Intervention Planning for Children who use Augmentative and Alternative Communication: Exploring the Expert-Novice Gap in Speech-Language Pathologists' Clinical Reasoning

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Abstract

Although supporting people who use augmentative and alternative communication (AAC) is included in the American Speech-Language-Hearing Association's certification standards, many speech-language pathologists are not competent supporting AAC (Costigan & Light, 2010; Ratcliff & Beukelman, 1995; Ratcliff, Koul, & Lloyd, 2008). The purposes of the study were to (a) inform a working definition of competency in AAC service provision, and (b) describe the bottlenecks to student learning in this area. The expert-novice gap in intervention planning was explored.

Eight experts, practicing speech-language pathologists with work activities primarily related to AAC participated, as well as eight novices, speech-language pathology students who had completed their first semester of graduate study, including an AAC course or clinical practicum. Participants completed two think-aloud tasks. They read two case studies of children who used AAC and thought aloud as they developed intervention plans for therapy. Data were qualitatively analyzed using grounded theory methodology. Member checks and peer debriefing validated the accuracy of the findings.

Four themes emerged, representing groups of clinical reasoning skills used by both groups: (1) developing intervention plans, (2) measuring and evaluating progress, (3) decision-making, and (4) teaming. Experts and novices used the following clinical reasoning skills similarly: planning activities, selecting or developing materials, planning teaching strategies, selecting targets, collecting data, goal setting, summarizing, interpreting, hypothesizing, and rationalizing. Clinical reasoning differed across groups in selecting treatment style, feature matching, comparing, deferring, seeking outside input, collaborating, and educating others.

Novice speech-language pathologists in the study were developing competency in developing intervention plans, measuring and evaluating progress, decision-making, and

teaming. Data analysis provided preliminary evidence that novices were developing skills in generating intervention plans, goal setting, collecting data, seeking outside input, and collaborating, but additional implementation data would be useful in triangulating these findings. Novices needed additional knowledge and skills related to feature matching and educating others. It is recommended that educators help novices build a database of prototypes during their graduate programs, so that they can more effectively compare clients and populations of clients and also defer less frequently during practice. Limitations and recommendations for future research are discussed.

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Introduction

Many students with autism spectrum disorder, Down syndrome, and cerebral palsy, as well as students with other developmental disabilities accompanied by complex communication needs, benefit from augmentative and alternative forms of communication. In some cases, these systems augment, or supplement, the child's verbal speech. In other cases, these symbol-based systems can provide an altogether alternative communication modality. Augmentative and alternative communication (AAC) aids, which can be non-electronic or electronic, include a variety of symbolic methods such as gestures, auditory, tactile, or graphic symbols used to enhance students' ability to communicate (Beukelman & Mirenda, 2013). AAC includes picture symbols, communication boards, sign language, and speech-generating devices (Beukelman & Mirenda, 2013). Students who use AAC use their systems to meet their needs at school, at home and in the community.

Speech-language pathologists, teachers, and other related service providers are expected to support students' use of AAC by developing and implementing individualized education programs that help students develop the communication skills needed to master grade level standards and communicate with their peers. Speech-language pathologists and other personnel in private practice and other practice settings may also support children who use AAC and their families. However, in communication sciences and disorders (CSD) programs in the United States, gaps continue exist as to the availability of coursework and clinical practica specific to AAC. The literature suggests that preservice learning opportunities related to the assessment, use, and support of AAC are inadequate in both quantity and quality (Costigan & Light, 2010; Ratcliff & Beukelman, 2008). CSD faculty report that speech-language pathologists are not adequately prepared in AAC (Ratcliff & Beukelman, 1995; Ratcliff, Koul, & Lloyd, 2008). As a

result, many speech-language pathologists are "at risk of graduating with minimal to no exposure to AAC, with little knowledge or skill in AAC service provision, and may be unprepared for entry-level practice" (Costigan & Light, 2010, p. 200). Children who use AAC may not receive the support they need to communicate efficiently or effectively. The lack of competency in AAC among speech-language pathologists impacts children's use of AAC systems, and in effect, their communication outcomes.

It is important that preservice education in CSD adequately address AAC so that speech-language pathologists can provide high-quality support to children who use AAC and their families. The following sections provide additional context for this challenge, particularly (a) CSD certification and accreditation standards and (b) the lack of literature that reports outcomes of preservice education related to AAC. In this literature review, preservice education is defined in terms of coursework, clinical practica (i.e. in-house clinical placements, field experiences or externships), and other community-based experiences. Each of these experiences in isolation are a form of preservice education, yet it is the combination of all of the learning opportunities that a preservice professional participates in that constitutes his or her preservice education.

The American Speech-Language-Hearing Association (ASHA, 2016) requires the completion of a master's level (i.e. M.A. or M.S.) graduate program of study comprised of coursework and clinical experience(s) in order for preservice professionals to meet initial requirements for certification to practice as speech-language pathologists. The certification standards outline anticipated student outcomes in both knowledge and skills. Applicants for certification must demonstrate knowledge of communication across multiple practice areas, which include AAC modalities (ASHA, 2016). Standard V states that applicants "must have demonstrated skills in oral and written or other forms of communication sufficient for entry into

professional practice" (Standard V-A section, para. 1) and must also have "completed a program of study that included experiences sufficient in breadth and depth to achieve… skills outcomes" (Standard V-B, section, para. 1) related to evaluation, intervention, and interaction and personal qualities (ASHA, 2016). The skills outcomes related to intervention are of significance to the study at hand. These include outcomes such as "develop setting-appropriate intervention plans with measurable and achievable goals that meet clients'/patients' needs" and "select or develop and use appropriate materials and instrumentation" (ASHA, 2016). Standard V-B states, "the applicant must have acquired the skills… applicable across the nine major areas listed in Standard IV-C," which includes AAC (ASHA, 2016, Standard V-B section, para. 2). These knowledge and skills align with the "Augmentative and Alternative Communication: Knowledge and Skills for Service Delivery" document published by ASHA in 2002, but that was rescinded in 2017 because the information was included in the "Augmentative and Alternative Communication" Practice Portal website (ASHA, 2002; ASHA, 2018a).

The Council on Academic Accreditation in Audiology and Speech-Language Pathology ASHA (CAA) offers accreditation for graduate programs in speech-language pathology. For a program to establish and maintain accreditation, its speech-language pathology curriculum must "include content and opportunities to learn so that each student can demonstrate knowledge and skills" in foundational areas in the certification standards referenced above (ASHA, 2016; CAA, 2016). In addition, accredited programs must also provide content and opportunities so that students can learn and demonstrate professional practice competencies like effective communication skills, evidence-based practice, and collaborative practice. Of particular interest in this study was the clinical reasoning competency, addresses students' ability to:

> Use valid scientific and clinical evidence in decision-making regarding assessment and intervention, apply current knowledge, theory, and sound professional judgment in approaches to intervention and management of individuals served, and use clinical judgment and self-reflection to enhance clinical reasoning. (CAA, 2016, p. 19)

Therefore, the knowledge and skills outcomes students are expected to meet are consistent across speech-language pathologist education programs in the United States; however, it is important to note that, as long as programs follow accreditation guidelines, individual programs can decide which learning opportunities to make available for students in the program, as well as what content and learning objectives will be addressed through those opportunities. Although this autonomy can benefit faculty responsible for preparing students in AAC by allowing creativity and individual preferences and priorities in their teaching, it also creates dissimilarities. Because CSD programs can embed AAC content in other graduate level coursework and meet American Speech-Language-Hearing Association (ASHA) standards, not all CSD programs offer a stand-alone AAC course (Koul & Lloyd, 1994; Ratcliff & Beukelman, 1995; Ratcliff, Koul, & Lloyd, 2008). Further, only 54% of CSD graduate programs report having one or more faculty members with AAC expertise (Koul & Lloyd, 1994; Ratcliff & Beukelman, 1995; Ratcliff, Koul, & Lloyd, 2008). In addition, children and adults who use AAC may be underrepresented in clinical practicum experiences available to CSD students. Faculty may recognize their own students' knowledge and skills related to AAC, but within the CSD discipline, very little is known about the knowledge and skills preservice students acquire across practice areas, including AAC.

Costigan and Light (2010) reviewed the literature related to preservice training for speech-language pathologists, special education teachers, and occupational therapists in the area of AAC. In particular, the researchers investigated the availability, characteristics, and

effectiveness of AAC training. A total of 11 studies discussed the availability and characteristics of preservice learning related to AAC, while only six studies examined the effectiveness of AAC training (Costigan & Light, 2010). The review found that four studies examined effectiveness by measuring participant perceptions, while the other two studies evaluated the effectiveness of student learning by measuring students' change in knowledge or skill(s) in relation to a criterion level. Analysis suggested that the "effectiveness of preservice programs in equipping professionals for entry level AAC practice is unclear" (Costigan & Light, 2010, p. 200).

Coupled with competency data reported by speech-language pathologists, the lack of information regarding the effectiveness of preservice education in AAC presents a considerable problem. Speech-language pathologists, both preservice and inservice, report low levels self-efficacy and competency in AAC service provision (ATIA, 2012; Beukelman, Burke, Ball, & Horn, 2002; Kent-Walsh, Stark, & Binger, 2008). In a survey conducted by the Assistive Technology Industry Association (ATIA), the majority of speech-language pathologist respondents reported that their preservice education did not prepare them to competently support individuals who use AAC (ATIA, 2012). A survey of school-based speech-language pathologists revealed low self-ratings of expertise ($M = 3.36$, $SD = 1.8$ on a 7-point scale in which 1=no expertise and 7=extensive expertise) (Kent-Walsh, Stark, & Binger, 2008). Further, there are few professional development opportunities described in the literature for school-based speech-language pathologists and other members of their professional teams (Meder & Wegner, 2015). Beyond these studies, there is little research that can be drawn on to describe speech-language pathologists' AAC-specific knowledge and skills. Additional research is needed to understand the effectiveness of preservice learning opportunities in AAC, especially the knowledge and

skills students are obtaining, and perhaps even more importantly, the knowledge and skills students aren't acquiring through their education programs.

Literature Review

A purposive, selective review of the literature was conducted to synthesize research articles that reported the outcomes of preservice professionals' AAC learning opportunities. The literature (a) search procedures, (b) selection procedures, and (c) coding procedures are presented in detail below.

Search Procedures

In order to identify research that reported the outcomes of preservice AAC learning opportunities, the researcher searched PsycINFO and ERIC electronic databases. Several combinations of search terms were used, including the following words and phrases and their related synonyms: preservice education (i.e. preservice, education, preservice education, teacher education, education, training, professional), AAC (i.e. augmentative and alternative communication, augmentative communication, communication) or students with complex communication needs (i.e. complex communication needs, low incidence disabilities, severe disabilities, multiple disabilities).

Selection Procedures

In all, 229 article titles and abstracts were discovered through database searches. The researcher read each abstract to determine if the article could potentially meet or did not meet this study's inclusion criteria. When it was clear that an article did not meet the criteria to be included, the article was eliminated; however, when the researcher could not determine inclusion or exclusion from reading the abstract, articles were read in their entirety. Inclusion criteria included: (a) publication in in a peer-reviewed journal between 1986 and 2016, (b) written in

English, and (c) use of primary research methodology to investigate and report outcomes of preservice AAC learning opportunities. Conversely, studies were excluded from review if they: (a) represented a thesis, dissertation, or book chapter, (b) described the design or model of preservice education (i.e. described a course or clinical practicum experience) without reference to implementation and associated outcomes, or (c) described professional development or other forms of in-service education, rather than preservice education.

The inclusion criteria used in this study were similar to that used by Costigan and Light (2010) which reviewed preservice training in AAC for speech-language pathologists, special education teachers, and occupational therapists; however, a major difference in the present research is the conceptualization of AAC as an area of teaching and learning. Because of the paucity of literature that investigates AAC-specific preservice education, the current literature review also included studies that explored preservice education more broadly focused on supporting populations of individuals who use AAC.

Of the 229 articles that were discovered via database searches, 204 articles did not meet inclusion criteria. In contrast, a total of 25 articles were read in their entirety, and 13 of these articles met inclusion criteria for the review. Next, ancestral searches (i.e. reviewing the titles and abstracts of articles listed in the references section) were conducted within the 13 articles that met inclusion criteria at that stage. This resulted in reading the titles and abstracts of 429 publications. Although 403 of these articles did not meet inclusion criteria, the remaining 26 articles were read in their entirety, and six of these 26 articles met inclusion criteria. Therefore, 13 articles found from database searches and six articles found from ancestral searches met inclusion criteria, resulting in a total of 19 articles to be used for manual searches. The author conducted a manual search within the two journals that published three or more articles eligible

for inclusion (i.e. *Augmentative and Alternative Communication* and *Teacher Education and Special Education*) within volumes published from 1986 to 2016. Six additional articles met inclusion criteria for the literature review. In summary, 25 articles were included in the current review: 13 articles from database searches and six articles each from ancestral and manual searches.

Coding Procedures

The information presented in the articles was coded for the following quantitative and qualitative parameters: participating group(s) of preservice professionals (i.e. preservice special education teachers, preservice speech-language pathologists, etc.), number of study participants, type of learning opportunity described (i.e. coursework, practica, community-based experience, or a combination), content or topics addressed, outcome measurement tool(s) or construct(s) and preservice professionals' outcomes (i.e. non-learning outcomes or learning outcomes). Further, learning outcomes were judged to be positive or negative based on the authors' description of preservice professionals' ability to meet (i.e. positive outcome) or not meet (i.e. negative outcome) the highest level of learning objective described in the article. The data were analyzed using frequency counts within each parameter.

Results

Recall that inclusion criteria required that studies report at least one outcome of professional preparation. A total of 18 of the 25 studies (72%) in the review described professionals' outcomes using non-learning measurement constructs, while the remaining seven studies (28%) presented learning outcomes, (i.e. knowledge or skills gained by students). The results of the literature review will be presented across these two groups separately, beginning with the 18 studies that reported non-learning outcomes.

Non-learning outcomes of preservice preparation in AAC. The groups of professionals who participated in studies consisted of speech-language pathologists, special education teachers, occupational therapists, physical therapists, general education teachers, and professionals referred to as teachers (i.e. teachers whose placement was not specified to note general or special education). Of studies that reported non-learning outcomes, 13 studies investigated SLPs' and six studies examined special education teachers' preservice preparation. Three studies focused on teachers and occupational therapists, while general education teachers and physical therapists were each participants in a single study. Participants also included social workers, nurses, and health/welfare workers although these groups represented a small portion of the group of participants investigated by Siu et al. (2010). Across the 18 studies, the number of participants varied widely. In studies in which faculty reported perceptions of students' learning (n = 4), the number of participants ranged from 54 faculty members to 251 faculty. In the studies which relied on current preservice professionals' report or practicing professionals' retroactive report of the outcomes of their preservice preparation (n = 14), the number of participants ranged from 10 participants to 480 participants.

Learning opportunities included coursework, practica (including clinical and student teaching experiences), and community-based experiences. Eight studies did not specify which type of preparation was being investigated or sought to study preservice preparation as a whole, without stating which particular facet of learning opportunity type was being examined. A total of 10 studies examined AAC coursework, six studies examined practica, and three studies examined community-based experiences. Some studies analyzed more than one type of learning opportunity. The content or topic areas addressed in the 18 studies included the following: AAC (n = 10), low incidence disabilities (n = 4), severe disabilities (n = 2), and multiple disabilities (n

= 2). Table 1 displays the professional group(s), the learning opportunity types, and the construct used to assess preservice professionals' preparation as reported in each study.

Table 1

Summary of Studies Reporting Non-Learning Outcomes

Study	Professional Group	Learning Opportunity	Measurement Construct
Able-Boone, Crais, & Downing, 2003	SLPs, SPED teachers, GenEd teachers, OTs	Coursework, practica, community	Self-report of satisfaction, job placement
Cross, Collins, & Boam-Wood, 1996	SLPs, Teachers, OTs, PTs	Not specified	Self-report of sufficiency of learning opportunities
Elliott & Powers, 1988	Teachers	Not specified	Faculty report of preparedness
Erin et al., 1990	Teachers	Not specified	Self-report of competence
Gorenflo & Gorenflo, 1990	SLPs	Not specified	Self-report of receipt of instruction in AAC
Grisham-Brown et al., 1998	SLPs, SPED teachers	Coursework	Self-report ratings of course content and form
Knowlton, 1987	SPED teachers	Coursework, practica	Self-report of job placement, licensure
Koul & Lloyd, 1994	SLPs, SPED teachers	Coursework	Faculty report of AAC content in program
Lane & Canosa, 1995	SPED teachers	Coursework, practica	Self-report of quality of involvement in the learning opportunity
Marvin et al., 2003	SLPs	Not specified	Self-report of adequacy of learning opportunities for their needs
Matthews, 2001	SLPs	Not specified	Self-report of perceived skill
Ratcliff & Beukelman, 1995	SLPs	Coursework, practica, community	Faculty report of professional preparedness
Ratcliff, Koul, & Lloyd, 2008	SLPs	Coursework, practica, community	Faculty report of professional preparedness
Russell & McAllister 1995	SLPs	Coursework	Self-report of adequacy of knowledge
Siu et al., 2010	SLPs, OTs, and others	Coursework, practica	Self-report of satisfaction
Snell, Martin, & Orelove, 1997	SPED teachers	Coursework	Self-report of influence of learning opportunity and degree of change in thinking
Sutherland, Gillon, & Yoder, 2005	SLPs	Not specified	Self-report of participation, desire for additional information
Wormnæs & Malek, 2004	SLPs	Not specified	Self-report of receipt of AAC information

As shown in Table 1, researchers used several measurement constructs to evaluate outcomes. Constructs such as preparedness, satisfaction, and adequacy evaluate qualities of the preservice learning opportunity are different from development of knowledge and skills, which will be discussed in the learning outcomes section. Three studies reported faculty's assessment of preservice professional preparedness, while two studies reported preservice professionals' satisfaction with their preparation. An additional three studies used adequacy or sufficiency as an outcome measure, and one study each investigated job placement and professional competence. Five studies simply described the availability, or whether or not preservice professionals participated in, learning opportunities related to AAC.

Although two studies reportedly measured knowledge, it is important to note that participants reported self-ratings on a scale from little to no knowledge to expertise area (Gorenflo & Gorenflo, 1990) or on a scale from nil to high (Russell & McAllister, 1995). These rating scales do not make clear what content was or was not actually learned. Similarly, participants in Matthews' (2001) study reported their skills on a scale from none to general. Finally, another study reported change in thinking and influence on thinking as constructs (Snell, Martin, & Orelove, 1997). Overall, these outcome measurements also do not make clear what the preservice professionals learned.

Learning outcomes of preservice preparation in AAC. Similar to the studies that reported non-learning outcomes, the preservice professional groups and types of learning opportunities will be described for the seven studies that reported learning outcomes. In total, four studies investigated the preservice preparation of speech-language pathologists, while three studies examined special education teachers' preservice preparation, and one study examined teachers' preservice preparation. In addition, preservice professional participants in this group of

studies also included students studying psychology, music therapy, and adapted physical education, although they represented a much smaller portion of the sample as compared to speech-language pathologists and special education teachers studied by Robinson and Sadao (2005). Across these seven studies, the number of participants ranged from 2 participants to 71 participants.

