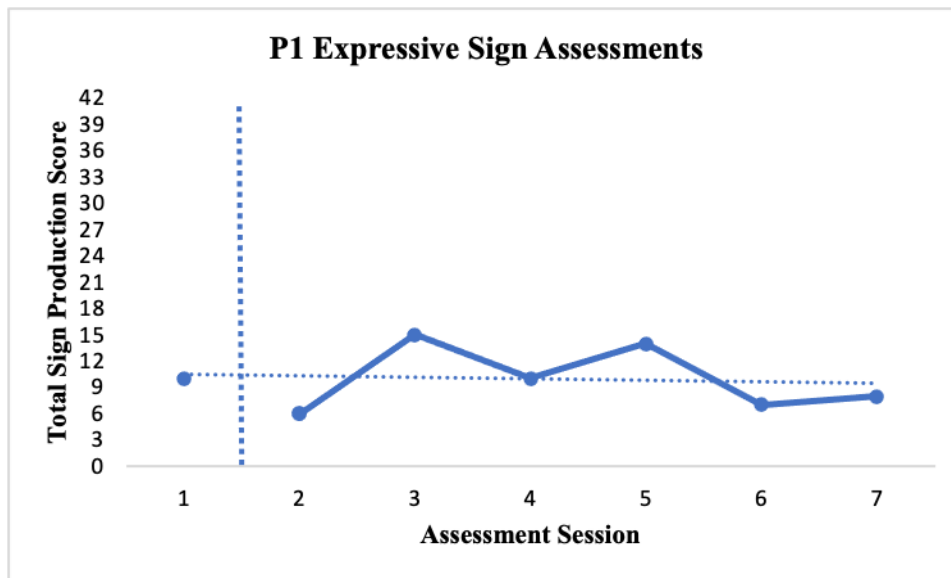
Expressive Sign Assessment

Six of the eight adult participants completed the expressive sign assessments, adhering to a pretest-posttest design with repeated posttest measures over time, to determine the effect of a KWS workshop on the participants' skill producing the 79 ASL signs taught during the KWS workshop (Research Question 2; Level 2 Learning). The six participants (i.e., Participants 2, 3, 4, 6, 7, and 8) completed the pretest expressive sign assessment within 1 week before the workshop(s) and the posttest expressive sign assessments within 1, 3, 5, 7, 9, and 11 work weeks after the workshop(s) (i.e., during Weeks 2, 4, 6, 8, 10, and 12). Participant 1 took the pretest expressive sign assessment within 1 week before a workshop and the posttest expressive sign assessments within 1, 4, 5, 8, 10, and 12 work weeks after the workshop (i.e., during Weeks 2, 5, 6, 9, 11, and 13). Participant 5 took the pretest expressive sign assessment within 1 week before a workshop and the posttest expressive sign assessments within 1, 3, 5, 7, 10, and 11 work weeks after the workshop (i.e., during Weeks 2, 4, 6, 8, 11, and 12). See Appendix AA for the expressive and receptive sign assessment and semi-structured interview schedule.

As shown in Figure 4-10, Participant 1 did not demonstrate an immediate increase in their ability to produce the ASL signs taught during the workshop, and they exhibited a descending trend over the six postworkshop assessment sessions in their ASL sign production skills. Participant 1's preworkshop expressive sign assessment score was 10 (out of 39), and their postworkshop expressive sign assessment scores ranged from 6 to 15. The mean of their six postworkshop expressive sign assessments was 10, and the standard deviation was 3.74.

Figure 4-10

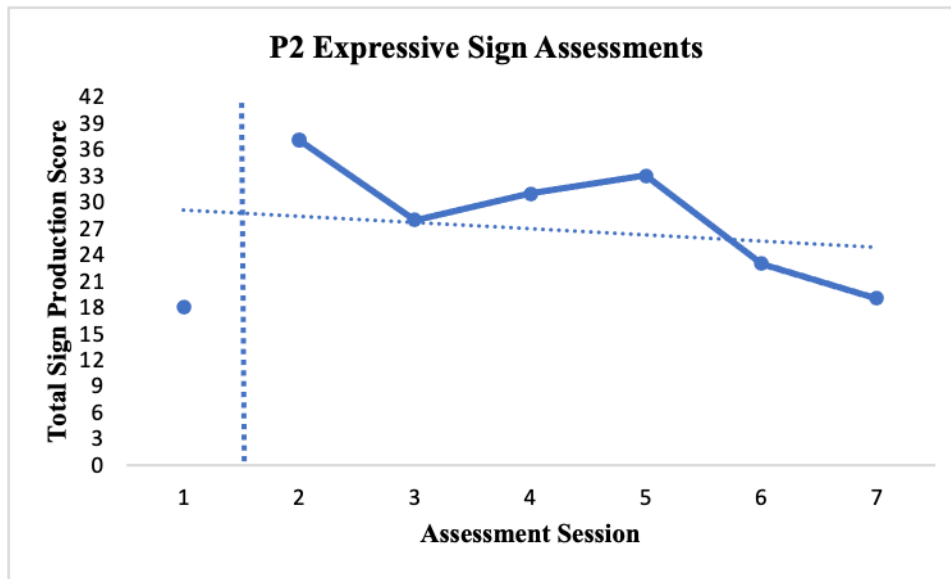
Participant 1's Total Sign Production Scores From the Expressive Sign Assessments



As shown in Figure 4-11, Participant 2 demonstrated an immediate increase in their ability to produce the ASL signs taught during the workshop, but they exhibited a descending trend over the six postworkshop assessment sessions in their ASL sign production skills. Participant 2's preworkshop expressive sign assessment score was 18 (out of 39), and their postworkshop expressive sign assessment scores ranged from 19 to 37. The mean of their six postworkshop expressive sign assessments was 28.5, and the standard deviation was 6.63.

Figure 4-11

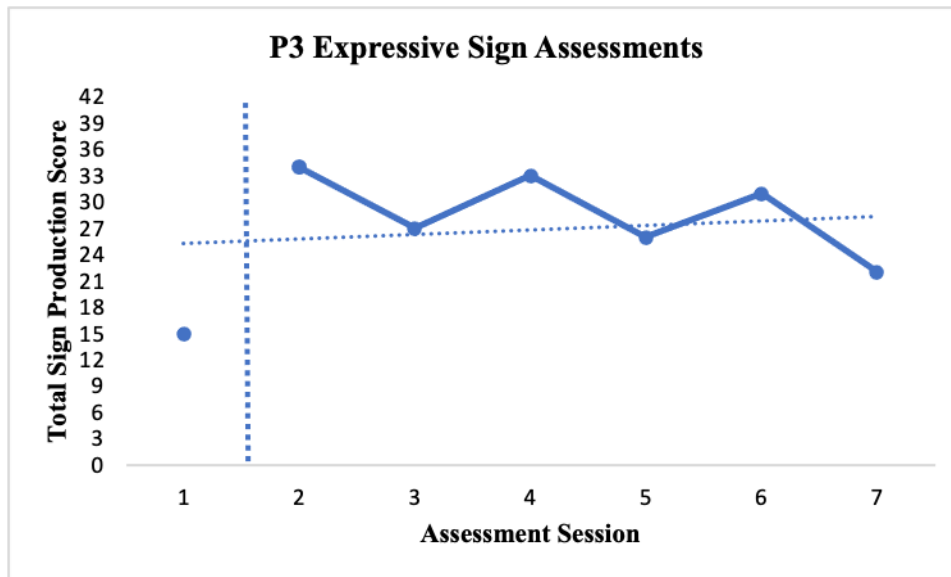
Participant 2's Total Sign Production Scores From the Expressive Sign Assessments



As shown in Figure 4-12, Participant 3 demonstrated an immediate increase in their ability to produce the ASL signs taught during the workshop, and they exhibited an ascending trend over the six postworkshop assessment sessions in their ASL sign production skills. Participant 3's preworkshop expressive sign assessment score was 15 (out of 39), and their postworkshop expressive sign assessment scores ranged from 22 to 34. The mean of their six postworkshop receptive sign assessments was 28.83, and the standard deviation was 4.62.

Figure 4-12

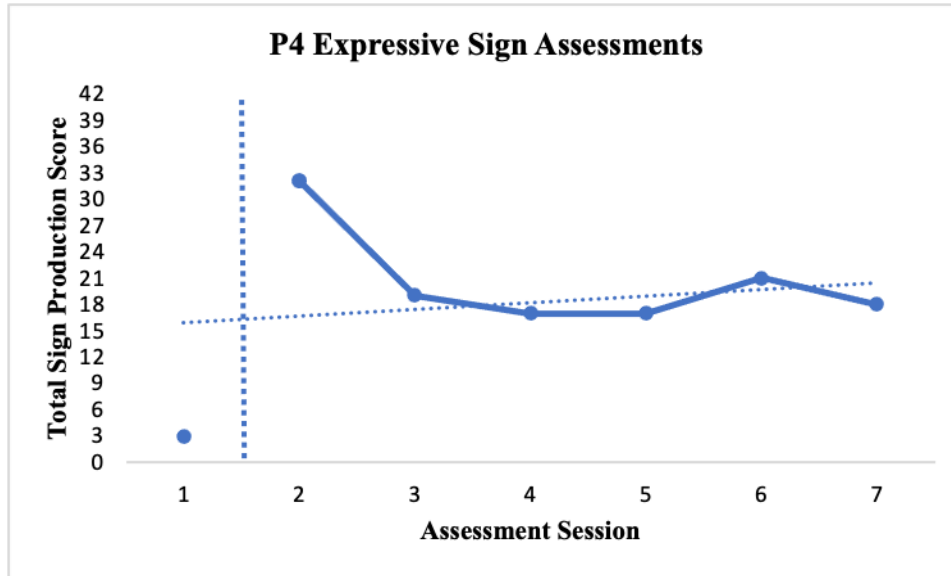
Participant 3's Total Sign Production Scores From the Expressive Sign Assessments



As shown in Figure 4-13, Participant 4 demonstrated an immediate increase in their ability to produce the ASL signs taught during the workshop, and they exhibited an ascending trend over the six postworkshop assessment sessions in their ASL sign production skills. Participant 4's preworkshop expressive sign assessment score was 3 (out of 42), and their postworkshop expressive sign assessment scores ranged from 17 to 32. The mean of their six postworkshop receptive sign assessments was 20.67, and the standard deviation was 5.75.

Figure 4-13

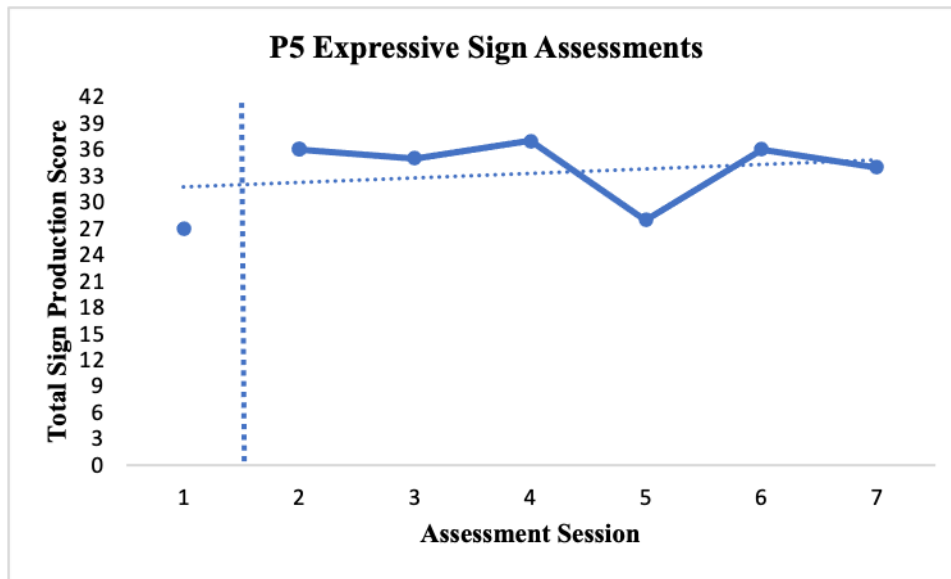
Participant 4's Total Sign Production Scores From the Expressive Sign Assessments



As shown in Figure 4-14, Participant 5 demonstrated an immediate increase in their ability to produce the ASL signs taught during the workshop, and they exhibited an ascending trend over the six postworkshop assessment sessions in their ASL sign production skills. Participant 5's preworkshop expressive sign assessment score was 27 (out of 39), and their postworkshop expressive sign assessment scores ranged from 28 to 37. The mean of their six postworkshop receptive sign assessments was 34.33, and the standard deviation was 3.27.

Figure 4-14

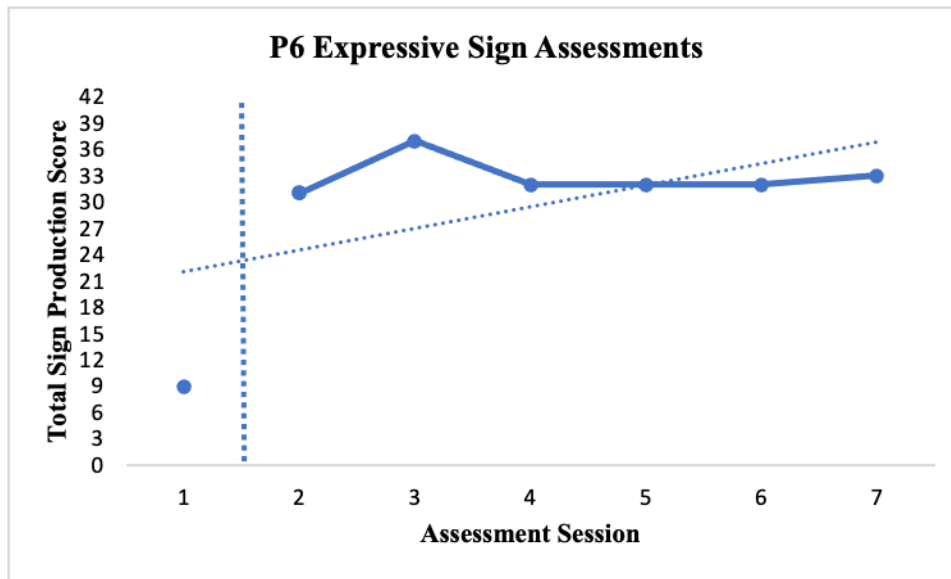
Participant 5's Total Sign Production Scores From the Expressive Sign Assessments



As shown in Figure 4-15, Participant 6 demonstrated an immediate increase in their ability to produce the ASL signs taught during the workshop, and they exhibited an ascending trend over the six postworkshop assessment sessions in their ASL sign production skills. Participant 6's preworkshop expressive sign assessment score was 9 (out of 39), and their postworkshop expressive sign assessment scores ranged from 31 to 37. The mean of their six postworkshop receptive sign assessments was 32.83, and the standard deviation was 2.14.

Figure 4-15

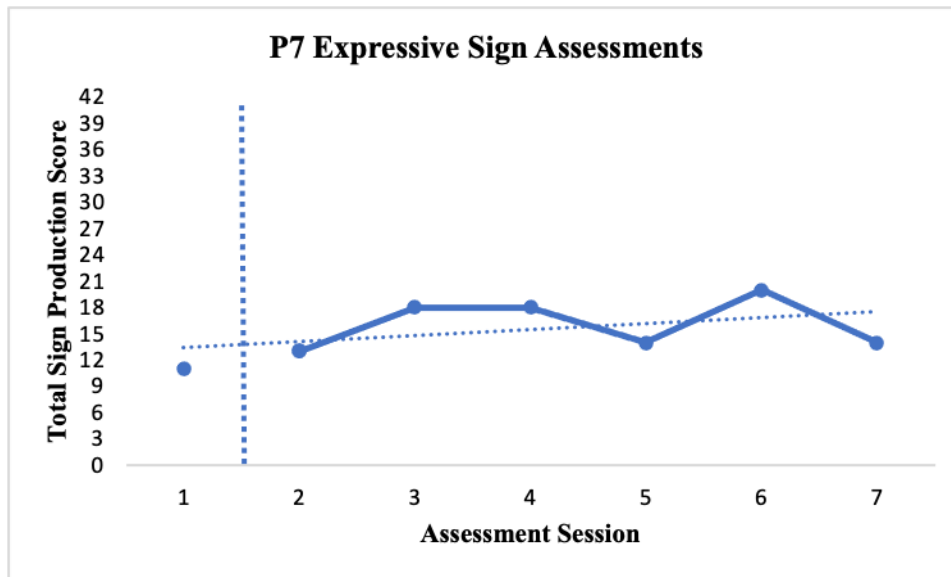
Participant 6's Total Sign Production Scores From the Expressive Sign Assessments



As shown in Figure 4-16, Participant 7 demonstrated a slight immediate increase in their ability to produce the ASL signs taught during the workshop, and they exhibited an ascending trend over the six postworkshop assessment sessions in their ASL sign production skills. Participant 7's preworkshop expressive sign assessment score was 11 (out of 39), and their postworkshop expressive sign assessment scores ranged from 13 to 20. The mean of their six postworkshop receptive sign assessments was 16.17, and the standard deviation was 2.86.

Figure 4-16

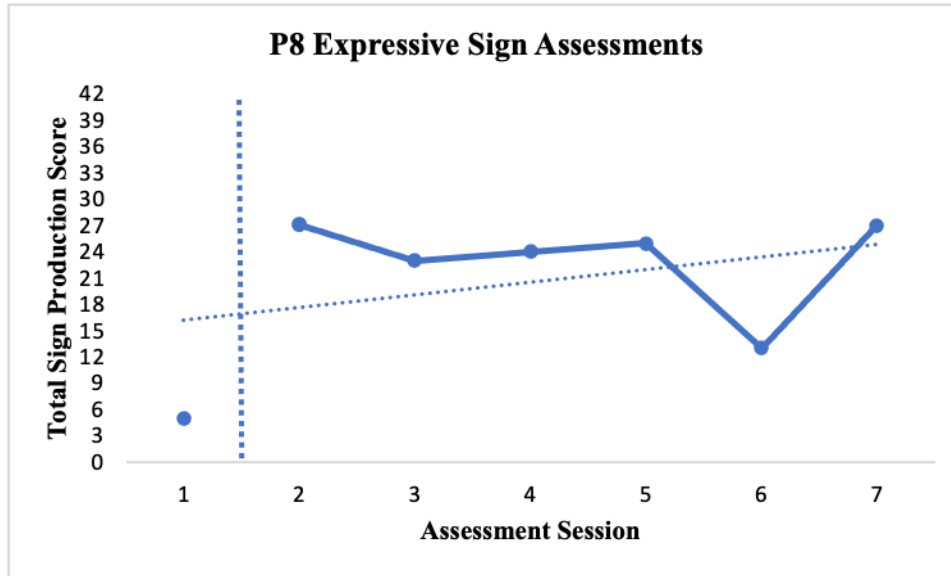
Participant 7's Total Sign Production Scores From the Expressive Sign Assessments



As shown in Figure 4-17, Participant 8 demonstrated an immediate increase in their ability to produce the ASL signs taught during the workshop, and they exhibited an ascending trend over the six postworkshop assessment sessions in their ASL sign production skills. Participant 8's preworkshop expressive sign assessment score was 5 (out of 39), and their postworkshop expressive sign assessment scores ranged from 13 to 27. The mean of their six postworkshop receptive sign assessments was 23.17, and the standard deviation was 5.23.

Figure 4-17

Participant 8's Total Sign Production Scores From the Expressive Sign Assessments



As shown in Figure 4-18, combined, the participants demonstrated an immediate increase in their ability to produce the ASL signs taught during the workshop, and they exhibited an ascending trend over the six postworkshop assessment sessions in their ASL sign production skills. The eight adult participants' combined total sign production scores from the preworkshop expressive sign assessments (Assessment Session 1) ranged from 3 to 27 with a mean of 12.25 (out of 39) and a standard deviation of 7.69. The combined total sign production scores from the first postworkshop expressive sign assessments (Assessment Session 2) ranged from 6 to 37 with a mean of 27 and a standard deviation of 11.39. The combined total sign production scores from the second postworkshop expressive sign assessments (Assessment Session 3) ranged from 15 to 37 with a mean of 25.25 and a standard deviation of 15.96. The combined total sign production scores from the third postworkshop expressive sign assessments (Assessment Session 4) ranged from 10 to 37 with a mean of 25.25 and a standard deviation of 9.5. The combined total sign

production scores from the fourth postworkshop expressive sign assessments (Assessment Session 5) ranged from 14 to 33 with a mean of 23.63 and a standard deviation of 7.69. The combined total sign production scores from the fifth postworkshop expressive sign assessments (Assessment Session 6) ranged from 7 to 36 with a mean of 22.88 and a standard deviation of 9.88. The combined total sign production scores from the sixth postworkshop expressive sign assessments (Assessment Session 7) ranged from 8 to 34 with a mean of 21.88 and a standard deviation of 9.06. Table 4-9 shows the ranges, means, and standard deviations for the combined or composite preworkshop and postworkshop total sign production scores from the expressive sign assessments.

Figure 4-18

Mean Composite Total Sign Production Scores From the Expressive Sign Assessments

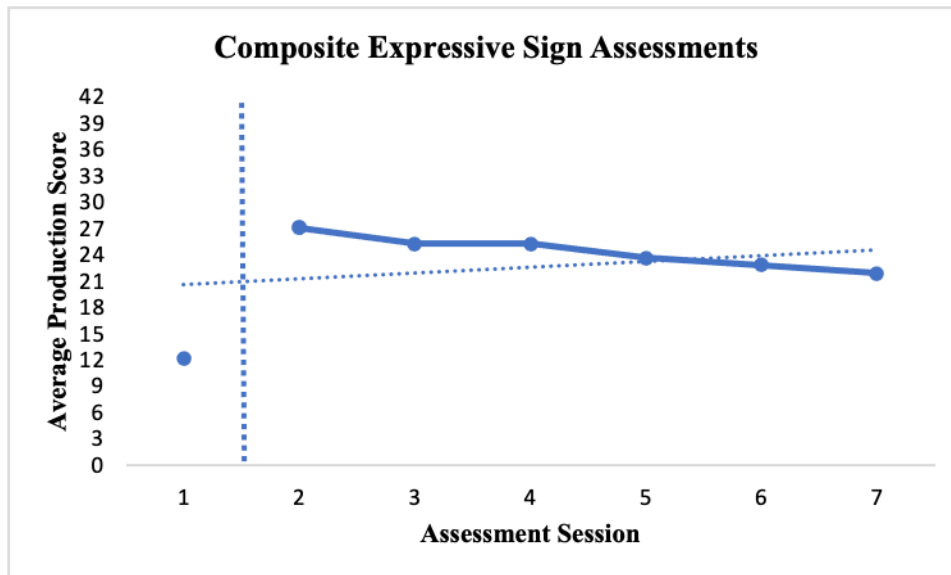


Table 4-9

Ranges, Means, and Standard Deviations for the Composite Total Sign Production Scores From the Expressive Sign Assessments

Assessment session	Range	<i>M</i>	<i>SD</i>
1 (Preworkshop)	3–27	12.25	7.69
2 (Postworkshop)	6–37	27	11.39
3	15–37	25.25	15.96
4	10–37	25.25	9.5
5	14–33	23.63	7.69
6	7–36	22.88	9.88
7	8–34	21.88	9.06

Supplemental Questions

Five of the eight adult participants completed the supplemental questions six times, in accordance with the posttest measures of the pretest-posttest design with repeated posttest measures over time, to find out the number of signs consistently used, the consistency of sign use, and the participants' experiences and/or thoughts on using signs in their classroom or therapy room. The five adult participants (i.e., Participants 3, 4, 6, 7, and 8) completed the supplemental questions for the expressive-receptive sign assessments within 1, 3, 5, 7, 9, and 11 work weeks after a workshop (i.e., during Weeks 2, 4, 6, 8, 10, and 12). Participant 2 responded to the questions within 2, 3, 5, 7, 9, and 11 work weeks after a workshop (i.e., during Weeks 3, 4, 6, 8, 10, and 12 [six times]). Participant 5 answered the questions within 1, 3, 5, 7, 10, and 11 work weeks after a workshop (i.e., during Weeks 2, 4, 6, 8, 11, and 12 [six times]).

Participant 1 responded to the questions seven times, that is, within 1, 4, 5, 8, 9, 11, and 12 work weeks after a workshop (i.e., during Weeks 2, 5, 6, 9, 10, 12, and 13). Participant 1 completed the supplemental questions seven times (instead of six times) because they answered the supplemental questions for Week 12 (i.e., within 11 work weeks after the workshop), but then they cancelled the expressive-receptive sign assessment for Week 12, which was scheduled later that week. Therefore, when Participant 1 took the expressive-receptive sign assessment during Week 13 (i.e., within 12 work weeks after the workshop), they mistakenly completed the supplemental questions again (see Appendix AA for the expressive and receptive sign assessment and semi-structured interview schedule).

For the supplemental questions, the participants were asked to report the number of signs they consistently used during classroom or therapy room activities (Research Question 3; Level 3 Behavior), rate the consistency of their sign use as compared to before the KWS workshop and the previous 2 weeks after the workshop (i.e., significantly worse [1], moderately worse [2], slightly worse [3], no difference [4], slightly better [5], moderately better [6], significantly better [7]; Research Question 3; Level 3 Behavior), and share their experiences and/or thoughts on using signs in their classroom or therapy room. The results for the participants' responses to the one close-ended/continuous scale question (i.e., Question 2) and the two open-ended questions (i.e., Questions 1 and 3) were as follows.

Please note that one participant seemed to misunderstand the question, "Approximately how many signs do you use consistently during classroom or therapy room activities?" (i.e., Question 1). The number of signs the participant reported to consistently use during classroom or therapy room activities ranged from 25 to 175, whereas the number of signs the other participants reported to consistently use during classroom or therapy room activities ranged from

“usually none” to 35. Thus, the researcher decided to exclude the number of signs the one participant reported to consistently use during classroom or therapy room activities in the results of the supplemental questions.

As shown in Table 4-10, the mean score for Week 2 or 3 (i.e., within 1 or 2 work weeks after a workshop) indicated that the consistency of the participants’ sign use as compared to before the KWS workshop was slightly better (5.5). The participant’s ratings for the consistency of their sign use ranged from significantly better (6) to no difference (4); and the number of signs the participants consistently used during classroom or therapy room activities ranged from “usually none” to 25.