All seven studies that measured student learning noted the learning opportunity type. Five studies examined coursework and two studies focused on practica. It should be noted that four studies investigated the implementation of an intervention specifically for research, and that no studies investigated community-based learning experiences. Multiple studies analyzed more than one type of learning opportunity. The content or topic areas addressed in these seven studies included the following: AAC (n = 2), severe disabilities (n = 2), autism spectrum disorders (n = 1), the Picture Exchange Communication System (n = 1), and an active listening strategy for use with parents of children who use AAC (n = 1). The active listening strategy taught by Thistle and McNaughton (2015) prompted preservice professionals to listen, ask questions, and focus on the issues, in order to improve communication with families of children who use AAC. Table 2 summarizes the professional group(s), the learning opportunity type(s), and the learning outcome reported in each study.

Table 2

Summary of Studies Reporting Learning Outcomes

Study	Professional Group	Learning Opportunity	Learning Outcome
Donaldson, 2015	SLPs	Practica, intervention	Generated lesson plan, collected data, wrote clinical report
Hill, Flores, & Kearley, 2014	SPED teachers	Coursework, intervention	Implemented PECS
McDonnell et al., 2011	Teachers	Coursework, practica	Generated IEP
Phillips & Halle, 2004	SPED teachers	Intervention	Implemented naturalistic teaching strategies
Robinson & Sadao, 2005	SPED teachers, SLPs, and others	Coursework	Designed and developed AAC system
Simpson et al. 1997	SLPs	Coursework	Programed AAC device
Thistle & McNaughton, 2014	SLPs	Coursework, intervention	Implemented active listening strategy

All seven of the studies that reported learning outcomes (100%) reported positive outcomes. Studies were judged to have positive outcomes when participants met or exceeded the learning objectives described by the author(s). If participants in the studies reviewed had not met the learning objectives, the study would have been classified as having negative outcomes. The learning outcomes will be discussed for the seven studies from the least complex dimension to the most complex dimension according to the revised Bloom's taxonomy (Bloom et al., 1956; Krathwohl, 2002).

According to the revised Taxonomy, the Apply dimension is defined as "carrying out or using a procedure in a given situation" (Krathwohl, 2002, p. 215). In four studies, preservice professionals applied what they had learned in preservice preparation. These preservice professionals were observed to implement the Picture Exchange Communication System (PECS) with students with autism (Hill, Flores, & Kearley, 2014), use naturalistic language teaching

strategies (Phillips & Halle, 2004), apply skills in AAC device programming (Simpson et al., 1997), and apply a four-step active listening strategy with parents of children who use AAC (Thistle & McNaughton, 2014). The researchers associated with three of these studies reported the frequency with which preservice professionals applied the skill or strategy with fidelity (Hill et al., 2004; Phillips & Halle, 2004; Thistle & McNaughton, 2014). Participants in Hill and colleagues' (2004) study, pre-service teachers "all demonstrated effective practice and fidelity of implementation of PECS procedures" (p. 250). Student teachers who learned naturalistic language teaching strategies "increased both the frequency and variation of environmental arrangement strategy and the frequency of delayed prompts" (Phillips & Halle, 2004, p. 91). Pre- and post-instruction tests revealed statistically significant differences in speech-language pathologists' use of an active listening strategy (Thistle & McNaughton, 2015). Simpson and colleagues (1997) used preservice professionals' performance on pre- and posttests to measure their application of knowledge. Preservice speech-language pathologists "performed at relatively high levels of proficiency… after only 60 minutes of instruction and practice" (Simpson et al., 1997, p. 84).

Preservice professionals in three studies created products that reflected their learning outcomes. The Create dimension, according to the revised Taxonomy, classifies tasks that require students to "put elements together to form a novel, coherent whole or make an original product" (Krathwohl, 2002, p. 215). A group of preservice special education teachers, speech-language pathologists, and other professionals designed and developed low- and high-tech AAC systems based on individual and family communication participation goals" (Robinson & Sadao, 2005, p. 153). Learning was measured by quantitative and qualitative coding of participants' written work, and the outcomes of the study revealed problem- and inquiry-based learning

method “was an effective means for preparing the students to develop inclusive AAC services with families” (Robinson & Sadao, 2005, p.160). Preservice teachers in the McDonnell et al. (2011) study produced individualized education programs (IEPs) and instructional programs for students with severe disabilities. These preservice teachers’ learning outcomes were measured using rubrics, and rubric criteria included present levels of academic achievement, annual goals, and short-term objectives, among other information federally mandated to be included in IEPs (McDonnell et al, 2011). Preservice teachers sufficiently included 90% of the criteria in the rubrics for individual education programs and instructional programs (McDonnell et al., 2011). Preservice speech-language pathologists generated lesson plans, collected data, and produced a final clinical report (Donaldson, 2015). Donaldson (2015) anecdotally reported that preservice speech-language pathologists’ demonstrated learning adequate to meet the learning objectives.

Literature Review Discussion

Overall, analysis of the articles in this review permits a preliminary description of preservice preparation in AAC, particularly of the groups of professionals and the knowledge and skills addressed in these specific learning opportunities. Drawing clear conclusions regarding the outcomes in the literature as a whole is difficult due to both small number of articles reviewed and the numerous differences in methodology across studies. To answer the research questions at hand, the results will be discussed by (a) describing preservice preparation learning opportunities and the student competencies addressed and (b) describing the outcomes of preservice preparation, as well as the patterns among outcomes.

Preservice programs and student competencies. In the studies reviewed, speech-language pathologists and special education teachers were the most frequent participants of preservice preparation in AAC. This supports existing literature (Bausch & Hasselbring, 2004);

however, it was not surprising that other preservice professionals such as occupational therapists, physical therapists, and general education teachers were reported to participate in learning opportunities as well (DePaepe & Wood, 2001; Soto et al., 2001). Coursework was the most common type of learning opportunity described in the studies (n = 15), followed by practica (n = 8), interventions (n = 4), and community-based experiences (n = 3). Analysis of the preservice professional groups and types of learning opportunities reviewed did not reveal any patterns, meaning that no particular group of preservice professionals was more likely to participate in a certain form of learning opportunity than any other group of preservice professionals. This may be due to the fact that the majority of the studies discussed the preservice preparation of speech-language pathologists and special education teachers, and/or due to the small number of studies included in the review. Also, coursework and practica are common learning opportunities available to preservice professionals while community-based experiences, such as those provided on training grants, are less commonly available in AAC (Ratcliff & Beukelman, 1995). It is important to note that these studies may not be a true representation of the coursework, practica, and community-based experiences offered in institutions of higher education across the country. It is possible that researchers simply reported one facet of preservice preparation that they taught personally, or of a learning opportunity they had easy access to investigate.

The outcomes of preservice preparation in AAC. Outcomes for preservice professionals found in the literature were similar to Costigan and Light's (2010) findings in that the majority of the studies included in the review note the availability of learning opportunities and characteristics of preservice preparation but leave much to be desired in reporting learning outcomes. Recall that the frequency of non-learning measurement construct use was as follows: the availability of AAC learning opportunities (n = 5), faculty assessment of preservice

professional preparedness (n = 3), preservice professionals' perception of adequacy or sufficiency of the learning opportunity (n = 3), preservice professionals' satisfaction with their preparation (n = 2), job placement (n = 1), and professional competence (n = 1). Even within measurement constructs that were used in more than one study, the content areas and participating groups of professionals differed. Using sufficiency and adequacy as an example, Cross, Collins, and Boam-Wood (1996) asked speech-language pathologists, teachers, occupational therapists, and physical therapists to report their perception of sufficiency of their preservice preparation in preparing them for work with students with multiple disabilities. On the other hand, Marvin et al. (2003) asked speech-language pathologists to report the adequacy of their preservice preparation in AAC use. Consequently, it is difficult to use the evidence presented in these studies to support each other. Although the results of this review can be used to evaluate preservice preparation for a particular group learning a particular content area, the diverse learning outcomes lead to more confusion and difference than consensus and similarity.

The learning outcomes reported in seven studies in this review are not enough to make conclusions as to the effectiveness of preservice preparation in AAC, but they can be used to shed light on the complexity of the learning objectives and outcomes that have been addressed to date. It is interesting to note that four of the seven studies that reported learning outcomes were published after 2010, as compared to the majority of the studies that reported non-learning outcomes, such that 17 of 18 of those studies were published before 2010. It seems, based on the studies included in this review, that researchers have begun reporting learning outcomes with increased frequency. This trend is promising for those who seek to better understand AAC preservice preparation using a learning lens.

Within the revised Bloom's Taxonomy, cognitive development is viewed on a continuum ranging from the least complex dimensions to the most complex dimensions, which include Remember, Understand, Apply, Analyze, Evaluate, and Create. The results of this review showed that students applied their knowledge in four studies and created products in three studies. While this is somewhat informative, digging a bit deeper to compare learning objectives to learning outcomes is even more telling. For some studies, such as Thistle and McNaughton (2014), Hill et al. (2014), and Phillips and Halle (2004), the primary learning objective was for students to learn to apply a particular strategy or skill. Thus, learning outcomes were reported in terms of application. This differs from Simpson et al. (1997). Although this group of researchers' objective for students was to program an AAC system (i.e. Apply), they also measured students' ability to Understand and Remember programming knowledge through pre- and posttest measures. Although skills are sometimes taught completely in isolation, like how to implement PECS or use naturalistic teaching strategies, it may be the case more often that students learn more about the strategies (e.g., who created the strategy, the populations the strategy is designed to support, etc.), which represents knowledge at the Remember and Understand levels. Simpson et al. (1997) reported a more comprehensive picture of student learning by reporting information at each of these cognitive dimensions. As for studies that addressed more complex cognitive dimensions, like Donaldson (2015), McDonnell et al. (2011), and Robinson and Sadao (2005) it can be more challenging to report across all the levels of cognitive dimensions. For example, McDonnell et al. (2001) reported students' (a) mean gain scores on coursework pre- and posttests, (b) scores on an individualized education program rubric, (c) scores on an instructional program rubric, (d) mean grade point average in concentration area coursework, and (e) composite scores on the Praxis national examination. Praxis scores may reflect Remembering

and Understanding, while aspects of the grading rubrics are likely to speak more to the Apply, Analyze, Evaluate, and Create dimensions. Depending on the learning objectives in coursework, the pre- and posttest and GPA measures could reflect a number of cognitive learning dimensions. As a result, as students complete more complex learning opportunities, it can be difficult to tease apart the learning demonstrated at each particular dimension.

Conclusion. Because the literature in AAC preservice preparation is so scarce, we can't quite answer the question "What have preservice professionals learned about AAC?" on a nationwide or discipline-wide level; however, we can begin to answer which learning opportunities lead to which learning outcomes for which groups of preservice professionals. For example, preservice special education teachers learned to implement naturalistic language teaching strategies with fidelity following two brief training sessions (Phillips & Halle, 2004). Simpson and colleagues (1997) found that preservice speech-language pathologists learned programming skills while enrolled in an AAC course and retained that knowledge over a period of two weeks. Also, preservice special educators, speech-language pathologists, and other professionals learned how to problem solve collaboratively and develop AAC systems based on individual needs, based on enrollment and participation in an AAC course (Robinson & Sadao, 2005). Although more examples can be described, the challenge of correlating and comparing studies, and thus finding patterns among the outcomes described in the studies, is apparent.

This literature review supports previous research that has concluded there are few high-quality preservice learning opportunities related to AAC for speech-language pathologists and other professionals. In particular, the results of this review suggest that the report of outcomes of preservice preparation in AAC has been based largely on non-learning constructs. Of the few studies published to date that have measured preservice professionals' learning, there are a wide

variety of content areas and competencies covered across disciplines. Thus, it is difficult to make conclusions regarding meaningful outcomes of preservice preparation in AAC.

Conceptual Framework

It is clear that additional information is needed regarding learning outcomes of preservice preparation in AAC. As revealed through the literature review, several studies utilizing surveys and/or interviews have been conducted that explored the outcomes of preservice preparation in AAC; however, the vast majority of these studies describe non-learning outcomes such as sufficiency, adequacy, satisfaction, and competence. Moving forward, research should extend what was learned through these studies by reporting the learning outcomes of preservice learning opportunities. The investigator's long-term research goals are to (a) define competency in AAC service provision, (b) identify bottlenecks to student learning in AAC service provision, and (c) develop procedures and tools for assessing competency development in AAC service provision. This work will aid faculty in designing and redesigning learning opportunities that prepare speech-language pathologists who are competent in AAC service provision.

The Scholarship of Teaching and Learning

Addressing these long-term goals requires the scholarship of teaching and learning. Ernest Boyer, an audiologist and faculty member prior to his work at the Carnegie Foundation for the Advancement of Teaching, was an influential voice in the scholarship of teaching and learning (Ginsberg, Friberg, & Visconti, 2012). *In Scholarship Reconsidered: Priorities of the Professoriate*, Boyer (1990) conceptualized four types of scholarship including, (a) scholarship of discovery, (b) scholarship of integration, (c) scholarship of application, and (d) scholarship of teaching. He suggested a shift from primary focus on the scholarship of discovery (i.e. knowledge or theory building) by redefining scholarship to serve other purposes. He recognized

the need for systematic study of teaching in higher education through classroom-based inquiry (Boyer, 1990). As a multidisciplinary form of scholarship, a major strength of the scholarship of teaching and learning is its ability to "bring richness and multiple perspectives to our understanding of teaching and learning processes" (Poole, 2013, p. 140). Ginsberg, Friberg, and Visconti (2012) call faculty in CSD to engage in the scholarship of teaching and learning to make a difference in students' learning.

Hutchings (2000) proposed a taxonomy of inquiry undertaken by scholars of teaching and learning. Question types include (a) "what works" questions (i.e. "seeking evidence about the relative effectiveness of different approaches", p. 4), (b) "what is" questions (i.e. describing what a teaching approach or what student learning looks like), (c) "visions of the possible" questions, and (d) questions that develop theory or conceptual frameworks (Hutchings, 2000). The investigator's first and second long-term research goals, defining competency in AAC service provision and identifying bottlenecks to student learning in AAC service provision, can be addressed initially with "what is" questions. The purpose of this study was twofold: (a) to inform a working definition of competency in AAC service provision, and (b) to better understand and describe the bottlenecks to student learning in AAC service provision. Working towards these research goals involves describing and understanding the landscape of teaching and learning in CSD related to AAC.

Decoding the Disciplines

Developed by Pace and Middendorf, and subsequently embraced by many teacher-researchers, "Decoding the Disciplines is a process for increasing student learning by narrowing the gap between expert and novice thinking" (Decoding the Disciplines, n.d., para. 1). Scholars

across disciplines can use this theory of pedagogy to explore the complexities of teaching and learning particular to their context.

The seven steps of the Decoding the Discipline (Decoding the Disciplines, n.d.) process are:

1. Identify a bottleneck to learning
2. Uncover the mental tasks needed to overcome the bottleneck
3. Model these tasks
4. Give students practice and feedback
5. Motivate and lessen resistance
6. Assess student mastery
7. Share what has been learned through the Decoding process

Identifying bottlenecks is the first step in the Decoding the Disciplines process, which aims to improve student learning by narrowing the gap between expert and novice thinking (Middendorf & Pace, 2004). Pace (2004) described uncovering a bottleneck in history: novices were unable to identify the most important aspects of historical texts. Next, Pace (2004) pinpointed the underlying skills needed for this task, which included identifying a central thesis, identifying subsidiary arguments, and distinguishing between arguments. In this step, the researcher determines the mental actions students need to take in order to be successful. In the classroom, he modeled "several different aspects of historical reading, such as linking parts of this text to other texts or themes from the course" (Pace, 2004, p. 16). Pace (2004) used pre-existing assignments, in-class exercises, and online assignments to provide opportunities for students to practice and receive feedback. He used a variety of techniques to increase student engagement and assessed student learning based on their performance on the assignments before disseminating what he learned to a broad higher education audience (Pace, 2004).

Literature on the quality and quantity of AAC preservice learning opportunities suggests that many speech-language pathologists are not adequately prepared to support children who use AAC. This problem is too broad to be addressed strategically within, or even across, CSD programs. The research questions in this study represent steps 1 and 2 of the Decoding the Disciplines process, which are to (a) identify bottleneck(s) to learning and (b) uncover the mental tasks needed to overcome the bottleneck(s). Results will define bottleneck(s) that explain the gap between novice (i.e. graduate student studying speech-language pathology) and expert (i.e. AAC clinical specialist speech-language pathologist) thinking and uncover the mental tasks used by both participant groups. This will inform designing and redesigning AAC coursework, clinical practica, and community-based experiences tasks needed to decrease the gap.

Clinical Reasoning

This study explored the mental tasks novice and expert speech-language pathologists used when developing intervention plans. The term clinical reasoning has been used in the medicine and nursing literature, but less frequently in CSD (McAllister & Rose, 2008). McAllister and Rose (2008) propose that clinical reasoning processes are mental tasks, defined as "the often intangible, rarely explicated thought processes that lead to the clinical decisions that [speech-language pathologists] make" (p. 398). Rather than a linear process, clinical reasoning is a series of interwoven cognitive processes that lead to a clinical decision (McAllister & Rose, 2008). Theoretical knowledge, cognition, and metacognition cooperatively impact clinical reasoning (Higgs, 1992; Higgs & Jones, 1995). This study focused the cognitive components (i.e. thinking skills of analysis, synthesis, and evaluation of data) that speech-language pathologists use when making decisions, problem solving, and reasoning (Claessen, 2004).

In the past decade, CSD faculty and program developers have realized the importance of clinical reasoning skill development, evidenced by the addition of clinical reasoning as a professional practice competency in the Standards for Accreditation of Graduate Programs in Audiology and Speech-Language Pathology (CAA, 2016). Therefore, as of August 2017, graduate programs are required to "provide content and opportunities for students to learn so that each student can demonstrate… clinical reasoning" (CAA, 2016, p. 45-47). The standards require that novice speech-language pathologists learn to use theory, clinical judgment, and self-reflection in clinical decision-making for both intervention and assessment. Although McAllister and Rose (2008) recognize the increase in use of the term clinical reasoning in the literature, they advocate for additional research in this area.

Prior Research in CSD

Two studies in CSD have investigated clinical reasoning, specifically diagnostic reasoning. Both sets of researchers argue the importance of breaking down clinical tasks into discrete clinical reasoning skills so that preservice speech-language pathologists can be taught and subsequently learn strategies to improve their decision making and problem solving. In addition, Dietz, Lund, and colleagues' (2012; 2017) work has explored the clinical decision making of speech-language pathologists specific to AAC assessment. These studies greatly influenced the participant selection, case study development, and data collection and analysis methods this study's design.

In the first study, Hoben, Varley, and Cox (2007) observed preservice speech-language pathologists as they worked in pairs to diagnose three simulated patients. Participants were instructed to reach a decision on a diagnosis for each patient and to generate a list of the key impairments that influenced their decision-making. The researchers coded the dialogue of each

preservice speech-language pathologist dyad on a continuum of the depth of their analysis, ranging from less complex levels, Level Zero (i.e. other) and Level One (i.e. reading of data), to more complex levels like Level Five (i.e. general diagnostic statement) and Level Six (i.e. specific diagnostic statement) (Hoben, Varley, & Cox, 2007). The pairs' performance was also rated as diagnostically accurate or inaccurate.

Ginsberg, Friberg, and Visconti (2016) noted two major limitations of the Hoben, Varley, and Cox (2007) study. The first limitation was the lack of experienced clinicians needed to compare the diagnostic reasoning of the preservice, novice clinicians to that of more experienced clinicians. Also, the researchers reported the depth of the students' thinking, but did not explicitly state the clinical reasoning skills used during the study (Ginsberg, Friberg & Visconti, 2016). Therefore, Ginsberg, Friberg and Visconti (2016) reported the thinking strategies (i.e. heuristics) used by their participants, both preservice speech-language pathologists and experienced speech-language pathologists, during a think-aloud task. In particular, participants thought aloud as they developed assessment plans for two case studies, one pediatric and one adult. A total of 10 diagnostic reasoning skills were observed, including hypothesizing, summarizing, rationalizing, seeking outside input, differentiating, deferring, comparing, specific planning, general planning, and treatment planning (Ginsberg, Friberg & Visconti, 2016). The researchers discussed the similarities and differences across the novices' and experts' performance on the think-aloud tasks.