Table 4-10

Week 2 Supplemental Question

	Week 2	<i>M</i>	<i>SD</i>
How do you rate the consistency of your sign use as compared to before the KWS workshop?		5.5	1.2

Some participants shared they increased their use of signs in their classrooms, and they felt more comfortable using signs because they knew they were producing them correctly. The participants wrote that they used signs during “good morning” (i.e., morning greetings), gave name signs to students and staff, began a biweekly sign language group, and taught students and staff the ASL manual alphabet. They believed that KWS was “an amazing way to support nonverbal or unintelligible students” and using KWS more consistently would increase their (i.e., the participants’) confidence and proficiency.

Contrarily, other participants shared that they had more motivation to incorporate more signs into their classroom activities, but they had not integrated more signs yet. The participants also believed that they could incorporate KWS into their classroom activities, but they did not

have much opportunity because it was only appropriate for one student. Lastly, the participants wrote that it was difficult to consistently use signs because their students required hand-over-hand support; therefore, they “barely have a free hand to be more consistent with [their] signing.”

As shown in Table 4-11, the mean score for Week 4 or 5 (i.e., within 3 or 4 work weeks after a workshop) indicated the consistency of the participants’ sign use as compared to the previous 1 to 3 weeks (i.e., Week 2 or 3) was slightly better (5.38). Participants’ ratings for the consistency of their sign use ranged from significantly better (6) to no difference (4); and the number of signs the participants consistently used during classroom or therapy room activities ranged from one to 20.

Table 4-11

Week 4 Supplemental Question 2

Week 4	<i>M</i>	<i>SD</i>
How do you rate the consistency of your sign use as compared to two weeks ago?	5.38	.92

Some participants expressed that they liked using signs in their classroom or therapy room, and they believed that using signs was beneficial or helpful for their students (regardless of the students’ communication mode or level). For example, they wrote that using signs was “like having portable visuals everywhere you go” and the signs seemed to help hold their student’s attention. The participants also expressed that using signs encouraged them to learn more signs so that they could teach their students new ways to express themselves.

Conversely, other participants shared that they were still having difficulty signing while giving their students hand-over-hand instruction, but they were getting better at it. They also shared that using an AAC device and the goals for using a device or vocalizations limited the

amount that they felt comfortable addressing KWS. However, a participant wrote that they wanted to learn how to use signs and AAC devices together.

As shown in Table 4-12, the mean score for Week 6 (i.e., within 5 work weeks after a workshop) indicated the consistency of participants’ sign use as compared to the previous 1 or 2 weeks (i.e., Week 4 or 5) was no difference (4.63). Participants’ ratings for consistency of their sign use were slightly better (6) or no difference (4); and the number of signs the participants consistently used during classroom or therapy room activities ranged from one to 25.

Table 4-12

Week 6 Supplemental Question 2

Week 6	<i>M</i>	<i>SD</i>
How do you rate the consistency of your sign use as compared to two weeks ago?	4.63	.52

The participants shared the benefits they experienced using signs in their classroom or therapy room. The benefits included “communicating better with [their] nonverbal students,” “better attending from many of [their] students,” imitation of signs by their students, and gains in their students’ communication. In addition, one participant wrote:

Using sign has increased the participation by those students with unintelligible speech as well as those with the most severe communication delays. It increases independence as well. Rather than pressing a button that has been preprogrammed; a student can use a sign to communicate exactly what they want to at that very moment.

Another participant expressed that they felt “like a more well-rounded clinician” because they could “provide [their] students with another communication modality to enhance their learning.”

The participants also shared the challenges they experienced using signs in their classroom or therapy room. The challenges included “COVID complications (short on staff and

time),” few opportunities to use signs because only one student used AAC, and “other communication methods taking priority (‘talkers’) due to being written into the IEP.”

As shown in Table 4-13, the mean score for Week 8 or 9 (i.e., within 7 or 8 work weeks after a workshop) indicated the consistency of participants’ sign use as compared to the previous 2 or 3 weeks (i.e., Week 6) was no difference (4.38). Participants’ ratings for the consistency of their sign use ranged from moderately better (6) to significantly worse (1); and the number of signs the participants consistently used during classroom or therapy room activities ranged from one to 35. The participant who indicated the consistency of their sign use was significantly worse commented they were on quarantine (i.e., at home due to COVID), so they had not used signs.

Table 4-13

Week 8 Supplemental Question 2

Week 8	<i>M</i>	<i>SD</i>
How do you rate the consistency of your sign use as compared to two weeks ago?	4.38	1.69

Other participants commented that they (i.e., the participants and their students) were learning and implementing new signs weekly, and their students and paraeducators enjoyed it when they used signs. Participants saw an increase in participation, joint attention, and understanding of commonly used signs. Further, participants observed their students imitate signs, produce sign approximations, and use signs to get their needs met. Participants believed it was “helpful to use sign when giving directions to students” and using sign was “a great way to incorporate an easy visual cue to help support student language growth.”

As shown in Table 4-14, the mean score for Week 10 or 11 (i.e., within 9 or 10 work weeks after a workshop) indicated the consistency of participants’ sign use as compared to the previous 1 to 3 weeks (i.e., Week 8 or 9) was no difference (4.63). Participants’ ratings for the

consistency of their sign use ranged from moderately better (6) to slightly worse (3). The number of signs participants consistently used during classroom or therapy room activities ranged from one to 30; however, one participant did not report the number of signs they consistently used during classroom or therapy room activities.

Table 4-14

Week 10 Supplemental Question 2

	Week 10	<i>M</i>	<i>SD</i>
How do you rate the consistency of your sign use as compared to two weeks ago?		4.63	.92

Participants shared that they were learning new ways to incorporate signs into classroom activities (e.g., weekend reviews and calendar). They also shared that learning new signs each week improved their and their students' sign vocabulary. Moreover, using sign or KWS improved their therapy as well as attention, participation, confidence, response time, and engagement in their classroom. However, one participant wrote:

I still think that it is sort of impractical to use for one student in a classroom. Considering my current caseload with only one student appropriate for key word sign, but who is used to using an AAC device, it has been a little difficult to use key word sign, because of the initial learning curve of learning signs.

As shown in Table 4-15, the mean score for Week 12 or 13 (i.e., within 11 or 12 work weeks after a workshop) indicated that the consistency of the participants' sign use as compared to the previous 2 or 3 weeks (i.e., Week 10) was slightly better (5.22). The participants' ratings for the consistency of their sign use ranged from significantly better (7) to no difference (4). The number of signs the participants consistently used during classroom or therapy room activities

ranged from 15 to 30, but two participants did not report the number of signs they consistently used during classroom or therapy room activities.

Table 4-15

Week 12 Supplemental Question 2

Week 12	<i>M</i>	<i>SD</i>
How do you rate the consistency of your sign use as compared to two weeks ago?	5.22	.97

Participants expressed that they (i.e., participants, paraprofessionals, students who used AAC, and peers) enjoyed using signs. They attempted to incorporate new signs, which were introduced to their students, into classroom activities every day and started using KWS with more students. Participants also expressed that students and classroom staff became more confident using sign. Their students used signs spontaneously and independently and combined two signs (e.g., to ask to play different games during a group lesson). However, some of their students were unable to produce the signs due to motor limitations. Therefore, some of their students enjoyed making sign approximations. Furthermore, another paraprofessional started using signs in a classroom, and students continued to increase their attention and understanding of the signs used daily. Lastly, participants wrote that using sign was “easy and low maintenance compared to using ‘talkers’ [i.e., AAC devices],” and they will continue to learn signs along with their students and paraprofessionals.

Expressive KWS Assessment

Classroom or Therapy Room Observations

Please note that due to COVID-19 (i.e., SARS-CoV-2) illness or exposure and COVID-19 quarantine or isolation, the posttest classroom or therapy room observations were not completed every other week for 9 work weeks in accordance with the A-B single case design;

however, the three adult participants (Participants 2, 5, and 6 [P2, P5, and P6]) and four minor participants (Students 1, 2, 3, and 4 [S1, S2, S3, and S4]) were observed three times before a workshop (during Week 1) and five times after a workshop (during Weeks 2, 4, 6, 8, and 10) to find out the effect of a KWS workshop on the participants' use of KWS in the classroom or therapy room (Research Question 3; Level 3 Behavior).

The seven participants (i.e., three adult and four minor participants) formed two dyads and one triad. The dyads consisted of a special education teacher (P2) and a student (S1) as well as an SLP (P5) and a student (S2). The triad was composed of a special education teacher (P6) and two students (S3 and S4). Participant 2 and Student 1 were observed three times during Week 1 (i.e., within 1 week before a workshop) and one time during Weeks 3, 4, 6, 11, and 12 (i.e., within 2, 3, 5, 10, and 11 work weeks after a workshop) for a total of five postworkshop observations. Participant 6, Student 3, and Student 4 were observed three times during Week 1 (i.e., within 1 week before a workshop) and one time during Weeks 2, 4, 6, 8, and 11 (i.e., within 1, 3, 5, 7, and 10 work weeks after a workshop) for a total of five postworkshop observations.

Participant 5 and Student 2 were observed one time within 1 week before the first workshop; however, due to COVID-19 quarantine and isolation, they were unable to be observed two more times before Workshop 1. Therefore, Participant 5 decided to attend the second workshop and was observed two additional times within 1 week before Workshop 2. As a result, the three preworkshop observations were completed within 1 (two observations) and 3 (one observation) weeks before Workshop 2. For the postworkshop observations, Participant 5 and Student 2 were observed one time during Weeks 3, 5, 6, 9, and 10 (i.e., within 2, 4, 5, 8, and 9 work weeks after a workshop) for a total of five observations after Workshop 2 (see Appendix BB for the expressive KWS assessment/observation schedule). Student 1 and Student 4 did not

produce signed utterances during the classroom activities throughout the three preworkshop observations and five postworkshop observations. Thus, their data (i.e., the total number of signed utterances, signs, and different signs) were not analyzed using a line graph, visual analysis (i.e., immediacy and trend), descriptive statistics (i.e., mean for level and range and standard deviation for variability), and percentage of nonoverlapping data (PND).

As shown in Figure 4-19, Participant 2 demonstrated an immediate increase in the number of signed utterances, signs, and different signs they used in the classroom after they attended a KWS workshop. Participant 2 exhibited a slight increasing trend for the number of signed utterances and signs and no trend for the number of different signs over the three preworkshop observations; and they showed an increasing trend for the number of signed utterances, signs, and different signs across the five postworkshop observations. Participant 2's PND for the number of signed utterances, signs, and different signs was 100%, which indicated a large effect (Scruggs & Mastropieri, 1998). Table 4-16 shows the ranges, means, and standard deviations for the number of signed utterances, signs, and different signs Participant 2 produced during the preworkshop and postworkshop observations.

Figure 4-19

Participant 2's Total Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments

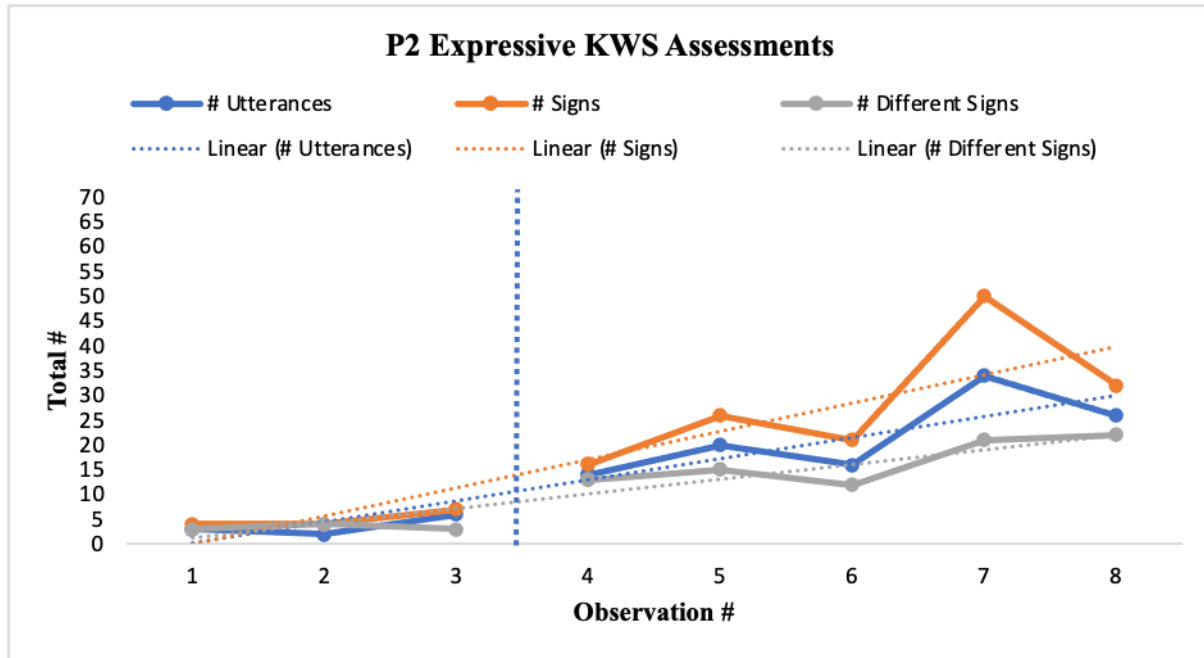


Table 4-16

Participant 2's Ranges, Means, and Standard Deviations for the Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments

Dependent variable	Range	<i>M</i>	<i>SD</i>
Number of signed utterances			
Preworkshop	2–6	3.67	2.08
Postworkshop	14–34	22	8.12
Number of signs			
Preworkshop	4–7	5	1.73
Postworkshop	16–50	29	13.15
Number of different signs			
Preworkshop	3–4	3.33	.58
Postworkshop	12–22	16.6	4.62

As shown in Figure 4-20, Participant 5 demonstrated an immediate increase in the number of signed utterances, signs, and different signs they used in the therapy room after they attended a KWS workshop. Participant 5 exhibited an ascending trend for the number of signed utterances and signs and a slight ascending trend for the number of different signs over the three preworkshop observations; and they showed an ascending trend for the number of signed utterances, signs, and different signs across the five postworkshop observations. Participant 5's PND for the number of signed utterances, signs, and different signs was 100%, which indicated a large effect (Scruggs & Mastropieri, 1998). Table 4-17 shows the ranges, means, and standard deviations for the number of signed utterances, signs, and different signs Participant 5 produced during the preworkshop and postworkshop observations.

Figure 4-20

Participant 5's Total Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments

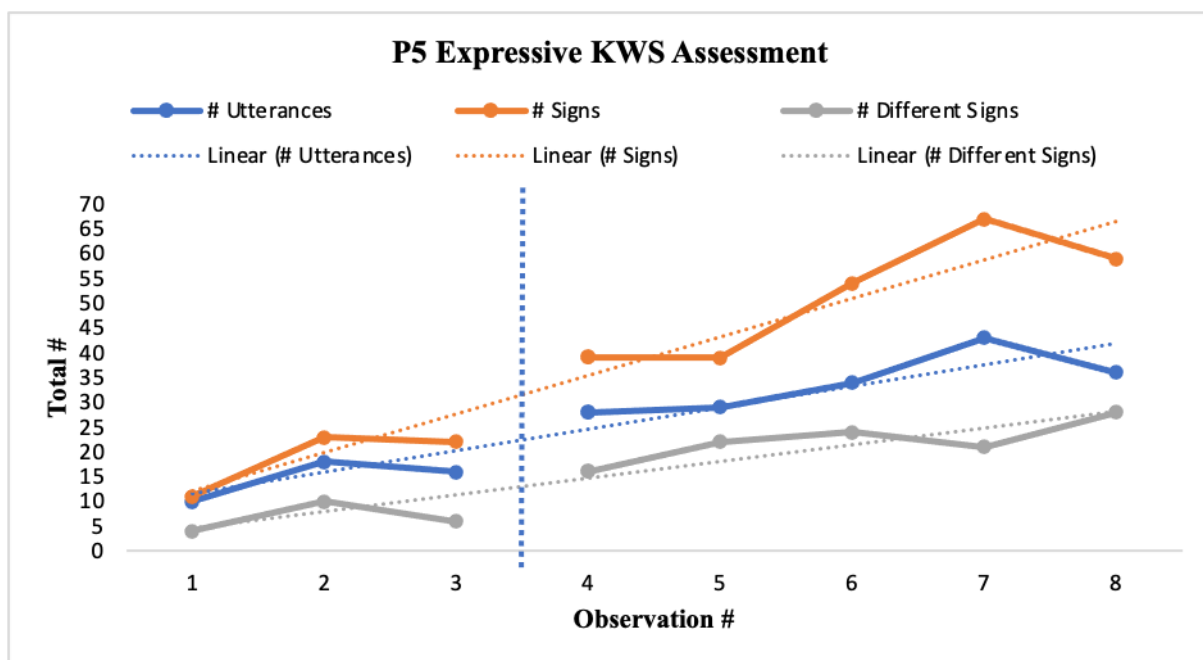


Table 4-17

Participant 5's Ranges, Means, and Standard Deviations for the Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments

Dependent variable	Range	<i>M</i>	<i>SD</i>
Number of signed utterances			
Preworkshop	10–18	14.67	4.16
Postworkshop	28–43	34	6.04
Number of signs			
Preworkshop	11–23	18.67	6.658
Postworkshop	39–67	51.6	12.40
Number of different signs			
Preworkshop	4–10	6.67	3.06
Postworkshop	16–28	22.2	4.38

Student 2 was observed during nonstructured teaching (i.e., individual play-based) therapy room activities throughout the preworkshop and postworkshop observations. During the three preworkshop observations, Student 2 produced the ASL signs ALL DONE and MORE; and, throughout the five postworkshop observations, they produced the ASL signs ALL DONE, EAT, HELP, MORE, OPEN, PLEASE, and TRAIN. The ASL signs were functionally used and produced without prompting or with verbal cues and/or visual models.

As shown in Figure 4-21, Student 2 demonstrated an immediate increase in the number of signed utterances, signs, and different signs they used during the therapy room activities after Participant 5 attended a KWS workshop. Student 2 exhibited a slight decreasing trend for the number of signed utterances, signs, and different signs over the three preworkshop observations; and they showed an increasing trend for the number of signed utterances, signs, and different signs across the five postworkshop observations. Student 2's PND for the number of signed utterances, signs, and different signs was 80%, which indicated a large effect (Scruggs &

Mastropieri, 1998). Table 4-18 shows the ranges, means, and standard deviations for the number of signed utterances, signs, and different signs Student 2 produced during the preworkshop and postworkshop observations.

Figure 4-21

Student 2's (Aged 3 years, 2 Months) Total Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments with Participant 5

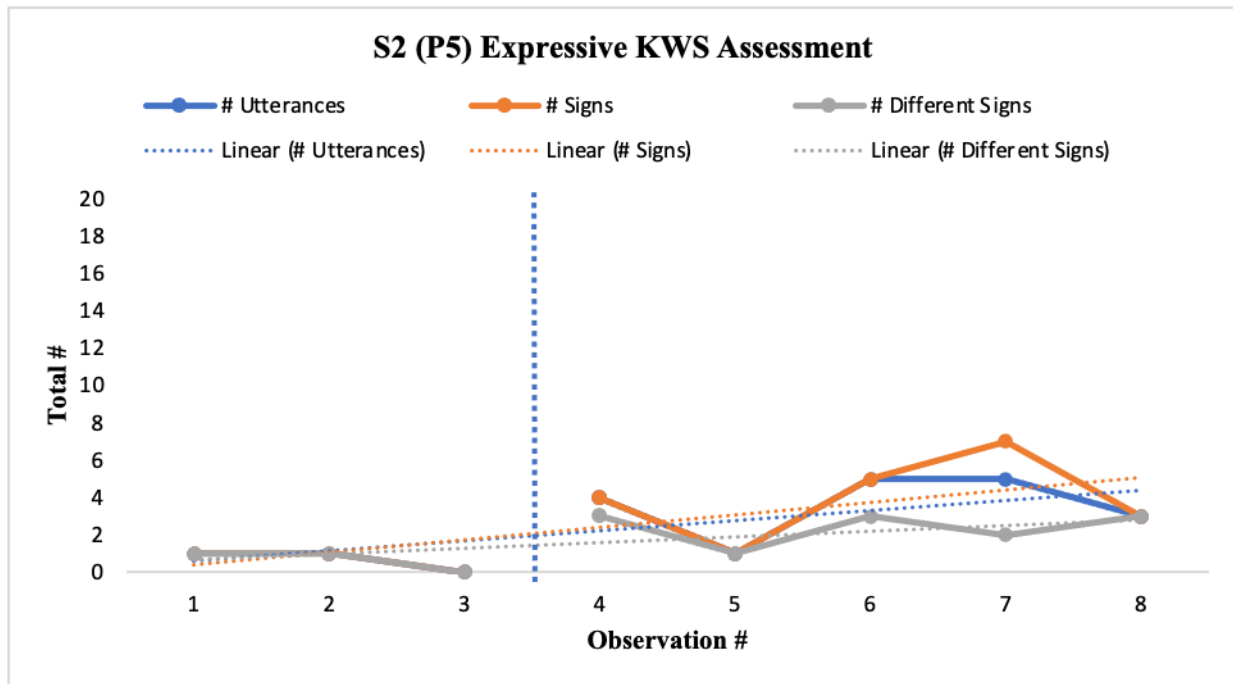


Table 4-18

Student 2's Ranges, Means, and Standard Deviations for the Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments With Participant

Dependent variable	Range	<i>M</i>	<i>SD</i>
Number of signed utterances			
Preworkshop	0–1	.67	.58
Postworkshop	1–5	3.6	1.67
Number of signs			
Preworkshop	0–1	.67	.58
Postworkshop	1–7	4	2.24
Number of different signs			
Preworkshop	0–1	.67	.58
Postworkshop	1–3	2.4	.89

As shown in Figure 4-22, Participant 6 demonstrated an immediate increase in the number of signed utterances, signs, and different signs they used in the classroom after they attended a KWS workshop. Participant 6 exhibited a descending trend for the number of signed utterances, signs, and different signs over the three preworkshop observations; and they showed an ascending trend for the number of signed utterances, signs, and different signs across the five postworkshop observations. Participant 6's PND for the number of signed utterances, signs, and different signs was 80%, which suggests a large effect (Scruggs & Mastropieri, 1998). Table 4-19 shows the ranges, means, and standard deviations for the number of signed utterances, signs, and different signs Participant 6 produced during the preworkshop and postworkshop observations.

Figure 4-22

Participant 6's Total Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments

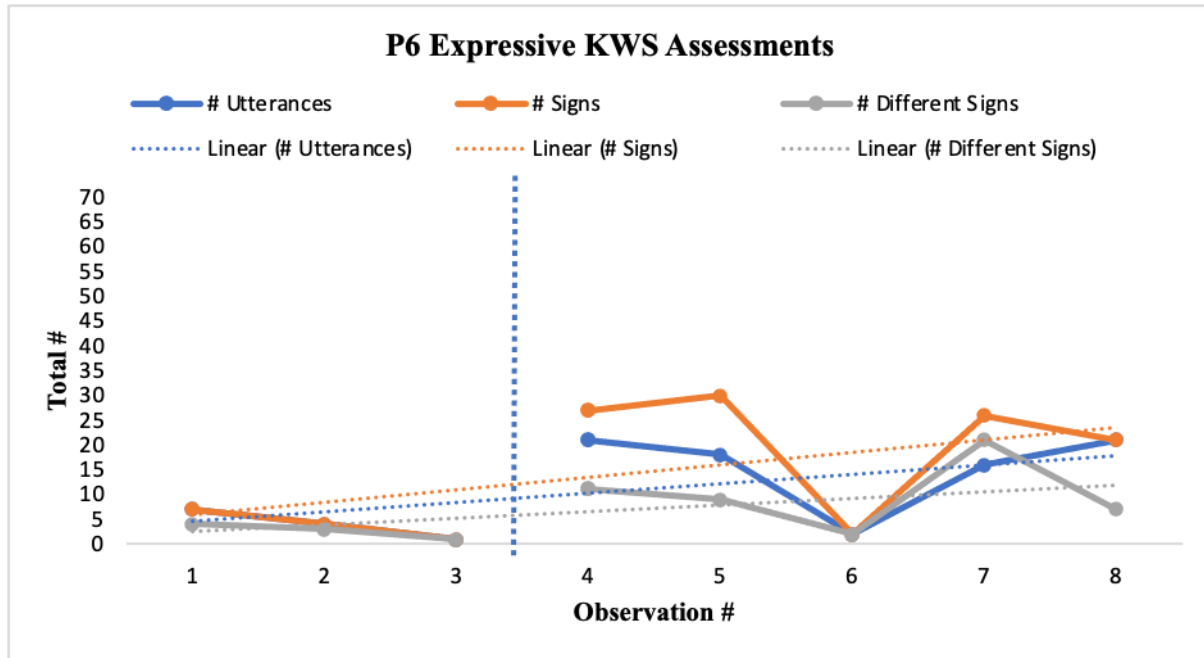


Table 4-19

Participant 6's Ranges, Means, and Standard Deviations for the Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments

Dependent variable	Range	<i>M</i>	<i>SD</i>
Number of signed utterances			
Preworkshop	1–7	4	3
Postworkshop	2–21	15.6	7.89
Number of signs			
Preworkshop	1–7	4	3
Postworkshop	2–30	21.2	11.21
Number of different signs			
Preworkshop	1–4	2.67	1.53
Postworkshop	2–21	10	7

Student 3 was observed during structured teaching (i.e., small group [three students total]) classroom activities throughout the preworkshop and postworkshop observations. During the three preworkshop observations, Student 3 produced the ASL signs ALL DONE, BYE(-BYE), ME, MY, SWIM, and YOU; and, throughout the five postworkshop observations, they produced the ASL signs BYE(-BYE), FIVE, HELLO, I, ME, MY, ONE, THANK, TIME, TWO, WHEN, and YOU. The ASL signs were functionally used and produced without prompting or with verbal cues and/or visual models.

As shown in Figure 4-23, Student 3 demonstrated an immediate increase in the number of signed utterances, signs, and different signs they used during the classroom activities after Participant 6 attended a KWS workshop. Student 3 exhibited a decreasing trend for the number of signed utterances, signs, and different signs over the three preworkshop observations. They showed a decreasing trend for the number of signed utterances and signs and no trend for the number of different signs across the five postworkshop observations. Student 3's PND for the number of signed utterances and signs was 20%, and their PND for the number of different signs was 40%, which indicated a small effect (Scruggs & Mastropieri, 1998). Table 4-20 shows the ranges, means, and standard deviations for the number of signed utterances, signs, and different signs Student 3 produced during the preworkshop and postworkshop observations.

Figure 4-23

Student 3's (Aged 14 years, 8 Months) Total Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments with Participant 6

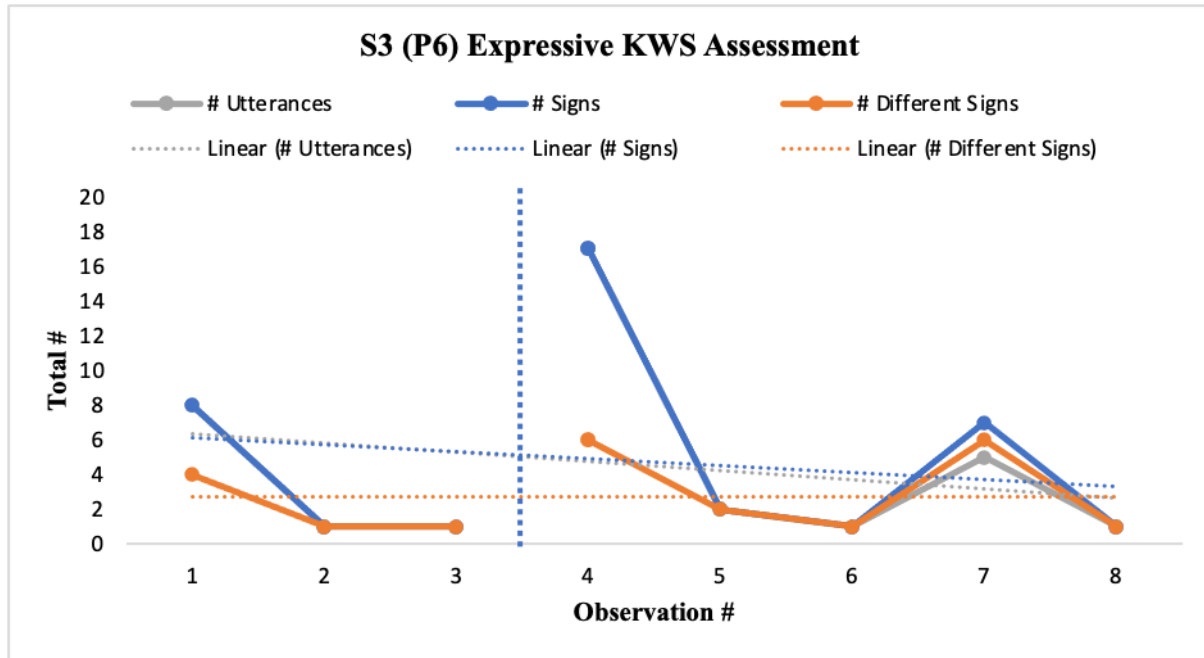


Table 4-20

Participant 3's Ranges, Means, and Standard Deviations for the Number of Signed Utterances, Signs, and Different Signs Produced During the Expressive KWS Assessments With Participant 6

Dependent variable	Range	<i>M</i>	<i>SD</i>
Number of signed utterances			
Preworkshop	1–8	3.33	4.04
Postworkshop	1–17	5.2	6.8
Number of signs			
Preworkshop	1–8	3.33	4.04
Postworkshop	1–17	5.6	6.84
Number of different signs			
Preworkshop	1–4	2	1.73
Postworkshop	1–6	3.2	2.59

Semi-structured Interviews

Six of the eight adult participants (i.e., Participants 2, 3, 4, 6, 7, and 8) completed the four individual, semi-structured interviews within 5, 7, 9, and 11 work weeks after the workshops (i.e., during Weeks 6, 8, 10, and 12). Participant 1 completed the four individual, semi-structured interviews within 5, 8, 10, and 12 work weeks after a workshop (i.e., during Weeks 6, 9, 11, and 13). Participant 5 completed the four individual, semi-structured interviews within 5, 7, 10, and 11 work weeks after a workshop (i.e., during Weeks 6, 8, 11, and 12; see Appendix AA for the expressive and receptive sign assessment and semi-structured interview schedule).

The semi-structured interviews were conducted to learn the in-service special education teachers' and SLPs' perceived changes from taking part in the KWS workshop (Research Question 4). The interview questions determined whether the participants applied the workshop material to their work (Level 3 Behavior; Kirkpatrick & Kirkpatrick, 2016), what assisted them with implementing the workshop material on the job, and what additional support(s) they needed to implement the workshop material on the job (Required Drivers; Level 3 Behavior; Kirkpatrick & Kirkpatrick, 2016). The questions also discovered the positive outcomes that the participants experienced due to implementing the workshop material on the job (Level 4 Results: Leading Indicators; Kirkpatrick & Kirkpatrick, 2016).

At the start of each interview, when the researcher asked whether the participants had used KWS in their classrooms or therapy rooms since the workshop (or in the past 2 weeks), seven of the eight participants indicated that they had used KWS (Level 3 Behavior). At the beginning of Interviews 1, 2, and 3 (during Weeks 6, 8, and 10), in general, Participant 4 stated that they did not use KWS because they had one student who relied on AAC and used an SGD. Accordingly, the student's Individualized Education Plan (IEP) goals targeted SGD use.

Participant 4 also stated that they did not use KWS due to the participant and the student being ill or quarantined. However, Participant 4 said, on one occasion (between Weeks 2 and 6), they used a few manual signs, during a therapy session, when the SGD was not charged. Moreover, Participant 4 said that, on another occasion (between Weeks 8 and 10), they used one or two signs at the end of a session. Lastly, at the start of Interview 4 (Week 12; between Weeks 10 and 12), Participant 4 reported that they taught a whole group lesson in the student's classroom, with the student and their classmates, using KWS.

Students

The students, with whom the special education teachers and SLPs used KWS, were aged 3 to 21 years and had ASD, hearing impairment, intellectual disability, multiple disabilities, orthopedic impairment, speech and language impairment, visual impairment, cerebral palsy, or Down syndrome. These students were nonverbal, preverbal, minimally verbal, or unintelligible; and they used oral speech or verbal approximations, manual signs, picture communication symbols (PCS), speech-generating devices (SGDs), and eye gaze to communicate.

Teaching and Nonteaching Activities

When the researcher inquired about the participants' use of KWS in their classrooms/therapy rooms since the workshop (Level 3 Behavior), the secondary special education teachers reported that they used KWS during teaching activities such as "good morning" (i.e., morning greetings), weekend review, calendar, English (or language), math, science (gardening), health, cooking, social games, and community-based instruction (CBI). They also reported that they used KWS during nonteaching activities like snack, lunch, and transitions as well as bathroom and mask breaks. The preschool special education teacher stated

that they used KWS during teaching activities such as circle time and centers (i.e., language and art) as well as nonteaching activities like snack, lunch, play, bathroom breaks, and transitions.

The SLPs reported that they used KWS during push-in and pull-out services. For the pull-out (therapy-room-based) sessions, they used KWS to teach wh-questions and emotions and increase utterance length (e.g., two-word utterances). For the push-in (classroom-based) sessions, the SLPs used KWS during centers (or tabletop activities), play activities (e.g., cars, trains, kitchen, and food), and read-alouds (with picture books). They also used KWS during CBI. Lastly, the SLPs used KWS during nonteaching activities such as lunch, recess (on the playground), play breaks (in the classroom or therapy room), and transitions.

KWS Uses

In addition to recounting the teaching and nonteaching activities during which KWS was used, the participants described two uses for KWS in their classrooms or therapy rooms (Level 3 Behavior). The uses included teaching language (i.e., AAC and English) and managing behavior. Seven of the eight participants used KWS to teach their students how to communicate using ASL signs. Six of the participants used KWS as a visual cue to teach their students how to communicate using English words.

KWS as Communication

The participants taught the students ASL signs as an augmentative or alternative form of communication (i.e., AAC) using two approaches. One approach was augmented input and the other was direct instruction.

For augmented input, the participants provided the students with models for using ASL signs during teaching and nonteaching activities. The participants also provided the models, throughout these activities, by using facilitative language techniques such as labeling, linguistic

mapping, close-ended question, open-ended question, and parallel or self-talk. For example, three participants reported and/or were observed describing or providing linguistic input about what they or the student was doing (i.e., using parallel or self-talk). Participant 2 stated, “In our play activities, I’ll use [KWS] to narrate what we’re playing, what we’re doing, or what we’re talking about” Participant 3 said, “I have two students that actually sign, so I use the signs with them to either model or describe what they’re doing.”

For direct instruction, the participants primarily taught the students ASL signs throughout structured teaching activities versus unstructured nonteaching activities. Five of the eight participants reported that they taught their students ASL signs during routine activities (e.g., morning greetings, calendar, and speech and language therapy) and/or courses (e.g., math, language, health, and science). Participant 6 explained their reason for directly teaching KWS during regular activities and classes as follows:

It just kind of gave us a structured time to sit down and talk about sign language and talk about, “Hey, we’re going to learn this word.” . . . I think that it also just helped the students understand that there is purpose behind it, and that it was important.

When the participants chose the structured teaching activities, in which ASL signs were taught, they selected routine activities and courses during which language was typically taught. For instance, Participant 2 said, “I kind of try and incorporate [KWS] in the activities where we’re talking about language, learning about language, trying to increase language.”

The participants slowly incorporated ASL sign instruction into the structured teaching activities by choosing a small number of ASL signs (e.g., one to three signs) to teach. The signs were directly taught a few times a week (e.g., two to four times) from 1 to 4 weeks. The participants taught the students how to produce the signs and gave them feedback on their sign

productions. Then they provided the students with opportunities to use the signs learned by asking close-ended and open-ended questions as well as using cloze procedure and role-play. Participant 1 gave an example of how they taught ASL signs, “the video first [teaches] us, and then I [teach] the class, and then [ask] the class to repeat it or show what their favorite vegetable might be.” As an example of a classroom role-play activity, Participant 4 shared, “The kids all came up and asked [the student who relied on AAC] to play and then [the student who relied on AAC] came up and asked another kid to play just like we demonstrated it.”

By directly teaching the ASL signs, the participants and paraeducators were able to learn the signs, with their students, and expand their vocabulary. Consequently, as the participants and paraeducators increased their sign knowledge and skill, through the structured teaching activities, they increased their sign use throughout the day. Participant 6 explained the benefit of using direct instruction to teach ASL signs as follows:

The more direct approach was really a learning process for me too because I wouldn't have necessarily known all of those words . . . so that kind of gave me the opportunity to say, “Okay, we're going to focus on this word and this word and this word,” and kind of do a series of lessons, and I was learning along with them. Then I found that when I did that more that I was also starting to use it more indirectly because then I had expanded my vocabulary.

Similarly, Participant 7 explained:

The words that we've been learning, like, “Who [signed WHO] do you want to say good morning to?” I use “who” [signed WHO] throughout the day now because I know “who” [signed WHO]. So as I learn words, I don't just use them during [sign language] time. Any time I say “who” to a student, I'll pair it with the sign. So as I'm learning new words

and as the staff are learning new words, we'll use it throughout the day. So just naturally, we're trying to incorporate more and more just throughout the day.

The regularity and structure of the activities and courses gave the participants and paraeducators the repetition that they needed to learn and remember ASL signs so that they could, eventually, provide the students with augmented input (i.e., models for using ASL signs or KWS) during structured and unstructured teaching and nonteaching activities.

Like the participants and paraeducators, students had the same advantage from the structured teaching activities. When students were given opportunities to use the ASL signs that they learned throughout routine activities and courses, they were able to employ the signs in other classes or educational environments (e.g., CBI) during which the signs were not taught; that is, they were able to generalize the use of the signs. For instance, Participant 1 shared:

I'll go from showing them in the classroom and then going out into the garden or into the cooking class and saying, "Okay, who remembers what peach is?" . . . and "Who remembers what color it is?" So they'll do the peach [signed PEACH] and then they'll do orange [signed ORANGE] for the color. . . So they are actually coming up with the answers without me having to demonstrate.

Participant 1 also expressed, "When we're at the grocery store, now we're signing what they've learned in their health class so that's, to me, exciting because we're carrying it over into real life."

KWS for Cueing Language

Concerning the participants' use of KWS as a visual cue to teach their students how to communicate using English words, they used KWS to help their students understand and use English or oral speech. To assist students with comprehending oral speech, the participants used

ASL signs to visually reinforce or demonstrate the meaning of words. For instance, Participant 6 used ASL signs “where you kind of need a concept and the visual would really kind of explain the concept a little bit.” Participants used ASL signs as a visual cue by producing the sign for a target word (e.g., wh-question words, emotions, and prepositions) while saying a sentence or asking a question. They did not sign the other key words in the sentence or question. Participant 3 explained:

I’ll pair it with the sign to kind of give them that visual cue; for example, “No, I didn’t ask a what [signed WHAT] question. . . I’m talking about who [signed WHO] . . .” I use [ASL signs] a lot as, again, another mode of teaching those vocabulary words to help the students who really struggle with differentiating between those questions.

Another manner in which the participants used ASL signs to help their students understand oral speech was by saying a sentence or asking a question without an ASL sign, waiting or using an expectant delay, and (if the student did not respond) producing an ASL sign as a visual cue without the word(s). Participant 2 explained the benefit of using KWS in this manner:

When I do the Key Word Sign [signed IN], sometimes I’ll see them just kind of follow through and continue, which is really exciting, because we do a lot of put in and take out [signed OUT] . . . Sometimes I’ll just take out that language and just give them the visual [signed IN], so it’s like, I’m taking a layer of prompting away.

To assist students with using oral speech or English, Participants 1 and 3 reported that they used ASL signs to help their students combine words, expand utterances, and write sentences. For instance, Participant 1 gave their students word banks for adjectives, pronouns, and prepositions so that they could form complex sentences. Participant 1 would sign words,

from those categories, that they learned during the workshop. Participant 2 shared that they used ASL signs to assist a student, who used Spanish to communicate, with using English as follows:

So I would tell him “stand up” in Spanish and I would show the hand gesture and then I changed the Spanish to English to say stand up. So now he’s repeating “stand up” and he’s showing me [signed STAND] . . . He’s now communicating more in English because of the gesture I think. I’ve noticed that with a lot of the English words that he’s catching on to, he’s catching on to the ones that have a hand gesture as opposed to the ones that don’t. . . So I’m trying to learn more of the language that he has in sign so that I can give him the sign for it so that I can prompt him to remember the English word for it.

KWS for Managing Behavior

Regarding the use of KWS for behavior management, five participants used ASL signs to reinforce or emphasize spoken directives in their classrooms. The participants shared that, for example, students would not follow instructions, yell or be loud, play loud music on a Chromebook, stand up to check their chair, walk around the classroom, and write on the whiteboard. Therefore, depending on the situation, they used ASL signs (e.g., LOOK AT, STOP, ALL DONE, SIT, WAIT) with or without spoken language to instruct or redirect the students. The participants used the ASL signs to reinforce or emphasize spoken directives because they believed the signs were less intrusive or less restrictive. Participant 7 explained the circumstances under which they used ASL signs without spoken language:

I’m using the sign for sit instead of telling them to sit just because it’s less invasive and less disruptive. . . I do pair it with the verbal sometimes, but if I’m in the middle of teaching and if a student that regularly gets out of his seat . . . I’ll just sign sit [signed SIT] to him.

Participant 6 shared the reason for which they used ASL signs without spoken language to manage behavior: “Everybody’s talking in here all the time, and there’s a lot of aids and a lot of teachers. So I think sometimes to break up the verbal. It’s nice to have a sign without the verbal. . . . Sometimes it’s received better.”

Supports Used for KWS

When the researcher asked about the supports that the participants received to help them use KWS in their classrooms or therapy rooms (Level 3 Behavior: Required Drivers), the participants reported that ASL resources were the primary support that helped them use KWS during activities and with students. All eight participants used videos of ASL signs online to recall or learn how to produce signs. Five of the participants worked with staff (i.e., paraeducators who signed and ASL interpreters) who reminded or taught them how to produce signs when asked; however, three of the five participants temporarily worked with staff members who signed. Four of the participants used the KWS vocabulary memory aids handout from the workshop, which contained descriptions of the sign parameters (i.e., location, handshape, orientation, and movement) and sign-referent relationships for the ASL signs in the KWS vocabulary. Lastly, single participants (three participants total) used an ASL dictionary, an ASL app, online ASL courses, and online ASL music videos to increase or improve their ASL sign knowledge and skill.

With respect to staff members who signed (as a support that the participants received), the participants emphasized the value of working with them. For themselves, the participants shared that they depended on the staff who signed and ASL interpreters. Together with showing the participants how to produce a sign when they asked, the staff who signed corrected the participants’ sign production when they produced a sign incorrectly, and they told the

participants the meaning of the students' signs when the participants did not understand them. The support that the staff who signed and ASL interpreters provided to the participants increased the participants' sign knowledge and skill, which helped and encouraged them to use KWS in the classrooms and therapy rooms. For the students, the participants shared that the staff who signed increased their sign use with the students, which provided additional models of ASL signs or KWS for the students. Further, the staff who signed understood the students' signs and responded to them as well as encouraged the students to sign and praised their sign use.

Supports Needed for KWS

In regard to the supports that the participants needed to continue to use KWS in their classrooms or therapy rooms (Level 3 Behavior: Required Drivers), the participants indicated that they needed practice, KWS-specific resources, and staff support. In particular, six of the eight participants stated that a 2-day KWS workshop with additional time to practice the ASL signs would be beneficial; and one participant said that an intermediate or advanced KWS workshop would be helpful. Five of the participants noted that they needed to practice the ASL signs learned during the KWS workshop outside the workshop. Four participants stated that videos of the ASL signs taught during the workshop would be beneficial, and one participant said that videos of "someone using [KWS] in a lesson" would be helpful (Participant 4). Lastly, three participants noted that a sign wall (i.e., pictures of ASL signs hung on a wall) or a sign-of-the-week program would help them use KWS in their classrooms.

Three participants shared information that they would have wanted to be provided or topics they would have liked to discuss during the KWS workshop (Level 1 Reaction: Relevance). The information included:

- strategies for teaching KWS to students with ASD

- how to write communication or academic goals for individualized education plans (IEPs) for students who use KWS
- how to write receptive and expressive communication goals for IEPs that target KWS
- a developmental hierarchy for KWS that tells what skill(s) to teach first as well as the progression or hierarchy of skills to teach (e.g., vocabulary, two-word utterances or two-word semantic relationships [noun + verb, adjective + noun])
- how to produce ASL signs (e.g., three or four) that are specific to the participants' students (i.e., substantive words or fringe vocabulary)
- how to create a manual sign for a word for which there is no ASL sign
- the need for a sign-friendly environment to use KWS
- how to use other communication modes (e.g., PECS or SGDs) with KWS, when students are not in sign-friendly environments, so that they may be independent and successful communicating with people who do not sign (i.e., across listeners)

No participants indicated that information or topics could be improved or removed from the KWS workshop (Level 1 Reaction: Relevance).

As far as staff support, one participant reported that staff who signed was needed. Participant 6 stated that it would be extremely helpful if there was a staff member (e.g., teacher, paraeducator, and/or SLP) who signed and worked with them in person with the students so that they could “encourage each other, hold each other accountable.” Participant 6 elaborated and said, “It would be nice if [the staff members] were in the classroom with me. . . Something that’s already built into the school day as opposed to adding one more thing to the schedule.”

Even though one participant reported the need for staff who signed, all but one participant discussed the need for and the benefit of a signing community or environment to use

KWS. The participants stated that it would be helpful if classroom staff at their schools learned ASL signs and became comfortable with using KWS because it “makes a difference when everyone is onboard” (Participant 5). If everyone used KWS, then students who relied on AAC could communicate with their teachers, paraeducators, and classmates. Participant 4 stated, “I do think a community is a little bit better, because just having the ability to Key Word Sign with one person. . . You can just talk to one person.” The participants believed that students need “a lot of input and output, in practice, to really see the results” (Participant 6), which was for the students to spontaneously use KWS themselves.

KWS Challenges

The challenges or obstacles the participants encountered using KWS in their classrooms or therapy rooms were due to COVID-19, limited sign knowledge and skill, limited planning time, and lack of staff support (Level 3 Behavior). Concerning COVID-19, five of the eight participants reported that COVID-19 hindered their use of KWS because either the participants, their paraeducators, and/or their students were ill or quarantined, which resulted in 1- to 3-week absences. Participant 2 described the challenge of the COVID-related absences, “a few of [my students] were out sick for a while, and then they’re back; and I was out for a while, and I’m back.” Participant 7 told about the effect of the absences, “So when you come back . . . if you haven’t used [KWS], it’s like you’re a little rusty.”

Seven of the eight participants stated their and community members’ limited sign knowledge and/or skill hampered their use of KWS. Five of the eight participants said that their limited sign knowledge and skill hindered their KWS use because they did not remember or “[have] all the vocabulary” (P5) and they were not “fluent in sign language” (P4). Participant 3 stated, “Just forgetting some of the signs that I learned was a big one. Like I’m sure I could be

using a lot more that we learned that I just don't remember," which showed the effect of limited sign knowledge on KWS use. Participant 2 said, "I feel like just my level of signing, my ability to be able to produce signs as quickly and efficiently as I need to," which illustrated the effect of limited sign skill on KWS use.

Furthermore, two participants reported that their limited sign knowledge impeded the use of KWS in their classrooms or therapy rooms because they did not understand signs produced by their students. Participant 1 stated, "The challenge is me learning more because there are signs that they're signing and I'm not sure what it is." Participant 7 described the challenge of not understanding the signs produced by their student, "We can't understand him. . . If he can't use his device to tell us, he'll sign. Then we have to google it or try to figure out what he's signing."

With respect to community members' limited sign knowledge and skill, three participants expressed concern about community members not understanding signs produced by their students. Participant 4 stated, "I guess with Key Word Sign too, it's like when she goes out into the community, people aren't going to know it." As a result of community members not understanding signs, the three participants conveyed a preference for speech-generating devices (SGDs) or "talkers." Participant 3 said, "I think it's important to also have him use his device because God forbid he was lost in the community, and it's not a signing environment." Participant 4 stated, "Why I want her to master [an SGD] is because one day she's going to have to go out into the community and communicate." Participant 6 said:

The parents and advocate and the team has really pushed the use of their talker to communicate their needs. And so there is a lot of pressure to really get them using that talker I think because it could be understood by everybody, it could be understood by a stranger who doesn't know sign language or doesn't know the student.

In addition, Participant 6 stated, “I think that they’re trying to include their child in more typical interactions where they can kind of go farther with being understood within their communities.”

Consequently, Participant 3 (an SLP) advised a special education teacher:

So the one student that signs, he has his device, and I encouraged his teacher to have him use his device versus signing because I think it gives him more independence when he’s ordering, and the Pizza Hut guy does not know sign language.

As a special education teacher, Participant 6 received the following recommendation:

There’s sort of a push to accept less gestures, I think, and really pretend like you don’t know what they’re saying if they’re gesturing to you. Instead, direct them towards their talking device so that they get more comfortable using it.

In regard to limited planning time, four of the eight participants stated that limited or interrupted planning time interfered with their use of KWS in their classrooms or therapy rooms.

Participant 4 expressed:

The real barrier is not [the special education teacher] at all, it’s me like having to really, like we talked about this too, the time to like, since [KWS] isn’t something that I’ve done before, like really plan out a lesson and think about how it would go. . . A lot of it is just time and planning time.” (P4).

Moreover, Participant 4 said, “Even on days where it’s like, I’ve got it written down on the schedule like, “Planning time,” something else usually comes in and bumps it.” Similarly,

Participant 6 said:

I think it’s just a bigger issue which is like feeling busy in general and not just with Key Word Sign, but just in general not having a ton of time to plan and prepare, and always

adjusting to things that are coming up in the moment, and so it kind of throws what plans did you have kind of off.

Although Participants 4 and 6 (and other participants) reported that a lack of planning time encumbered their KWS use, Participant 4 learned that KWS use did not require a large amount of planning:

I kept it super simple and then I felt stupid that I was like, “This has taken too much planning,” because it really doesn’t take very much planning at all. . . The experience of teaching the class made me feel better about it. That we could do more, or practice periodically, so that they could keep it in the wheelhouse (P4).

Participant 6 realized that their KWS use improved with a small amount of preparation:

Even though I didn’t do a lot of preparation . . . I had a little preparation and just the repetition of doing it within calendar. I do think that I really noticed myself get better towards the end and feel much more confident and fluent. I still got better and I didn’t do that much preparation. . . Imagine how much better I could have gotten if I would’ve done more preparation (P6).

In regard to the lack of staff support, which was related to the need for staff support and a signing environment, two participants reported that a lack of staff support or buy-in was an obstacle to their and their students’ KWS use. Participant 4 stated that staff members were not accepting of an SGD for a student whose oral speech was unintelligible; therefore, they thought that the staff would not be responsive to KWS also. Participant 4 said that they would have been more inclined to use KWS with the student who used AAC had the staff been more willing to use the student’s SGD.

Participant 2 believed that students would make more progress toward communicating with ASL signs if the staff (i.e., paraeducators) signed or used KWS too; thus, they said that they hoped their staff would learn and use more ASL signs. However, Participant 2 stated, “[My staff] definitely share how hard it is to learn the words that we’re using, especially because I use multiple words throughout the day.” Further, Participant 2 said that their staff expressed reluctance because they thought the students were not looking or paying attention.

KWS Results

The benefits that resulted from the participants using KWS in their classrooms or therapy rooms included increased the students’ attention and engagement as well as increased their ASL sign imitation and spontaneous production (Level 4 Results: Leading Indicators). With respect to increased attention and engagement, four of the eight participants believed that, when they used KWS, their students were more attentive and engaged. Participant 7 said, “If I’m signing when I’m talking, those gestures bring attention to you.” The participants stated that their students looked at them, made eye contact with them, watched their hands, and watched the activities more as they signed. Consequently, Participant 2 said, “I have seen [my students] pay attention more, look more, listen more, following directions more.” The participants also stated that their students smiled while they watched the signs and imitated the signs that they observed.

Participant 7 said, “It helps [my student] be engaged because he feels proud to show me. He likes me to watch him.”

Students’ KWS Use

As far as the students' use of ASL signs or KWS, seven of the eight participants reported that students, who used oral speech or relied on AAC, imitated or produced approximations of signs the participants produced with and without prompts. Participant 7 said that one student also

imitated their classmates' signs without prompts. In addition, students, who used oral speech, often produced the sign and the word without assistance. When prompts were required, the levels of prompting included direct verbal prompts (e.g., "Show me more.") or full physical guidance. However, Participant 2 stated that, over time, some students needed less assistance to produce signs; that is, the students started to produce signs with direct verbal prompts instead of full physical guidance. Further, the frequency with which the students imitated the signs, when they were given direct verbal prompts, increased.