Dietz et al. (2012) conducted semi-structured interviews with general practice speech-language pathologists, clinical specialist speech-language pathologists, and research/policy specialists to identify procedures participants used when planning for AAC assessments. Procedures included case history, prep-time, language and communication assessment, symbol

assessment, device trials, access methods, multi-modality approach, AAC instruction, and personalization (Dietz et al., 2012). The researchers discussed the differences across the groups of speech-language pathologists.

In a follow up study, Lund et al. (2017) used semi-structured interviews with four of the clinical specialist speech-language pathologists and four of the research specialists from the Dietz et al. (2012) study. These participants read two case studies, each of a child who might benefit from AAC, and were interviewed about their approach to AAC assessment for each case. The researchers reported subthemes related to areas of assessment (i.e. the what), evaluation preparation, method of assessment (i.e. the how), and parent education. Lund et al. (2017) described the components of informal assessment, dynamic assessment, collaborations, and formal assessment described by participants. For example, categories within the informal assessment subtheme included case history information, observation, interview, and extended device trial; however, the decision-making skills used by participants during assessment planning were not explicitly reported.

Although Ginsberg, Friberg, and Visconti (2016) investigated the differences in performance on a think-aloud task among SLP graduate students and experienced SLPs, the current study was unique in that participants thought aloud about case studies specific to children who use AAC. Although Dietz et al. (2012) and Lund et al. (2017) investigated clinical decision making related to AAC assessment, this study focused on intervention planning. Table 3 summarizes the study design elements of previous studies and the present study.

Table 3

CSD Clinical Reasoning and Decision Making Studies

	Dietz et al. (2012)	Ginsberg, Friberg, & Visconti (2016)	Lund et al. (2016)	Meder (2018)
		Participants		
Number of participants	8 novices, 15 experts	15 novices, 15 experts	8 experts	8 novices, 8 experts
Inclusion criteria: novices	**General Practice SLPs:** provide wide range of clinical services in daily practice, including AAC; but do not specialize in AAC	**Graduate Students:** no more than 2 semesters of on-campus, university clinical experience; not yet completed an externship	N/A	**Graduate Students:** (1) no more than 2 semesters of on-campus experience, (2) not yet completed an externship, and (3) completion of an AAC course and/or practicum
Inclusion criteria: clinical experts	**AAC-CS (clinical specialists):** at least 50% of workload is AAC-related; often instruct other AAC personnel, obtain funding for AAC, and support and prepare GPSLPs	**Experienced clinicians:** held CCC-SLP certification for at least 5 years	**AAC-CS (clinical specialists):** see inclusion criteria for Dietz et al. (2012)	**Experienced AAC-CS (clinical specialists):** (1) held CCC-SLP certification for at least 5 years, (2) practiced as an SLP for at least 5 years, and (3) at least 50% of workload is AAC-related
		Case Studies		
Assessment/ intervention	Assessment	Assessment	Assessment	Intervention
Adult/child	N/A	1 child, 1 adult	2 children	2 children
Diagnosis provided	N/A	No	Yes (CP & ASD)	Yes (CP & ASD)
		Data Collection & Analysis		
Data collection methods	Semi-structured interviews	Think-alouds	Semi-structured interviews	Think-alouds
Data analysis methods	General inductive approach (Creswell, 2002; Thomas, 2006)	Grounded theory research (Creswell, 2002; Denzin & Lincoln, 2012)	Inductive coding analysis (Strauss & Corbin, 1998)	Coding & analysis to develop grounded theory (Strauss & Corbin, 1998)
Data reported	Presented themes that	Presented themes	Presented four	Present four major

	describe differences and similarities among groups of participants	framed as heuristics (type of thinking strategy)	major themes, and subthemes and categories	themes and subthemes, propose grounded theory

Purpose & Research Questions

The purpose of this study was twofold: (a) to inform a working definition of competency in AAC service provision, and (b) to better understand and describe the bottlenecks to student learning in AAC service provision. Therefore, three research questions were posed:

1. What clinical reasoning processes do expert speech-language pathologists use when planning AAC intervention for children with developmental disabilities?
2. What clinical reasoning processes do novice, preservice speech-language pathologists use when planning AAC intervention for children with developmental disabilities?
3. What are the differences and similarities between the clinical reasoning processes used by experts and novices?

The data obtained in this study was analyzed to uncover the clinical reasoning processes novices and experts use that led them to make clinical decisions. The purpose of research question 1 was to inform a working definition of competency in AAC service provision. Experts' performance on the tasks was used to develop a working definition of competence and expertise related to intervention planning for children who use AAC. Conversely, research questions 2 and 3 were used to explore the bottlenecks to student learning in AAC service provision by uncovering the novices' weaknesses in clinical reasoning as well as the gap between the novices' and experts' clinical reasoning skills.

Methods

The purpose of this study was to explore the clinical reasoning skills master's level speech-language pathology students and practicing speech-language pathologists with AAC expertise use when planning for intervention. The research questions were: (a) What clinical reasoning processes do expert speech-language pathologists use when planning AAC intervention for children with developmental disabilities?, (b) What clinical reasoning processes do preservice speech-language pathologists use when planning AAC intervention for children with developmental disabilities?, (c) What are the differences and similarities between the clinical reasoning processes used by expert speech-language pathologists and the processes used by preservice speech-language pathologists?

This study utilized think-aloud methods to investigate the gap in clinical reasoning skills among novices and experts. Participants were provided two case studies, each of a child who used AAC and were prompted to share their thoughts aloud while planning for intervention. Specifically, participants thought aloud about (a) planning for the first therapy session, (b) describing what the first session would look like, and (c) planning for future therapy sessions. The verbal data was transcribed and subsequently analyzed using grounded theory methodology.

Rationale for Methods Used

In this study, eight novice and eight expert participants completed two think-aloud tasks. Provided two pediatric AAC intervention case studies, participants shared their thoughts aloud while they planned for intervention. The thinking-aloud process begins with instructions to verbalize thoughts that are generated while in the process of performing a task (Ericcson & Simon, 1993). Think-aloud methodology was used to allow clinical reasoning processes to become observable (Aitken et al., 2011; Banning, 2008; Ginsberg, Friberg, & Visconti, 2016).

This validated data collection method created verbal data to be transcribed for analysis (Ericcson & Simon, 1993; Ginsberg, Friberg, & Visconti, 2016).

Two main benefits to using think-aloud methods are that (a) verbalization occurs while the participant is attending to the information, and (b) inferencing and generative processes are immediate and in real-time (Ericcson & Simon, 1980). This is in contrast to retrospective probing tasks in which participants are required to access both short term and long-term memory simultaneously (Ericcson & Simon, 1980). In accordance with Ericcson and Simon's levels of verbalization framework, this study utilized a level 3 task, in which participants both described and explained their thought processes, interpreting their thoughts by "linking this information to earlier thoughts" (Ericcson & Simon, 1993, p. 79). Data represented each participant's independent cognitive processes, which is a preferable alternative to using semi-structured interview and/or survey methodology, which can inadvertently guide participants' responses (Cardon, 2017; Finke & Quinn, 2012; Lund et al., 2017).

Other communication sciences and disorders research teams who investigated clinical reasoning skills used qualitative data analysis methods. In particular, Dietz et al. (2012) used a general inductive approach (Creswell, 2002; Thomas, 2006), while Ginsberg, Friberg and Visconti (2016) used grounded theory methods described by Denzin and Lincoln (2012). This study, similar to Lund et al. (2016), used grounded theory methodology as described by Strauss and Corbin (1998); however, while Lund and colleagues (2016) used inductive coding analysis, this study took that analysis further by proposing grounded theory. According to Strauss and Corbin (1998), "grounded theories, because they are drawn from data, are likely to offer insight, enhance understanding, and provide meaningful guide to action" (p. 12). In other words, grounded theory methods allow the researcher to propose a new theory based on the data set.

Participants

Two groups of participants, from here on referred to as novices and experts, participated in the study. A total of eight novices and eight experts participated. Group sizes are commensurate with similar studies in communication sciences and disorders, which ranges from eight to 15 participants across studies (Dietz et al., 2012; Ginsberg, Friberg, & Visconti, 2016; Lund et al., 2017).

Inclusion criteria. In order to participate in the study, novice participants met the following criteria: (a) first year speech-language pathology master's student status at the University of Kansas (i.e. completed no more than two semesters of study), (b) not yet begun an SLP field study (i.e. off-campus externship), and (c) completion of an introduction to AAC course and/or clinical practicum with at least one client who uses AAC. Criteria a and b match that for novices in Ginsberg, Friberg, and Visconti's (2016) study, which also included student novices. The third inclusion criterion was added to ensure that at the time of participation in the study, novice participants had some knowledge and skills related to AAC intervention, whether in theory in the classroom or in practice in the clinic.

Expert inclusion criteria were determined based on Ginsberg, Friberg, and Visconti's (2016) participants' experience (i.e. five years of certification and clinical practice) and the AAC Assessment Personnel Framework (Binger et al., 2012) used by Dietz et al. (2012) and Lund et al. (2017) when selecting participants. According to the Framework, AAC clinical specialists (i.e. experts) "typically spend at least 50% of their working day on AAC-related activities" (Binger et al., 2012, p. 282). Their primary roles include AAC clinical implementation, evaluation, and technical support (Binger et al., 2012). Therefore, expert inclusion criteria included (a) holding a Certificate of Clinical Competence in speech-language pathology for at

least 5 years, (b) practicing as a speech-language pathologist for at least 5 years, and (c) at least 50% of current daily work activities related to supporting children who use AAC. Because this study focused on two pediatric case studies, it was important that expert participants had experience supporting children who use AAC.

Recruitment. All participants were recruited through direct contact from the primary investigator. To encourage participant recruitment and retention, each participant received a $25 gift card following participation in the study.

Novices were recruited by sampling a subset of the 2017-2019, first-year master's cohort at the University of Kansas who had completed the Introduction to AAC course and/or completed an experience with a client who used AAC in clinical practicum in the Fall 2017 semester. Of these 16 students who took the course or completed clinical practicum, the researcher recruited eight novices to participate. The researcher gained access to students' names and contact information through the faculty members teaching AAC courses and supervising clients who use AAC in the clinic and then contacted the potential novice participants directly via email. The eight expert participants were recruited through the primary investigator's professional network of speech-language pathologists. The researcher contacted speech-language pathologists who met inclusion criteria directly via email regarding participation in the study.

Novice demographics. A total of 8 novices participated in the study. All were first year graduate students studying speech-language pathology at the University of Kansas. Seven females and one male participated in the study. Six participants identified as white, one participant identified as American Indian or Alaska Native, and one participant identified as Black or African American. Novice participants' ages ranged from 21 to 34, with a mean of 25.13 years. It should be noted that the University of Kansas has a prerequisite completion

program, wherein students with a bachelor's degree from another discipline complete the prerequisites needed to begin a master's in speech-language pathology. Two of the novice participants had completed the prerequisite program and were in the first year of the master's program at the time of participation.

Novices had not yet completed a field study (i.e. externship) at the time of participation. Four of the eight novices had both taken the Introduction to AAC class and supported one or more clients who used AAC in clinical practicum. All four of these novices reported taking only one AAC course at the time of participation, and none reported having additional prior experience supporting people who use AAC. One of these novices had supported one client who used AAC in a clinical practicum, two of these novices had supported two clients, and an additional of these novices had supported three clients.

Two novice participants reported taking only the AAC course. Thus, they had not completed a clinical practicum with a person who used AAC; however, one of these novice participants worked as a speech/language paraprofessional in an elementary school for one year, supporting six students who used speech-generating devices. The remaining two novice participants had completed a clinical practicum with AAC only (i.e. not taken an AAC course). One of these novices worked as a paraprofessional in special education classroom in at an elementary school in which multiple students used the Picture Exchange Communication System (PECS). Demographic data and pseudonyms for the novice participants are presented in Table 4.

Table 4

Novice Participant Demographic Information

Participant	Completed AAC course	Completed AAC practicum	Number of clients supported in practicum	Prior experience with children who use AAC
AR-N	Yes	Yes	2	No
GY-N	Yes	No	N/A	Yes
II-N	Yes	Yes	2	No
NI-N	No	Yes	2	No
OO-N	Yes	Yes	1	No
RZ-N	Yes	No	N/A	No
WB-N	Yes	Yes	3	No
YS-N	No	Yes	3	Yes

Expert demographics. All eight expert participants in the study identified as female and white. Expert participants' ages ranged from 37 to 64 years (M = 51.00). The expert participants were practicing speech-language pathologists who had held the Certificate of Clinical Competence in speech-language pathology from the American Speech-Language-Hearing Association for at least 5 years. The length of practice time among the expert participants ranged from eight years to 40 years (M = 22.00, SD = 9.83). Seven of the eight expert participants had provided AAC services for the majority of their years as a speech-language pathologist, whereas one expert had provided AAC services for 12 of the 27 years she had practiced in total. Expert participants reported the percentage, on average, of their daily work activities that were related to supporting children who use AAC, which ranged from 50% to 100% (M = 81.88%, SD = 17.92%).

In addition, expert participants reported their practice location, work environment, and whether or not she had completed an AAC course. Five experts practiced in Illinois, two experts practiced in Missouri, and one expert practiced in Colorado. Three experts were in private practice. Two participants worked in a special education cooperative (i.e. supported students ages 3 to 22). One participant each worked in a transition program, elementary school, and both

an elementary and a secondary school. Four of the eight experts had taken an AAC course during their bachelor and/or master's program of study. Table 5 presents demographic data and pseudonyms for the expert participants.

Table 5

Expert Participant Demographic Information

Participant	Years SLP Experience	Years AAC Experience	Percentage of Workload Related to AAC	Work environment
CW-E	19	19	100	School-based
HF-E	40	40	50	School-based
IH-E	26	26	80	School-based
JJ-E	8	7	95	School-based
KC-E	25	25	100	Private practice
MF-E	13	13	75	Private practice
OI-E	27	12	90	School-based
SU-E	18	18	65	Private practice

Instruments

Two instruments were developed for the study: (a) two demographic surveys and (b) two case studies.

Demographic surveys. The researcher developed two brief demographic surveys, one for novice participants and another for expert participants, which were hosted online by Qualtrics. Individuals interested in participating in the study completed the appropriate survey in order to verify that they met the inclusion criteria for participation prior to scheduling a data collection meeting. The survey was also used to collect demographic data for each of the participant groups to account for individual performance differences on the think-aloud task. The researcher considered demographic data reported by Dietz, Lund and colleagues (Dietz et al., 2012; Lund et al., 2017) and Ginsberg, Friberg, and Visconti (2016), and collected similar data to allow for comparisons across data sets.

Because the novice participants in the Dietz et al. (2012) study were general practitioner speech-language pathologists, the demographic information obtained was not applied to the novice participants in this study. Therefore, in addition to determining that the respondent met inclusion criteria to the study, the novice demographic survey was used to collect the following data: (a) gender, (b) age, and (c) race. In addition, a question was included to determine if participants had experience with a child who uses AAC (i.e. has a sibling who uses AAC, volunteered with a child who used AAC, etc.).

Experts in the present study were also prompted to report their gender and age, similar to Ginsberg, Friberg, and Visconti (2016). In addition, expert participants in this study reported their race/ethnicity, work environment, practice location, and whether or not they had completed a course in AAC during their preservice education, consistent with Dietz et al. (2012) and Lund et al. (2017).

Two pilot participants completed both surveys, which required approximately 2-3 minutes for completion. The researcher refined the response choices of two survey items using pilot feedback. The survey questions are included in Appendices A (novice survey) and B (expert survey).

Case studies. Because other studies have addressed clinical reasoning related to AAC assessment, the case studies were designed to focus on intervention for children who have completed an assessment for an AAC system**.** Case studies developed for the study were based loosely on the work of Metzler-Barrack (2011) and Hart and Wiley (2011) in *The Communication Disorders Handbook: Learning by Example* (Chabon & Cohn, 2011). The primary investigator added fictional information as needed so that both case studies referenced

the child's: (a) vision status, (b) hearing status, (c) language skills, (d) cognition, (e) overall communication needs, (f) gross and fine motor skills, and (g) current use of the AAC system.

Three practicing speech-language pathologists piloted the think-aloud tasks using the case studies Case Study C and Case Study S. All three pilot participants reported that Case Study S seemed authentic and true to life, and noted that they had supported a similar child in their practice. On the other hand, all three pilot participants noted that the child's age (2;10) in Case Study C "threw [them] off" and/or that their lack of experience in early intervention made this case study more challenging. One participant noted that therapy would be dramatically different if the child was in early childhood. Therefore, the researcher changed the age of the child in Case Study C from 2;10 to 4;0. Also, pilot participants' feedback about Case Study S, particular to 1) Sam's mobility, 2) device mounting, and 3) number of buttons per page on the device, were addressed through minor additions and modifications.

When developing the case studies, the researcher also considered the child's duration of AAC device use, diagnosis, and impairment type. Case Study C describes a child who recently completed an assessment and is beginning to use a speech-generating device, and Case Study S describes a child who has been using a device for two years. In order to add to the work of Lund and colleagues (2017), this study also focused on children with developmental disabilities. Case Study C, Christopher, has a diagnosis of autism spectrum disorder and Sam, Case Study S, is a child with cerebral palsy. In addition, the case studies were designed so that Case Study C was a child with a primary social interactive impairment, while Case Study S was focused on a child with a primary motor impairment. This addresses the findings of Lund et al. (2017) that speech-language pathologists considered different characteristics and skills of children with complex communication needs, depending on whether his or her impairment was primarily social or

motor in nature. The case studies were presented to participants as two separate Microsoft Word documents. Case Study C for "Christopher" was 292 words in length and Case Study S for "Sam" was 354 words long. The case studies can be found in Appendices C (Case Study C) and D (Case Study S).

Procedures

Data collection began in November 2017 and was completed in January 2018. Procedures for survey distribution, data collection meetings, and think-aloud instructions are described further below.

Survey distribution and recruitment. Recruitment began with survey distribution via email. The researcher emailed potential participants with information about the study tasks, inclusion criteria, and a link to the demographic survey. The email also included a two-letter, randomly generated code specific to the individual participant. Each participant entered his or her code in the survey so that survey responses and audio and video data from the think-aloud task could be de-identified. The hyperlink in the email opened the informed consent page. After respondents selected the link to go on, the one page survey was presented. Because survey completion was optional, participants were self-selected. The researcher reviewed the respondents' demographic data obtained via the survey in order to determine if participants met inclusion criteria for the think-aloud portion of the study. Eight respondents took the novice survey, met inclusion criteria, and were subsequently recruited for participation in the study. Nine respondents took the expert survey and met inclusion criteria. One expert respondent did not respond to scheduling requests for data collection. Thus, the other eight expert respondents participated in the data collection meetings.

Data collection meetings. After respondents completed the survey, the researcher followed up with an email with multiple options for scheduling an online data collection meeting. Based on piloting, the researcher anticipated that participants would require approximately 45 to 60 minutes to complete the data collection meeting tasks. Therefore, participants chose a one-hour appointment time and then the researcher followed up with a meeting preparation email that included a brief meeting agenda, a participant-specific link to join the data collection meeting via Zoom, and links to videos that demonstrated how to download the Zoom application. Zoom is an online web conferencing application.