Four of the eight participants reported that students, who used oral speech or relied on AAC, began to spontaneously or independently produce single signs (e.g., MORE, ALL DONE, EAT, BATHROOM) and combine two signs (e.g., YELLOW and GREEN to describe a pineapple) without direct verbal prompts. The participants also reported that the students independently used manual signs to communicate with them, staff (i.e., paraeducators, teachers, and SLPs), peers, and/or parents. As an example of student-to-participant communication, Participant 2 stated, "Every time he asks for a book, he's like, 'I wanna book,' and he'll always just [sign BOOK] now, so that's really exciting. Before he wouldn't really ever ask for a book, he would just go and get it." To give an example of student-to-student communication, Participant 1 said, "It was [a student], grabbing the bag, because he was trying to have some more food, not his, but some student's next to him, and then the student said, 'No, mine, it's my food' [and signed FOOD]." Lastly, as an example of student-to-parent communication, Participant 1 stated:

The mom is saying the student is signing the different fruits and vegetables. . . She's asking [ORANGE] and then [the mom] said, "Orange? You want your orange cup?"

which is a little cup with mandarin oranges. . . Her daughter is starting to sign some of the signs that we've been learning together, so that was nice.

Six participants taught or treated students who knew ASL signs prior to the start of the study. One of the six participants (i.e., Participant 6), shared that KWS helped them attend more to a student's signs and what the student was communicating. Participant 6 said, "I didn't always notice everything that [the student who signed] was saying before, until I started paying more attention, had Key Word Sign on my mind." Participant 6 thought that modeling ASL signs as well as showing the student that they understood and were interested in the signs helped the student express themselves and increased the students' (and their) sign use. Participant 6 also said, "When we understand each other through signs, it's a happy thing."

Two participants shared that they each discovered a student who knew ASL signs. The students did not use ASL signs to communicate until the participants began to use KWS. Participant 2 stated that a student used a sign that they did not model when they asked, "What color do you want?" and modeled two or three choices (i.e., two or three colors). Participant 2 explained, "He said orange [signed ORANGE] and I'm just like, 'Your parents have tried this before at home, haven't they?' which is really exciting." Participant 7 stated that a student, who used an SGD, started to spontaneously or independently use ASL signs. Participant 7 explained, "He'd sign, and it was like, 'Are you signing?' So I'm like, 'Oh, so wow, he was taught sign, I don't know when.'"

Lastly, one participant (i.e., Participant 8) did not report their students imitated or independently used manual signs. Participant 8 taught two students with ASD who used little to no spoken language (i.e., Student A and Student B) in a collaborative geometry class. A collaborative or coteach class is one in which students with and without IEPs are taught by a

general education teacher and a special education teacher. Student A comprehended spoken language and used oral speech, but their speech was unintelligible. Student B comprehended spoken language with some difficulty and used unintelligible speech and grunt-like vocalizations to communicate. Participant 8 used natural gestures and ASL signs to assist the two students with following instructions (Student A) and managing behavior (Student B). Participant 8 explained that they could use spoken language with 90% of their class, so it was hard for them to use sign.

Even though Participant 8 used a small number of ASL signs and natural gestures to reinforce spoken language, they reported that the two students were more responsive (e.g., to verbal directions) and did what was required; therefore, they believed the signs and gestures increased the students' comprehension. Student A progressed from requiring repeated verbal instructions with signs and gestures (i.e., multiple repetitions) to needing one or two repetitions. Consequently, Student A demonstrated a decrease in "transition time from activity to activity during class" as well as an increase in time on task. Student B showed an improvement in time on task and behavior. Participant 8 thought the signs and gestures were helpful because "the fact that [Student B] gets frustrated and gets loud causes him to kind of shut down, so using the visuals helps him see what I'm requesting him to do."

Staff Members' KWS Use

In addition to telling about students' KWS use, the participants told about staff members' KWS use. Six of the eight participants regularly worked with staff (i.e., teachers and paraeducators) who knew little to no ASL signs and taught the students with whom the participants used KWS. Two of the six participants (i.e., Participants 4 and 8), who used a limited amount of ASL signs after attending a KWS workshop, reported that the staff with whom they worked did not use ASL signs. However, four of the six participants, who used a greater

amount of ASL signs after attending a KWS workshop, stated that staff with whom they worked began to use ASL signs in various degrees.

Participant 2 stated that the paraeducators in their classroom minimally used ASL signs. The paraeducators produced the signs Participant 2 frequently used (e.g., MORE, ALL DONE, STAND, and LINE UP). Although the paraeducators minimally used signs, Participant 2 believed the exposure or models the paraeducators provided contributed to the students' increased sign use. Participant 2 said, "I definitely think the reason why I'm seeing 'more' [signed MORE] and 'all done' [signed ALL DONE] with our students is that [the paraeducators are] starting to use it more often . . . especially since I've been gone for 2 weeks."

Participant 5 shared that they worked with two special education teachers who taught preschool-age students who relied on AAC. One teacher (Teacher 1) occasionally used ASL signs (e.g., MORE, HELP, PLEASE, and OPEN) and the other teacher (Teacher 2) consistently used ASL signs (e.g., YOUR TURN, GO, LINE UP, EAT, HELP, and PLEASE). After Participant 5 attended a workshop and started to use KWS, Teacher 2 saw Participant 5 using ASL signs and made an effort to use signs in their classroom as well. Teacher 2 and one of the paraeducators in the classroom would ask Participant 5 how to produce signs. If Participant 5 did not know how to make a sign, then they looked up the sign together. Participant 5 stated that Teacher 2 created an environment in which the classroom staff could learn and use ASL signs. Participant 5 discussed the benefit of creating a signing environment:

I think just creating a culture in the classroom where it's kind of expected and accepted to be using signs. And I think it's great, especially for the kiddo who is using total communication to feel really welcome in the class. And I think it's encouraging [Student

2] also to use it more because, when you see those models from the adults around you, I think that kids pick up on that and start to use it more.

Participant 6 reported that the paraeducators in their classroom learned and used ASL signs during structured teaching activities. While the participant taught the lessons (using KWS), the paraeducators modeled the signs and prompted the students (e.g., with full physical guidance) to use them. However, even though the paraeducators used the signs during the activities, they did not use the signs outside the lessons. Lastly, Participant 7 stated that the paraeducators in their classroom learned 20 to 25 ASL signs; and, as the paraeducators became more comfortable (i.e., less embarrassed) and natural using the signs, they increased their use of the signs throughout the day (e.g., to give or reinforce directions).

ASL Signs Used

When the researcher asked whether the ASL signs taught, during the KWS workshop, were appropriate for the participants and their students, they indicated that the KWS workshop vocabulary was suitable (Level 1 Reaction: Relevance). Together, the adult participants used 79 of the 91 ASL signs taught during the KWS workshop. Specifically, they used 19 of the 20 nouns, 29 of the 31 verbs, 13 of the 16 adjectives, all seven adverbs, six of the 12 pronouns, and all five prepositions. The signs that the participants did not use were HERE, CAN, TAKE, ALL, HEAVY, SOME, HE, IT, MY/MINE, SHE, THAT, and THEY. See Appendix CC for the KWS vocabulary that the participants reported or were observed to use.

In addition to using ASL signs taught during the KWS workshop, combined, the adult participants used 89 ASL signs learned outside the KWS workshop. The ASL signs included 48 nouns, 20 verbs, 14 adjectives, three adverbs, one pronoun, one preposition, one conjunction, and one interjection. The participants also shared that they used name signs, which they created for

their students and staff members (e.g., paraeducators), as well as ASL signs for animals, colors, days of the week, fruits, months of the year, numbers, transportation, and vegetables. See Appendix DD for the non-KWS vocabulary that the participants reported or were observed to use.

ASL Signs Needed

When the researcher inquired about the ASL signs the participants would have wanted to be taught during the KWS workshop (Level 1 Reaction: Relevance), together, they listed 44 ASL signs that they would have liked to learn. The adult participants also named 21 categories from which they would have wanted to be taught ASL signs. Table 4-21 shows the ASL signs the participants wanted to be taught during the KWS workshop, and Table 4-22 displays the ASL sign categories that the participants wanted to learn. In general, the participants wanted to be taught, during the KWS workshop, nouns that were functional and motivating as well as specific to their students, school curriculum, and classroom or therapy room environments.

Table 4-21*ASL Signs the Participants Wanted to be Taught During the KWS Workshop*

Nouns	Nouns cont.	Verbs
1. BACKBACK	18. MONTH	35. BRUSH TEETH
2. BED	19. MORNING	36. DANCE
3. BLOCK(S)	20. NAPKIN	
4. BREAK	21. NEED	Adjectives
5. CAR	22. PAPER	37. HUNGRY
6. CLASSROOM	23. PLATE	38. SICK
7. COLORED PENCIL	24. SPEECH	39. SMALL/LITTLE
8. CRAYON	25. SPOON	40. THIRSTY
9. DAY	26. START	41. TIRED
10. DIRT	27. TEACHER	
11. DOOR	28. TODAY	Adverbs
12. FORK	29. TOMORROW	42. FIRST
13. FRIEND	30. WEATHER	43. LAST
14. GAME	31. WEEK	44. NEXT
15. GLUE	32. WORM	
16. KNIFE	33. WRITE	
17. MARKER	34. YESTERDAY	

Table 4-22*ASL Sign Categories the Participants Wanted to be Taught During the KWS Workshop*

Categories	Categories cont.
1. Animals (e.g., farm animals)	12. School supplies
2. Colors	13. Seasonings/spices
3. Days of the week	14. Shapes
4. Foods	15. Sports
5. Fruits	16. Temperatures (i.e., cold, warm)
6. Garden tools	17. Toys
7. Kitchen tools/utensils (e.g., cutting board)	18. Transportation/Vehicles
8. Mathematics	19. Vegetables
9. Months of the year	20. Weather
10. Numbers/dates (e.g., 1–31)	21. Years (e.g., 2022)
11. Plants (i.e., herbs)	

Summary

Chapter 4 reviewed the research purpose, questions, and participants. Further, it reported the findings from the adult participants' personal commitment statement and communication action plan, which were completed during the KWS workshop to follow the CPI model. Chapter 4 also reported the findings of the receptive and expressive sign assessments; expressive KWS assessments (observations), surveys (i.e., acceptability questionnaire and supplemental questions), and semi-structured interviews, which were completed before and after the workshop in accordance with the pretest-posttest design with repeated posttest measures over time and A-B single-case design.

Next, Chapter 5 will consider the strength of the results from this study, answer the research questions, and connect the findings from this study with the results from prior studies. In addition, it will discuss research limitations and implications for practice and future research.

Chapter 5: Discussion

Chapter 5 considers the strength of the results from this study, which examined the efficacy of a KWS workshop, using Kirkpatrick's four-level training evaluation model. It also answers the four research questions asked to determine the effect of the KWS workshop on in-service special education teachers' and SLPs' manual sign skill and KWS use with students who relied on AAC. Lastly, Chapter 5 compares or contrasts the findings from this study with the results from prior studies as well as discusses research limitations and implications for practice and future research.

Level 1 Reaction

Level 1 Reaction of Kirkpatrick's four-level training evaluation model was used to appraise the extent to which the adult participants approved of the KWS workshop, were involved throughout the workshop, and thought the workshop material was applicable to their job (Kirkpatrick & Kirkpatrick, 2016). For the current study, the participants' reaction (i.e., engagement, relevance, and customer satisfaction; Level 1 Reaction) was measured using the acceptability questionnaire, supplemental questions, and semi-structured interviews. Based on the findings from these measures, the participants appeared to find the workshop engaging and interesting (Level 1 Reaction: Engagement) and the information provided (e.g., KWS, ALgS/augmented input, language response strategies/facilitative language techniques, LTM prompting, and vocabulary selection) relevant and applicable to their job (Level 1 Reaction: Relevance). These results from this study were similar to the findings from Fitzgerald et al. (1984) and Meuris et al. (2015) in that the participants enjoyed the manual sign or KWS training program, and they found the sign knowledge they gained and KWS useful.

Even though the participants from this study indicated that they were satisfied with the KWS workshop, they offered suggestions for improving the workshop and shared information that they would have wanted to be provided or topics they would have liked to discuss during the workshop. The suggestions and information included (a) providing longer practice sessions for the ASL signs, (b) offering a multi-day workshop with more signing practice, (c) teaching ASL signs that are specific to the participants' students (i.e., fringe vocabulary), and (d) presenting the workshop to support staff in moderate-severe programs.

Additional Sign Practice

Regarding the suggestions to provide longer practice sessions for the ASL signs and offer a multi-day workshop with more signing practice, components from the direct instruction (Gunter et al., 1995) and CPI (Kent-Walsh & Naughton, 2005) models were used to teach the ASL signs during the KWS workshop for the current study. Kent-Walsh and Naughton (2005) did not state a specific amount of time needed to successfully teach a communication strategy using the CPI model. Douglas (2012) reviewed seven studies that provided AAC-related, CPI-based trainings to paraeducators and reported that the length of the training sessions ranged from “multiple 15-minute sessions to a 1-day workshop,” the number of sessions ranged from one to 20, and the duration of the trainings ranged from one day to 14 months (p. 5). Further, Smidt et al. (2019) taught 100 Auslan signs during a 1-day workshop, which was similar to the current study (i.e., 91 ASL signs were taught during a 1-day, 6-hour workshop); and Meuris et al. (2015) taught 100 Flemish signs during four 2-hour workshops (i.e., 8 hours total) over 2 months. Although the length, number, and duration of the CPI-based and KWS trainings varied, additional time for independent or advanced practice with corrective feedback for the ASL signs may be beneficial based on the feedback given by the participants in this study.

KWS Workshop Vocabulary

Concerning the relevance of the KWS workshop vocabulary, the participants stated that the ASL signs learned were relevant to their work. The adult participants used 79 of the 91 ASL signs taught during the workshop as well as 89 ASL signs learned outside the workshop. Additionally, they listed 44 ASL signs that they would have liked to learn and named 21 categories from which they would have wanted to be taught ASL signs. Mainly, the participants wanted to be taught nouns that were functional and motivating as well as specific to their students, school curriculum, and classroom or therapy room environments. For instance, one participant noted that some of the core words (or ASL signs) were not relevant to their work because their students were labeling; therefore, the participant needed to learn more ASL signs for nouns (i.e., fringe words or vocabulary).

According to Adamson et al. (1992) and van Tilborg and Deckers (2016), communication partners are inclined to select nouns for AAC systems because they are considered easier to teach and test and more functional in everyday conversations. This inclination may explain this study's participants' request to be taught more nouns during the KWS workshop. Due to the tendency of communication partners to select nouns for AAC systems, Bean et al. (2019) emphasized the importance of selecting "a vocabulary that includes a variety of word classes" (p. 1001). If there is a higher proportion of nouns in an AAC vocabulary, then the communication of an individual who relies on AAC may be restricted, for example, to requesting objects (Snodgrass et al., 2013). Thus, the participants in this study were taught a KWS vocabulary that included a variety of word classes (i.e., nouns, verbs, adjectives, adverbs, pronouns, and prepositions) so that students who relied on AAC may use the ASL signs for various communicative functions (i.e., semantic, syntactic, and pragmatic) across individuals, environments, and time.

Moderate-Severe Programs

With respect to presenting the workshop to support staff in moderate-severe programs, two participants in the current study reported that they had difficulty using KWS with individual students whose oral speech was unintelligible and had little to no difficulty understanding spoken language. The students were placed in special education (for students with mild or moderate disabilities) and collaborative (for students with and without IEPs) programs; therefore, they were the only students in the classrooms with CCN. One of the two participants thought that KWS would be more beneficial in programs with multiple students with limited verbal production so that the teacher and paraeducators would have more buy-in and form a signing community in which the students, teacher, and paraeducators could communicate with one another. Related, two other participants believed that KWS was appropriate for special education programs for students with moderate or severe disabilities and it would be advantageous for all teachers who teach students with moderate or severe disabilities to be trained to use KWS.

These results suggest that four of the eight participants in this study believed that KWS was appropriate for special education programs for students with moderate or severe disabilities, but it was not appropriate for special education programs for students with mild or moderate disabilities or collaborative programs for students with and without IEPs. In other words, KWS was appropriate for elementary and secondary programs in which most of the students had CCN or relied on AAC, but it was not appropriate for elementary and secondary programs in which one or two students had CCN.

In contrast, teachers at secondary special education schools, who participated in the study conducted by Rombouts et al. (2017a), consistently used KWS with all students in their classrooms regardless of the severity of the students' communication needs. KWS has been

shown to benefit students without CCN, for instance, students with learning disabilities with reading difficulties and students who had English as a second language (Mandel & Livingston, 1993; Mistry & Barnes, 2013). The use of KWS improved the ability to follow written instructions in students with learning disabilities with reading difficulties and increased the number of communicative interactions using English in students who had English as a second language. In addition, students without CNN, who attended mainstream schools and participated in the study completed by Bowles and Frizelle (2016), indicated that they enjoyed and appreciated learning KWS in school so that they could communicate with students with Down syndrome in their classrooms and teach manual signs to people who did not know them, which could contribute to the growth of a signing community.

Level 2 Learning

Level 2 Learning of Kirkpatrick's four-level training evaluation model was used to assess "the degree to which participants acquire the intended knowledge, skills, attitude, confidence and commitment based on their participation in the training" (Kirkpatrick & Kirkpatrick, 2016, p. 15). For the current study, the acceptability questionnaire measured the adult participants' attitude, confidence, and commitment. The participants indicated (a) it was worthwhile for them to use manual signs in their classroom or therapy room (Level 2 Learning; Attitude), (b) they were confident about using manual signs in their classroom or therapy room (Level 2 Learning; Confidence), and (c) they would recommend the KWS workshop to their co-workers (Level 2 Learning; Commitment).

The participants' ASL sign knowledge and skill were measured by the expressive-receptive sign assessments. The receptive sign assessments examined the participants' ASL sign knowledge and provided a response to Research Question 1, What is the effect of a KWS

workshop on in-service special education teachers' and speech-language pathologists' skill identifying manual signs? The expressive sign assessments tested the participants' ASL sign skill and gave an answer to Research Question 2, What is the effect of a KWS workshop on in-service special education teachers' and speech-language pathologists' skill producing manual signs?

Research Question 1

The results of the receptive sign assessments suggested that the KWS workshop effectively taught a majority of the participants to identify ASL signs, and the participants retained most of their sign knowledge over time (i.e., across 11 or 12 weeks). Collectively, the participants displayed an immediate increase in their ability to identify the ASL signs taught during the workshop, and they showed an increasing trend over the six post-workshop assessment sessions in their ASL sign identification skills.

Individually, all the adult participants demonstrated an immediate increase in their ability to identify the ASL signs taught during the workshop. Six of the eight participants exhibited an increasing trend over the six post-workshop assessment sessions in their ASL sign identification skills. Participant 1 displayed a decreasing trend and Participant 4 showed no trend over the six post-workshop assessment sessions in their ASL sign identification skills.

During the semi-structured interviews, Participant 1 reported that they taught their students the ASL signs for the days of the week, months of the year, colors, fruits, vegetables, kitchen and garden tools, transportation, emotions, and wh-questions. Most of the signs Participant 1 used were substantive words or fringe vocabulary and most of the signs taught, during the KWS workshop, were relational or core vocabulary. Thus, a majority of the ASL signs Participant 1 used in their classroom were not taught during the KWS workshop, which

may explain why Participant 1 did not retain the ASL signs taught and demonstrated a decreasing trend across the six post-workshop assessment sessions.

Concerning Participant 4, they stated, during the semi-structured interviews, that they used KWS three times throughout the study (i.e., over 11 weeks). Participant 4 also said that they used seven ASL signs total (i.e., ALL DONE, BALL, CAR, FOOD, SLIDE, CHASE, PLAY), which may explain why Participant 4 did not retain the ASL signs taught and exhibited no trend over the six post-workshop assessment sessions.

These results from this study were similar to the findings from the study conducted by Smidt et al. (2019). The participants in the study ran by Smidt et al. (2019) identified a statistically significant number of signs immediately after the workshop as well as 6 and 12 weeks after the workshop; however, there was a statistically significant decrease in the number of signs the participants correctly identified 6 weeks after the workshop.

Research Question 2

The findings from the expressive sign assessments indicated that the KWS workshop effectively taught a majority of the participants to produce ASL signs, and the participants retained most of their sign skill over time (i.e., across 11 or 12 weeks). Combined, the participants demonstrated an immediate increase in their ability to produce the ASL signs taught during the workshop, and they displayed an ascending trend over the six post-workshop assessment sessions in their ASL sign production skills.

Separately, all the adult participants demonstrated an immediate increase in their ability to produce the ASL signs taught during the workshop. Six of the eight participants displayed an ascending trend over the six post-workshop assessment sessions in their ASL sign production

skills. Participants 1 and 2 showed a descending trend over the six post-workshop assessment sessions in their ASL sign production skills.

As previously stated, most of the ASL signs Participant 1 used in their classroom were not taught during the KWS workshop, which may explain why Participant 1 did not retain the ASL signs taught and exhibited a descending trend over the six post-workshop expressive sign assessments. Regarding Participant 2, they reported and were observed to use ASL signs taught during the KWS workshop in their classroom. Participant 2's post-workshop expressive sign assessment scores were respectively 37, 28, 31, 33, 23, and 19 (out of 39). During the fifth post-workshop assessment session, they said that they were absent from work for 2 weeks due to a COVID-related illness, which may explain why Participant 2 exhibited a descending trend across the six post-workshop expressive sign assessments.

These findings from this study were similar to the results from the studies conducted by Chadwick and Joliffe (2008), Fitzgerald et al. (1984), and Smidt et al. (2019). The participants in the studies carried out by Chadwick and Joliffe (2008) and Fitzgerald et al. (1984) were able to correctly or more accurately produce most of the target signs 6 to 12 months after the trainings. Further, the participants in the study completed by Smidt et al. (2019) produced a statistically significant number of signs immediately after the workshop as well as 6 and 12 weeks after the workshop, but there was a statistically insignificant decrease in the number of signs they accurately produced 6 weeks after the workshop.

Level 3 Behavior

Level 3 Behavior of Kirkpatrick's four-level training evaluation model was used to evaluate "the degree to which participants apply what they learned during training when they are back on the job" (Kirkpatrick & Kirkpatrick, 2016, p. 10). For the current study, the

supplemental questions, expressive KWS assessments (observations), and semi-structured interviews measured the extent to which the adult participants used the ASL signs or KWS learned during the workshop in their classrooms or therapy rooms.

The supplemental questions were used to discover (for all eight participants) the number of signs consistently used, the consistency of sign use, and the participants' experiences and/or thoughts on using signs in their classrooms or therapy rooms (Level 3 Behavior). The expressive KWS assessments were used to ascertain the number of signed utterances, signs, and different signs produced by three of the eight adult participants before and after a workshop (Level 3 Behavior). The semi-structured interviews were used to find out how the eight adult participants used KWS and the challenges of using KWS in their classrooms or therapy rooms (Level 3 Behavior). The interviews were also used to learn what supports the adult participants received to help them use KWS and what supports they needed to continue to use KWS (Level 3 Behavior; Required Drivers). In addition, the information from the supplemental questions, expressive KWS assessments, and semi-structured interviews provided a response to Research Question 3, What is the effect of a KWS workshop on in-service special education teachers' and speech-language pathologists' use of KWS in the classroom or therapy room?

Research Question 3

During the semi-structured interviews, most of the adult participants reported that they used ASL signs or KWS with students who were nonverbal, preverbal, minimally verbal, or unintelligible. They used ASL signs or KWS with their students to teach language (i.e., AAC and English) and manage behavior (Level 3 Behavior). To teach their students how to communicate using ASL signs as AAC, the participants used augmented input (i.e., by providing models of signs or KWS and using facilitative language techniques) throughout teaching and nonteaching

activities and direct instruction during structured teaching activities (i.e., routine activities and/or courses during which language was taught). To teach their students how to communicate using English words, they used KWS to help their students understand and use English or oral speech by using ASL signs to visually reinforce or demonstrate the meaning of words (i.e., as a visual cue). To manage their students' behavior, the participants used ASL signs to reinforce or emphasize spoken directives (i.e., with or without spoken language to instruct or redirect the students) in their classrooms.

On the supplemental questions, which were adapted from Spragale and Micucci (1990), the eight adult participants in the current study altogether rated the consistency of their sign use as slightly better from 1 to 4 work weeks after a workshop, no difference from 5 to 10 work weeks after a workshop, and slightly better within 11 or 12 work weeks after a workshop. Across the 12 weeks, the participants reported that they used “usually none” to 35 ASL signs. On the sixth or last supplemental questions questionnaire, five of the eight participants who consistently used signs plateaued at 20 to 30 ASL signs. Similarly, the participants in the study conducted by Spragale and Micucci (1990) indicated that the number of signs they consistently used and the consistency of their sign use increased over the 9-month evaluation period albeit with slight decreases or periodic plateaus respectively. The participants also indicated that the number of signs consistently used stabilized at 30 to 40, and the consistency of their sign use plateaued during the third evaluation period out of three.

Spragale and Micucci (1990) stated that the 30 to 40 signs consistently used “may represent the most functional words used by direct care staff in a group home setting” (p. 37). Spragale and Micucci (1990) also said that staff may have believed that they did not need to learn or use more signs once they were consistently using the most functional signs, which may

have explained the stabilization of the number of signs consistently used. Although these explanations could be applied to the current study, the participants in this study indicated that they wanted to learn more functional and motivating nouns that were specific to their students, school curriculum, and classroom or therapy room environments. Therefore, the plateau in this study, between the fifth and tenth work weeks after a workshop, could be explained by COVID-related illness or quarantines, which resulted in extended absences and a lack of practice for the participants. It could also be explained by the small number of ASL signs (e.g., one to three signs) the participants chose to teach and thereby learn, during structured teaching activities, over 1 to 4 weeks.

Even though participants in this study experienced COVID-related illness or quarantines and chose to slowly introduce ASL signs to their students using direct instruction instead of augmented input, a majority of the participants reported improvement in the consistency of their sign use. In addition, during the expressive KWS assessments or observations, the three adult participants (Participants 2, 5, and 6) demonstrated an immediate increase in the number of signed utterances, signs, and different signs they used in the classroom or therapy room after they attended a KWS workshop; and, over the five post-workshop observations, they exhibited an increasing trend for the number of signed utterances, signs, and different signs. The PND for the number of signed utterances, signs, and different signs that the three adult participants used in their classrooms or therapy rooms indicated a large effect. Lastly, the adult participants were noted to produce signed utterances containing one to three ASL signs. Thus, the findings from the supplemental questions and expressive KWS assessments or observations, suggested that the participants successfully applied what they learned, during the KWS workshop, to their job.

The results from the expressive KWS assessments or observations were similar to the results from the studies carried out by Fitzgerald et al. (1984; Experiment I) and Meuris et al. (2015). Fitzgerald et al. (1984; Experiment I) observed small, consistent increases in the participants' (i.e., multidisciplinary institutional staff's) sign use when they interacted with residents with developmental disabilities. Meuris et al. (2015) observed a significant increase in the number of signs, sign utterances, and different signs used by the participants (i.e., support staff) when they interacted with adults with ID during conversations and narrative tasks. However, the multidisciplinary institutional staff, in the study conducted by Fitzgerald et al. (1984; Experiment I), were observed interacting with residents with developmental disabilities in a living unit in a state residential facility; and the support staff, in the study completed by Meuris et al. (2015), were observed interacting with adults with ID "in a quiet room in the residence or day care center of the [adult]" (p. 549). In contrast, the special education teachers and SLPs, in the current study, were observed interacting with children with CCN in their classrooms and therapy rooms, during routine teaching and nonteaching activities.

KWS Challenges

The challenges that negatively affected the participants' KWS use in their classrooms or therapy rooms were COVID-19, limited sign knowledge and skill, limited planning time, and lack of staff support (Level 3 Behavior). COVID-related illness or quarantines resulted in extended absences for the participants, their paraeducators, and/or their students, which diminished their sign knowledge and skill due to a lack of practice and exposure.

Limited Sign Knowledge and Skill. The participants' and community members' limited sign knowledge and/or skill, during this study, hindered the use of KWS because of the difficulty understanding and using ASL signs. Moreover, the community member's limited sign

knowledge and skill resulted in a preference for SGDs by parents, advocates, and IEP team members. Likewise, teachers from inclusive schools, who were interviewed by Sheehy and Budiyanto (2014), discussed that signing was seldomly used in society and more commonly used in schools or special education; therefore, they believed signing was more practical in educational environments. Some of the teachers in the study completed by Sheehy and Budiyanto (2014) also believed that technology (e.g., SGDs with graphic symbols) should replace signing because it permitted interactions outside of school.

Limited Planning Time. The limited planning time did not give the participants in this study the time they needed to learn unknown ASL signs (e.g., fringe vocabulary) so that they were prepared to use KWS during activities and/or lessons. Similarly, special education teachers interviewed by Andizik et al. (2019) reported that preparation time affected their delivery of AAC services. The teachers in the study conducted by Andizik et al. (2019) stated that they received “zero to 90 minutes per day of paid preparation time...to prepare academic materials, behavioral supports, and communication systems,” which was not sufficient (p. 93). Thus, special education teachers and SLPs require more planning time so that they may ready AAC systems in addition to creating lesson plans, preparing behavioral supports, and developing IEPs.

Lack of Staff Support. Lastly, the lack of staff support or buy-in hampered the participants’ use of KWS because the staff members’ reluctance or resistance to use AAC (i.e., SGDs and KWS) lessened the participants’ inclination to use KWS and the students’ exposure to ASL signs. According to Rombouts et al. (2021), an individual’s sign use is influenced by their colleague’s perceived feelings toward signing. Consequently, “a valued colleague who has a negative attitude toward signing may have a negative impact on implementation” (p. 372). Unfortunately, the negative impact on implementation may adversely affect sign use in

individuals who rely on AAC due to a reduction in sign modeling (i.e., augmented input) or intelligible communication (Rombouts et al., 2017b; 2017c; 2021). Therefore, it is essential that staff members (e.g., special education teachers, SLPs, and paraeducators) collaborate and create a signing environment, that is, “a setting where [communication partners] provide consistent sign models and use manual signs when interacting with others in the environment” (Spragale & Micucci, 1990, p. 30).

KWS Supports

The supports that positively affected the participants’ KWS use in their classrooms or therapy rooms in the current study were ASL resources which included videos of ASL signs online, staff members who signed (i.e., paraeducators and ASL interpreters), and the KWS vocabulary memory aids handout from the workshop (Level 3 Behavior: Required Drivers). Out of these supports, the participants stressed the importance of the staff members who signed. The staff members who signed showed the participants how to produce signs and interpreted the students’ signs when the participants did not understand them. This support increased the participants’ sign knowledge and skill, which helped and encouraged them to use KWS in the classrooms and therapy rooms.

The supports that the participants in this study needed to continue to use KWS in their classrooms or therapy rooms were practice, KWS-specific resources, and staff support (Level 3 Behavior: Required Drivers). The participants stated that they needed additional time to practice the ASL signs inside and outside the KWS workshop; for example, they said a two-day KWS workshop or an intermediate or advanced KWS workshop would be beneficial. The participants also stated that videos of the ASL signs taught during the workshop and someone using KWS in

a lesson as well as a sign wall (i.e., pictures of ASL signs hung on a wall) or a sign-of-the-week program would be helpful.

ASL Sign Videos. A website or application with videos of the ASL signs taught may provide better support than the KWS vocabulary memory aids (i.e., sign parameters and sign-referent relationships) given to the participants for this study. The participants in this study primarily used videos of ASL signs online to recall or learn how to produce signs. Additionally, videos of the ASL signs taught during the workshop may provide better support than videos of someone using KWS in a lesson. Participants in the study conducted by Chadwick and Joliffe (2008) ranked a training video as least effective or useful compared to formal training and a sign language reference card. Furthermore, participants in the study completed by Smidt et al. (2019) stated that they used websites and iPhone applications to look up manual signs they forgot how to produce.

Sign-of-the-Week Program. A sign-of-the-week program may provide the support needed to reduce the amount of sign knowledge and skill lost after completing a manual sign training program and continue to use KWS on the job. Although seven of the eight participants in this study exhibited an increasing trend over the six postworkshop receptive and/or expressive sign assessments (i.e., across 11 or 12 weeks), the participants did not retain all sign knowledge and skill acquired during the KWS workshop (as reported by the participants). Likewise, as stated above, the participants in the study ran by Smidt et al. (2019) demonstrated a reduction in their sign knowledge and skill 6 weeks after the KWS workshop.

In addition to limited sign knowledge and skill adversely affecting the participants' KWS use during the current study, the participants stated that a lack of staff support negatively impacted their KWS use in their classrooms or therapy rooms. Thus, by implementing a sign-of-

the-week program, using the vocabulary taught during a manual sign or KWS training program for large vocabularies, the attendees can retain their sign knowledge and skill while their co-workers increase their sign knowledge and skill.

The results of the studies conducted by Meuris et al. (2015) and Spragale and Micucci (1990), which employed sign-of-the-week programs, showed that the participants increased their use of manual signs during interactions with individuals with ID. Further, the interviews conducted by Smidt et al. (2018) revealed that collaboration and regular practice with colleagues were important for learning and retaining the signs. Furthermore, interviews completed by Rombouts et al. (2017a) with teachers at special education secondary schools and residential homes revealed that “as staff used manual signing, they had opportunities to experience its effects. When these experiences were positive, they were encouraged to increase their use of KWS” (p. 93).

Therefore, if KWS training program attendees implemented a sign-of-the-week program so that the attendees and their colleagues may retain and learn signs together, then their colleagues’ reluctance or resistance to use KWS may be reduced and the attendees’ inclination to use KWS may be increased. Moreover, if the attendees and their co-workers used KWS together, then they may increase manual sign exposure for individuals who use KWS and thereby experience benefits from using manual signs, which may further encourage them to increase their KWS use.

Follow-up Calls. Lastly, Participant 6 mentioned that meeting with the researcher, talking about KWS, and having the assessments helped them by “helping it stay on [their] mind and use [KWS] more with the students.” Similar to the current study, residential support workers who supported individuals with ID, who received follow-up telephone calls after attending a 1-

day KWS workshop, demonstrated greater retention and implementation of KWS on a quiz that tested their knowledge of signs and theoretical concepts and a self-report measure for KWS use (Le Van et al., 2019). Specifically, the participants in the study completed by Le Van et al. (2019) attended a 1-day KWS workshop and a follow-up workshop three months after the first workshop during which they completed the KWS knowledge quizzes and KWS use self-report measures. Between the workshops, the participants in the experimental groups received two or three Motivating Interviewing or “check-in control” follow-up telephone calls 1, 4, and/or 8 weeks after the initial KWS workshop. The expressive-receptive sign assessments and semi-structured interviews used in the current study may have supported the participants’ ASL sign retention and KWS use, as cited by Participant 6, like the follow-up calls in the study conducted by Le Van et al. (2019). Thus, follow-up video conferences or telephone calls could be a support that assists staff members with using KWS in their classrooms or therapy rooms.

Level 4 Results

Level 4 Results of Kirkpatrick’s four-level training evaluation model was used to determine “the degree to which targeted outcomes occur as a result of the training and the support” (Kirkpatrick & Kirkpatrick, 2016, p. 10). A targeted outcome of the study was for the preschool and school-age students who relied on AAC, with whom the adult participants used KWS, would increase their use of manual signs. This outcome was measured by the expressive KWS assessments or observations and semi-structured interviews; however, the participants also shared results from using KWS in their classrooms or therapy rooms on the supplemental questions questionnaire.

The expressive KWS assessments or observations were used to find out the number of signed utterances, signs, and different signs produced by the four minor participants (i.e.,

Students 1, 2, 3, and 4) before and after their special education teacher or SLP attended a KWS workshop (i.e., Participants 2, 5, and 6; Level 4 Results: Leading Indicators). The semi-structured interviews were used to discover what resulted from all eight adult participants using KWS in their classrooms or therapy rooms (Level 4 Results: Leading Indicators). Further, the semi-structured interviews gave an answer to Research Question 4, What are in-service special education teachers' and speech-language pathologists' perceived changes from taking part in a KWS workshop?

During the expressive KWS assessments or observations, two of the four minor participants (i.e., Students 2 and 3) demonstrated an immediate increase in the number of signed utterances, signs, and different signs they used during therapy room activities after Participants 5 and 6 attended a KWS workshop. Across the five post-workshop observations, Student 2 showed an ascending trend for the number of signed utterances, signs, and different signs; and Student 3 showed a descending trend for the number of signed utterances and signs and no trend for the number of different signs.

Student 2 was noted by the researcher, during the observations, to produce signed utterances containing one or two manual signs and reported by Participant 5, during the semi-structured interviews, to produce the ASL signs ALL DONE and OPEN more accurately. Participant 5 also reported that Student 2 started to use the ASL signs OPEN and TRAIN after Participant 5 attended a KWS workshop and began to use KWS.

In addition, Participant 5 shared that Student 2's special education teacher and one of the paraeducators in the classroom started using ASL signs after Participant 5 attended the KWS workshop. The IEP team members recognized that Student 2 was a "total communicator," that is, Student 2 used ASL signs and an SGD to communicate. The IEP team members also recognized

the importance of using signs to communicate with Student 2 when they did not have the SGD (e.g., when Student 2 ran off, outside on the playground, and the SGD was not with them) or the battery for the SGD was dead. The ASL sign models and value placed on manual signing or KWS may explain why Student 2 exhibited an increasing trend for the number of signed utterances, signs, and different signs over the five post-workshop observations.

Concerning Student 3, Participant 6 shared that Student 3 displayed intense behaviors at the beginning of the school year. Consequently, Participant 6 was urged by IEP team members to encourage Student 3 to decrease their use of gestures and increase their use of the SGD to communicate so that people could understand Student 3 quicker. The IEP team members believed if people could understand Student 3 quicker, then Student 3's frustration would be reduced even though Student 3 did not enjoy using the SGD, and it created more behaviors for Student 3. Participant 6 also shared that Student 3 was eager to produce ASL signs given models and/or verbal prompts (e.g., "Okay, let's do it together"), produced the ASL signs or approximations of EAT, MORE, and CANDY spontaneously, and demonstrated understanding of BATHROOM by pointing to their stomach and nodding their head YES or shaking their head NO. The encouragement to use the SGD in place of the gestures and ASL signs may explain why Student 3 showed a decreasing trend for the number of signed utterances and signs and no trend for the number of different signs across the five post-workshop observations.

Student 1 and Student 4 did not produce signed utterances during the classroom activities throughout the three pre-workshop observations and five post-workshop observations. However, during the semi-structured interviews, Participant 2 reported that Student 1 progressed from requiring full physical guidance to produce an ASL sign to needing a visual model or direct verbal prompt (e.g., "Show me more.") to produce a sign. Participant 2 also reported that Student

1 increased the frequency with which they produced ASL signs (i.e., MORE, ALL DONE) and natural gestures (i.e., HI and BYE). Lastly, Participant 2 stated that Student 1 began to sign MORE when asked, "Do you want more?" (without prompting) albeit infrequently. This information indicated that Student 1 made progress, with respect to their manual sign use, even though they did not produce signed utterances during the pre- and post-workshop observations.

Regarding Student 4, Participant 6 shared that they used ASL signs with Student 4 to improve Student 4's comprehension of spoken language because they believed that Student 4 may understand a few signs. Participant 6 did not believe that Student 4 would be able to produce ASL signs because Student 4 did not use natural gestures such as HI and BYE; therefore, Participant 6 did not expect Student 4 to suddenly start using signs. Student 4's use of eye gaze to communicate instead of gestures may explain why they did not produce signed utterances throughout the pre- and post-workshop observations.

Like Duker and Moonen (1985), the current study taught the adult participants to use augmented input (i.e., manual sign models) with LTM prompting to elicit signs from students. This study and Duker and Moonen (1985) showed that when teachers and staff members (e.g., paraeducators) provided students with opportunities to use manual signs and used augmented input with or without LTM prompting (e.g., direct verbal and full physical guidance) to elicit signs, the students increased their imitation of signs and the frequency with which they produced signs. This study and Duker and Moonen (1985) also showed that the teacher and staff members were able to gradually fade the prompts over time until the students were able to produce the signs with a lesser degree of assistance or independently. However, it should be noted that the special education teachers, SLPs, and students with CCN in the current study were observed interacting during routine teaching and nonteaching activities in their classrooms and therapy

rooms whereas the classroom teacher, residential staff members, and students or residents, in the study conducted by Duker and Moonen (1985), were observed interacting “in an experimental classroom and on the residents’ wards” at a state facility for individuals with developmental disabilities (p. 149).

Direct Instruction

Even though the participants in the current study were taught to use augmented input or KWS with facilitative language techniques in real-life events or situations during the KWS workshop, five of the eight participants decided to teach their students ASL signs as an unaided AAC form using direct instruction during structured teaching activities (i.e., routine activities and/or courses during which language was taught). Specifically, they chose a small number of ASL signs (e.g., one to three signs) and directly taught the signs a few times a week (e.g., two to four times) for 1 to 4 weeks. By directly teaching ASL signs, the participants learned the signs with their students and expanded their vocabulary. As the participants increased their sign knowledge and skill, they increased their sign use throughout the day and provided their students with augmented input during structured and unstructured teaching and nonteaching activities.

These findings were similar to the procedure for the KWS program implemented by Meuris et al. (2015). Throughout the KWS program used by Meuris et al. (2015), the workshop attendees taught their colleagues (i.e., support staff) and the adults with ID two manual signs a week for 12 months for the sign-of-the-week program or approach. The support staff were taught the signs at team meetings, and the adults with ID were taught the signs at client meetings. The support staff then used KWS and modeled the signs they learned for the adults with ID “on all relevant occasions in natural communication” (p. 549). Therefore, based on the findings of the current study and the KWS program implemented by Meuris et al. (2015), directly teaching

manual signs to individuals with CNN, when initially employing augmented input or a total immersion approach for KWS, may be beneficial.

Research Question 4

Throughout the semi-structured interviews, the adult participants in this study discussed the benefits that resulted from them using KWS in their classrooms or therapy rooms (Level 4 Results: Leading Indicators). They expressed that KWS increased their students' attention, engagement, and participation. Participants also stated that KWS improved their students' behavior, comprehension, and expression. Students were more responsive to verbal directions or instructions (e.g., decreased need for repetitions and increased time on task), and they increased their ASL sign imitation and spontaneous production.

Student Benefits. Students, who relied on AAC or used oral speech, imitated or produced approximations of the signs that the participants produced with and without prompts. One student also imitated their classmates' signs without prompts. Gradually, some of the students, who needed assistance to produce signs, started to produce signs with direct verbal prompts instead of full physical guidance. Further, students began to imitate the signs more frequently when they were given direct verbal prompts. Lastly, students, who relied on AAC or used oral speech, began to produce single signs spontaneously or independently as well as combine two signs without direct verbal prompts. They independently used the ASL signs to communicate with the participants, staff (i.e., paraeducators, teachers, and SLPs), peers, and/or parents.

The student-related benefits described above, from this study, were observed or reported by individuals in other studies. In the study conducted by Lal (2010), classroom teachers noted the emergence of joint attention in students with ASD after the employment of KWS (i.e.,

Makaton). In the study carried out by Glacken et al. (2019), parents reported that the use of KWS (i.e., Lámh) reduced frustration, improved behavior, and increased engagement in their children, who were diagnosed with Down syndrome, ASD, or cerebral palsy. Kurt (2011) found that using manual signs as visual supports for verbal instructions, during discrete trial teaching, effectively taught students with ASD receptive language skills. Pattison and Robertson (2016) found that simultaneous verbal and KWS prompting resulted in a greater increase in MLU in a student with ID compared to verbal imitation and ASL prompting. Duker and Moonen (1985) and Valentino and Shillingsburg (2011) found that students with ID or ASD imitated first and then spontaneously produced manual signs when they were provided augmented input (i.e., sign models or exposure) with or without prompting.

Staff Benefits. The participants from this study, who used a limited amount of ASL signs after attending a KWS workshop, reported that the staff (i.e., teachers and paraeducators) with whom they worked did not use ASL signs. Whereas the participants, who used a greater amount of ASL signs after attending a KWS workshop, stated that staff with whom they worked began to use ASL signs in various degrees. The number of signs the staff members used ranged from approximately 4 to 25, and the frequency of their sign use ranged from minimally or occasionally to consistently. The staff members used the signs during structured teaching activities and increased their sign use throughout the day (e.g., to give or reinforce directions) as they became more comfortable (i.e., less embarrassed) and natural at using the signs. Regardless of the number of signs used and frequency of sign use, the participants believed the models and prompting (to use ASL signs) the staff members provided contributed to the students' increased sign use. Lastly, the staff members' sign use assisted with creating a signing environment in

which sign use was expected and accepted so that the students who relied on AAC (e.g., total communication) felt welcomed or included and encouraged to use ASL signs to communicate.

Research Limitations

This research study was conducted using convergent mixed methods. The four methodologies or research designs used were a pretest-posttest design with repeated posttest measures over time, A-B single-case design, a survey design, and phenomenological research. Due to the following limitations, the findings from this study must be interpreted with caution.

The survey design (i.e., acceptability questionnaire and supplemental questions) had three primary limitations that may have introduced bias into the sample (Dillman et al., 2014; Floyd & Fowler, 2014). The first limitation was sampling error. Sampling error occurred because a sample of the target population was surveyed instead of the whole target population (Dillman, et al., 2014).

The second limitation was coverage error. Coverage error occurred because the sample may not accurately represent the target population. In other words, the samples' characteristics may be different from the target population's characteristics "in ways that are important to the survey" (Dillman et al., 2014, p. 4; Floyd & Fowler, 2014).

The third limitation was measurement error. Measurement error occurred because the respondents may have been unable or unwilling to accurately answer the survey questions (Dillman et al., 2014). The respondents may have inaccurately answered the questions due to poor question design and survey mode effects as well as "...misunderstanding the question, not having the information needed to answer, and distorting answers to look good..." (Dillman et al., 2014; Floyd & Fowler, 2014, p. 12).

The pretest-posttest design with repeated posttest measures over time and the A-B single-case design had three primary threats to internal validity. The first threat to internal validity was history. History was a threat because one participant participated in a research project that a co-worker was conducting for their master's degree in administration. For the research project, the participant attended two ASL classes with their students. The participant was also observed and interviewed by the co-worker. Further, the participant stated that their co-worker taught ASL signs without spoken language, and their co-worker taught signs that were different from the ASL signs taught during the KWS workshop.

History was again a threat because another participant changed their service delivery model and took online ASL courses, which posed a threat to internal validity. Regarding the change in the service delivery model, the participant began providing push-in therapy services during play activities, instead of tabletop activities (e.g., during centers), after attending a KWS workshop. The participant stated that students started to use more "naturalistic language" when they provided push-in services during play activities (i.e., a more "naturalistic setting") and used KWS. Specifically, the participant stated that the students increased their use of signed and/or spoken language. Concerning the online ASL courses, the participant took two online ASL courses (after they attended a KWS workshop) to support their use of KWS in their therapy room and classrooms. The classes the participant took were "Introduction to ASL" and "Pronouns and Vocabulary."

The second threat to internal validity was maturation. Maturation was a threat because two of the eight participants taught or treated preschool-age students who relied on AAC. Children typically experience extraordinary growth in their language abilities throughout the preschool years (James, 1990).

The third threat to internal validity was testing. Testing was a threat because the format, content (i.e., KWS workshop vocabulary), and/or procedures for the outcome measures (i.e., expressive-receptive sign assessments and expressive KWS assessments) did not change. Therefore, the participants became familiar with the elements of the instruments and concluded that they would be tested on the ASL signs taught during the KWS workshops and were expected to use ASL signs or KWS when the researcher observed them in their classrooms or therapy rooms even though the ASL signs were randomized on the expressive-receptive sign assessments and the researcher did not disclose the purpose of the expressive KWS assessments or observations.

With respect to the threats to external validity, there were three primary threats to the pretest-posttest design with repeated posttest measures over time and the A-B single-case design. The threats were interaction of selection and treatment, interaction of setting and treatment, and interaction of history and treatment (Creswell & Creswell, 2018). According to Creswell and Creswell (2018), the results of this study cannot be generalized to (a) individuals who have different characteristics (interaction of selection and treatment); (b) individuals who are in different settings (interaction of setting and treatment); and (c) situations that are in the past or future (interaction of history and treatment) due to these threats to external validity.

Additional limitations, which affected all four research designs (i.e., a pretest-posttest design with repeated posttest measures over time, A-B single-case design, a survey design, and phenomenological research), were due to a nonprobability sample (or convenience sample) being used, small sample size, duration of the study, and COVID-19 (i.e., SARS-CoV-2). Due to a nonprobability sample being used and the sample size being small, sampling error was increased, and the findings were not generalizable to a larger population (Bailey, 2007; Dillman et al.,

2014). Due to the duration of the study (i.e., 12 to 13 weeks), the development of the trends for ASL sign retention and KWS implementation was restricted (Creswell & Creswell, 2018).

Lastly, because of COVID-19 illness or exposure and COVID-19 quarantine or isolation, (a) the posttest expressive-receptive sign assessments and supplemental questions were not completed every other week for 11 work weeks for the pretest-posttest design with repeated posttest measures over time and survey design, (b) the expressive KWS assessments (observations) were not completed every other week for 9 work weeks for the A-B single case design; and (c) the semi-structured interviews were not completed every other week for 6 work weeks for the phenomenological research (see Appendix AA for the expressive and receptive sign assessment and semi-structured interview schedule and Appendix BB for the expressive KWS assessment/observation schedule).

Implications for Future Research

The special education teachers' and SLPs' suggestions and the study's limitations indicated the need for future studies. First, the minor adjustments to the instruction model suggested by the adult participants indicated the need for future studies that investigate the effectiveness of a multi-day KWS workshop (e.g., 2-day workshop) with additional time for independent or advanced practice with corrective feedback for the ASL signs to further increase sign knowledge and skill. Moreover, the reduction in the staff members' sign knowledge and skill that naturally occurred over time indicated the need for future studies that further examine the effectiveness of sign-of-the-week programs, websites or applications with videos of the signs taught, and follow-up video conferences or telephone calls (as components of KWS training programs) to restrict reductions in sign knowledge and skill.

Furthermore, participants' requests for nouns that were functional and motivating as well as specific to their students, school curriculum, and classroom or therapy room environments indicated the need for future studies that further evaluate the KWS vocabulary created for this study. The researcher used the suggested initial and core vocabularies from Fristoe and Lloyd (1980), Dennis et al. (2013), and van Tilborg and Deckers (2016) as well as the guidelines for vocabulary selection from Fristoe and Lloyd (1980), Holland (1975), Lahey and Bloom (1977), Lederer and Battaglia (2015), and van Tilborg and Deckers (2016) to compose the vocabulary. Therefore, the KWS vocabulary was not created by consensus with experts in AAC vocabulary selection.

Second, the limitations discussed above suggested the need for future studies that investigate the effectiveness of a KWS workshop using a control group for within- and between-group comparisons (i.e., pretest-posttest control group design) as well as multiple baseline design. The studies should be completed over a longer duration so that the trends for or changes in the participants' behavior (e.g., KWS use) may be better developed or measured. Additionally, the studies should be with different populations (e.g., special education teachers, SLPs, paraeducators, and parents) at different times to minimize threats to external validity (i.e., interaction of selection and treatment and interaction of history and treatment). Also, a larger number of people (from those populations) should be recruited, and the participants should be randomly selected to reduce threats to internal validity (i.e., study attrition and selection). Lastly, minor participants who are the same age and develop at the same rate should be recruited to control for maturation, a threat to internal validity.

Implications for Practice

The findings from this study have implications for preprofessional training programs for special education teachers and SLPs, public schools, special education teachers, and SLPs.

Preprofessional Training Programs

Special education teachers and SLPs in the current study stated that they needed to learn how to (a) use KWS with other communication modes (e.g., PECS or SGDs), (b) write communication or academic goals for IEPs for students who use KWS, and (c) write receptive and expressive communication goals for IEPs that target KWS. Special education teachers and SLPs also stated that they needed a developmental hierarchy for KWS that tells what skill(s) to teach first as well as the progression or hierarchy of skills to teach (e.g., vocabulary and two-word semantic relationships), and they demonstrated a tendency to select nouns for AAC vocabularies.

Some of the special education teachers and SLPs in this study took ASL courses in high school and/or college. ASL courses typically teach individuals how to employ ASL signs, without spoken language, using ASL grammatical structure. They do not teach them how to code the content words in spoken sentences using ASL signs for KWS. Participant 7 shared that, when they used sign language with a student who relied on AAC in the past, they felt overwhelmed and could not do it because they felt pressured to sign every single word. After the KWS workshop, Participant 7 stated that they did not feel pressured to sign every word. Instead, they focused on signing the keywords for the students so that they understood, which was helpful and made it more manageable. Therefore, it cannot be assumed that individuals can take an ASL course and transfer what they learned to KWS.