The researcher piloted the data collection meetings with three pilot participants in September 2017. After piloting, the researcher finalized the agenda for the data collection meetings which included (a) introductions, (b) reviewing the agenda, (c) oral consent procedures, (d) the warm up task, (e) two think-aloud tasks, and (f) farewells and reminders regarding next steps in the study. The data collection meetings ranged from approximately 45 to 75 minutes in duration, depending largely on length of the participants' response on the think-aloud tasks. Audio and video recordings of the meetings were saved for transcription and data analysis.

Warm up task. Two of the three pilot participants reported that they liked the opportunity to warm up to get accustomed to the task. Further, a warm up improved their level of comfort during the case study think-alouds. Therefore, before completing the think-aloud for intervention planning, participants became accustomed to the task by thinking aloud about packing a lunch. During the warm-up, the researcher reminded participants to share every thought they had and to explain their rationale as thoroughly as they could. The instructions were as follows: "In this project, you will be thinking aloud as you develop therapy plans. This means sharing aloud everything that comes to your mind. I want you to explain each step and rationale

as thoroughly as you can. To warm up, I would like you to practice thinking aloud as you develop your plan for packing a lunch. Please share aloud everything that comes to your mind and explain each step and rationale as thoroughly as you can."

After the warm up, the researcher reiterated that (a) the purpose of the task was to learn about participants' thought processes, and (b) there was no correct or right answer to the case studies. These statements were included to address pilot participants' concerns about "feeling judged," "wanting to be right," and "telling [the researcher] what she wants to hear."

Think-aloud tasks. Next, the researcher read the instructions to the participants for the intervention think-alouds. During piloting, the researcher read the following instructions to the participants: "First, you will read a case study. Immediately after you finish reading it, I want you to think aloud as you develop your intervention plan. This means sharing aloud everything that comes to your mind. Explain each step and your rationale as thoroughly as you can." Based on pilot participants' feedback, the researcher added to the instructions to address confusion regarding (a) what an intervention plan includes, (b) the perspective the participant should assume (i.e. school-based speech-language pathologist or private practice speech-language pathologist), and (c) what a participant should do if he or she wants to know additional information not included in the case study. Participants were instructed to develop their plan for intervention in private practice. This context was selected to eliminate the context-specific constraints of practicing in the schools, so that participants could express their plan based on their preferences. For example, speech-language pathologists in private practice can write goals not directly related to the child's academic curriculum, whereas this is not the case in the schools. Therefore, the instructions for the think-aloud tasks during the study were revised to:

"First, you will read a case study. Immediately after you finish reading it, I want you to think aloud as you develop your plan for therapy as an SLP in private practice. Your therapy plan should include: planning for the first session, describing what the first session will look like, and your plan for future therapy sessions. Thinking-aloud means sharing aloud everything that comes to your mind. Explain each step and your rationale as thoroughly as you can. If there is information you would like that is not included in the case study, think aloud about how you would obtain that information. You may ask me questions about the instructions during the task. Remember to explain each step in your decision making and include your rationale."

Next, the researcher asked the participant if he or she had questions, and then presented the participant with his or her first case study. Half of the participants in each group were presented with Case Study C first, and half of the participants in each group were presented with Case Study S first. Participants read the case study to him or herself, and then completed the think-aloud task. Prompting mirrored that used by other research teams, namely that the researcher used general prompts such as "Remember to think aloud," or "Tell me more" to elicit description and explanation as needed (Ginsberg, Friberg, & Visconti, 2016; Lund et al., 2017). No additional information or instructions was provided. This level of prompting was unlikely to affect participant's processing (Ericcson & Simon, 1993).

After participants completed the first think-aloud task, the researcher read the following instructions to the participants: "Please read Case Study X. Take your time. After you finish reading it, please think aloud as you develop your therapy plan. This means sharing aloud everything that comes to your mind. Explain each step and rationale as thoroughly as you can."

Analyses. Transcription of verbal data produced by the think-aloud task began in December 2017 and was completed in January 2018. The researcher transcribed the verbal data

in NVivo, a qualitative data analysis software package that allows researchers to import audio files, create and import transcripts, and code transcripts and data sets. The software also can be used to create visualizations and diagrams of qualitative data.

Data analysis occurred between January and April 2018. In accordance with Strauss and Corbin's (1998) guidelines for proposing grounded theory, the researcher conducted open, axial, and selective coding. The researcher also refined and authenticated the theory in alignment with Brantlinger and colleagues' (2005) quality indicators for document analysis and data analysis in qualitative research, including member checks and peer debriefing.

Open coding. An inductive, rather than a deductive, approach was used to develop codes. An inductive approach uses the data to develop hypotheses and working theories, rather than testing an a priori hypothesis. It should be noted that Strauss and Corbin (1998) acknowledge that, "some concepts might turn up… in the literature and *also* appear in the data" (p. 49). During open coding, it was important for the researcher to consider whether concepts coded in prior communication sciences and disorders studies were, in fact, emergent in the current data set. Research memos were used to catalog how the researcher's understanding of these codes developed throughout the study, as well as how they were similar to and different from codes used in the literature.

Open coding began with microanalysis, with the primary investigator coding each transcript line-by-line in order to identify, name, and develop emerging concepts that represented clinical reasoning skills. This is consistent with methods used by Ginsberg, Friberg, and Visconti (2016). The researcher conceptualized within the data by labeling phenomenon described in the data to denote context-specific concepts. In addition, the researcher considered the potential

range of meanings of concepts uncovered from the data. The primary investigator wrote a preliminary codebook, which provided definitions and examples for each of the emerging codes. Although multiple members of other research teams worked collaboratively to create codebooks, this was not possible in the present study because the assistant was purposefully kept unaware of the goals of the study during open coding (Dietz et al., 2012; Ginsberg, Friberg, & Visconti, 2016; Lund et al., 2017). Authentication processes were included in the study in because the primary researcher initially created the codebook independently. Peer debriefing and member checks were used to validate the analyses and findings.

Peer debriefing. Peer debriefing is "having a colleague or someone familiar with a phenomena being studied review and provide critical feedback on descriptions, analyses, and interpretations or a study's results" (Brantlinger et al., 2005, p. 201). Strauss and Corbin (1998) recommend this high-level analysis that compares the theoretical scheme to the raw data set. A second-year graduate student, studying speech-language pathology at the University of Kansas, assisted with peer debriefing. Based on recommendations from The Center for Research Methods and Data Analysis (CRMDA) at the University of Kansas, the research assistant was "aware of the study's methodology, but not the overall goals of the study" (personal communication, September 28, 2017). Also based on CRMDA's recommendations, the researcher ensured that the assistant was blind to whether each transcript represented data from an expert or a novice participant.

"Intercoder agreement requires that two or more coders are able to reconcile through discussion whatever coding discrepancies they may have for the same unit of text" (Campbell et al., 2013, p. 297). Working collaboratively to achieve 100% agreement is consistent with interrater agreement methods used by Dietz et al. (2012) and Lund et al. (2017). After the

primary investigator initially coded all 16 transcripts, the research assistant independently read and coded four transcripts (25%), including two expert and two novice transcripts, using the researcher-developed codebook and checking for concept clarity. Then, the researcher and assistant met via Zoom to discuss and refine the codes. At this time, 12 of the codes were refined and 1 code was added to the codebook. Following that discussion, the researcher recoded and the assistant coded an additional four transcripts (25%) independently, including two expert and two novice transcripts, using the updated codebook. When that round of coding was complete, the researcher and assistant conducted multiple lengthy Zoom meetings to reach 100% agreement on the first eight transcripts. Each transcript was reviewed line-by-line until consensus was reached on every code on the transcript. The researcher and assistant identified and discussed codes that they had interpreted differently and came to a consensus on definitions for these concepts, and subsequently refined the codebook. The researcher independently recoded the remaining eight transcripts (50%), 4 expert and 4 novice transcripts, using the updated codebook. Next, the assistant reviewed each of these transcripts line by line, and then the researcher and assistant met multiple times via Zoom to discuss and reconcile differences in order to obtain 100% agreement on the remaining eight transcripts. The codebook was refined continuously throughout this process. The final codebook can be found in Appendix E.

In order to maintain a record of open coding, the researcher wrote memos to document thoughts, questions, and notes for future analysis. Memos were used to keep an audit trail, a record of data collection and analysis procedures to "substantiate that sufficient time was spent in the field to claim dependable and confirmable results" (Brantlinger et al., 2005, p. 201). Using an audit trail ensured transparency of the research process and increased the study's credibility.

In addition, the researcher contacted a qualitative researcher familiar with think-aloud methodology in CSD for feedback regarding the codebook. The peer debriefer "review[ed] and ask[ed] questions about the qualitative study so that the account will resonate with people other than the researcher" (Creswell, 2002, p. 196). In particular, the peer debriefer reviewed the codebook as well as a subset of the coded transcripts and provided the researcher with feedback about the codes after open coding had been completed. The peer debriefer also made recommendations for subsequent data analysis.

Member checks. It was also important to ensure that the theory did in fact represent the raw data by authenticating the data transcription and analysis. In this study, member checks were used to provide participants an opportunity to (a) correct any inaccuracies in their transcript and (b) provide feedback on the initial analysis of their transcript (Guba & Lincoln, 1989; Sandelowski, 2008). Member checks were conducted with each participant as a "separate event… with each individual participant, as soon as some analysis has been completed of that participants' data" (Sandelowski, 2008, p. 501). After the researcher and assistant reached 100% agreement on the transcripts, and concurrent with peer debriefing, the researcher contacted each participant to arrange a member check. Participants had the option of meeting with the researcher via Zoom to conduct the member check, or participants could choose to provide written feedback on the transcript and send the feedback to the researcher via email. All 16 participants returned feedback via email. Upon completion of the member check, participants were sent their compensation for the study, a $25 Amazon electronic gift card.

Axial coding. After open coding, which broke down the data, the researcher used axial coding to put the data back together. "Axial coding is the act of relating categories to subcategories along the lines of their properties and dimensions" (Strauss & Corbin, 1998, p.

124). While categories provide properties and dimensions with which to describe a phenomenon, using subcategories allows the researcher to answer questions about the research topic. Strauss and Corbin (1998) note that although a researcher may not realize which categories are subcategories at the beginning of the data analysis, these differences become evident over time as the researcher asks deeper questions about categories and concepts within them.

Therefore, the steps of axial coding were to (a) continue to identify categories' properties and dimensions, (b) identify the conditions, actions, interactions and consequences of the broad topic (i.e. answer "who," "what," "where," "when," and "why" questions), (c) determine the relationship between each theme and its subthemes and (d) explore the relationships between themes (Strauss & Corbin, 1998). Again, the researcher wrote research memos to document ongoing understanding of axes of themes. Therefore, when axial coding was complete, the researcher had an understanding of categories and subcategories of clinical reasoning skills and their properties, dimensions, conditions, interactions, and consequences. Similar to prior research, the research assistant provided the researcher with critical feedback on axial coding (i.e. the relationships among concepts, categories, and categories) (Ginsberg, Friberg, & Visconti, 2016). The researcher and assistant met via Zoom to hone the major themes and subthemes.

Selective coding. Last, the researcher used selective coding to identify the central theme and explain the relationships between the central theme and other themes. The research assistant provided critical feedback on selective coding (i.e. the proposed theory and its justification), similar to Ginsberg, Friberg, and Visconti (2016). In other words, "Selective coding is the process of integrating and refining categories" (Strauss & Corbin, 1998, p. 143). Central themes explain variation and the main theory, supported by the data. Strauss and Corbin state that, "if

theory building is indeed the goal of a research project, then findings should be presented as a set of interrelated concepts, not just a listing of themes." (p. 145). Therefore, selective coding commenced when the researcher exhibited a strong theoretical understanding of the data and was able to propose grounded theory that accurately reflects the data set (Strauss & Corbin, 1998).

Results

Recall that the purpose of the study was to both (a) inform a working definition of competency in AAC service provision, and (b) describe the bottlenecks to student learning in AAC service provision. The research questions were:

1. What clinical reasoning processes do expert speech-language pathologists use when planning AAC intervention for children with developmental disabilities?
2. What clinical reasoning processes do novice, preservice speech-language pathologists use when planning AAC intervention for children with developmental disabilities?
3. What are the differences and similarities between the clinical reasoning processes used by experts and novices?

Data were coded for the clinical reasoning skills used by the participants. A total of four major themes (i.e. developing intervention plans, measuring and evaluating progress, decision-making, and teaming) and 17 subthemes emerged from the data set, all of which were present to some extent for both expert and novice participants. The subthemes reflected the mental actions and strategies participants used during intervention planning.

The following sections present additional detail and examples of the clinical reasoning skills experts and novices used during the think-aloud tasks. Many of the expert and novice participants used the majority of the clinical reasoning skills that emerged from the data at least once, as can be seen in Table 6; however, there were qualitative differences among the groups, which are depicted in Figure 1 and will be discussed by each individual theme in the sections that follow. In Table 6, the four themes and 17 subthemes are presented along with their definitions from the codebook, as well as the number of experts and novices who used each clinical reasoning skill at least once during the think-aloud tasks.

Table 6

Number of Experts and Novices who Used Subthemes, by Theme

Theme	Subtheme	Definition	Experts	Novices
Developing Intervention Plans	Planning activities	Indicating or describing activities they would use during therapy sessions, or setting up the environment for activities	8	8
	Selecting or developing materials	Indicating materials that they would create or choose to use during therapy	8	7
	Planning teaching strategies	Indicating teaching or facilitation strategies they would use during therapy	8	7
	Selecting targets	Providing examples of targets that would be used during therapy to make progress towards goals	8	8
	Selecting treatment style	Indicating or describing therapy style or philosophy to approaching therapy	8	8
Measuring & Evaluating Progress	Goal setting	Developing short- or long-term objectives, or broad goal areas, to address during therapy	8	8
	Collecting data	Planning to obtain information about the case through observation or monitoring/tracking behavior(s) during therapy	8	8
	Feature matching	Indicating that they would assess or modify AAC system features based on the case's skills and needs	8	8
Decision-Making	Summarizing	Providing a summary of information provided in the case study	8	8
	Interpreting	Making assumptions or subjectively interpreting information in the case study, particularly about the child's current level of functioning	8	8
	Hypothesizing	Making assumptions regarding prognosis or outcomes related to the case	6	6
	Rationalizing	Explaining why they would take a particular action	8	8
	Comparing	Making a comparison between the case and prior knowledge or experience	7	6
	Deferring	Commenting on a lack of knowledge or experience relative to the case study	1	7
Teaming	Seeking outside input	Indicating that they would seek further detail about history, skills, or preferences, or would consult other disciplines to get more information	8	8
	Collaborating	Planning to work jointly to problem solve, set goals or implement therapy plans from multiple perspectives relevant to the case	8	7
	Educating others	Planning to teach families/professionals/peers about goals or implementation	7	5

Qualitative differences across groups were observed. Figure 1 presents the four major themes, as well as the 17 subthemes. Clinical reasoning skill subthemes that participants used similarly are shown in white. Clinical reasoning skills that experts and novices used qualitatively differently are shown in gray.

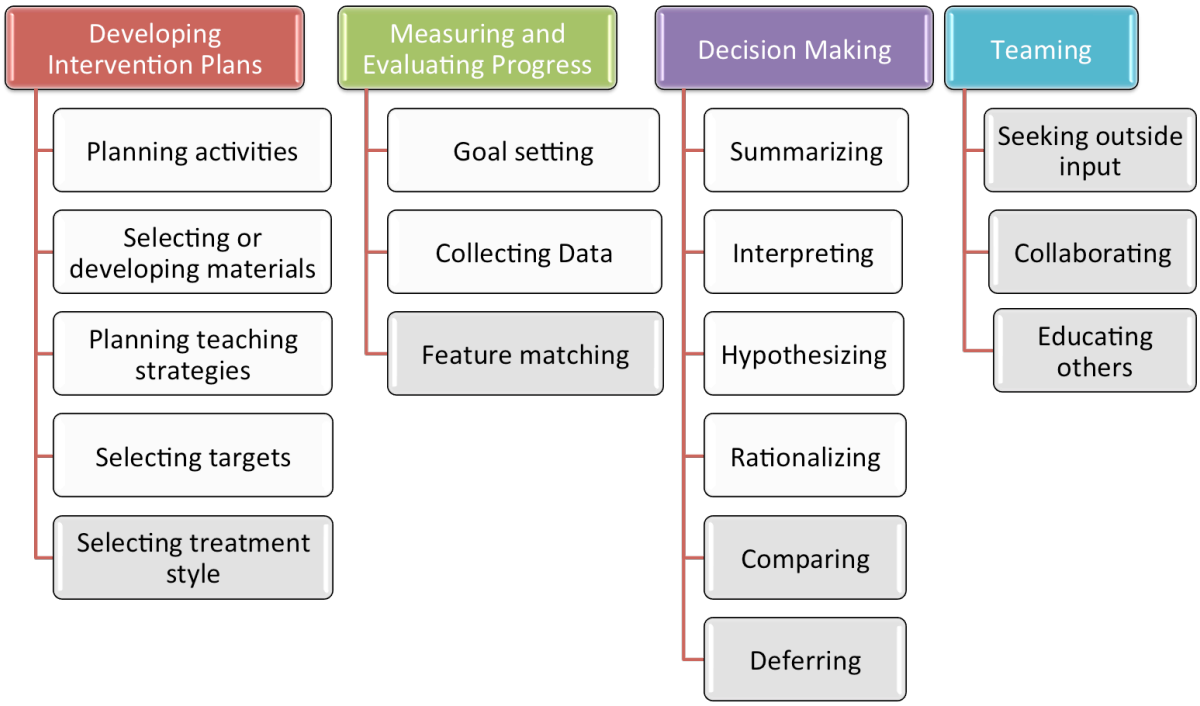

Figure 1. *Qualitative differences in use of clinical reasoning skills across groups.* Figure 1 is a visualization of the clinical reasoning skills that experts and novices used similarly (displayed in white) and clinical reasoning skills they used differently (displayed in gray).

The following sections present additional detail and examples of the clinical reasoning skills experts and novices used during the think-aloud tasks.

Developing Intervention Plans

Five subthemes for developing intervention plans emerged from the data, including planning activities, selecting or developing materials, planning teaching strategies, selecting

targets, and selecting treatment style. All subthemes were present for both groups of participants, but differences in clinical reasoning skills were noted.

Figure 2. *Intervention plan components.* This figure is a visualization of the relationships between the subthemes within the developing intervention plans theme.

In particular, activities provided a context for speech-language pathologists to introduce materials, use teaching strategies, and address therapy targets. In addition, experts' and novices' treatment style influenced their decision making in planning, selecting, and implementing these components of therapy.

Planning activities. Experts and novices approached planning activities similarly. Participants in both groups wanted activities to be fun or engaging. Both groups of participants planned different types of activities for Christopher than they planned for Sam., and both experts and novices planned to use activities for similar purposes.

Experts and novices planned activities with the children's interests and likes in mind. The majority of participants specifically noted that they wanted activities to be fun, engaging, motivating, or a combination of the three qualities. An expert stated that she would "start with

activities that the kiddo is highly motivated by, and interested in, and competent in doing" (KC-E) and a novice noted the importance of "taking [the child's] interests um, and creating activities that are really fun and engaging and he can move around" (AR-N).