These findings imply that preprofessional training programs need to make sure pre-service special education teachers and SLPs acquire unaided AAC competencies (e.g., KWS knowledge and skills) in addition to aided AAC competencies (e.g., PECS and SGD knowledge and skills) so that they are prepared to write IEP goals and teach or treat students who use a combination of unaided and aided AAC forms to communicate. These results also imply that preprofessional training programs need to infuse early language development (e.g., semantic-grammatical rules, early sentence types, and communication intentions) and vocabulary selection (e.g., relational and substantive words or core and fringe vocabulary) into coursework so that in-service special education teachers and SLPs are prepared to choose a developmentally appropriate AAC vocabulary and facilitate language acquisition in students who rely on AAC.

Public Schools

Like preprofessional training programs, public schools need to ensure in-service special education teachers and SLPs have the competencies to write IEP goals for students who use KWS, use KWS with aided AAC forms for augmented input, select developmentally appropriate AAC vocabularies, and facilitate language acquisition. Public schools can make sure special education teachers and SLPs develop these competencies by providing AAC-related staff trainings. The current study showed that in-service special education teachers and SLPs can be taught ASL signs, KWS, ALgS/augmented input, language response strategies/facilitative language techniques, LTM prompting, and vocabulary selection during a 6-hour workshop and successfully apply what they learn to their job.

Public schools also need to provide special education teachers and SLPs with the time needed to ready AAC systems (e.g., learn ASL signs for KWS or prepare displays for SGDs) and plan activities dedicated to communication along with creating academic lesson plans and

materials, preparing behavioral supports, and developing IEPs. Special education teachers and SLPs in this study reported that they rarely or generally did not have much time to plan and prepare. Often, unexpected events took the place of planning even if they set aside time to plan. In addition, special education teachers and SLPs reported that IEPs frequently took the place of planning and preparation. The lack of planning time and unaided AAC competencies is problematic because special education teachers and SLPs must be prepared to convey information to or receive information from students who rely on AAC so that opportunity barriers (i.e., knowledge and skill barriers), which limit participation opportunities, are not imposed on these students.

Special Education Teachers and Speech-Language Pathologists (SLPs)

During the current study, special education teachers reported that they did not understand ASL signs produced by students in their classrooms. They also reported that they discovered students who knew ASL signs, but the students did not use ASL signs to communicate until the special education teachers began to use KWS. Additionally, a special education teacher and SLP shared that they worked with students with CNN who did not like or enjoy using their SGDs. These findings suggest that special education teachers and SLPs need to find and attend KWS trainings so that they can be prepared to use KWS and provide augmented input for students who use or may benefit from using ASL signs to communicate.

The results from this study also suggest that special education teachers and SLPs can learn to identify and produce ASL signs during a 6-hour KWS workshop and retain most of their sign knowledge and skill over time. However, a sign wall or sign-of-the-week program may help special education teachers and SLPs further retain their sign knowledge and skill while their colleagues increase their sign knowledge and skill so that they can work together and create a

signing environment where staff members consistently use KWS to provide augmented input when they interact with students in the school environment.

Lastly, special education teachers and SLPs in the current study decided to use direct instruction to teach ASL signs to their students during structured learning activities even though they were taught to use augmented input throughout learning and nonlearning activities during the KWS workshop. They selected this instruction model because it allowed them to learn ASL signs with their students and, as a result, increase their sign use throughout the day. Although special education teachers and SLPs chose to directly teach ASL signs, students who relied on AAC or used oral speech started to imitate and/or spontaneously produce signs with and without prompts. Students also started to combine two ASL signs without prompts and independently use signs to communicate with staff members (i.e., special education teachers, paraeducators, and SLPs), peers, and/or parents. These findings imply that using direct instruction to teach ASL signs to students may be a viable alternative for expanding students' and staff members' sign vocabulary until staff members are able to employ augmented input or KWS throughout the day.

Conclusion

Although the findings from the current study must be interpreted with caution due to its limitations, the appraisal of the 1-day, 6-hour KWS workshop developed for this study, using Kirkpatrick's four-level training evaluation model, suggested that the workshop increased the adult participants' ability to identify and produce the ASL signs taught during the workshop, and they retained most of their sign knowledge and skill over time (Level 2 Learning; Research Questions 1 and 2). The results also suggested that the KWS workshop improved the consistency of the adult participants' sign use and increased the number of signed utterances, signs, and different signs they used in their classrooms and therapy rooms with students who relied on AAC

(Level 3 Behavior; Research Question 3). Further, the results indicated that the participants' increase in KWS use in their classrooms and therapy rooms (a) increased their students' attention, engagement, and participation; (b) improved their students' behavior (e.g., increased time on task), comprehension (e.g., decreased need for repetitions), and expression (i.e., increased imitation and spontaneous production of ASL signs); and (c) increased staff members (i.e., teachers and paraeducators) sign use during structured teaching activities and throughout the day (Level 4 Results; Research Question 4). Lastly, the results indicated that the participants found the workshop engaging and interesting and the information provided relevant and applicable to their work (Level 1 Reaction; Kirkpatrick & Kirkpatrick, 2016).

These results from this study demonstrated that a 1-day, 6-hour KWS workshop can provide special education teachers and SLPs with the foundational skills needed to support the communication needs of students who use or may benefit from manual signs, an unaided AAC form. Even though individuals with CNN may use multiple AAC forms or systems, individuals with developmental disabilities often use one AAC system more than another, and they may learn and maintain skills more effectively when their preferred AAC system is used (Gevarter et al., 2013). Therefore, it is essential to provide these individuals with opportunities to use different AAC forms (e.g., manual signs and PCS) so that their preferred AAC system may be determined. Consequently, special education teachers and SLPs must learn to use KWS along with aided AAC systems (e.g., PECS and SGDs) so that they may provide augmented input and/or ALgS (i.e., AAC system modeling) for students with CNN. If these students are not shown or taught how to use different AAC forms, then (a) they may not have an effective way to communicate, (b) they may not become proficient communicators, and (c) they may not be able to access the curriculum. In other words, if special education teachers and SLPs cannot

communicate with (i.e., convey information to or receive information from) students who rely on AAC using the students' preferred AAC system(s), then special education teachers and SLPs may not be able to effectively educate students with CCN who rely on AAC.

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Appendix A

Number of Participants in the Manual Sign and Key Word Signing Studies' Groups, Participants' Group Assignment, Participants' Type, and Participants' Age and Gender

Study	Study assignment	Participant type	Age, gender
Chadwick & Jolliffe (2008)	Training group (n = 30)	Direct caregivers, social care organizers, therapy/health service staff, management staff	Mean age = 41.36, 6 males, 24 females
	Untrained control group (n = 30)		Mean age = 39.75, 10 males, 20 females
Duker & Moonen (1985)	Training group (n = 13)	Teacher, state facility staff members	Teacher's age = 24 Staffs' mean age = 26 1 male, 12 females
Fitzgerald et al. (1984): Experiment I	Training group (n = 6)	Paraprofessional direct care staff	Mean age NR 3 males, 3 females
Fitzgerald et al. (1984): Experiment II	Training group (n = 4)	Registered occupational therapist, recreation therapist, speech therapy assistant, physical therapy assistant	NR
Fitzgerald et al. (1984): Experiment III	Training group (n = 3)	Nurses	NR
Meuris et al. (2015)	Intensive KWS training group (n = 8)	Psychologist (n = 1), Support workers (n = 7)	Mean age = 36.57, 2 males, 6 females
	"Signs of the week" training group (n = 15)	Support workers	Mean age = 32.67, 2 males, 13 females
Smidt et al. (2019)	Training group (n = 21)	Parents, teachers, speech-language pathologist	Mean age = 38, 2 males, 19 females
Spragale & Micucci (1990)	"Signs of the week" training group (n = 47)	Direct care staff	Mean age NR, Gender NR

Note. NR = not reported.

Appendix B

Number of Manual Signs Taught, Sign Language/System Used, Training Format, and

Training Length

Study	Sign language/ system	# of signs taught	Training format	Training length
Duker & Moonen (1985)	NR	NR	Individual (teacher; n = 1)	NR
			Group (residential staff; n = 12)	NR
Chadwick & Jolliffe (2008)	British Sign Language (BSL)	20	Trained group (n = 30)	A series of half-day trainings
			Untrained group (n = 30)	
Fitzgerald et al. (1984): Experiment I	NR	34	Group (n = 3)	Four 30- to 40-minute sessions
			Individual (n = 3)	Four 5- to 10-minute sessions
Fitzgerald et al. (1984): Experiment II	NR	21	Group (n = 4)	Two sessions (no more than 1 hour) on 2 separate days
Fitzgerald et al. (1984): Experiment III	NR	21	Group (n = 3)	Two sessions (no more than 1 hour) on 2 separate days
Meuris et al. (2015)	Flemish KWS System	100	Group (n = 8)	Four 2-hour workshops, two signs a week for 12 months
Smidt et al. (2019)	Australian Sign Language (Auslan)	100	Group (n = 21)	1-day workshop
Spragale & Micucci (1990)	Signed English	NR	Group	1- to 2-hour session, One to two sign(s) a week for 9 months

Appendix C

The Design, Evaluation Methods, Analysis Methods, and Kirkpatrick Level(s) of Efficacy

Studies for Manual Sign or Key Word Signing Training Programs

Study	Study design	Evaluation method(s)	Analysis method(s)	Kirkpatrick level(s)
Chadwick & Jolliffe (2008)	Independent groups (one-shot case study)	Face-to-face interview, expressive sign assessment	Friedman analysis, one-factor ANOVA, <i>t</i> test, descriptive statistics	1, 2, 3
Duker & Moonen (1985)	Multiple-baseline across situations	Observations, questionnaire	Descriptive statistics	1, 3, 4
Fitzgerald et al. (1984): Experiment I	Multiple probe across groups of signs	Expressive sign assessments, observations	Descriptive statistics	2, 3
Fitzgerald et al. (1984): Experiment II	Multiple probe across groups of signs	Expressive sign assessments, acceptability questionnaire	Descriptive statistics	1, 2, 3
Fitzgerald et al. (1984): Experiment III	Multiple probe across groups of signs	Expressive sign assessments	Descriptive statistics	2
Meuris et al. (2015)	One-group pretest-posttest	Natural communication sample (support workers and adults with ID), narrative task (adults with ID)	Shapiro-Wilk tests, Wilcoxon signed-ranks tests, effect sizes	3, 4
Smidt et al. (2019)	Pretest/posttest single case	Receptive sign assessments, expressive sign assessments, interviews	Repeated-measures ANOVA, Bonferroni <i>t</i> test, Eta squared	1, 2, 3
Spragale & Micucci (1990)	Not reported	Questionnaire, observations	Descriptive statistics	1, 3

Appendix D

Recruitment Email: First Contact

Dear [SCHOOL DISTRICT NAME] staff member:

We are conducting a research study to examine the effect of a key word signing (KWS) workshop on in-service education specialists' and speech-language pathologists' manual sign skill and KWS use. To participate, you must meet the inclusion criteria as follows: (a) work as a special education teacher or speech-language pathologist; (b) teach or treat students with little to no functional speech due to speech that is developing slowly, spoken words that are unintelligible, or speech that is not developing; and (c) have little to no American Sign Language (ASL) and key word signing (KWS) knowledge and skill.

Participation will take place over 14 weeks. If you are interested, then you will be asked to:

- Attend a six-hour KWS workshop.
- Complete four 10-minute receptive sign assessments (i.e., within one week before the workshop and within one, six, and 12 weeks after the workshop) using Zoom video conferencing.
- Complete four 10-minute expressive sign assessments (i.e., within one week before the workshop and within one, six, and 12 weeks after the workshop) using Zoom video conferencing.
- Complete a 15-minute acceptability questionnaire via the internet 6 weeks after the workshop.

You may also be asked to be observed interacting with a student three, six, or nine times for 15-minutes before the workshop in your classroom or therapy room and five times for 15-minutes after the workshop in your classroom or therapy room. As with any study involving the collection of data, there is the possibility of breach of confidentiality of data. Other than the loss of confidentiality, there are no known risks involved in this research.

If you meet the inclusion criteria and would like additional information about this research, please contact us at telephone numbers or email addresses listed below. Thank you for your consideration of participation in this study.

Sincerely,

Krista L. McMorran-Maus, M.A., CCC-SLP
Student Researcher
Chapman University
Email: mcmorranmaus@chapman.edu
Phone: 949-375-0600

Scot Danforth, Ph.D.
Lead Researcher
Chapman University

Email: danforth@chapman.edu
Office: 714-516-5967

Appendix E

Recruitment Email: First Follow-Up

Dear [SCHOOL DISTRICT NAME] staff member:

Recently, we sent you an email asking for your help with a research study. We are conducting the study to examine the effect of a key word signing (KWS) workshop on in-service education specialists' and speech-language pathologists' manual sign skill and KWS use.

To investigate the effects of the KWS workshop, we need special education teachers and/or speech-language pathologists to participate in the study. To participate, you must:

- Teach or treat students with little to no functional speech due to speech that is developing slowly, spoken words that are unintelligible, or speech that is not developing.
- Have little to no American Sign Language (ASL) and key word signing (KWS) knowledge and skill.

Participation will take 8 to 11 ½ hours over 14 weeks. If you are interested, then you will be asked to:

- Attend a six-hour KWS workshop.
- Complete four 20-minute receptive and expressive sign assessments (i.e., within one week before the workshop and within one, six, and 12 weeks after the workshop) using Zoom video conferencing.
- Complete a 15-minute acceptability questionnaire via the internet 6 weeks after the workshop.

You may also be asked to be observed interacting with a student three, six, or nine times for 15-minutes before the workshop in your classroom or therapy room and five times for 15-minutes after the workshop in your classroom or therapy room.

As with any study involving the collection of data, there is the possibility of breach of confidentiality of data. Other than the loss of confidentiality, there are no known risks involved in this research.

If you have any questions, please let us know. Thank you for considering our request for you to participate in this study.

Sincerely,

Krista L. McMorrان-Maus, M.A., CCC-SLP
Student Researcher
Chapman University
Email: mcmorrانmaus@chapman.edu

Phone: 949-375-0600

Scot Danforth, Ph.D.
Lead Researcher
Chapman University
Email: danforth@chapman.edu
Office: 714-516-5967

Appendix F

Recruitment Email: Second Follow-Up

Dear [SCHOOL DISTRICT NAME] staff member:

Last week, we sent you an email asking for your assistance with a research study to investigate the effect of a key word signing (KWS) workshop on in-service education specialists' and speech-language pathologists' manual sign skill and KWS use.

I am following up with this email to provide you with information about the six-hour KWS workshop. During the workshop, you will learn about:

- Augmentative and Alternative Communication (AAC)
- Key Word Signing (KWS)
- American Sign Language (ASL) manual signs
- Aided Language Stimulation (ALgS)/Augmented Input
- Language Response Strategies (LRSs)
- Least-to-Most (LTM) Prompting
- Vocabulary Selection

Participation in this study will take 8 to 11 ½ hours over 14 weeks, which includes the six-hour KWS workshop, four 20-minute receptive and expressive sign assessments (completed using Zoom video conferencing), and a 15-minute acceptability questionnaire (completed via the internet).

You may also be asked to be observed interacting with a student three, six, or nine times for 15-minutes before the workshop in your classroom or therapy room and five times for 15-minutes after the workshop in your classroom or therapy room.

If you are a special education teacher or speech-language pathologist, who (a) teaches or treats students with little to no functional speech; and (b) has little to no ASL and KWS knowledge and skill, please contact us at telephone numbers or email addresses listed below for additional information about this research.

Your participation is very important, and it will help us with evaluating and improving the effectiveness of the KWS workshop. Thank you for considering our request.

Sincerely,

Krista L. McMorrان-Maus, M.A., CCC-SLP
Student Researcher
Chapman University
Email: mcmorrانmaus@chapman.edu
Phone: 949-375-0600

Scot Danforth, Ph.D.
Lead Researcher
Chapman University
Email: danforth@chapman.edu
Office: 714-516-5967

Appendix G

Recruitment Email: Third Follow-Up

Dear [SCHOOL DISTRICT NAME] staff member:

Two weeks ago, we sent you an email asking for your help with a research study to examine the effect of a key word signing (KWS) workshop on in-service education specialists' and speech-language pathologists' manual sign skill and KWS use.

I am following up with this email to provide you with additional information about the six-hour KWS workshop. The workshops will be held on 9/25/21, 10/2/21, and 10/9/21. Ten to 12 special education teachers and/or speech-language pathologists will attend each workshop. Special education teachers and/or speech-language pathologists from the same school site are encouraged to attend a workshop together. As a speech-language pathologist, you may receive ASHA Certification Maintenance Hours for attending the KWS workshop.

Participation in this study will take 8 to 11 ½ hours over 14 weeks, which includes the six-hour KWS workshop, four 20-minute receptive and expressive sign assessments (completed using Zoom video conferencing), and a 15-minute acceptability questionnaire (completed via the internet).

You may also be asked to be observed interacting with a student three, six, or nine times for 15-minutes before the workshop in your classroom or therapy room and five times for 15-minutes after the workshop in your classroom or therapy room.

If you meet the inclusion criteria (i.e., teach or treat students with little to no functional speech, and have little to no ASL and KWS knowledge and skill), please contact us at telephone numbers or email addresses listed below for additional information about this research.

Thank you for considering attending a KWS workshop and participating in this study. Your participation is important in assisting us with evaluating and improving the effectiveness of the workshop.

Sincerely,

Krista L. McMorrان-Maus, M.A., CCC-SLP
Student Researcher
Chapman University
Email: mcmorrانmaus@chapman.edu
Phone: 949-375-0600

Scot Danforth, Ph.D.
Lead Researcher
Chapman University

Email: danforth@chapman.edu
Office: 714-516-5967

Appendix H

Recruitment Email: Fourth Follow-Up

Dear [SCHOOL DISTRICT NAME] staff member:

A few weeks ago, we sent you an email asking for your help with a research study to investigate the effect of a key word signing (KWS) workshop on in-service education specialists' and speech-language pathologists' manual sign skill and KWS use.

I am following up with this final email to provide you with the informed consent form so that you may review it. The informed consent form is attached to this email.

Participation in this study will take 8 to 11 ½ hours over 14 weeks, which includes the six-hour KWS workshop, four 20-minute receptive and expressive sign assessments (completed using Zoom video conferencing), and a 15-minute acceptability questionnaire (completed via the internet).

You may also be asked to be observed interacting with a student three, six, or nine times for 15-minutes before the workshop in your classroom or therapy room and five times for 15-minutes after the workshop in your classroom or therapy room.

As an education specialist, you may receive column advancement hours from [SCHOOL DISTRICT NAME] for your participation in this research study. As a speech-language pathologist, you may receive [SCHOOL DISTRICT NAME] column advancement hours and ASHA Certification Maintenance Hours for participating.

If you teach or treat a student who (a) has little to no functional speech; (b) has little to no ASL and KWS knowledge and skill; and (c) may be interested in participating in the study, then we can email the recruitment letter, the Adult Informed Consent to Participate in Research form, and the Assent to Participate in Research to you so that you can forward the documents to the parent/guardian of the student. Once the parent/guardian of the student has these documents, they may contact us via email or phone (if they are interested in the research study).

If you meet the inclusion criteria (i.e., teach or treat students with little to no functional speech, and have little to no ASL and KWS knowledge and skill), please contact us at telephone numbers or email addresses listed below for additional information about this research.

The results of the study will assist us with evaluating and improving the effectiveness of the KWS workshop. Your participation is very important, and we appreciate you considering our request.

Sincerely,

Krista L. McMorrان-Maus, M.A., CCC-SLP

Student Researcher
Chapman University
Email: mcmorranmaus@chapman.edu
Phone: 949-375-0600

Scot Danforth, Ph.D.
Lead Researcher
Chapman University
Email: danforth@chapman.edu
Office: 714-516-5967

Appendix I

Verbal Script for Direct (Face-to-Face) Contact/Recruitment

Hi! My name is Krista L. McMorrان-Maus. I am a doctoral student at Chapman University. I am conducting a research study on the effect of a key word signing (KWS) workshop on in-service education specialists' and speech-language pathologists' manual sign skill and KWS use.

To investigate the effects of the KWS workshop, I need special education teachers and/or speech-language pathologists to participate in the study. To participate, you must:

- Teach or treat students with little to no functional speech due to speech that is developing slowly, spoken words that are unintelligible, or speech that is not developing.
- Have little to no American Sign Language (ASL) and key word signing (KWS) knowledge and skill.

Participation will take 8 to 11 ½ hours over 14 weeks. If you are interested, then you will be asked to:

- Attend a six-hour KWS workshop.
- Complete four 20-minute receptive and expressive sign assessments (i.e., within one week before the workshop and within one, six, and 12 weeks after the workshop) using Zoom video conferencing.
- Complete a 15-minute acceptability questionnaire via the internet 6 weeks after the workshop.

You may also be asked to be observed interacting with a student three, six, or nine times for 15-minutes before the workshop in your classroom or therapy room and five times for 15-minutes after the workshop in your classroom or therapy room.

As with any study involving the collection of data, there is the possibility of breach of confidentiality of data. Other than the loss of confidentiality, there are no known risks involved in this research.

If you have any questions, please let me know. You may reach me and the other researcher at:

Krista L. McMorrان-Maus, M.A., CCC-SLP
Email: mcmorrانmaus@chapman.edu
Phone: 949-375-0600

Scot Danforth, Ph.D.
Email: danforth@chapman.edu
Office: 714-516-5967

Appendix J
Recruitment Flyer



Come learn and earn!

Help evaluate and improve the effectiveness of a
Key Word Signing Workshop.

You will learn about:

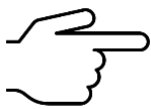
- Augmentative and Alternative Communication (AAC)
- Key Word Signing (KWS)
- American Sign Language (ASL) manual signs
- Aided Language Stimulation (ALgS)/Augmented Input
- Language Response Strategies (LRSs)
- Least-to-Most (LTM) Prompting
- Vocabulary Selection

And you may earn:

- [SCHOOL DISTRICT NAME] column advancement hours.
- ASHA Certification Maintenance Hours.
- Continuing professional development (CPD) credit for your California Department of Consumer Affairs (DCA) License.

At the workshop, you will be:

- Provided with a continental breakfast and lunch.
- Given a [COMPANY NAME] gift box.



After the study, you will be given a \$20 [COMPANY NAME] gift card.



Your assistance is greatly appreciated!

Appendix K

Adult Informed Consent to Participate in Research

Title of the Study:

The Effectiveness of a Key Word Signing Workshop

Members of the Research Team:

Student Researcher: Krista L. McMorrان-Maus, M.A., CCC-SLP

Email: mcmorrان-maus@chapman.edu

Lead Researcher: Scot Danforth, Ph.D.

Email: danforth@chapman.edu

Office: 714-516-5967

Key Information:

You are being asked to take part in a research study. Research studies include only people who choose to take part. A member of the research team will explain the study to you and will answer any questions you might have. You should take your time in deciding whether or not you want to participate.

If you agree to participate in this study, the project will involve:

- Males and/or females ages 18 and older.
- The procedures will include: (a) a six-hour key word signing (KWS) workshop at a [SCHOOL DISTRICT NAME] school site; (b) four 10-minute receptive sign assessments (i.e., within one week before the workshop and within one, six, and 12 weeks after the workshop) using Zoom video conferencing; (c) four 10-minute expressive sign assessments (i.e., within one week before the workshop and within one, six, and 12 weeks after the workshop) using Zoom video conferencing; and (d) a 15-minute acceptability questionnaire via the internet.
- There is one workshop; two pre-workshop assessments; six post-workshop assessments; and one questionnaire.
- These procedures will take 8 hours total.
- There are not risks associated with this study that exceed what would typically be encountered in daily life.
- You will not be paid for your participation.
- You will be provided a copy of this consent form.

Invitation:

You are invited to take part in this research study. The information in this form is meant to help you decide whether or not to participate. If you have any questions, please ask.

Why are you being asked to be in this research study?

You are being asked to be in this study because you are either a speech-language pathologist or an education specialist working with students who rely on augmentative and alternative communication (AAC). You must be 18 years of age or older to participate.

What is the reason for doing this research study?

The purpose of the study is to examine the effect of a key word signing (KWS) workshop on in-service education specialists' and speech-language pathologists' manual sign skill and KWS use. KWS is a manually coded sign system that was developed for hearing individuals with complex communication needs (e.g., little or no functional speech).

What will be done during this research study?

You will be asked to: (a) attend a six-hour KWS workshop at a [SCHOOL DISTRICT NAME] school site; (b) complete four 10-minute receptive sign assessments (i.e., within one week before the workshop and within one, six, and 12 weeks after the workshop) using Zoom video conferencing; (c) complete four 10-minute expressive sign assessments (i.e., within one week before the workshop and within one, six, and 12 weeks after the workshop) using Zoom video conferencing; and (d) complete a 15-minute acceptability questionnaire via the internet.

The expressive sign assessments will be video recorded so that the researchers can score the assessments after they are administered.

How will my data be used?

Your data will not be sent to researchers outside of Chapman University; however, the data analyses or summaries, which contain no personal information that could identify you, will be shared with researchers outside of Chapman University.

What are the possible risks of being in this research study?

As with any study involving collection of data, there is the possibility of breach of confidentiality of data.

What are the possible benefits to you?

The benefits to you may include learning: (a) KWS, a sign system (which uses American Sign Language [ASL] signs) that was developed for hearing individuals with complex communication needs; (b) facilitative language techniques, strategies that may be used to respond to utterances produced by individuals who rely on AAC; (c) Aided Language Stimulation (ALgS), a method for providing individuals with models for combining AAC symbols; (d) least-to-most (LTM) prompting, a method that involves deciding on a hierarchy of prompts and then systematically carrying out those prompts. However, you may not get any benefit from being in this research study.

What are the possible benefits to other people?

The benefits to students who rely on AAC may include: (a) enhanced language learning when you use facilitative language techniques; (b) learning to understand and use representational symbols when you use ALgS; and (c) an increase in receptive communication skills when you use LTM prompting. Further, the benefits to students who rely on AAC, when you use KWS, may include improved joint attention, symbolic communication development, functional vocabulary use, spoken language comprehension and production, and speech production.

What will participating in this research study cost you?

There is no cost to you to be in this research study.

Will you be compensated for being in this research study?

You will not be compensated for your participation in this research study.

What should you do if you have a problem during this research study?

Your welfare is the major concern of every member of the research team. If you have a problem as a direct result of being in this study, you should immediately contact one of the people listed at the beginning of this consent form.

How will information about you be protected?

Reasonable steps will be taken to protect your privacy and the confidentiality of your study data; however, we cannot guarantee total privacy.

The data collected using paper records will be stored in a locked cabinet in the investigator's home office and will only be seen by the research team during the study and for seven years after all of the minor participants turn 18 years.

The data collected using electronic records will be stored electronically through a secure server and will only be seen by the research team during the study and for seven years after all of the minor participants turn age 18 years.

The only people who will have access to your research records are the members of the research team, the Institutional Review Board (IRB), and any other person, agency, or sponsor as required by law. Information from this study may be published in scientific journals or presented at scientific meetings but the data will be reported as group or summarized data and your identity will be kept strictly confidential.

Please note that all Chapman University employees are required to report any known or suspected abuse of children or minors to appropriate authorities.

What are your rights as a research subject?

You may ask any questions about this research and have those questions answered before agreeing to participate in the study or during the study.

For study related questions, please contact the investigator(s) listed at the beginning of this form.

For questions concerning your rights or complaints about the research, contact the Institutional Review Board (IRB) at (714) 628-2833 or irb@chapman.edu.

What will happen if you decide not to be in this research study or decide to stop participating once you start?

You can decide not to be in this research study, or you can stop being in this research study (i.e., “withdraw”) at any time before, during, or after the research begins for any reason. Deciding not to be in this research study or deciding to withdraw will not affect your relationship with the investigator or with Chapman University and Santa Ana Unified School District. You will not lose any benefits to which you are entitled.

Documentation of informed consent

You are voluntarily deciding whether or not to be in this research study. Signing this form means that (1) you have read and understood this consent form, (2) you have had the consent form explained to you, (3) you have had your questions answered, and (4) you have decided to be in the research study. You will be given a copy of this consent form to keep.

Printed Name of Participant or Legal Guardian

Signature of Participant or Legal Guardian

Date

VIDEO RECORDING:

I have received an adequate description of the purpose and procedures for video recording sessions during the course of the proposed research. I give my consent to allow myself to be video recorded during participation in this study, and for those records to be reviewed by persons involved in the study, as well as for other professional purposes as described to me.

_____ **Yes**, I agree to allow the research team to **video record** my participation.

_____ **No**, I do not wish to have my participation **video recorded**.

Signature of Participant or Legal Guardian

Date

Investigator certification:

My signature certifies that all elements of informed consent described on this consent form have been explained fully to the subject. In my judgment, the participant possesses the capacity to give informed consent to participate in this research and is voluntarily and knowingly giving informed consent to participate.

Signature of Person Obtaining Consent

Date

Appendix L

Words/Signs Added to KWS Workshop Vocabulary

Words/signs in 3 lists	Words/signs in 2 lists
1. DO (R)	1. ALL (R)
2. GO (R)	2. CAN (R)
3. GOOD (R)	3. COME (R)
4. IN (R)	4. EAT (R)
5. LOOK/WATCH (R)	5. FINISHED (R)
6. MAKE (R)	6. GET (R)
7. ON (R)	7. HAVE (R)
8. THAT (R)	8. HE (S)
9. YOU (S)	9. HELP (R)
	10. HERE (R)
	11. I (S)
	12. IT (S)
	13. LIKE (R)
	14. MORE (R)
	15. NO (R)
	16. NOT (R)
	17. OPEN (R)
	18. PUT (R)
	19. SHE (S)
	20. STOP (R)
	21. THIS (R)
	22. UP (R)
	23. WANT (R)
	24. WHAT (R)

Note. (R) = Relational words; (S) = Substantive words.

Appendix M

Words/Signs Added to KWS Workshop Vocabulary

Words/signs in 1 list	
1. AFRAID (R)	30. PLAY (R)
2. ANGRY/MAD (R)	31. RUN (R)
3. BALL (S)	32. SAD (R)
4. BATHROOM/TOILET (S)	33. SAME (R)
5. BIG (R)	34. SAY (R)
6. BOOK (S)	35. SCHOOL (S)
7. BOY (S)	36. SEE (R)
8. BROKEN/BREAK (R)	37. SIT/CHAIR (R)
9. COAT (S)	38. SLEEP (R)
10. CRY (R)	39. SOME (R)
11. CUP (S)	40. SPOON (S)
12. DIFFERENT (R)	41. STAND (R)
13. DIRTY (R)	42. TABLE (S)
14. DOWN (R)	43. TAKE (R)
15. DRINK (R)	44. THERE (R)
16. FALL (R)	45. THEY (S)
17. FATHER/DADDY (S)	46. THROW (R)
18. GIRL (S)	47. TIME (S)
19. GIVE (R)	48. TURN (R)
20. HAPPY (R)	49. UNDER (R)
21. HEAVY (R)	50. WALK (R)
22. HELLO (R)	51. WASH (R)
23. HOT (R)	52. WATER (S)
24. HOUSE (R)	53. WE (S)
25. KNOW (R)	54. WHEN (R)
26. MOTHER/MOMMY (S)	55. WHERE (R)
27. MY/MINE (R)	56. WHO (R)
28. OKAY (R)	57. WHY (R)
29. PEOPLE (S)	58. YES (R)

Note. (R) = Relational words; (S) = Substantive words.

Appendix N

Personal Commitment Statement

YOU CAN MAKE A DIFFERENCE

MY PERSONAL COMMITMENT

After this workshop, I CAN and WILL do the following:

Signature

Date

From Bornman and Louw (2019)

Appendix O

Communication Action Plan

1. During which teaching/learning activities will I sign (choose 3 to start)?

- a. _____
- b. _____
- c. _____

2. During which non-teaching/non-learning activities will I sign (choose 2 to start)?

- a. _____
- b. _____

3. What signs (taught during the workshop) will I use throughout these activities?

Sign	How will I remember the sign (memory aid[s])?
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	

4. What other signs do I need to learn for these activities?

- a. _____
- b. _____
- c. _____

5. What facilitative language techniques will I use during these activities (choose 3 to start)?

- a. _____
- b. _____
- c. _____

Adapted from Bonvillian et al. (2020) and Scope (2019).

Appendix P

An Introduction to Key Word Signing (KWS)

For **Key Word Signing (KWS)**:

- Always speak while using manual signs (**Say it**).
- Use signs to support key words in spoken sentences (**Sign it**).
- Use gestures, body language, and facial expressions (**Show it**).

When communicating with students who rely on AAC, **give it A.L.L.:**

1. **A** – Aided Language Stimulation/Augmented Input
 2. **L** – Language Response Strategies
 3. **L** – Least-to-Most (LTM) Prompting
-
1. Aided Language Stimulation (Beukelman & Mirenda, 1998)
 - **D** – prepare **Displays**
 - **E** – organize **Environments**
 - **M** – provide **Models**
 - **O** – provide **Opportunities**
-
1. Augmented Input/KWS
 - **D** – prepare with **Dictionary**
 - **E** – organize **Environments**
 - **M** – provide **Models**
 - **O** – provide **Opportunities**
 2. Language Response Strategies/Facilitative Language Techniques (DesJardin, 2006)
 - a. Higher level FLT's
 - **P** – Parallel talk
 - **O** – Open-ended questions
 - **R** – Recast
 - **E** – Expansion

- b. Lower Level FLTs.
 - **Daily** - D – Directive
 - **Language** - L – Label
 - **Learning** – L - Linguistic mapping
 - **In** - I – Imitation
 - **Child's** - C - Closed-ended questions
 - **Context** - C – Comment

- 3. Least-to-Most (LTM) Prompting (Ault & Griffen, 2013; Finke et al., 2017)
 - a. Expectant delay
 - b. Direct verbal
 - c. Indirect verbal
 - d. Verbal cue
 - e. Visual model
 - f. Verbal model
 - g. Full physical guidance

Vocabulary Selection

- Select 10 to 12 signs to start.
- Then systematically introduce a minimum of 50 to 150 words/signs.

- Select signs that may be used:
 - With multiple communication partners.
 - Across multiple contexts/environments.
 - For various communication/pragmatic functions.
 - Over an extended period of time.

- When selecting signs, include:
 - Core words (e.g., various verbs).
 - Relevant nouns.
 - Basic concepts.

- Also include signs that:
 - Facilitate developmentally appropriate grammatical structures.
 - Elicit, maintain, and terminate social interactions.
- It is suggested that there be at least **4 times more core words** than fringe words in a vocabulary.
- “Best clinical practice is to not include or eliminate vocabulary based on categorization of words as ‘core’ or ‘fringe’ but rather strike a balance between the two that best reflects **natural language development and vocabulary acquisition**” (Bean et al., 2019, p. 1002).

Resources for semantic, syntactic, and pragmatic functions:

- Semantic Relationships
 - <https://www.asha.org/practice-portal/clinical-topics/late-language-emergence/semantic-relationships/>
- Social Communication Benchmarks
 - <https://www.asha.org/practice-portal/clinical-topics/social-communication-disorder/social-communication-benchmarks/>
- Communication Bill of Rights
 - <https://www.asha.org/njc/communication-bill-of-rights/>

ASL Resources

- Signing Savvy
 - <https://www.signingsavvy.com>
- ASLPro.cc
 - <http://www.aslpro.cc>
- Baby Sign Language
 - <https://www.babysignlanguage.com>

Appendix Q

KWS Workshop Vocabulary

Nouns

1. BALL
2. BATHROOM/TOILET
3. BOOK
4. BOY
5. COAT
6. CUP
7. FATHER/DADDY
8. GIRL
9. *HELLO*
10. HERE
11. HOUSE
12. MOTHER/MOMMY
13. PEOPLE
14. SCHOOL
15. SPOON
16. TABLE
17. (TAKE) TURN
18. *THERE*
19. TIME
20. WATER

Verbs

21. CAN
22. COME
23. CRY
24. DO
25. DRINK
26. EAT/FOOD
27. FALL
28. GET
29. GIVE
30. GO
31. HAVE
32. HELP
33. KNOW
34. LIKE
35. LOOK AT
36. MAKE
37. OPEN
38. PLAY
39. PUT
40. RUN
41. SAY
42. SEE
43. SIT/CHAIR
44. SLEEP
45. STAND
46. STOP
47. TAKE
48. THROW
49. WALK
50. WANT
51. WASH

Adjectives

52. AFRAID/SCARED
 53. ALL
 54. ANGRY/MAD
 55. BIG
 56. BROKEN/BREAK
 57. DIFFERENT
 58. DIRTY
 59. FINISHED
 60. GOOD
 61. HAPPY
 62. HEAVY
 63. HOT
 64. MORE
 65. SAD
 66. SAME
 67. SOME
- #### Adverbs
68. *NO*
 69. NOT
 70. OKAY (sign/gesture)
 71. WHEN
 72. WHERE
 73. WHY
 74. *YES*

Pronouns

75. *HE*
76. *I*
77. *IT*
78. MY/MINE
79. *SHE*
80. THAT
81. *THEY*
82. THIS (sign/gesture)
83. WE
84. WHAT
85. WHO
86. *YOU*

Prepositions

87. *DOWN*
88. IN
89. ON
90. UNDER
91. *UP*

Signs/Gestures

1. *DOWN* (point)
2. *HE* (point)
3. *I* (point)
4. *IT* (point)
5. *SHE* (point)
6. *THERE* (point)
7. *THEY* (point)
8. *UP* (point)
9. *YOU* (point)

Gestures

1. *HELLO* (wave)
2. *NO* (head shake)
3. *YES* (head nod)

Appendix R

KWS Vocabulary

Memory Aids

Note: The memory aids for the ASL manual signs were developed for right-handed individuals; therefore, left-handed individuals should reverse hands. In the descriptions for movement, “repeatedly” refers to repeating the movement two or more times. For descriptions of the ASL handshapes, please see <https://www.helenkeller.org/hknc/asl-handshapes-described-0>.

Nouns

1. BALL
 - a. Location: In front of chest.
 - b. Handshape: “Bent 5”/“claw” hands (right and left hands).
 - c. Orientation: Palms face each other (not touching).
 - d. Movement: Repeatedly (i.e., two or more times) move forearms together and apart so that fingertips tap.
 - e. Sign-referent relationship: Holding a ball.
2. BATHROOM/TOILET
 - a. Location: In front of right shoulder.
 - b. Handshape: Right “T” hand.
 - c. Orientation: Palm faces out.
 - d. Movement: Shake slightly side to side (left and right).
 - e. Sign-referent relationship: T for toilet.
3. BOOK
 - a. Location: In front of chest.
 - b. Handshape: “Flat B” hands (right and left hands).
 - c. Orientation: Palms together. Fingertips point out.
 - d. Movement: Repeatedly open and close hands while little fingers touch/stay together.
 - e. Sign-referent relationship: Opening a book.
4. BOY
 - a. Location: Right side of forehead.
 - b. Handshape: Right “flat C” hand.
 - c. Orientation: Palm faces left.
 - d. Movement: Repeatedly open and close fingers and thumb together.
 - e. Sign-referent relationship: Grasping/tipping a cap brim.
5. COAT
 - a. Location: Close to shoulders.
 - b. Handshape: Right and left “A” hands.
 - c. Orientation: Palms face each other.
 - d. Movement: Arc downward toward waist so that palms face body/waist.
 - e. Sign-referent relationship: Thumb tips trace coat lapels.

6. CUP
 - a. Location: In front of chest.
 - b. Handshape: “C” hand (right hand). “Flat B” hand (left hand).
 - c. Orientation: Palm of right “C” hand faces left. Palm of left “flat B” hand faces up.
 - d. Movement: Repeatedly tap right “C” tap on left “flat B” hand (with little finger touching palm).
 - e. Sign-referent relationship: Shape of a cup and saucer.
7. FATHER/DADDY
 - a. Location: Center/right side of forehead.
 - b. Handshape: Right “5” hand.
 - c. Orientation: Palm faces left.
 - d. Movement: Repeatedly move forearm forward and backward so that thumb tip taps forehead.
 - e. Sign-referent relationship: Male position.
8. GIRL
 - a. Location: Right side of face.
 - b. Handshape: Right “A” hand.
 - c. Orientation: Palm faces right side of face.
 - d. Movement: Repeatedly trace above jawline (from cheek to chin) with inside of thumb tip.
 - e. Sign-referent relationship: Girls’ bonnet strings.
9. HELLO (*natural gesture; wave hand*)
10. HERE
 - a. Location: In front of body.
 - b. Handshape: “Flat B” hands (right and left hands).
 - c. Orientation: Palms face up. Fingertips point out.
 - d. Movement: Right hand circles clockwise and left hand circles counterclockwise.
 - e. Nonmanual expression: Nod head.
 - f. Sign-referent relationship: “That which lies before you” (Riekehof, 1987, p. 120).
11. HOUSE
 - a. Location: In front of face.
 - b. Handshape: “Flat B” hands (right and left hands).
 - c. Orientation: Palms face each other. Fingertips touch, forming a pyramid shape.
 - d. Movement: Separate fingertips by moving down diagonally a few inches. Then straighten hands and move down a few inches.
 - e. Sign-referent relationship: House roof and walls.
12. MOTHER/MOMMY
 - a. Location: In front of chin.
 - b. Handshape: Right “5” hand.
 - c. Orientation: Palm faces left.
 - d. Movement: Repeatedly move forearm forward and backward so that thumb tip taps chin.
 - e. Sign-referent relationship: Female position.

13. PEOPLE

- a. Location: In front of chest.
- b. Handshape: "P" hands (right and left hands).
- c. Orientation: Palms face down. Hands side by side (not touching).
- d. Movement: Move hands in alternating outward/clockwise circles.
- e. Sign-referent relationship: Initialized sign. People walking.

14. SCHOOL

- a. Location: In front of body.
- b. Handshape: "Flat B" hands (right and left hands).
- c. Orientation: Right hand palm faces down. Left hand palm faces up. Right fingertips point toward left. Left fingertips point toward right. Right hand above left hand.
- d. Movement: Clap hands twice.
- e. Sign-referent relationship: Teacher clapping for attention.

15. SPOON

- a. Location: In front of chest.
- b. Handshape: Right "U" hand. Left "flat B" hand.
- c. Orientation: Right and left palms face up. Right fingertips point left. Left fingertips point toward right.
- d. Movement: Repeatedly move right "U" hand in clockwise circle from left palm to lips.
- e. Sign-referent relationship: Eating food (in a dish) with a spoon.

16. TABLE

- a. Location: In front of body.
- b. Handshape: Open "B" hands (right and left hands).
- c. Orientation: Palms face down.
- d. Movement: Put right forearm on top of left forearm so that arms are horizontal/parallel. Then repeatedly move forearms apart and together so that they strike together or clap.
- e. Sign-referent relationship: Top of a table.

17. (TAKE) TURN

- a. Location: In front of body.
- b. Handshape: Right "L" hand. Thumb pointing up. Index finger pointing to the left.
- c. Orientation: Palm faces body.
- d. Movement: Point thumb toward the person whose turn it is.
- e. Sign-referent relationship: Pointing toward the person whose turn it is.

18. *THERE* (manual sign/natural gesture; open "B" hand/point)

19. TIME

- a. Location: In front of body.
- b. Handshape: Right "1" hand with index finger slightly curved. Left "S" hand.
- c. Orientation: Palms face down.
- d. Movement: Repeatedly tap back of left wrist with right index finger.
- e. Sign-referent relationship: Watch on an arm.

20. WATER

- a. Location: In front of face.
- b. Handshape: Right “W” hand.
- c. Orientation: Palm faces left.
- d. Movement: Repeatedly tap chin/lips with side of index fingertip.
- e. Sign-referent relationship: Initialized sign. Drinking water.

Verbs

21. CAN

- a. Location: In front of chest.
- b. Handshape: Right and left “A” hands.
- c. Orientation: Palms face down. Hands side by side (not touching).
- d. Movement: Move “A” hands down a few inches.
- e. Sign-referent relationship: Nodding head.

22. COME

- a. Location: In front of body.
- b. Handshape: “1” hands (right and left hands).
- c. Orientation: Palms face up. Index fingers point forward.
- d. Movement: Arc index fingertips upward toward chest. COME may be produced with right hand only.
- e. Sign-referent relationship: Beckoning motion.

23. CRY

- a. Location: In front of face.
- b. Handshape: “1” hands (right and left hands).
- c. Orientation: Palms toward face. Index fingers point up.
- d. Movement: Alternately move index fingers from eyes down cheeks.
- e. Sign-referent relationship: Tears streaming down face/cheeks.

24. DO

- a. Location: In front of body.
- b. Handshape: “C” hands (right and left hands).
- c. Orientation: Palms face down.
- d. Movement: Move/swing from left to right several times.
- e. Sign-referent relationship: Hands doing something.

25. DRINK

- a. Location: In front of mouth.
- b. Handshape: Right “C” hand.
- c. Orientation: Palm faces left.
- d. Movement: Put thumb on bottom lip. Tip fingers toward nose.
- e. Sign-referent relationship: Taking a drink.

26. EAT/FOOD

- a. Location: In front of mouth.
- b. Handshape: Right “flat O” hand.
- c. Orientation: Palm faces mouth.
- d. Movement: Repeatedly move fingertips toward mouth.
- e. Sign-referent relationship: Putting food in mouth.
- f. Note: one movement represents the verb EAT, and two movements represent the noun FOOD.

27. FALL

- a. Location: In front of body.
- b. Handshape: Right “V” hand. Left “open B” hand.
- c. Orientation: First, right palm faces body. Then, right palm faces up. Left palm faces up.
- d. Movement: Put right “V” hand (in a standing position) on palm of left “open B” hand. Then, flip right “V” hand so that it “falls” onto left palm (and right palm is facing up).
- e. Sign-referent relationship: Falling from standing position.

28. GET

- a. Location: In front of chest.
- b. Handshape: “5”/“bent 5” hands (right and left hands).
- c. Orientation: Right palm faces left. Left palm faces right. Fingertips point forward.
- d. Movement: Put right “5” hand on top of left “5” hand.” Move “5” hands toward chest while closing fingers to form “S” hands.
- e. Sign-referent relationship: Taking hold of something.

29. GIVE

- a. Location: In front of body.
- b. Handshape: Right “flat O” hand.
- c. Orientation: Palm faces up.
- d. Movement: Arc right “flat O” hand away from body. GIVE may be produced with two hands.
- e. Sign-referent relationship: Holding something and giving it to someone.

30. GO

- a. Location: In front of body. Left hand is closer to body than right hand.
- b. Handshape: “1” hands (right and left hands).
- c. Orientation: Palms face outward. Index fingers point up.
- d. Movement: Arc index fingertips downward away from body. GO may be produced with right hand only.
- e. Sign-referent relationship: Something going away (from body).

31. HAVE

- a. Location: In front of chest.
- b. Handshape: “Bent B” hands (right and left hands) with extended thumbs.
- c. Orientation: Palms face body. Fingertips point toward body. Thumbs point up.
- d. Movement: Move fingertips (side by side) toward body until they touch the chest.
- e. Sign-referent relationship: Holding something against yourself.

32. HELP

- a. Location: In front of body.
- b. Handshape: Right “open B” hand. Left “A/S” hand.
- c. Orientation: Right palm faces up. Right fingertips point toward left. Left palm faces body. Put left “A/S” hand (thumb side up) on right “open B” hand.
- d. Movement: Move both hands up (together) a few inches.
- e. Sign-referent relationship: Lending a helping hand.

33. KNOW

- a. Location: Right side of face.
- b. Handshape: Right “flat B” (fingers may be slightly bent at the base)/“bent B” (gap between thumb and edge of hand may be present [“open B”]) hand.
- c. Orientation: Palm faces side of face.
- d. Movement: Pat forehead with fingertips.
- e. Sign-referent relationship: Knowledge inside head.

34. LIKE

- a. Location: In front of chest.
- b. Handshape: Right “open 8” hand.
- c. Orientation: Palm faces body. Thumb and middle finger point toward chest.
- d. Movement: First, move thumb and middle finger (of the “open 8” hand) toward chest. Then, close thumb and middle finger (forming an “8” hand) as they move away from chest.
- e. Sign-referent relationship: Taking something from heart.
- f. Note: LIKE may be produced with right “5” hand. First, move “5” hand toward chest. Then, close thumb and index finger (forming an “F” hand) as they move away from chest.

35. LOOK AT

- a. Location: In front of face.
- b. Handshape: Right “V” hand.
- c. Orientation: Palm toward face. Fingertips below eyes.
- d. Movement: Arc/swing fingertips away from face so that they point outward.
- e. Sign-referent relationship: Eyes looking around.

36. MAKE

- a. Location: In front of body.
- b. Handshape: “S” hands (right and left hands).
- c. Orientation: Right palm faces left. Left palm faces right. Right “S” hand on top of left “S” hand.
- d. Movement: Repeatedly turn “S” hands back and forth so that palms face body and then face sides. Tap “S” hands together after each turn.
- e. Sign-referent relationship: Making something.

37. OPEN

- a. Location: In front of body.
- b. Handshape: “B” hands (right and left hands).
- c. Orientation: Palms face out. Put “B” hands side by side so that index fingers touch.
- d. Movement: Arc “B” hands apart so that palms face each other.
- e. Sign-referent relationship: Opening something.

38. PLAY

- a. Location: In front of chest/body.
- b. Handshape: “Y” hands (right and left hands).
- c. Orientation: Palms face chest/body.
- d. Movement: Repeatedly twist “Y” hands at wrist.
- e. Sign-referent relationship: Shaking tambourines.

39. PUT

- a. Location: In front of body.
- b. Handshape: “Flat O” hands (right and left hands).
- c. Orientation: Palms face down. “Flat O” hands side by side (not touching).
- d. Movement: Arc “flat O” hands (together) forward toward the left.
- e. Sign-referent relationship: Lifting something and putting it somewhere.

40. RUN

- a. Location: In front of body.
- b. Handshape: “L” hands (right and left hands).
- c. Orientation: Palms face down. “L” hands side by side so that thumb tips touch. Index fingers point out.
- d. Movement: Move “L” hands forward together while repeatedly bending index fingers.
- e. Sign-referent relationship: Legs running (Note: researcher’s memory aid).

41. SAY

- a. Location: In front of mouth.
- b. Handshape: Right “1” hand.
- c. Orientation: Palm faces right side of face. Index finger points left.
- d. Movement: Make small circles with right index finger.
- e. Sign-referent relationship: Words coming from mouth.
- f. Note: SAY (as described above) may mean hearing (person); therefore, SAY may be produced with tip of right index finger tapping chin (palm faces neck).

42. SEE

- a. Location: In front of face.
- b. Handshape: Right “V” hand.
- c. Orientation: Palm toward face. Index and middle fingertips near eyes.
- d. Movement: Move right “V” hand forward.
- e. Sign-referent relationship: Looking at something.

43. SIT/CHAIR

- a. Location: In front of body.
- b. Handshape: Curved “U” hands (right and left hands).
- c. Orientation: Palms face down.
- d. Movement: Put the right curved “U” hand across the top of the left curved “U” hand. Both hands may be moved down (together) a few inches.
- e. Sign-referent relationship: Someone (legs) sitting down.
- f. Note: SIT may be produced with right curved “U” hand across the top of the left “U” hand. One movement represents the verb SIT, and two movements represent the noun CHAIR.

44. SLEEP

- a. Location: In front of face.
- b. Handshape: Right “5” hand.
- c. Orientation: Palm toward face. Fingertips point up.
- d. Movement: Move right “5” hand downward while closing fingers to form “flat O” hand and slightly bowing head.
- e. Sign-referent relationship: Eyes closing.

45. STAND

- a. Location: In front of body.
- b. Handshape: Right “V” hand. Left “open B” hand.
- c. Orientation: Right palm faces body. Left palm faces up.
- d. Movement: Put right “V” hand (in a standing position) on palm of left “open B” hand.
- e. Sign-referent relationship: Someone (legs) standing.

46. STOP

- a. Location: In front of body.
- b. Handshape: “Open B” hands (right and left hands).
- c. Orientation: Right palm faces left toward side of body. Left palm faces up with fingertips pointing out toward the right.
- d. Movement: Quickly bring right “open B” hand (little finger side) down onto left “open b” hand at an angle.
- e. Sign-referent relationship: Cutting short/forming a barrier.

47. TAKE

- a. Location: In front of body.
- b. Handshape: Right “flat B/bent 5” hand.
- c. Orientation: Palm faces left.
- d. Movement: Quickly move right “flat B”/“bent 5” hand from the right side of the body to the left side while closing fingers to form an “A/S” hand.
- e. Sign-referent relationship: Taking something.

48. THROW

- a. Location: Right side of body (e.g., above/next to right shoulder).
- b. Handshape: Right “S/O” hand.
- c. Orientation: Palm faces out.
- d. Movement: Quickly move right “S/O” hand forward toward the left while opening fingers to form a “5” hand.
- e. Sign-referent relationship: Throwing something.