Recall that Christopher was a four-year-old boy with ASD. Both groups planned play-based therapy for Christopher, and planned to use toys like puzzles, balls, cars, and farm animals as materials within activities. For Sam, a ten-year-old boy with cerebral palsy, most participants in both groups planned conversation-based therapy. Examples of these activities included telling jokes, playing a game, or having an open-ended conversation. All but one participant in the study, a novice, mentioned incorporating literacy activities into the sessions. Some described a particular curriculum (e.g. Accessible Literacy Learning (ALL)), whereas others planned to embed literacy instruction within their activities.

Participants in both groups planned to use activities to a) take data or observe the child, b) build rapport or "get to know" the child, and c) use teaching strategies and address therapy targets. Experts were more likely to plan activities specifically to take data or to observe the child. One expert planned to have an open-ended conversation with Sam, so that she could take an informal language sample (JJ-E). Another expert planned to use activities during the first session to determine if Sam was "prompt dependent." (OI-E). Novices, on the other hand, were more likely to specifically mention planning activities for building rapport or to "get to know" the child. In addition, three experts said they would use activities that were already "naturally occurring" (KC-E) within the child's routines, such as during snack, meal, or bath time (IH-E). All participants in the study described activities as the context in which teaching and learning occurred. Activities provided the context for experts and novices to incorporate materials, use

teaching strategies, and address therapy targets. Thus, there was significant overlap between planning activities and other subthemes in this category, which will be described in detail below.

Selecting or developing materials. Expert and novices were alike in their plans to select and develop materials in that they provided specific details. Both groups named specific materials they planned to use within therapy sessions that were appropriate for the children's age and for the therapy context. Experts and novices mentioned multiple materials they would select or develop based on the child's interests and needs. All participants mentioned having alternatives, so that the child had multiple options to choose from during therapy or to have a "back up" plan in the event that a child did not like or engage with other materials.

For Sam, materials participants planned to use included matching games, bingo, books, reading passages, a graphic novel, a comic book, videos, and YouTube. Materials planned for Christopher's therapy included books, cars, games, bubbles, puzzles, snack, dolls or action figures, balls, a basketball hoop, Play Doh, music, Pin Art, a vibrating massager, farm animals, and blocks. Experts and novices said they would develop a visual schedule and/or other visual supports in therapy for Sam and Christopher.

It was interesting to note that five experts mentioned developing an overlay, or multiple overlays, for Christopher's static, low-tech AAC device, but novices did not include this in their plans. Multiple experts mentioned specific details for developing the overlays. An expert said, "That would be the first thing, I would want to make my overlay for my device" and named two word lists she would consult to choose core vocabulary for the overlay (CW-E). Another expert planned to use 20 of the 32 buttons for core vocabulary, program other buttons with phrases like "Hi, my name is Chris… my turn, I like it, I don't like it," and also create "a little flipbook on the top of this 32 message communicator with some fringe vocabulary that would correlate to the

core vocabulary that [she] included on the buttons" (HF-E). Another approach was to develop the vocabulary displays for particular routines or activities like "meal time, or for bath time, or transition time, or something new comes up in his world that he doesn't really know how to, to deal with" (IH-E).

Planning teaching strategies. The majority of participants in the study discussed the facilitation strategies they would use to teach during the therapy sessions. Both experts and novices frequently mentioned using modeling and aided input (or "aided language," "aided language input," "partner augmented input," or "aided language stimulation") to support the children's learning and use of therapy targets. Also, these teaching strategies were discussed in terms of intensity, as participants in both groups said they would use "lots of" or "a lot of" modeling and aided input. Interestingly, novices were more likely than experts to specifically name other teaching strategies they would use during therapy. Additional strategies included prompting, (JJ-E, OO-N, WB-N, YS-N), recasting (MF-E, WB-N), expansion (GY-N, WB-N), bombardment (WB-N YS-N), event casting (YS-N), partner-focused questions (NI-N), and positive reinforcement or praise (OO-N, YS-N). Participants in both groups gave examples of how they would use teaching strategies or defined the strategy. For example, a novice referenced event casting and defined it, "He doesn't have a lot of expressive language, so maybe just doing a lot of event casting, sort of describing what he's doing out loud" (YS-N). An expert described aided input, "I would be accessing the buttons and then show him how to access the buttons and use the language to go with the pages" (HF-E).

Only two participants in the study, both experts, planned to monitor and/or modify their use of teaching strategies over time. One expert planned to monitor the "level of prompting" (JJ-E) that Christopher needed over time in order to be successful. The other expert planned to

monitor the following: “I would look to see [Sam’s] response based on his um, level of prompt, prompt hierarchy, as well as the rate of response, how intensely they needed to be modeled, how frequently they needed to be modeled. That, that would help me set the rate and frequency for rotating core words for modeling for Sam for his therapy plan for the rest of his sessions” (MF-E).

It was common for planning teaching strategies to overlap with planning activities, selecting or developing materials, and selecting targets. Participants described the activities holistically, discussing teaching strategies, materials, and targets within the context of the activity. For example, an expert (JJ-E) and a novice (AR-N) both mentioned introducing cars (i.e. materials) and playing with them (i.e. activity), and using modeling and aided input (i.e. teaching strategies) to target core vocabulary words “stop” and “go” (i.e. targets).

Selecting targets. This subtheme was defined as “providing examples of targets that would be used during therapy to make progress towards goals.” Selecting targets frequently overlapped with other developing intervention plan subthemes (i.e. planning activities, selecting materials, and planning teaching strategies); however, there was also considerable overlap with measuring and evaluating progress subthemes (i.e. collecting data, goal setting, and feature matching), which will be discussed in a subsequent section.

Experts and novices identified similar targets to address in therapy. Core vocabulary was the most frequent target planned by both groups of participants. In fact, all participants except for one novice planned to address core vocabulary. Experts and novices noted the importance of targeting core vocabulary to address the children’s goals and improve receptive and expressive language. For example, JJ-E said that working on core words would help Christopher get his wants and needs met, and AR-N indicated that using core words and expanding utterances could

be targeted simultaneously. Some participants gave examples of target core vocabulary words, while others generally planned to teach and use core vocabulary during the activities.

The next most common set of targets was social in nature. Some experts and novices mentioned that they would target social skills generally, whereas others generated specific social targets. These included turn taking, directing, protesting, requesting, commenting, telling jokes, and Social Thinking skills (i.e. identifying expected and unexpected behaviors, asking partner-focused questions). Turn taking was included the most frequently in experts' and novices' planning. Discussed less frequently, but by members of both groups, were expanding utterances or sentence structure. One expert specifically mentioned targeting sentence structure (OI-E), and a novice specifically indicated she would target subject-verb-object sentence structures. Other participants planned to set goals to targeted increasing the length of the children's utterances, which will be discussed further below.

Selecting treatment style. All participants in the study, both experts and novices, described some element(s) of their treatment style, which would impact their development of intervention plans. In particular, data included in the selecting treatment style subtheme "indicat[ed] or describe[ed] therapy style of philosophy to approaching therapy." Experts' and novices' treatment styles were considerably different in their focus.

When novices made reference to their treatment style, it was typically in reference to therapy frequency and/or duration, preparedness, or flexibility. Six of the eight novices specifically mentioned session or activity length or number of sessions per week. In contrast, experts did not mention variables related to time. NI-N planned to spend 20 minutes or more per activity, and AR-N planned to use 5-10 minutes after the therapy session for family education. WB planned one-hour therapy sessions twice per week, whereas YS-N planned two, forty-five-

minute sessions per week. One novice specifically indicated that she would plan a one-hour first session, while another novice planned the first session to be two hours in length.

Two novices intentionally planned to get comfortable with the children's devices prior to the first session. A novice indicated,

> I'd also like to get familiar with his device because I may or may not know how to use this one. It doesn't name exactly which one but um, I'd find out which one and then um, practice myself on how to use the eye gaze and then figure out the competencies because even though he knows how to use it, I don't yet (YS-N).

OO-N provided additional rationale by stating, "because I would also like to be prepared and not have to learn on the spot cause that could delay, or not have as many opportunities for um, Christopher to learn, if I'm spending most of the time just figuring out where um, words are on the device." In addition, two novices specifically mentioned being flexible during therapy, particularly in the first sessions as they were getting to know the children.

Experts' descriptions of their treatment style were markedly different from the novices, in that they were influenced by time practicing as a speech-language pathologist. In particular, experts had developed preferences and priorities. The experts used language like "I always like to" or "I always work on." For example, IH said, "I like to have a set schedule." And MF-E said, "I like to have families involved as much as possible, as they are comfortable and as much as they are willing." HF-E mentioned being an "advocate" for teaching core and fringe vocabulary. IH mentioned embracing, and incorporating in her plans, AAC specialists Gail Van Tatenhove and Linda Burkhart's work.

It was interesting to note that two of the three experts in the study who worked in private practice (SU-E, KC-E) had significantly more references in their data to their treatment style.

KC-E mentioned several processes that she used at the clinic she owns such as intake forms and procedures, initial and updated assessments, and having two speech-language pathologists present in the initial therapy session. SU-E discussed the importance of coaching in her therapeutic approach, in that she prioritized "involving the stakeholders and really making them an active partner in therapy and in the goals because then they're more invested." The selecting treatment style code was named after the following portion of SU-E's data.

> More my style of therapy is… learning is a hybrid between ABAs, natural environment teaching, and follow their lead (laughs). So to kind of, it's evolving, and I'm more a follow their lead type of, especially during free play, but... wanting to build on and call their attention to certain things as well, so it's a little bit more structured um, than my understanding of a true Floortime approach.

Developing intervention plans summary. There was considerable overlap in experts' and novices' data for planning activities, materials, strategies, and targets. Differences in planning activities were that experts were more likely to plan activities specifically to take data whereas novices more frequently mentioned planning activities to "get to know" the child. Also, experts planned to use "naturally occurring" activities within the child's routines. Experts, but not novices, planned to develop overlay(s) for Christopher's device. Novices specifically named more teaching strategies than experts in their plans, but a small number of experts were the only participants who planned to scaffold their use of teaching strategies.

There were noticeable differences among the experts and novices in their development and plan to use an individual treatment style. Novices' treatment style was less developed when compared to experts'. Experts indicated their preferences and priorities, but novices were less specific, referring to their therapy frequency and/or duration, preparedness, or flexibility.

Measuring and Evaluating Progress

Participants discussed their plans to measure and evaluate progress, specifically their plans to collect data, set goals, and use feature matching processes. Although these subthemes were present in all participants' data, there were differences in how experts and novices approached feature matching.

Goal setting. Experts and novices were similar in their approach to setting goals during the think-aloud tasks. This subtheme captured data focused on "developing short- or long-term objectives, or broad goal areas, to address during therapy." Goal setting commonly overlapped with selecting targets. Experts and novices described broad goal areas, but were much less specific when planning goals as compared to when they described therapy targets. Recall that the main types of targets that participants planned were core vocabulary, social targets, and increasing utterance length. Goal areas described by both experts and novices correlated with these targets in that most participants wanted to write expressive and/or receptive language goals (i.e. by targeting core vocabulary or increasing utterance length) and at least one goal targeting pragmatics. In addition, some participants in both groups planned to include a literacy goal in their intervention plan.

Descriptions made by both groups of participants were broad. For example, one participant stated, "I would probably write a plan to work on… expanding uh use of core words and… expanding utterance length… work on including more um pragmatic functions" (JJ-E) and another participant noted, "One of your goals would definitely be to try to extend like the length of his utterances so that he can be more complex with what he's, with what he's saying um, as well as to expand his vocabulary" (NI-N).

Some participants simply said they would develop goals at a later date. For example, a novice stated, “I would set just a couple goals at first that we just focus on and everything and then moving forward just building on all of his skills and, you know, meeting those goals and how to meet those goals” (AR-N). Overall, both groups of participants omitted information regarding context, time, specific behaviors that would be measured as well as a target threshold; however, participants were more specific in reference to expanding the child’s length of utterance. OO-N planned to work on “two word combinations” whereas SU-E’s goal would target increasing length of utterance to two to three symbols.

Collecting data. Data collection, or “planning to obtain information about the case through observation or monitoring/tracking behavior(s) during therapy” is part of measuring and evaluating progress in therapy. Similar to their description of goals, experts and novices described their plans to collect data broadly. Most of the references to this subtheme were about what to “look for” or what participants planned to “see” or observe during therapy sessions. Some participants mentioned data collection methods such as language sampling (JJ-E, OI-E), a checklist (WB-N), a preference assessment (MF-E), and interviewing (KC-E, OI-E, RZ-N), but these were infrequent throughout the data set.

Participants in both groups planned to take data on the words, vocabulary, or utterances the children used during therapy sessions. OO-N indicated she wanted data on which words the child used most frequently by indicating, “I'd review his first session just to see um, his strengths again, so like which words he's most frequently using.” SU-E planned to collect data on the core vocabulary she observed the child use and to note specifically which of the words the child used in a sentence. OI-E described her plan to collect a language sample of the words Christopher would use in the first therapy session:

> Um, would be doing a pre-language sample, again just getting a baseline of what those words are, and so that we could follow up with a more lengthier post sample to see if aided language and how my goals were written increased um, any of those weaknesses that were identified.

In addition, experts and novices were both interested in collecting data about "communication functions" (CW-E) or "pragmatic functions" (JJ-E). Some of the specific functions participants planned to observe included initiating, responding, requesting, and commenting. JJ-E described her data collection plan to both inventory the child's utterances and to note the pragmatic functions of his communication:

> I think I would just be trying to get a sense of what those 1 to 2-word utterances are and why is he using them? Is he using them to um, make a request? Is he saying like I want, or want more um, like what, um, almost like taking a language sample. You know, figuring out what the richness of his language is like.

Overall, similar to goal setting, the participants across groups described their approach with little detail in regards to how they would collect data or the specific behaviors they were planning to measure or evaluate.

Feature matching. In assessments and intervention with people who use AAC, feature matching is a process by which speech-language pathologists match the person's skills and needs to the features of AAC systems, in order to determine the most effective and efficient mode of AAC for that person. In this study, feature matching occurred when participants "indicat[ed] that they would assess or modify AAC system features based on the case's skills and needs." There were qualitative differences in how experts and novices engaged in feature matching. Novices

were more likely to plan to program the AAC device or talk generally about feature matching. Conversely, experts were more likely to plan to assess or modify the Sam's access methods.

Some novices discussed feature matching without developing a specific plan to do so. For example, YS-N noted that her plan of "making sure that um, as I can tell in this session and maybe the next few sessions, that this is the appropriate device and program for him." RZ-N planned to bring two or three additional devices to Christopher's session for him to trial. Other novice participants discussed programming. II-N planned to program a page for Sam, and AR-N planned to program fringe vocabulary related to Sam's interest. A novice noted in her plan "possibly masking some things or not um, to really focus his uh, attention" (GY-N). The experts discussed upgrading Christopher's device to a high-tech device and evaluating the children's access to their devices much more often than the novices; however, WB-N mentioned exploring a dynamic high tech display in future sessions with Christopher and II -N planned to monitor Sam's fatigue, and explore using switch access if eye gaze proved to be too fatiguing for him.

In contrast, experts expressed concerns about the appropriateness of Christopher's device. One expert said, "To be perfectly honest, my question, or the, the other bit of information that I wondered about was why he was recommended only a low tech static 32 button device when his skills indicated that he had uh... some of the developing skills that he did" (MF-E). Another stated, "I would really question who today would recommend that device for a kid" (KC-E). Six of the seven experts that engaged in feature matching mentioned assessing or modifying access methods, particularly Sam's eye gaze system. First, two experts (KC-E & CW-E) planned to check that the eye gaze software was up to date. JJ-E and IH-E planned to assess how Sam's device was mounted and whether or not that had an impact on his ability to access all four quadrants of the device screen. Three experts planned to evaluate Sam's accuracy or efficiency,

coupled with his level of fatigue when using eye gaze to access the device. In addition, SU-E planned to ask Sam if he had "a resting spot," where he could pause the device, and MF-E planned to determine if a backup, or secondary, access method would be beneficial.

Measuring and evaluating progress summary. Both participant groups approached goal setting and data collection broadly, and provided few specific planning details during the think-aloud tasks. Differences were observed in how experts and novices planned to engage in feature matching. Specifically, experts planned to evaluate the access features of Sam's current system while novices were more likely to program the device or provide fewer details about their feature matching plan.

Decision-Making

Participants' decision-making was reflected through several subthemes of clinical reasoning skills, including summarizing, interpreting, hypothesizing, and rationalizing which experts and novices used similarly. Groups of participants engaged in comparing and deferring differently.

Summarizing. Both groups of participants frequently summarized information included in the case study. Although there was individual variation and variation within groups in terms of frequency, the majority of participants (13/16) summarized information ten times or more during the think-aloud tasks. Data coded as summarizing were not subjectively interpreted. Instead, most participants quoted information directly from the case study or repeated it in their own, similar words. Information that was frequently summarized by both experts and novices included the cases' ages, language and literacy skills, and motor skills and characteristics about the device features such as number of buttons per page. Participants also summarized the details about

family members mentioned in the case study and information about the children's education and other therapies.

Interpreting. Summarizing was sometimes combined with interpreting, which was common to experts and novices. Data that made assumptions or subjectively interpreted information in the case study, particularly about the child's current level of functioning, were coded as interpreting. All experts and novices in the sample were observed to interpret information at least 4 times, but the majority interpreted the case study 11 times or more (range = 4 to 21). Related to the children's current level functioning, both experts and novices interpreted case study information regarding the children's cognition or attention to task, language skills, literacy skills, and use of the device. Most of the participants' interpretation was positive in nature, observed through use of words like "good," "well," and "decent" in adding value-laden statements into their interpretation of the case study information. Examples of positive interpreting statements include, "He seems fairly proficient with [the device]" (II-N), "Well it seems like he's doing well with the AAC device," (OO-N), and "Sounds like he has got some great operational skills in terms of adjusting volume and on/off control" (OI-E). Experts' and novices' interpretations generally indicated potential for development and learning. An expert stated, "Sound like he could be doing a lot more" and another expert said, "I mean it sounds like he has so much potential" (HF-E). A novice interpreted "I would expect a 10-year-old with good cognition and receptive abilities um, ability to learn, to maybe possibly doing a little bit more" (RZ-N). When participants' interpretations were neutral or negative, they were typically stated professionally. For example, IH-E interpreted the information about the device set up, "Well if he has to navigate four displays to sequence two words that's inefficient."

Three participants, two experts and one novice, were observed to differentiate, a form of interpreting that was defined in the preliminary codebook as "indicating differential or additional diagnosis options." This code emerged only four times in the data set. IH-E thought Christopher might be "delay-disordered" and JJ-E thought he might be "hyperlexic." The novice who engaged in differentiating wanted to "keep an eye out" for cortical visual impairment when working with Sam.

Hypothesizing. Six experts and six novices hypothesized by "making assumptions regarding prognosis or outcomes related to the case." Both groups of participants hypothesized that the children would make progress. Some made general statements like "he's going to continue to do a great job" (AR-N) or "he might catch on pretty quick" (YS-N) about Sam and "I would think that with a four year old, and that development on my side, it might… help" (IH-E) and "It bodes fairly well for prognosis and for treatment that his receptive language skills do seem to be a little bit stronger than his expressive" (GY-N), which were for Christopher. Examples of more specific hypotheses are that "[Christopher] looks like he's a kid that's gonna be an early reader" (IH-E) and that "he should be able to handle a, a, high tech device" (WB-N). There were few instances of hypothesizing in the data, which partially may be why there were no noticeable differences observed in the experts' and novices' use of this skill.

Rationalizing. Defined as "explaining why they would take a particular action," rationalizing was the most frequently used clinical reasoning skill during the think-aloud tasks by both experts and novices. Both experts and novices rationalized their decisions related to developing components of their intervention plan, evaluating and measuring progress, and teaming. Thus, rationalizing overlapped frequently with an additional subtheme in the coding.

Referencing evidence or research was also included in the rationalizing subtheme. A total of six experts and six novices made a reference to evidence in justifying their intervention plan, but the majority of these participants did so only one or two times during the study. Some participants, such as CW who referenced Karen Erickson's work, mentioned specific researchers. Participants in both groups mentioned research more broadly. For example, a novice noted that video models have "been shown… in research to have success with… those with autism spectrum disorder" (II-N). Another novice planned to access the ASHA Practice Portal for evidence about literacy instruction. Overall, no major differences were observed in how groups rationalized or referenced evidence or research in their intervention planning during the think-aloud task.

Comparing. The process of "making a comparison between the case and prior knowledge or experiences," was relatively infrequent in the data set for both groups. Comparing appeared more frequently in expert data than the novices' data. Novices' comparisons were limited to children of similar ages or a client they had supported in the university clinic. One novice said, "I know kids, especially 10 year olds, like to teach older people things, especially technology" (OO-N) while another novice compared Sam to her own child in terms of their independence (RZ-N). Another novice planned to use a literacy program based on her experience doing so in the university clinic, "At KU we do the ALL curriculum, and I've done that with a few clients and I've really enjoyed that" (AR-N). Another novice compared Sam to a client a peer had supported in the university clinic stating, "I had a friend who had a client actually with cerebral palsy and um, he uses an AAC device. He might've been around 10, but um, one of the things that like he really enjoyed was using the AAC device, and they would use that to practice word, like, to practice greeting" (NI-N).

Conversely, experts compared the children in the case study to larger populations by diagnosis, like children with cerebral palsy or children with autism. For example, an expert shared the following when planning for therapy with Christopher, “With kids with autism, when they come in to me… I like to have a set schedule. And I'll present uh pictures and text along with those, um with that schedule so he knows what activities we're going to be playing and when they're going to happen” (IH-E). When experts compared Christopher and Sam, they compared them to “older kids” (Sam) or “younger kids” (Christopher). One expert stated, “And usually for kids with autism, especially and younger kids, I tend, I try, I’m not always successful, but I try to limit my verbal language and, in conjunction with the, what I’m modeling” (SU-E). Generally, experts made more comparisons than novices, and more frequently referenced specific therapy approaches they had used in the past, or use with clients, by large population.

Deferring. Experts and novices also differed in this skill, which is “commenting on a lack of knowledge or experience relative to the case study.” One expert and seven novices deferred during the think-aloud tasks; however, it was relatively infrequent even in the novices’ data set. An expert mentioned having difficulty, specifically switching therapy contexts by saying, “Sorry, I work in a school most of the time, so I don’t, I don’t think private practice” and later went on to comment on her lack of recent experience with younger children, saying, “This is the other hard part. I don’t work with little kids anymore” (IH-E). Although this participant had not worked with young children recently, she had prior experiences to draw on in this area.

On the other hand, novices’ deferring was related to limited knowledge and clinical experience overall. For example, one novice commented on her lack of knowledge of cerebral palsy and an additional novice indicated having limited exposure to low-tech speech generating devices. Other novices described lack of knowledge about their instruction and collaboration

with families. One novice wanted to incorporate literacy instruction with Sam, but said, “I'm not entirely sure about the sequence of teaching reading” (WB-N). Another novice planned to target letter-sound knowledge, but stated, “I don’t have an activity off the top of my head” (OO-N). Referring to family education, a novice indicated, “I would certainly want to be making sure that as much as possible I'm training them in the process while I'm treating him um, so that he has that support around the clock and not just when he's at therapy. I'm not sure of the specifics of how I would do that” (GY-N).

Decision-making summary. Experts and novices engaged similarly in summarizing, interpreting, hypothesizing, and rationalizing, but their decision-making differed with respect to comparing and deferring. In summary, experts compared the cases more frequently than the novices. Experts compared the children in the cases to larger populations, whereas novices were more likely to compare the case to a particular client they had supported in their practicum. Novices were more likely to defer during the think-aloud, which reflected their limited clinical experience as compared to the experts.

Teaming

The three teaming subthemes included seeking outside input, collaborating, and educating others. All three subthemes were present to some extent for both groups of participants, but differences in clinical reasoning skills were noted across groups.

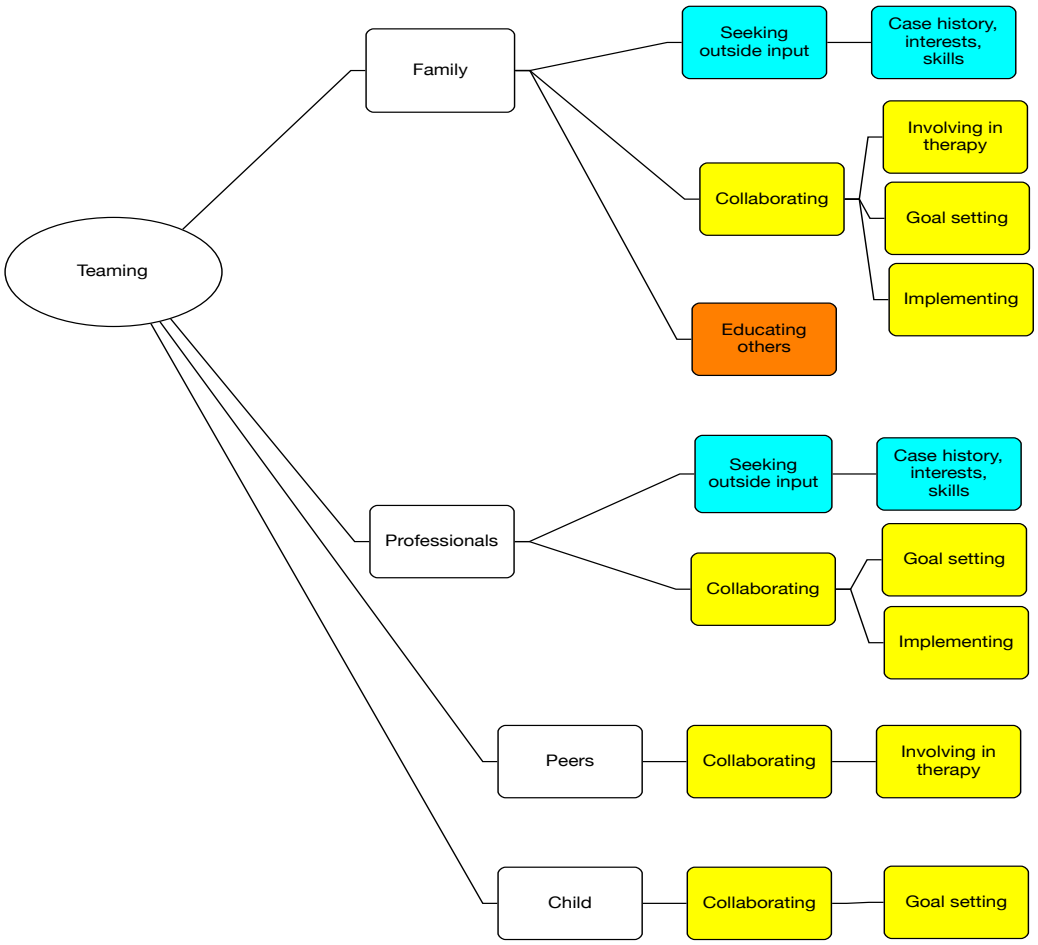

Figure 3. *Teaming with stakeholders*. Figure 3 is a visualization of the types of teaming that both groups of participants planned to engage in with stakeholder groups (i.e. families, professionals, peers, and the child who uses AAC).

Color coding was used simply to allow comparison of subthemes across groups of stakeholders at a glance. In the figure, groups are positioned in the figure according to the frequency with which participants planned to team with that group (i.e. participants most frequently mentioned planning to team with families and least frequently planned to team with the child).

Seeking outside input. Defined as "indicating that they would seek further detail about history, skills, or preferences, or would consult other disciplines to get more information," both

groups of participants sought outside information. Participants wanted the majority of their information from the children's families, but also sought information from teachers and school-based speech-language pathologists. Few participants specifically mentioned asking occupational therapists or physical therapists for information. Both groups wanted to get additional information about (a) the children's interests and likes, (b) the case history, and (c) the children's skills.

Interests and likes. Participants in both groups frequently mentioned obtaining information about the children's likes, interests, and preferences. Participants planned to use this information to guide activity planning, material selection or development, and general therapy planning.

Case history. When obtaining a case history, participants wanted information about home use, school use, and about the device. Experts were more likely to seek information about the children's relationships and interactions with their siblings. Some participants in both groups were interested in the children's use of the device at school; however, expert participants were more likely to ask about the therapies at school and the curriculum or goals. Both experts and novices planned to seek outside input about 1) the device's vocabulary or pages, 2) the child's access methods, and 3) rationale for why the device was chosen.

Participants in both groups wanted information about the vocabulary on the device (i.e. button labels, layout, and symbol representation), and about access methods, although fewer novices (n=2) sought information about access as compared to experts (n=5). Expert and novices wanted to know why the device was chosen, including the evaluator's decision-making or feature matching processes. For example, one participant said, "I would want to know if, if any other access points have been… looked at besides just going straight into the eye gaze because of the

limited mobility in his hands" and later added, "I would want to know what… those messages are, what those buttons are, what the purpose was, why they chose those buttons" (JJ-E).

Skills. Third, participants wanted to know more specific information about the children's skills, in addition to the details provided in the case study. For example, Case Study S notes that "[Sam] uses approximately only 25% of the core vocabulary on the device's main page." Experts and novices wanted to know which words Sam understood and was using to communicate. Both groups of participants asked questions about terms used in the case study to clarify what was meant by terms such as "contact gestures" and "word approximations" to better understand the cases' present levels of functioning. Some participants asked about details not included in the case study such as the children's sensory needs or ability to identify colors.

In addition, five of the experts indicated that they wanted to obtain or see the AAC evaluation report or other speech, language, and psychological reports, whereas no novices mentioned seeking out reports. Also, four of the novices indicated that they would review notes or resources from their Introduction to AAC course and/or research or look up information online about the children's diagnosis or how to treat a child who uses AAC, whereas experts did not plan to seek additional resources like this.

Collaborating. Present for both groups of participants, collaborating is defined as "planning to work jointly to problem solve, set goals, or implement therapy plans from multiple perspectives relevant to the case." Within this subtheme, both experts and novices planned to collaborate with the family (i.e. parents and siblings) most frequently, followed by professionals, peers, and the child. Collaboration will be discussed in this order with respect to dimensions of the subtheme: (a) involving in the therapy session, (b) goal setting, and (c) implementation.

Families. Participants labeled this differently, such as having family "in the session" versus "involving" or "including" them, but both expert and novice speech-language pathologists planned to involve families in the therapy sessions in some way. Both groups explicitly mentioned involving siblings in the session, but experts (n=5) were more likely than novices (n=2) to specifically mention involving parents in the session.

The relationship between collaborating and the goal setting subtheme frequently appeared in the data. Participants from both groups approached collaborating to set goals in a similar manner. Experts and novices planned to collaborate with parents or said they would collaborate with "the family." Thus, they did not specifically state they would involve siblings in the goal setting. Both groups wanted to know the parents' or family's goals for the child, particularly which skills were important for the child to be able to do at home. Experts and novices both planned to ask families "what they were hoping for out of the experience" (II-N) or "what their goals are, and what their priorities are" (SU-E) for the device, therapy sessions, and long-term.

Both experts and novices planned to collaborate with siblings and parents to support implementation of the intervention plan. Participants across groups approached this similarly, with the intention of maximizing carry over of skills learned in therapy to the child's day-to-day life. A novice said "His caregivers, his family, his siblings… are gonna be really key to encouraging use of the device at home and encouraging him to be doing the things that we practice in therapy" (GY-N). Experts and novices planned to discuss with families how activities and teaching strategies might be adapted for the home environment and also planned to send home materials like video models (II-N), books (JJ-E), and other "homework" (CW-E).

Professionals. Both experts and novices planned to collaborate with other professionals, particularly the school-based speech-language pathologists, but also mentioned teachers,

occupational therapists and physical therapists. Participants also referenced collaborating with the "classroom team" or "school" more generally. Members of both groups wanted to talk with other professionals about their goals for the child. Specifically, participants wanted to target similar or complementary goal areas. A novice planned to collaborate with the school-based therapist, "trying to build on each other's work without overlapping too much um, or perhaps overlap would be good for him, could be useful" (GY-N). An expert talked about the importance of "working on similar things" (OI-E) in order to avoid disconnect across therapies. Experts and novices also wanted to coordinate elements of the therapy plan (i.e. activities, teaching strategies, materials, target words, etc.) across settings. Some participants referenced being consistent or "on the same page" with their therapy plan whereas others planned to collaboratively develop an intervention plan with the other professional. Individual responses varied across groups in terms the collaboration focus, including, activities (II-N, YS-N), core vocabulary word targets (HF-E), facilitating peer relationships (GY-N, WB-N), materials to send home (JJ-E) developing an overlay for the low-tech device (OI-E), and skills or behaviors to monitor across settings (IH-E).

Peers. Three novices and two experts discussed collaborating with the children's peers. Peers were not involved in problem solving or goal setting. Rather, participants mentioned simply involving peers in the therapy sessions using phrases like "pulling in" peers (GY-N), "pair kids that are more neurotypical" (IH-E) and "invite some friends [to the session]" (RZ-N). The purpose of inviting peers was either for the therapist to observe the child with peers, or to facilitate peer relationships. One novice planned to "set up some type of activity that… is as natural as possible… to watch him interacting with a peer or peers" (RZ-N) and another novice planned to "facilitate a peer interaction" (WB-N).

Child who uses AAC. Four experts and one novice planned to collaborate with the child. Both the experts and novices wanted to include the child in goal setting. In addition, experts planned to problem solve with the child. For example, two experts (KC-E & MF-E) planned to collaborate with Sam in order to determine what messages to program and where they should be programmed on the device.

Educating others. Fewer novices, as compared the experts, planned to "teach families/professionals/peers about goals or implementation." Although some aspects of planning for incorporating partner education into therapy were similar, the groups' plans differed in two ways: (a) using a family-centered approach and (b) content or topic.

Across groups, participants referenced ongoing education, rather than a one-time session. Both experts and novices planned to incorporate education into their chosen therapy context, at a clinic or at the child's home. One novice specifically mentioned finding extra time once a month, outside of therapy, to visit the family at their home for education. All participants who planned to educate stakeholders referenced teaching the family (i.e. parents and/or siblings), although one expert also wanted to teach school professionals and peers. Overall, both groups wanted to educate families so that parents and/or siblings could (a) better understand the therapy methods and approach and/or (b) improve their ability to support the child outside of therapy sessions.

Differences were present in how participants across groups approached educating others. Participants in both groups had topics in mind that they would initiate, but only experts explicitly planned to ask the family to initiate topics that they wanted more information about. An expert said, "I don't know if they need more training or support for using the device. So that's something that I would like to know, ask them, or find out what their needs are, so I would do that in the first session as well" (MF-E). Further, the novices discussed content or topics for

education more broadly than the experts. For example, novices planned to teach families how to incorporate the AAC device at home and "to support all modes of communication, both sign and verbal and the use of the device," (WB-N) and two novices said they would incorporate training without specific details. In contrast, experts also mentioned teaching families how to incorporate the device at home, but added that they would teach families about core vocabulary, facilitation strategies (i.e. modeling, aided language stimulation, wait time), and strategic competence (i.e. turning the device off/on, etc.). One expert said, "I'll be communicating with the family, talking about core vocabulary, how this is something that can be used across the day, across activities, that our goal is to develop more expressive language across settings and we don't want him to become frustrated with not being able to communicate" and later added, "I would work with the family on the concept of partner augmented input and show the family, encourage the family to use the device with Christopher as they are communicating."

Teaming summary. When seeking outside input, although both groups planned to compile case histories for the children, experts' plans were more thorough. Novices planned to reference their class notes or find additional information about the children's diagnoses or to generate therapy approaches, and did not plan to obtain a copy of evaluation reports. Both groups planned to collaborate with families, professionals, peers, and the children; however, experts were more likely than novices to engage the child who uses AAC in problem solving and planned to involve parents in therapy sessions. When educating others, experts planned specific topics or content for education, and planned to ask families to initiate topics as well.

Summary of Findings

Research questions 1 and 2 sought to determine the clinical reasoning processes used by expert speech-language pathologists and novice speech-language pathologists when planning

AAC intervention for children with developmental disabilities. Both experts and novices used the following clinical reasoning skills: planning activities, selecting or developing materials, planning teaching strategies, selecting targets, selecting treatment style, goal setting, collecting data, feature matching, summarizing, interpreting, hypothesizing, rationalizing, comparing, deferring, seeking outside input, collaborating, and educating others. These skills were grouped into four themes: developing intervention plans, evaluating and measuring progress, decision-making, and teaming.

Research question 3 was, what are the differences and similarities between the clinical reasoning processes used by experts and novices? Experts and novices used the following clinical reasoning skills similarly: planning activities, selecting or developing materials, planning teaching strategies, selecting targets, collecting data, goal setting, summarizing, interpreting, hypothesizing, and rationalizing. Experts and novices differed in their use of the following clinical reasoning skills: selecting treatment style, feature matching, comparing, deferring, seeking outside input, collaborating, and educating others.

Discussion

This study focused on the clinical reasoning processes expert and novice speech-language pathologists use when planning for AAC intervention with children, including differences and similarities across groups. Research was needed specifically to uncover the bottlenecks that novice speech-language pathologists encounter when learning about AAC intervention. This work informs a working definition of competency, as well as students' competency development during their preservice education. A total of eight expert and eight novice speech-language pathologists completed think-aloud tasks. Participant responses were transcribed and analyzed qualitatively to develop grounded theory that explained the expert-novice gap in this study. This chapter will review novices' competency development and the expert-novice gap by theme (i.e. developing intervention plans, measuring and evaluating progress, decision-making, and teaming). Limitations, recommendations, and future directions will also be discussed.

Developing Intervention Plans

ASHA's 2014 Standards and Implementation Procedures for the Certificate of Clinical Competence in Speech-Language Pathology include skills outcomes related to intervention (Standard V-B 2a-g; ASHA, 2016). Four skills outcomes in Standard V-B (ASHA, 2016) are specifically related to intervention planning:

1. "*Develop setting-appropriate intervention plans with measurable and achievable goals that meet clients'/patients' needs.* Collaborate with clients/patients and relevant others in the planning process." (Standard V-B 2a)
2. "*Implement intervention plans* (involve clients/patients and relevant others in the intervention process)." (Standard V-B 2b)

3. "*Select or develop and use appropriate materials and instrumentation for intervention*." (Standard V-B 2c)

4. *Modify intervention plans, strategies, materials or instrumentation as appropriate to meet the needs of clients/ patients*." (Standard V-B 2e)

Within the developing intervention plans theme, both experts and novices engaged in the following clinical reasoning processes: planning activities, selecting or developing materials, planning teaching strategies, selecting targets, and selecting treatment style. Experts and novices approached planning activities, materials, teaching strategies, and targets similarly. The bottleneck in this theme was related to the expert-novice gap in developing treatment style.

Planning activities. Participants in both groups planned age- and setting-appropriate activities, designed to be fun, engaging, and specific to the individual client. Experts were more likely than novices to plan activities specifically to take data and to use activities already occurring in the child's day-to-day life. Novices did plan to take data, but more linearly, rather than holistically by incorporating it within activities. This discrepancy will be discussed further in the measuring and evaluating progress section. Also, experts may have had more opportunities than novices to incorporate "naturally occurring" activities, as most novices' experiences were limited to the university clinic setting. Despite these differences, members of both groups demonstrated competency in planning appropriate activities for the children in the case studies.