49. WALK

- a. Location: In front of body.
- b. Handshape: “Flat B” hands (right and left hands).
- c. Orientation: Palms face down. “Flat B” hands side by side (not touching).
- d. Movement: Alternate moving “flat B” hands in a forward-downward motion (i.e., stepping motion).
- e. Sign-referent relationship: Walking feet.

50. WANT

- a. Location: In front of chest/body.
- b. Handshape: “Bent 5”/“claw” hands (right and left hands).
- c. Orientation: Palms face up. “Bent 5”/“claw” hands side by side (not touching). Knuckles face forward.
- d. Movement: Move “bent 5”/“claw” hands toward body while slightly closing fingers.
- e. Sign-referent relationship: Bringing something toward yourself.

51. WASH

- a. Location: In front of body.
- b. Handshape: Right and left “A” hands.
- c. Orientation: Right palm face down. Left palm face up. Right “A” hand on top of left “A” hand.
- d. Movement: Rub right and left “A” hands together (i.e., washing motion).
- e. Sign-referent relationship: Washing something by hand.

Adjectives

52. AFRAID/SCARED

- a. Location: In front of chest.
- b. Handshape: “Flat O”/“S” hands (right and left hands).
- c. Orientation: Palms face body. Fingertips point toward each other (not touching).
- d. Movement: Quickly move “flat O”/“S” hands toward each other while opening fingers to form “5” hands. “5” hands stop in center of chest with right hand above left hand.
- e. Sign-referent relationship: Protecting yourself.

53. ALL

- a. Location: In front of body.
- b. Handshape: “Flat B” hands (right and left hands).
- c. Orientation: Palms face body. Fingertips on left hand point upward toward right. Fingertips on right hand point upward toward left. Right hand in front of left hand.
- d. Movement: Circle the right hand (palm facing out) around the left hand, ending with the right hand on the left hand (both palms facing up).
- e. Sign-referent relationship: Including everything.

54. ANGRY/MAD

- a. Location: In front of face.
- b. Handshape: Right “5” hand.
- c. Orientation: Palm toward face.
- d. Movement: Bend fingers to form “bent 5”/“claw” hand. Movement may be repeated.
- e. Sign-referent relationship: Wrinkling brow.

55. BIG

- a. Location: In front of body.
- b. Handshape: "L" hands with bent index fingers (right and left hands).
- c. Orientation: Palms face each other. Index finger knuckles face forward.
- d. Movement: Move bent "L" hands apart.
- e. Sign-referent relationship: Shows something big.

56. BROKEN/BREAK

- a. Location: In front of body.
- b. Handshape: "S" hands (right and left hands).
- c. Orientation: Palms face down. "S" hands side by side with sides of thumbs and index fingers touching. Knuckles face forward.
- d. Movement: Quickly twist wrists outward and apart.
- e. Sign-referent relationship: Breaking something.

57. DIFFERENT

- a. Location: In front of body.
- b. Handshape: "D"/"1" hands (right and left hands).
- c. Orientation: Palms face downward. Index fingers crossed.
- d. Movement: Arc index fingers outward and apart so that palms face outward-downward. Movement may be repeated.
- e. Sign-referent relationship: Separating things/Not the same.

58. DIRTY

- a. Location: Under chin.
- b. Handshape: Right "5" hand.
- c. Orientation: Palm faces down. Knuckles touch chin. Fingers point left.
- d. Movement: Wiggle fingers.
- e. Sign-referent relationship: Pig eating from trough. Similar to the sign for PIG.

59. FINISHED

- a. Location: In front of body.
- b. Handshape: "5" hands (right and left hands).
- c. Orientation: Palms face each other. Fingertips point out.
- d. Movement: Quickly twist wrists so that palms face downward. Movement may be repeated.
- e. Sign-referent relationship: Shaking hands to free them of something.

60. GOOD

- a. Location: Right hand in front of mouth (fingertips touch lips). Left hand in front of chest.
- b. Handshape: "Open B" hands (right and left hands).
- c. Orientation: Right palm faces mouth/chin. Left palm faces upward.
- d. Movement: Move right hand forward and downward, ending with the right hand on the left hand (both palms facing up). GOOD may be produced with right hand only.
- e. Sign-referent relationship: Tasting something good and then offering it to someone.

61. HAPPY

- a. Location: In front of chest.
- b. Handshape: Right “open B” hand.
- c. Orientation: Palm faces chest. Fingertips point left.
- d. Movement: Repeatedly circle right hand up and out, tapping chest after each circle/rotation.
- e. Sign-referent relationship: Stirring the heart with happiness/Good feelings rise up.

62. HEAVY

- a. Location: In front of chest.
- b. Handshape: “5”/“bent B” hands (right and left hands).
- c. Orientation: Palms face up. Hands side by side (not touching). Fingertips point out.
- d. Movement: Quickly move/drop hands downward a few inches.
- e. Sign-referent relationship: Holding something heavy.

63. HOT

- a. Location: In front of mouth.
- b. Handshape: Right “bent 5”/“claw” hand.
- c. Orientation: Palm toward mouth.
- d. Movement: Quickly turn/twist wrist so that palm faces outward-downward.
- e. Sign-referent relationship: Quickly removing something hot from mouth.

64. MORE

- a. Location: In front of chest.
- b. Handshape: “Flat O” hands (right and left hands).
- c. Orientation: Palms face each other. Hands side by side (not touching). Fingertips point toward each other.
- d. Movement: Bring fingertips of both hands together. Movement may be repeated, using tapping motion.
- e. Sign-referent relationship: Adding to something.

65. SAD

- a. Location: In front of face.
- b. Handshape: “5” hands (right and left hands).
- c. Orientation: Palms toward face. Hands side by side (not touching). Fingertips point up.
- d. Movement: Move hands downward a few inches (fingertips stop at mouth) while slightly bending head/neck down.
- e. Sign-referent relationship: Shows downturned expression/dropping facial features.

66. SAME

- a. Location: In front of body.
- b. Handshape: “1” hands (right and left hands).
- c. Orientation: Palms face down. Hands side by side (not touching). Fingertips point forward.
- d. Movement: Bring sides of index fingers together. Movement may be repeated.
- e. Sign-referent relationship: Same fingers are brought together.

67. SOME

- a. Location: In front of body.
- b. Handshape: “Open B” hands (right and left hands).
- c. Orientation: Right palm faces left toward side of body. Left palm faces up with fingertips pointing out toward the right.
- d. Movement: Move right “open B” hand (little finger side) down/across the middle of the left “open B” hand.
- e. Sign-referent relationship: Cutting something in half.

Adverbs

68. NO (*natural gesture; shake head*)

69. NOT

- a. Location: In front of neck/under chin.
- b. Handshape: Right “A” hand.
- c. Orientation: Palm faces left. Knuckles face up. Thumb tip touches underside of chin.
- d. Movement: Arc thumb/“A” hand forward, out from under chin.
- e. Sign-referent relationship: None given.

70. OKAY (*manual sign/natural gesture; “F” hand/thumbs up*)

- a. Location: In front of body.
- b. Handshape: Right “O” and “K” handshapes.
- c. Orientation: Palm faces outward.
- d. Movement: Fingerspell O.K.
- e. Sign-referent relationship: Fingerspelled word.

71. WHEN

- a. Location: In front of chest/body.
- b. Handshape: “1” hands (right and left hands).
- c. Orientation: Left palm faces body. Left index fingertip points upward. Right palm faces left hand. Right index fingertip points toward left index fingertip.
- d. Movement: With the right “1” hand, make a clockwise circle around the left index fingertip, ending with the right index fingertip touching the left index fingertip.
- e. Sign-referent relationship: Setting a point in time.

72. WHERE

- a. Location: In front of right shoulder.
- b. Handshape: Right “1” hand.
- c. Orientation: Palm faces outward. Index finger points up.
- d. Movement: Repeatedly and quickly move/shake hand from left to right.
- e. Sign-referent relationship: Looking for something (in alternate directions).

73. WHY

- a. Location: Right side of face.
- b. Handshape: Right “open B” hand.
- c. Orientation: Palm faces right side of face. Fingertips point upward.
- d. Movement: Touch side of forehead with fingertips, then move hand outward-downward while closing fingers to form “Y” hand (with palm toward face).
- e. Sign-referent relationship: Reason comes from mind. Phonetic equivalent of “why” (i.e., Y).

74. YES (*natural gesture; nod head*)

Pronouns

75. HE (*natural gesture; point*)

76. I (*natural gesture; point*)

77. IT (*natural gesture; point*)

78. MY/MINE

- a. Location: In front of chest.
- b. Handshape: Right “open B” hand.
- c. Orientation: Palm faces chest.
- d. Movement: Put right “open B” hand on chest.
- e. Sign-referent relationship: Holding something against chest to show ownership.

79. SHE (*natural gesture; point*)

80. THAT

- a. Location: In front of body.
- b. Handshape: Right “Y” hand. Left “open B” hand.
- c. Orientation: Right palm faces down. Knuckles/fingertips point toward left. Left palm faces up. Fingertips point toward right.
- d. Movement: Put right “Y” hand (palm down) on palm of left “open B” hand. THAT may be produced with right hand only.
- e. Sign-referent relationship: Indicating something specific.

81. THEY (*natural gesture; point*)

82. THIS (*sign/natural gesture; point*)

- a. Location: In front of body.
- b. Handshape: Right “1” hand. Left “open B” hand.
- c. Orientation: Right palm faces body. Index fingertip points downward. Left palm faces up. Fingertips point toward right.
- d. Movement: Touch middle of left palm with index fingertip. THIS may be produced with right hand only.
- e. Sign-referent relationship: Pointing to something specific.

83. WE

- a. Location: In front of chest.
- b. Handshape: Right “1” hand.
- c. Orientation: Palm faces body/right shoulder. Right index finger points to right shoulder.
- d. Movement: Touch right shoulder with index fingertip, then arc outward from right shoulder to left shoulder (palm facing body), ending with index fingertip touching left shoulder.
- e. Sign-referent relationship: Pointing to self and others.

84. WHAT

- a. Location: In front of body.
- b. Handshape: “5” hands (right and left hands).
- c. Orientation: Palms face up. Hands side by side (not touching). Fingertips point outward.
- d. Movement: Slightly move/shake hands back and forth (left and right).
- e. Sign-referent relationship: Inquiry gesture with hands.

85. WHO

- a. Location: In front of face.
- b. Handshape: Right “open X” hand
- c. Orientation: Palm faces left.
- d. Movement: Put thumb tip on chin. Repeatedly bend index finger.
- e. Sign-referent relationship: Lip formation.

86. *YOU* (natural gesture; point)

Prepositions

87. *DOWN* (natural gesture; point)

88. IN

- a. Location: In front of body.
- b. Handshape: Right “flat O” hand. Left “C” hand.
- c. Orientation: Right palm faces down. Left palm faces right. Right hand above left hand.
- d. Movement: Put the right “flat O” hand into the left “C” hand.
- e. Sign-referent relationship: Putting something in another thing.

89. ON

- a. Location: In front of body.
- b. Handshape: “Flat B/“open B” hands (right and left).
- c. Orientation: Palms face down. Right fingertips point toward left. Left fingertips point toward right. Right hand above left hand.
- d. Movement: Put right hand on back of left hand.
- e. Sign-referent relationship: Putting something on another thing.

90. UNDER

- a. Location: In front of chest.
- b. Handshape: Right “open A” hand. Left “flat B” hand.
- c. Orientation: Right palm faces left. Left palm faces down. Put right hand between left hand and chest (not touching).
- d. Movement: Arc right hand downward and under the left hand.
- e. Sign-referent relationship: Putting something under another thing.

91. *UP* (natural gesture; point)

Appendix S

Receptive Sign Assessment

Date _____

Participant # _____

Video/List # _____

Instructions:

For the receptive portion of the sign assessment, I will show you a video containing ASL signs. You will see each sign three times in the video. After the third presentation of a sign, tell me one or two words that tell the meaning of the sign.

Sign Produced/Participant's Response
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.

Appendix T

Receptive Sign Rubric

Date _____

Participant # _____

Video/List # _____

Examiner _____

Identification Score
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
Total Identification Score

1 = an accurate sign identification.

0 = an inaccurate sign identification.

Appendix U

Expressive Sign Rubric

Date _____

Rater _____

Participant # _____

List # _____

Instructions:

For the expressive portion of the sign assessment, I will say a word, and then you will show me the ASL sign for the word.

Sign/Associated Word	Sign Production Score
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
	Total Sign Production Score

3 = an accurate sign production. A manual sign production that included all four critical components of the target sign (i.e., location, handshape, orientation, and movement).

2 = a partially accurate sign production. A manual sign production that included two or three of the four critical components of the target sign.

1 = an inaccurate sign production. A manual sign production that included one of the four critical components of the target sign.

0 = no sign production. No attempt to produce a manual sign or a manual sign production that included none of the four critical components of the target sign

Adapted from Chadwick and Jolliffe (2008).

Appendix V

Participant KWS Rubric

Date _____

Rater _____

Participant # _____

Student # _____

Sign Measures	Tally	Total
Signed utterances		
Signs		
Different signs		

Appendix W
Student KWS Rubric

Date _____

Rater _____

Student # _____

Participant # _____

Sign Measures	Tally	Total
Signed utterances		
Signs		
Different signs		

Appendix X

Acceptability Questionnaire

Welcome to the questionnaire!

Thank you for participating in the Key Word Signing (KWS) workshop. Please complete this questionnaire so that you can share your reaction to the workshop as well as your learning and application of the knowledge and skills that you acquired during the workshop. Your responses will assist with evaluating and improving the effectiveness of the workshop.

The questionnaire is anonymous. One demographic question will be asked in the questionnaire, but no personally identifiable information will be associated with your responses. The questionnaire will take about 15 minutes for you to complete. Your responses will be saved as you answer the questions. If you are not able to complete the questionnaire in one sitting, then you may return to it later and resume where you left off. Please note that you will not be able to change your responses once you submit the survey.

If you have any questions or comments before or after you complete the questionnaire, please feel free to contact Krista L. McMorrان-Maus by email at mcmorrانmaus@chapman.edu. Thank you for your willingness to complete the questionnaire. Your input is important to the research study.

1. What is your job title?
(Answer box)
2. I was encouraged to participate throughout the KWS workshop.
(Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree)
3. The KWS workshop held my interest.
(Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree)
4. The information provided in the KWS workshop was applicable to my job.
(Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree)
5. I believe it is worthwhile for me to use manual signs in my classroom or therapy room.
(Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree)
6. I am confident about using manual signs in my classroom or therapy room.
(Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree)
7. I am committed to using manual signs in my classroom or therapy room.

(Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree)

8. I will recommend the KWS workshop to my co-workers.
(Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree)
9. What information from the KWS workshop was the most relevant to your work?
(Answer box)
10. What information from the KWS workshop was NOT relevant to your work?
(Answer box)
11. How can the KWS workshop be improved?
(Answer box)

We thank you for your time spent taking this survey.

Your response has been recorded.

Appendix Y

Semi-structured Interview Guide

Interview Questions/Prompts:

Please note: questions will be added to clarify special education teachers’ and speech-language pathologists’ perspectives on topics.

Week 7

1. Have you used KWS in your classroom/therapy room since the workshop?

Yes	No
2. How you have used KWS in your classroom/therapy room?	2. What has hindered your use of KWS in your classroom/therapy room?
a. Tell me about the student(s) with whom you have used KWS.	3. What would help you use KWS in your classroom/therapy room?
b. Tell me about the activities (teaching/nonteaching) during which you have used KWS.	4. Tell me about your thoughts on using KWS in your classroom/therapy room.
3. Tell me about other experiences and/or thoughts on using KWS in your classroom/therapy room.	

Probing Question/Prompt:

1. Anything else?
2. Tell me more.

Week 9

Please note: if the participant responded “yes,” to the question, “Have you used KWS in your classroom/therapy room since the workshop?” which was asked during the Week 7 interview, then they were asked the questions preceded by the word “yes.” However, if the participant responded “no,” to the question, “Have you applied KWS to your work?” then they were asked the question preceded by the word “no.”

1. Yes – Are you continuing to use KWS in your classroom/therapy room?
1. No - Have you used KWS in your classroom/therapy room in the past two weeks?

Yes	No
2. 1 st Yes: the participant/interviewee will be asked the questions from the previous week in addition to the questions for the current week.	2. 1 st No - What has hindered your use of KWS in your classroom/therapy room?
2. 2 nd Yes: the researcher/interviewer will review the students with whom and/or activities during which each participant/interviewee had used KWS.	2. 2 nd No - Tell me about new obstacles you have encountered.
3. What has helped you use KWS with these students?	3. What would help you get around these obstacles?

4. What has helped you use KWS during these activities?	4. Tell me about new thought(s) you have had on using KWS in your classroom/therapy room.
5. What has hindered your use of KWS in your classroom/therapy room?	
a. What has helped you get around these obstacles?	
b. What would help you get around these obstacles?	
6. Tell me about other experiences and/or thoughts on using KWS in your classroom/therapy room.	

Probing Question/Prompt:

1. Anything else?
2. Tell me more.

Week 11

1. Yes – Are you continuing to use KWS in your classroom/therapy room?
1. No - Have you used KWS in your classroom/therapy room in the past two weeks?

Yes	No
2. 1 st Yes: the participant/interviewee will be asked the questions from the previous week(s) in addition to the questions for the current week.	2. 1 st No - What has hindered your use of KWS in your classroom/therapy room?
2. 3 rd Yes - What has resulted from you using KWS in your classroom/therapy room?	2. 3 rd No - Tell me about new obstacles you have encountered.
a. Tell me about the benefits of using KWS in your classroom/therapy room.	3. What would help you get around these obstacles?
b. Tell me about the challenges of using KWS in your classroom/therapy room.	4. Tell me about new thought(s) you have had on using KWS in your classroom/therapy room.
3. Do others use manual signs or KWS in your classroom or therapy room?	
a. No – No follow-up questions.	
b. Yes – Tell me about the student's/staff member's use of KWS.	
c. Yes - What has resulted from them using KWS in your classroom/therapy room?	
4. Tell me about other experiences and/or thoughts on using KWS in your classroom/therapy room.	

Probing Question/Prompt:

1. Anything else?
2. Tell me more.

Week 13

1. Yes – Are you continuing to use KWS in your classroom/therapy room?
1. No - Have you used KWS in your classroom/therapy room in the past two weeks?

Yes	No
2. 1 st Yes: the participant/interviewee will be asked the questions from the previous week(s) in addition to the questions for the current week.	2. 1 st No - What has hindered your use of KWS in your classroom/therapy room in the past two weeks?
2. 4 th Yes - Tell me about new experiences and/or thoughts on using KWS in your classroom/therapy room.	2. 4 th No - Tell me about new obstacles you have encountered.
3. What supports you have received to help you use KWS in your classroom/therapy room?	3. What would help you get around these obstacles?
4. What supports do you need to continue to use KWS in your classroom/therapy room?	4. What supports do you need to use KWS in your classroom/therapy room?
5. What information would you have wanted to be provided, or topics would you have liked to discuss, during the KWS workshop?	5. Tell me about new thought(s) you have had on using KWS in your classroom/therapy room.
6. What information or topics could be improved or removed from the KWS workshop?	6. What information would you have wanted to be provided, or topics would you have liked to discuss, during the KWS workshop?
7. Were the ASL signs taught, during the KWS workshop, appropriate for you and your students?	7. What information or topics could be improved or removed from the KWS workshop?
8. What ASL signs, which you were taught during the KWS workshop, do you use most?	8. Were the ASL signs taught, during the KWS workshop, appropriate for you and your students?
9. Are there ASL signs you would have wanted to be taught during the KWS workshop?	9. Are there ASL signs you would have wanted to be taught during the KWS workshop?
10. Tell me your final thoughts on the KWS workshop.	10. Tell me your final thoughts on the KWS workshop.

Probing Question/Prompt:

1. Anything else?
2. Tell me more.

Appendix Z

KWS Vocabulary Participants Chose to Use During Teaching/Learning or Nonteaching/Nonlearning Activities

- | | |
|--|---------------|
| 1. BALL | 27. SIT/CHAIR |
| 2. BATHROOM/TOILET | 28. STAND |
| 3. BOOK | 29. STOP |
| 4. BOY | 30. TAKE |
| 5. CUP | 31. WALK |
| 6. GIRL | 32. WANT |
| 7. HELLO/HI | 33. WASH |
| 8. MOTHER | 34. ALL |
| 9. SCHOOL | 35. ANGRY/MAD |
| 10. TABLE | 36. DIFFERENT |
| 11. (TAKE) TURN (e.g., MY TURN, YOUR TURN) | 37. GOOD |
| 12. TIME | 38. HAPPY |
| 13. WATER | 39. HOT |
| 14. DO | 40. MORE |
| 15. DRINK | 41. SAD |
| 16. EAT/FOOD | 42. SAME |
| 17. FINISHED/ALL DONE | 43. NO |
| 18. GIVE | 44. WHEN |
| 19. GO | 45. WHERE |
| 20. HELP | 46. WHY |
| 21. LIKE | 47. YES |
| 22. LOOK AT | 48. WHAT |
| 23. OPEN | 49. WHO |
| 24. PLAY | 50. IN |
| 25. PUT | 51. ON |
| 26. SEE | 52. UNDER |

Appendix AA

Expressive and Receptive Sign Assessment and Semi-structured Interview Schedule

Participant	Week 1 *	Week 2 *	Week 3	Week 4 *	Week 5	Week 6 *	Week 7	Week 8 *	Week 9	Week 10 *	Week 11	Week 12 *	Week 13
1	SA	SA, SQ	SA, SQ	SA, SQ	SA, SQ	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I
2	SA	SA	SA, SQ	SA, SQ	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I
3	SA	SA, SQ	SA, SQ	SA, SQ	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I
4	SA	SA, SQ	SA, SQ	SA, SQ	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I
5	SA	SA, SQ	SA, SQ	SA, SQ	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I
6	SA	SA, SQ	SA, SQ	SA, SQ	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I
7	SA	SA, SQ	SA, SQ	SA, SQ	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I
8	SA	SA, SQ	SA, SQ	SA, SQ	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I	SA, SQ, I

Note. * = regular assessment/interview week; SA = expressive and receptive sign assessment; SQ = supplemental questions; I = interview.

Appendix BB

Expressive KWS Assessment/Observation Schedule

Participant	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week
	1 *	2 *	3	4 *	5	6 *	7	8 *	9	10 *	11	12
2	3 ROs		MO	RO		RO					MO	MO
5	3 ROs		MO		MO	RO			MO	RO		
6	3 ROs	RO		RO		RO		RO				MO

Note. * = regular observation week; RO = regular observation; make-up observation. The preworkshop observations included three observations per participant within one week before a workshop (i.e., Week 1). The postworkshop observations involved one observation per participant during the regular or make-up observation weeks.

Appendix CC

KWS Vocabulary Participants Used

<u>Nouns</u>	<u>Verbs</u>	<u>Adjectives</u>	<u>Prepositions</u>
1. BALL	20. COME	49. AFRAID/SCARED	75. DOWN
2. BATHROOM/TOILET	21. CRY	50. ANGRY/MAD	76. IN
3. BOOK	22. DO	51. BIG	77. ON
4. BOY	23. DRINK	52. BROKEN/BREAK	78. UNDER
5. COAT	24. EAT/FOOD	53. DIFFERENT	79. UP
6. CUP	25. FALL	54. DIRTY	
7. FATHER/DADDY	26. GET	55. FINISHED/ALL DONE	
8. GIRL	27. GIVE	56. GOOD	
9. HELLO	28. GO	57. HAPPY	
10. HOUSE	29. HAVE	58. HOT	
11. MOTHER/MOMMY	30. HELP	59. MORE	
12. PEOPLE	31. KNOW	60. SAD	
13. SCHOOL	32. LIKE	61. SAME	
14. SPOON	33. LOOK AT		
15. TABLE	34. MAKE	<u>Adverbs</u>	
16. THERE	35. OPEN	62. NO (sign/gesture)	
17. TIME	36. PLAY	63. NOT	
18. (TAKE) TURN	37. PUT	64. OKAY (sign/gesture)	
19. WATER	38. RUN	65. WHEN	
	39. SAY	66. WHERE	
	40. SEE	67. WHY	
	41. SIT/CHAIR	68. YES (sign/gesture)	
	42. SLEEP		
	43. STAND	<u>Pronouns</u>	
	44. STOP	69. I	
	45. THROW	70. THIS (sign/gesture)	
	46. WALK	71. WE	
	47. WANT	72. WHAT	
	48. WASH	73. WHO	
		74. YOU	

Appendix DD

Non-KWS Vocabulary Participants Used

<u>Nouns</u>	<u>Nouns cont.</u>	<u>Adjectives</u>
1. AIRPLANE	36. PUZZLE	69. BLUE
2. BANANA	37. RABBIT/BUNNY	70. COLD
3. BAKER	38. SKI	71. FUN
4. BERRY	39. SLED	72. GREEN
5. BOAT	40. SLIDE	73. HUNGRY
6. BOX	41. TODAY	74. LITTLE
7. BED	42. TOMORROW	75. ORANGE
8. BREAD	43. TRAIN	76. PURPLE
9. BROCCOLI	44. TREE	77. RED
10. CANDY	45. WEATHER	78. SMALL
11. CAR/TRUCK	46. WEEKEND	79. SWEET
12. CAT	47. WINTER	80. WARM
13. CENTER	48. YESTERDAY	81. WHITE
14. CHERRY		82. YELLOW
15. CHICKEN	<u>Verbs</u>	
16. CHOCOLATE	49. BUY	<u>Adverbs</u>
17. COLOR	50. CHASE	83. FIRST
18. DOG	51. CLEAN	84. NOW
19. EYE	52. CLOSE	85. PLEASE
20. FIRE	53. CUT	
21. FIREFIGHTER	54. DON'T LIKE	<u>Pronoun</u>
22. FRIEND	55. FIND	86. ME
23. HEADPHONES	56. HAPPEN	
24. HOME	57. LINE UP	<u>Preposition</u>
25. HORSE	58. LISTEN	87. OUT
26. MAN	59. MEET	
27. MORNING	60. NEED	<u>Conjunction</u>
28. MUFFIN	61. STAY	88. AND
29. MUSIC	62. SWIM	
30. NAME	63. TELL (ME)	<u>Interjection</u>
31. NECKLACE	64. THANK	89. BYE(-BYE)
32. ONE	65. TOW	
33. OSTRICH	66. WAIT	
34. PEACH	67. WHAT-DO?	
35. PIG	68. WORK	