Selecting or developing materials. Participants in both groups planned to select and develop materials that were appropriate for intervention, which is the basis of Standard V-B 2c. Their materials were appropriate for the individual child's needs as well as the private practice setting. Materials fit within the context of the activities participants planned, and the combination of activities and materials provided opportunities for the teaching strategies experts and novices

planned to use. Multiple experts mentioned creating paper overlays for the static low-tech device, whereas the novices overlooked this step. This may be due to a lack of experience with this type of device, as experts in prior research also prepared "materials to ensure that the child had a method with which to communicate during the evaluation" (Lund et al., 2017, p. 64). Novices would likely realize the need for an overlay if Christopher arrived at his first therapy session without one, but they may need assistance in developing that material. Overall, materials that experts and novices selected or planned to develop for intervention were appropriate, demonstrating competency with ASHA Standard V-B 2c.

Planning teaching strategies. Experts and novices planned to use modeling and aided language input most frequently during therapy, as compared to other teaching strategies. This is not surprising, as both teaching strategies are evidence-based (Binger & Light, 2007; Sevcik & Romski, 2002). AAC clinical specialists in prior research also mentioned using modeling frequently during AAC assessments (Lund et al., 2017). It was interesting that the novices mentioned more teaching strategies by name than experts did. This may be explained by clinical practica expectations at the University of Kansas, where student clinicians are required to develop weekly intervention plans that list and describe teaching strategies. On the other hand, it is highly unlikely that experts would engage in a similar level of planning, even though they are likely aware of and could potentially use, the strategies novices named during the think-aloud tasks.

Standard V-B 2e is based on applicants' ability to "Modify intervention plans, strategies, materials…" In the present study, experts were more likely to describe how they would scaffold or modify their use of teaching strategies than the novices; however, only a few experts included this in their intervention planning, rather than the majority. Therefore, some expert participants,

but no novices, demonstrated competency in modifying teaching strategies to meet the children's needs. It is possible that the think-aloud task instructions did not encourage participants to describe how they would modify the intervention plan, including the teaching strategies.

Selecting targets. Both experts and novices demonstrated the ability to select appropriate targets for therapy. Participants across groups planned to target core vocabulary during intervention. A core vocabulary approach for vocabulary selection is common for people who use AAC (Beukelman, McGinnis, & Morrow, 1991; Witkowski & Baker, 2012). A core vocabulary approach targets the linguistic competence of children who use AAC (Light, Beukelman, & Reichle, 2003). Both novices and experts also planned to target increasing utterance length, an additional component of linguistic competence. Further, several experts and novices included pragmatic targets such as turn taking and using a variety of pragmatic functions, in their intervention plans. These targets aimed to improve the children's social competence (Light, Beukelman, & Reichle, 2003). Operational competence and strategic competence, also described by Light, Beukelman, and Reichle (2003) will be discussed further in the feature matching section. In all, both experts and novices selected appropriate targets to include in their therapy plans, particularly targets related to linguistic and social competence.

Selecting treatment style. This subtheme was based on participants' description of their individual philosophy and/or approach to therapy. It may not be surprising that experts and novices differed in their focus related to this theme. Novices frequently mentioned temporal variables like determining the length of activities or the entire session. Novices also specifically indicated they would spend time getting familiar with the children's devices. Although experts are also likely to set temporal limits, these decisions may be more automatic. Similarly, experts may also want to get familiar with the device, but demonstrated more flexibility in this regard. In

contrast, novices explicitly stated they would be flexible, yet wanted to do more preparation prior to the first session. An additional caveat is that novice clinicians at the University of Kansas have access to an AAC lab, with a large number of devices available for exploration and practice. Novices at this university may be accustomed to suggestions from their clinical educators to visit the lab to familiarize themselves with devices, whereas student clinicians in other settings are unlikely to have similar opportunities. Experts, on the other hand, demonstrated that they had developed preferences and priorities over time, which influenced their philosophy about intervention. These preferences and priorities are likely to shape experts' habits and routines, leading them to engage in these approaches frequently and with automaticity.

Using a particular treatment style is not a requirement, or included in the standards related to intervention; however, it was a common subtheme during the think-aloud tasks. Rather, it is likely a consequence of continued practice as a clinician, by which clinicians develop their identity as a speech-language pathologist. Novices are continuously developing their identity as a speech-language pathologist during their master's program, but it is less likely as developed when compared to experts'. Therefore, it is not particularly concerning if novices' treatment style during their master's program is less developed than experts'. This clinical reasoning process bottleneck seems more likely to evolve with time and additional practice as a therapist, influenced by instructors, mentors, and clinical contexts and learning opportunities.

Overall, the think-aloud data suggested that experts and novices are demonstrating some competency at developing activities, materials, strategies, and targets. The think-aloud data provides preliminary evidence that novices are developing skills needed to meet Standards V-B 2a and V-B 2c. From the think-aloud data alone we have less information about participants' competency in implementing intervention plans or modifying intervention plans (Standards V-B

2b, V-B 2e; ASHA, 2016). Novices' ability to implement intervention plans, and to modify those plans over time, are likely to be better observed in their clinical settings using observation and by reviewing written intervention plans, than through thinking-aloud.

Measuring and Evaluating Progress

ASHA Standard V-B (2016) states that applicants for certification must meet two outcomes related to measuring and evaluating clients' progress:

1. "*Develop setting-appropriate intervention plans with measurable and achievable goals that meet clients'/patients' needs*. Collaborate with clients/patients and relevant others in the planning process." (Standard V-B 2a)
2. "*Measure and evaluate clients'/patients' performance and progress*." (Standard V-B 2d)

Both experts and novices used three clinical reasoning processes in their plans to measure and evaluate client progress: goal setting, collecting data, and feature matching. The expert-novice gap revealed a bottleneck related to feature matching.

Goal setting. Standard V-B 2a indicates that intervention plans should include "measurable and achievable goals that meet clients'/patients' needs" (ASHA, 2016). Experts and novices included general goal areas in their plans during the think-aloud tasks, but did not generate specific, measurable goals. Similar to the therapy targets, the goals were appropriate for the children in the case studies, and focused primarily on improving linguistic and social competence (Light, Beukelman, & Reichle, 2003); however, no participants in the study created measurable goals during the think-aloud tasks, which would include a specific behavior to monitor, level of clinician support, and accuracy or frequency threshold level. The instructions for the think-aloud task did not explicitly prompt participants to write formal goals. Therefore, it

is not possible to determine if the goals participants planned would be achievable for the children in the case study; however, the broad goal areas discussed that addressed linguistic and social competence would likely be appropriate, with the addition of goals to target operational and strategic competence. Although their performance during the think-aloud tasks demonstrates novices have a foundational understanding of the importance of targeting linguistic and social competence in therapy with children who use AAC, it would be important to further evaluate student clinicians' ability to write measurable and achievable goals that meet clients' unique needs before assessing their competence in this area.

Collecting data. Speech-language pathologists collect and evaluate data in order to "Measure and evaluate clients'/patients' performance and progress" (Standard V-B 2d; ASHA, 2016). Like their description of goals, both experts and novices thought aloud broadly about data collection. They discussed collecting data on the children's expressive vocabulary or utterances used during the sessions as well as communicative functions, appropriate for data collection because these represent targets and goal areas described by experts and novices. Similar to other findings, participants in the present study described using observation to collect data "by watching the child either during the evaluation or in a natural environment" (Lund et al., 2017, p 64). Both groups of participants talked about data collection methods such as language sampling, checklists, and preference assessments, less frequently. These methods seem appropriate, but without additional detail from participants directly or by observing the novices in therapy sessions, it is unclear exactly what knowledge and skills they have related to data collection – generally, or specifically for children who use AAC. Therefore, it would be important to further assess student speech-language pathologists' abilities related to collecting data, as well as how they evaluate that data in order to assess clients' progress.

Feature matching. Both experts and novices described feature matching processes in their intervention planning. Novices planned to program the device, and otherwise discussed feature matching without precise details. The major difference was that experts were more likely to evaluate the child's access methods, as compared to the novices. This is similar to the findings of Dietz et al. (2012), particularly that AAC specialist speech-language pathologists evaluated access methods as part of their AAC assessments, whereas general practice speech-language pathologists did not.

Determining an efficient and effective mode for the child to access the AAC device is a typical component of a comprehensive AAC evaluation (ASHA, 2018a; Lund et al., 2017). In the case studies, Christopher accesses his device with direct physical touch using his finger, a form of direct selection. Sam uses eye gaze, another form of direct selection. While direct physical touch is clearly an efficient access mode for Christopher, several experts wondered if switch scanning, a form of indirect selection, might be more appropriate for Sam. Experts mentioned specific features of the device that they would evaluate such as input type and mounting, which suggests they would target operational competence, or the clients' ability to use selection techniques and operate the AAC system. Further, a few experts indicated they would target strategic competence by teaching Sam to use a recorded statement to explain AAC to unfamiliar communication patterns and also teaching him to work collaboratively with the therapist or family member(s) to help repair communication breakdowns.

Novice participants demonstrated basic knowledge and skills related to goal setting and collecting data; however, additional data is needed to determine whether these novices are truly competent in these areas. The expert-novice gap most evident in evaluating client progress was planning to match features of the AAC systems to the children's individual needs. It was clear

that novices needed additional knowledge and skills to plan to use feature matching during therapy. Experts demonstrated the mental actions they would take to evaluate access, among other AAC system features. Similar to findings of Dietz et al. (2012), experts are likely to consider alternative access and incorporate multiple modalities.

It is important that novice clinicians consider the types of features that can be assessed, and also understand that feature matching can be ongoing after an AAC evaluation and receipt of a device. Work by Dietz and Lund et al. (2012; 2017) aims to create an AAC assessment protocol outline, which would be especially helpful to novices as they gain experience feature matching during assessments and intervention. Further, novice clinicians in the study would benefit from instruction and opportunities to practice targeting operational and strategic competence during therapy. For example, novice clinicians can learn to support their clients' access modes, navigation within the AAC system, charging the device, modifying the volume, and turning the device on and off – all components of operational competence (ASHA, 2018a; Light, Beukelman, & Reichle, 2003). Novices can also learn how to improve their clients' strategic competence by teaching them to use word prediction, ask for choices when device vocabulary is limited, and repair communication breakdowns (ASHA, 2018a; Light, Beukelman, & Reichle, 2003).

Decision-Making

Revisions made in 2016 to ASHA certification standards specified that preservice learning experiences should allow opportunities for students to "incorporate critical thinking and decision-making skills while engaged in identification, evaluation, diagnosis, planning, implementation, and/or intervention" (ASHA 2016). CAA (2016, p. 19) standards defines clinical reasoning and its relationship to decision-making as students' ability to:

> Use valid scientific and clinical evidence in decision-making regarding assessment and intervention, apply current knowledge, theory, and sound professional judgment in approaches to intervention and management of individuals served, and use clinical judgment and self-reflection to enhance clinical reasoning.

Both experts and novices were observed to engage in summarizing, interpreting, hypothesizing, rationalizing, comparing, and deferring, but there were differences across groups in comparing and deferring. Overall, the main bottleneck related to decision-making was in comparing the children in the case study to prior knowledge or experience.

McAllister and Rose (2008) suggest that clinical reasoning is a series of interwoven cognitive processes that lead to a clinical decision, rather than a linear process. These thought processes result in the clinical decisions speech-language pathologists make. Subthemes in the decision-making theme (i.e. summarizing, interpreting, hypothesizing, rationalizing, comparing, and deferring) frequently overlapped with other mental actions participants took when planning for intervention. Both experts and novices frequently engaged in summarizing, interpreting, and rationalizing. Members from both groups also were observed to hypothesize during the think-aloud tasks. These findings are comparable with Ginsberg, Friberg, and Visconti (2016), which revealed experienced speech-language pathologists' and novice student clinicians' use of summarizing, rationalizing, and hypothesizing were similar during diagnostic planning. Novices in the present study demonstrated the ability to summarize, interpret, hypothesize, and rationalize as they were planning for intervention – exhibiting their development towards competency in clinical decision-making. Alternatively, experts and novices in the present study differed in how they deferred and compared the children in the case study.

Deferring. Only one expert in the study deferred during the think-aloud tasks, as compared to a total of seven novices. Deferring was observed relatively infrequently, even within the novices' data set. Novices' deferring was related to their limited clinical experience, which is to be expected at the end of their first semester of their master's program. It is also to be expected that novices will continue to gain knowledge and skills in the remainder of their academic program, as well as when they enter practice following graduate school.

Comparing. It was observed that experts compared more frequently, and differently, than the novices. Experts compared the children in the cases to larger populations, whereas novices were more likely to compare the case to a particular client they had supported in their practicum. These patterns are similar to how experts and novices in Ginsberg, Friberg, and Visconti's (2016) study compared the cases during assessment. Similar to their results, novices in the present study relied on a "classic representation of a particular condition," whereas experts had a larger range of exemplars from their experiences from which to draw parallels and incongruities when comparing the cases (Ginsberg, Friberg, & Visconti, 2016, p. 94). Having a deeper "prototype database" yields a more holistic, in depth approach to planning by the expert speech-language pathologists (Ginsberg, Friberg, & Visconti, 2016, p. 88). Clinicians with a strong prototype database are able to develop flexible schemas, or mental models, for decision making related to assessment and intervention (Ginsberg, Friberg, & Visconti, 2016).

Overall, novices in the study have demonstrated some ability to use critical thinking and decision-making skills (i.e. summarizing, hypothesizing, interpreting, and rationalizing) while engaged in intervention planning. In order to address the expert-novice gap in deferring and comparing, it is important that novices engage in learning opportunities that help them build a prototype database. "Experienced clinicians have prototypes that are based on extensive domain-

specific knowledge as well as experience with real patients; therefore, their prototypes are typically complex" (Ginsberg, Friberg, & Visconti, 2016, p. 88). With exposure to multiple exemplars of clients with a variety of disorders, students can move away from prototypes based on "classic cases," or those described in textbooks, and begin to understand the complexity and variance within disorders and populations (Ginsberg, Friberg, & Visconti, 2016). Ginsberg, Friberg, and Visconti (2016) propose, "We need to develop approaches to teaching that will foster the development of prototypes and schemas and the use of heuristics that are seen with experienced clinicians in speech-language pathology" (p. 95). Rather than expect students to be able to more effectively compare clients with prototypes and to defer less frequently over time, learning opportunities should be designed so that students can purposefully work towards competence. Building a prototype database will improve novices' ability to filter out irrelevant information, ask important questions and collect meaningful data, and to organize their planning more hierarchically. Problem- or case-based learning can provide opportunities for student clinicians to use a variety of clinical reasoning skills while also widening their prototype database and refining their schemas for assessment and intervention with clients with a variety of communication needs.

Teaming

The teaming theme was informed by the description of team-based services and collaboration in ASHA's Practice Portal on Intellectual Disabilities:

> Team-based services provide the opportunity to obtain input from professionals with different perspectives. Family members are integral members of any team. Collaboration involves problem solving and mutual goal setting from multiple perspectives that are relevant to an individuals needs (ASHA, 2018b).

Certification standards V-B 2a and 2b (ASHA, 2016) are related to teaming:

1. "Develop setting-appropriate intervention plans with measurable and achievable goals that meet clients'/patients' needs. *Collaborate with clients/patients and relevant others in the planning process*." (Standard V-B 2a)
2. "Implement intervention plans (*involve clients/patients and relevant others in the intervention process*)." (Standard V-B 2b)

During the think-aloud tasks, both experts and novices were observed to plan to seek outside input, collaborate, and educate others; however, the bottleneck in this theme was related to educating stakeholders.

Seeking outside input. Experts and novices both engaged in seeking outside input in a think-aloud study related to diagnostic planning (Ginsberg, Friberg, & Visconti, 2016). Participants' plan to seek outside input was comparable in the present study. Across the expert and novice groups, participants were similar in their approach by seeking input about the children's interests, likes, and skills. This is similar to Lund et al. (2017) findings' that AAC clinical specialists planned to prepare for assessments by preparing activities centered on the child's interests. Novices in the present study planned to reference their class notes or research additional information that was not provided in the case study about the children's diagnoses or how to plan for therapy.

Both groups planned to obtain case history information for the children, but experts' plans were more thorough. At the conclusion of the first semester of their master's program, novices in the study may have had few opportunities to collect a case history. These novices might benefit from instruction on the types of information that should be included in case histories such as the child's relationship with siblings and participation in outside therapies, and

should take advantage of opportunities obtain case histories in coursework and clinical practica. It was interesting that novices did not plan to request a copy of outside evaluation reports, which would be important in reviewing the case history. Overall, although the novices' planning sought some information from families and related services providers, their plans were less comprehensive in that they collected less information overall, demonstrating initiative but room for improvement in seeking outside input.

Collaborating. Both groups planned to collaborate with families, professionals, peers, and the children described in the case studies, demonstrating skills in planning to "collaborate with clients/patients and relevant others in the planning process" and "involve clients/patients and relevant others in the intervention process" (ASHA, 2016). In this study, experts and novices sought outside input from the children's family, school team, and other related service providers, similar to AAC clinical specialists in the Lund et al. (2017) study. In particular, experts and novices wanted to collaborate with school teams and related services providers in order to improve implementation of the therapy plan.

Thus, participants described several groups of "relevant others" in the planning and intervention processes; however, experts were more likely than novices to engage the child who uses AAC in problem solving and planned to involve parents in therapy sessions. ASHA notes the importance of family-centered practice, in which speech-language pathologists "recognize the essential role that families play in all aspects of service, from assessment through treatment, and the role that families and individuals play as key decision makers, recognized for their knowledge and skills" (ASHA, 2018c, para. 1). As new clinicians, most with clinical experience only in the university setting, novices may not be comfortable involving parents in the therapy session; however, ASHA urges speech-language pathologists to include families in the

intervention process, and stresses the importance of providing parent/family education (ASHA, 2018c). In this study, novices planned to collaborate with families and related service providers, but further evaluation is needed to determine the level of competency novices have developed in this area. In other words, novices know that they should collaborate, but think-aloud data does not provide adequate evidence of how novices or experts engage in collaboration during the intervention process.

Educating others. Although educating others is not specifically stated in ASHA's certification standards, it is an important part of speech-language pathologists' roles and responsibilities related to AAC assessment and intervention (ASHA, 2018a; ASHA, 2018c). The roles and responsibilities state that, "appropriate roles for SLPs include the following":

> Provide training for medical and allied health professionals, educators, and family members about AAC use and the impact of AAC on quality of life, and educate other professionals and caregivers on the needs of personas using AAC and the roles of SLPs in meeting the needs of individuals who use AAC (ASHA, 2018a, para. 53).

When educating others, experts planned specific topics or content and also planned to ask families to initiate topics based on their needs. After completing one semester of their master's programs, novices may not have much, if any, experience educating others. Since they are continuing to expand their knowledge and skills, they may not feel they have knowledge to share with families, or the skills with which to do so. Regardless of their competency in this area, novices can learn to follow families' and clients' leads in order to identify areas that further training is needed. With support from clinical supervisors, novices can gain experience providing family-centered education to parents and caregivers, and include clients in that process during their clinical practica.

Summary

Overall, expert performance on the think-aloud tasks reveals a level of competence that novices did not consistently match qualitatively; however, the skills experts used help inform a working definition of competent services delivery in AAC service provision. Results suggest that novice speech-language pathologists are developing competency in four areas related to service provision: developing intervention plans, measuring and evaluating progress, decision-making, and teaming.

First, the study provided preliminary evidence that novices are developing skills related to creating intervention plans; however, additional data about implementation and modifying plans over time would strengthen evidence gained from think-aloud tasks. Next, novices demonstrated basic knowledge and skills related to goal setting and collecting data during the think-aloud tasks. On the other hand, feature matching was an area in which novices needed additional knowledge and skills in order to become competent. Third, novices used multiple critical thinking and decision-making skills including summarizing, hypothesizing, interpreting, and rationalizing. To defer less frequently, and to efficiently compare clients to larger populations or schemes, it is important that novices develop a robust prototype database. Last, novices demonstrated a basic competency in planning to seek outside input from and to collaborate with stakeholders; however, additional data about how novices actually collaborate and seek outside input in practice would be useful in determining their levels of competency. With regards to teaming, the main bottleneck was related to educating others. Novices in the study would benefit from opportunities to educate families in order to build knowledge and skills in this area of service provision.

Limitations

The study was not without limitations. First, eight experts and eight novices participated in the study, resulting in a small sample size. Participants were convenience sampled through the researcher's personal networks. As a result, the participants were not racially or ethnically diverse, and all lived in the Midwestern United States. Therefore, the results represent these participants' thoughts, decisions, and experiences, but may not represent those of other practicing speech-language pathologists or first-year master's students. Further, differences in participants' performance could be related to other variables such as age, and where or how they were trained to become speech-language pathologists. Second, using think-aloud tasks to collect data informs how experts and novices approach and plan for intervention, but does not reflect actual implementation. Because using think-alouds created a flexible, open-ended data collection process, participants may not have included or thoroughly described all procedures and decisions they would use in actual intervention planning. For example, the lack of detail provided by participants when goal setting may be a result of the open-ended nature of the think-aloud process. Because participants were not interviewed, and the data were more generative than if participants were led by interview questions, the amount and depth of data provided by participants varied. Further, asking participants to plan for therapy "on the fly" may have been challenging for participants. The researcher did not observe participants plan for intervention or implement an intervention plan, which would increase the ecological validity of the results. Also, participants were instructed to develop their plan for therapy in private practice. Although this was intended to provide participants with greater flexibility in their therapy planning, the results of this study may not reflect how participants would plan for therapy in the schools or other clinical environments. Last, a graduate student research assistant served as the primary peer

debriefer in this study. This assistant was not an expert in qualitative data analysis, nor was she familiar with think-aloud data collection methods. This limitation was addressed by having a qualitative data analysis expert and an AAC pedagogy expert serve as the secondary and tertiary peer debriefers.

Future Directions

The results of this study revealed the clinical reasoning processes that expert speech-language pathologists and graduate student clinicians use when planning for intervention with AAC. Addressing the lack of diversity among participants in this study and by sampling additional experts and novices will provide further information about how experts and novices with different experiences, and practicing as speech-language pathologists in different contexts, approach intervention planning. The case studies represent two children who use AAC, one with ASD and another with cerebral palsy. Children with many different needs and diagnoses use AAC. Therefore, it is important that variety is incorporated in cases used in future research so that we can better understand how experts and novices approach intervention planning for children with different strengths and challenges. It is also important that future research examine how speech-language pathologists approach planning within different clinical environments such as the schools. Future research is needed to continue to explore the expert-novice gap in AAC service provision, particularly in implementing intervention plans. In other words, it is important to examine how planning for intervention translates into actual practice. Triangulating methods would be useful in this endeavor, perhaps by assessing clinicians' performance on case-based projects as well as implementation during clinical practica.

The purpose of this study was to assess the expert-novice gap; however, differences in clinical reasoning were observed within the groups of participants as well. It is important to

further evaluate the range of novices' performance within the think-aloud context, but also how this affects their clinical practice and competency development. First, data is needed from additional novices in order to make comparisons with data in the present study and novices in other educational contexts. In particular, it would be informative to study the variation in how novices measure and evaluate progress and make clinical decisions, as this was an area in which some of the novices had noticeably different clinical reasoning skills when compared to their peers. Obtaining this information is vital in delineating what competencies should be focused on and how to address them in AAC coursework and clinical practica. This would allow educators to individualize learning opportunities to meet each master's students' unique needs.

Conclusion

The results of this study revealed the clinical reasoning processes expert and novice speech-language pathologists used when planning for AAC intervention with children. Bottlenecks that novice speech-language pathologists encounter when learning about and implementing AAC intervention were uncovered, which reiterates the importance of improving AAC preservice learning opportunities for speech-language pathologists (Costigan & Light, 2010; Meder & Wegner 2015; Ratcliff, Koul & Lloyd, 2008). It is important to continue to improve our understanding of "how individuals develop expertise in clinical decision making" (Dietz et al., 2012, p. 157). This will be crucial in identifying pedagogical approaches needed to develop speech-language pathologists competent in AAC service provision, by monitoring students' individual development throughout their undergraduate and graduate programs. Ginsberg, Friberg, and Visconti (2016) suggest multiple approaches to engage student clinicians in developing clinical reasoning processes, including apprenticeship models, learning collaboratively and through problem- and case-based learning. The expert-novice gap in AAC

service provision highlights the need for improving our teaching and students' learning by addressing bottlenecks through authentic learning opportunities that strategically develop competence and proficiency so that children who use AAC and their families can receive high quality, effective speech and language support.

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Appendix A

Novice Survey Questions

Q1 Enter your age in years.

_____

Q2 Select your gender.

- ❍ Female
- ❍ Male

Q3 Select your race.

- ❍ White
- ❍ Black or African American
- ❍ American Indian or Alaskan Native
- ❍ Asian
- ❍ Native Hawaiian or Pacific Islander
- ❍ Two or more races
- ❍ Other

Q4 Are you a first year master's student (i.e. completed no more than two semesters of on-campus study in speech-language pathology)?

- ❍ Yes
- ❍ No

Q5 Enter the name of the state in which your master's program is located.

_____

Q6 Have you completed an externship or field study experience as part of your master's program?

- ❍ Yes
- ❍ No

Q7 Are you currently participating in an externship or field study as part of your master's program?

- ❍ Yes
- ❍ No

Q8 Have you taken a course about AAC in either your undergraduate or graduate education?

- ❍ Yes
- ❍ No

Q9 If yes, how many AAC courses have you taken?

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4 or more

Q10 Have you supported, or are you currently supporting, a client in clinical practicum who uses AAC?

- ❍ Yes
- ❍ No

Q11 If yes, how many clients who use AAC in total have you supported in clinical practicum to date?

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4 or more

Q12 Do you have prior experience(s) working with or supporting individuals who use AAC that were not coursework or clinical practica?

- ❍ Yes
- ❍ No

Q13 If yes, please briefly describe your prior experience working with or supporting individuals who use AAC.

Appendix B

Expert Survey Questions

Q1 Enter your age in years.

_____

Q2 Select your gender.

- ❍ Female
- ❍ Male

Q3 Select your race.

- ❍ White
- ❍ Black or African American
- ❍ American Indian or Alaskan Native
- ❍ Asian
- ❍ Native Hawaiian or Pacific Islander
- ❍ Two or more races
- ❍ Other

Q4 Select your primary work setting.

- ❍ Day or residential school
- ❍ Elementary school
- ❍ General medical hospital
- ❍ Home health agency
- ❍ Outpatient clinic or office
- ❍ Pediatric hospital
- ❍ Preschool
- ❍ Private practice
- ❍ Secondary school
- ❍ Other, please specify

Q5 Enter the name of the state in which your primary work setting is located.

_____

Q6 Did you complete a course about AAC during your undergraduate or graduate education?

- ❍ Yes
- ❍ No

Q7 Do you currently hold the Certificate of Clinical Competence in Speech-Language Pathology?

- ❍ Yes
- ❍ No

Q8 Enter the number of years you have held your certification (CCC-SLP) from the American Speech-Language-Hearing Association.

_____

Q9 Enter the number of years you have practiced as an SLP-CF and/or SLP-CCC (i.e. not including your master's program).

_____

Q10 Enter the number of years you have provided AAC services as an SLP-CF and/or SLP-CCC (i.e. not including your master's program).

_____

Q11 Estimate the percentage of your daily work activities that is related to supporting children who use AAC, on average. Enter a number between 0 and 100.

_____

Appendix C

Case Study C

Christopher is a 4 year, 0 month old male who has a diagnosis of Autism Spectrum Disorder (ASD). Christopher's vision and hearing were recently screened and judged to be within normal limits. He achieved some developmental milestones within normal limits; for example, he rolled over at 4 months, crawled at 9 months, and walked at 13 months; however, he said his first word at 18 months and his expressive vocabulary is limited. Christopher indicates his wants and needs by using contact gestures and speech approximations. Christopher lives at home with his mother, father, and two older sisters.

During a recent evaluation, the speech-language pathologist noted that Christopher typically uses jargon with a few real words. Based on standardized assessment, his receptive language skills are at the 18-21-month level and his expressive language skills are at the 15-18-month level. He has some skills that are above age expectations, including identifying (by pointing) all letters of the alphabet and some shapes and colors. Overall, Christopher presents with marked impairments in his nonverbal behaviors, ability to form peer relationships, and lack of social and emotional reciprocity. He also has a delay of spoken language and lack of varied make-believe and symbolic play. Christopher attends an early childhood center, and participates in speech/language therapy and occupational therapy at school.

As a result of an AAC evaluation, it was recommended that Christopher obtain a low-tech static speech-generating device with 32 buttons per page. He received the device yesterday. He has demonstrated initial interest in the device, and has explored the device by selecting each of the buttons and attending and listening to the speech output. Christopher is ambulatory and is

able to carry the device independently. He uses his right index finger to access the device independently.

Appendix D

Case Study S

Sam is a 10-year old male who was born with a form of spastic cerebral palsy, and as a result, is unable to walk or speak intelligibly and has severely limited use of his hands. Sam lives at home with his mother, father, and younger sister. He uses a manual wheelchair, and he requires assistance for mobility. Sam's vision is satisfactory, with a recent examination indicating 20/20 acuity, and his hearing abilities are within normal limits.

Prior to an AAC assessment at age 8, Sam communicated by responding to yes/no questions by turning his head to the right to indicate "yes" or to the left to indicate "no." He used this strategy to meet his basic wants and needs and to participate in the modified curriculum he participated in a self-contained room at school. The speech-language pathologist who conducted the AAC assessment recommended a high-tech speech-generating device with dynamic display with eye gaze access. Sam has now used the recommended device for the two years since the assessment. The device is mounted to his wheelchair.

Currently, Sam spends half of his school day in the general education classroom. In the last two years, he has learned to: 1) navigate to 12 pages within the device consistently, 2) adjust volume and on/off controls, 3) initiate basic greetings and farewells with peers and caregivers, and 4) extend turn-taking during a conversation with caregivers and peers to 2 comments on the same topic. However, he uses approximately only 25% of the core vocabulary on the device's main page, which has 48 buttons. The majority of his utterances are 1-2 words in length. Sam's parents, teachers, and therapists report that he is very social and eager to communicate.

Although Sam's cognition has not been formally evaluated, he exhibits good ability for new learning and good attention to task. His receptive language skills are a relative strength, as Sam demonstrates understanding of conversation, multi-step directions, and humor. He is currently in the early stages of literacy development. Using eye gaze with letters placed in the four quadrants of the device screen, Sam demonstrates letter-sound knowledge for 13/26 lowercase letters.

Appendix E

Codebook

Collaborating: planning to work jointly to problem solve, set goals or implement therapy plans from multiple perspectives relevant to the case

- "I would also really like to get the family involved, you know, get the family involved in their, their comfort level, with really using this device across, across the day…"
- "Just seeing what they expect um, what they want him to be able to accomplish, you know, with the device, with his speech, and everything. And um, just kind of talking with the family would definitely help to kind of set those goals that, you know, they want and that are reasonable and that um, will help him in the long run…"
- "Definitely pulling in the classroom team, um working with the classroom team on um... you know, I might even recommend like every month we just shoot an email to each other to get an update on how he's doing in, in, in the school and how... we can expand, you know, his, his utterances."
- Includes: collaborating with parents, siblings, professionals, Christopher/Sam

Collecting Data: planning to obtain information about the case through observation or monitoring/tracking behavior(s) during therapy

- "During the first session I'm going to be taking more data on specifically what behaviors he's using to communicate and why he's using them to communicate."
- "I would definitely spend a lot of the first session, kind of doing observe, not observations, but just playing along with him and, you know, taking notes of how he's um, initiating, the words he's using again and um, you know, how he's navigating his environment, and how he's communicating with those around him."

- “I would assess what vocabulary words he is currently using…”
- “And really start to probe diagnostically, with him, what do you want to be able to say? What do you need to be able to say? How can we help you quote say it/access it as efficiently as possible?”

Comparing: making a comparison between the case and prior knowledge or experience

- “You know it's funny because I look at this case study and I literally had a kid that I started out on a, a 32 location Tech Speak.”
- “You just described my favorite kids. Okay? That's the population that I worked with mostly.”
- “… because I know kids with autism can tune into that text and it appears that he does have that skill.”
- “Um because I know that from my own experience... people don't necessarily, the conversational partners don't necessarily wait, for these folks to create their messages.”

Deferring: commenting on a lack of knowledge or experience relative to the case study

- “I just realized how much I don't know.”
- “I don’t remember like what steps would come next.”
- “I haven't done anything at all with kids at all yet.”
- “I'm not exactly certain as to what that is, so I would um, write down the um um, syndrome or disorder. I don't know if it's genetic. I don't know anything about it…”
- Excludes: being indecisive, or changing their mind (“I would do X, no wait, maybe I wouldn’t do that”)

Educating others: planning to teach families/professionals/peers about goals or implementation

- "There would be partner training throughout my sessions on how to increase engagement, increase that reciprocity, and increase the AAC use."
- "…But I would certainly want to be making sure that as much as possible I'm training them in the process while I'm treating him."
- "My therapy with someone this age would also be targeting how I can have the parents come in and sit with me um, to be learning how to do this themselves. How they can provide aided language, how they can be looking to see what my results would be as I'm tracking improvement and progress."

Feature matching: indicating that they would assess or modify AAC system features based on the case's skills and needs

- "I would want to know if that 48 button display was um, was an okay number for him to navigate using eye gaze…"
- "Seeing what he needs on his device, what he has there, what he needs added to his device, what makes it best for him um, so that would be an ongoing process, but a very important one."
- "I would also like to see the report if possible, or talk through and find out from the parents why eye gaze was recommended over say, switch access, just so that I know what the assessment process was like and what they were thinking."
- Includes: collecting data particular to the AAC system, programming the device, and assessing client's ability to access the device

Goal setting: developing short- or long-term objectives, or broad goal areas, to address during therapy

- "There would probably be using, a verbal speech goal, so using his verbal language, using verbal speech to express himself along with AAC so using symbol, any symbolic form to express himself."
- "…And then definitely going forward, I would really really want to build on the um, the utterances, the length of the utterances. And then lots of core vocabulary…"
- Examples: improving preliteracy or literacy skills, building social emotional reciprocity, expanding/using/learning core vocabulary, increasing expressive language, increasing utterance length, improving social language or social skills

Hypothesizing: making assumptions regarding prognosis or outcomes related to the case

- "It looks like he's a kid that's gonna be an early reader."
- "He might catch on pretty quick…"
- Includes: making assumptions about case in the future: ("I think it bodes fairly well for prognosis and for treatment that his receptive language skills do seem to be a little bit stronger than his expressive.")
- Excludes: providing a hypothetical example ("So let's say he likes…")

Interpreting: making assumptions or subjectively interpreting information in the case study, particularly about the child's current level of functioning

- "Health-wise we're fine."
- "And it seems like he's fairly proficient with it…"
- "So from what I could gather in my quick reading is that he needs to know more core."
- **"**He's clearly communicating, or trying to, or mimicking or something…"

Planning activities: indicating or describing activities they would use during therapy sessions, or setting up the environment for activities

- "Creating activities that are really fun and engaging and he can move around and, you know, run around."
- "…A simple cooking activity, again by having him make choices, having him comment, how he is interacting…"
- Examples: implementing/doing the ALL curriculum, science experiment, play, bubbles, book reading

Planning teaching strategies: indicating teaching or facilitation strategies they would use during therapy

- "I would probably use a lot of aided language to go through um, the device and just kind of model different things."
- "…Explicitly teaching that with like direct instruction and modeling."
- "I... would be modeling for those key words based on a set of uh 2 to 5 just to sample, to see his rate of response to the modeling just to get a kind of idea for his rate and response."
- Examples: providing direct instruction, explaining, modeling, aided input (or aided language stimulation), video modeling

Rationalizing: explaining why they would take a particular action

- "So that he can be more explicit in what he wants because I think that's really important."
- "…In order to engage him with the device…"
- "…Because he's, he's at the early stages of literacy."

Seeking outside input: indicating that they would seek further detail about history, skills, or preferences, or would consult other disciplines to get more information

- **“**I would want to ask the parents prior to the assessment, you know, if they, if there's anyone they want us to contact ahead of time.”
- **“**Um, I had a question about how many hours of therapy he was receiving at school. I think that that's important and also what the goals are that he's working on with his school therapist.”
- “I would want to talk to the parents about what he enjoys, what he likes doing, and especially if he is getting other therapies, and what those therapies are and seeing some of those therapy reports if he is getting other outside therapies.”
- Includes: seeking information from family or professionals or finding information online or from article/textbook
- Excludes: data collection, observation, interview

Selecting or developing materials choose to use during therapy

- “I think I'd prepare some blocks because she said he liked those. He really likes Batman, so maybe having some cars with Batman or um, a Batman doll figure. Um and then... he also likes other cars, too. So maybe having like a race track or something like that prepped.”
- “And then, I would develop, I would add a little flipbook on the top of this 32 message communicator with some fringe vocabulary that would correlate to the core vocabulary that I included on the buttons.”
- Examples: ALL curriculum, Ekwall Shanker, video model, bubbles, visual supports, apps, card games, books, puzzles

Selecting targets: providing examples of targets that would be used during therapy to make progress towards goals

- **“**I would probably look at even just introducing the first 8. Okay? Uh, the first 8 core words, so those usually are uh more, stop, go, (laughs) come, my, I…”
- “…happy, mad, sad, scared…”
- “I think we would move from short vowels to CVCs and then introduce long vowels. Um so we would work on b, bob, and then babe um, later on after he, after he had mastered um, the CVCs.”
- Examples: letters, shapes, colors, core vocabulary, specific target words during an activity (nose, foot, hand; go/stop; your turn/my turn)

Selecting treatment style: indicating or describing therapy style or philosophy to approaching therapy,

- “More my style of therapy is... learning is a hybrid between ABAs, natural environment teaching, and follow their lead…”
- “I am an advocate of using a lot of core vocabulary and fringe vocabulary to go with the core.”
- “…It’s not about pushing people through the door, ever. I was a social worker. I spend a lot of time with people. Um, I wouldn't just do future therapy sessions in an office. They would not be in my office…”
- Includes: Following the child’s or family’s lead, prioritizing the child’s interests, building rapport, getting down and playing on the floor, specifically mentioning spending time getting familiar with the device, establishing session parameters such as frequency or

duration; Phrases like “I always...” “I usually” or “I’m an advocate for…” are typically an indicator for this code

Summarizing: providing a summary of information provided in the case study

- “So it's saying right now that he indicates his wants and needs using by contact gestures and speech approximations.”
- “He's 4 years old and his expressive skills are 15 to 18 month level…”
- “He received the device yesterday.”
- “… Operationally he's navigating 12 pages... but he's using only 1 to 2 words.”