



Communication Competence in the Inclusive Setting

A Review of the Literature

Communication Competence in the Inclusive Setting: A Review of the Literature

Jane Kleinert, Jacqui Kearns, Kristin K. Liu, Martha L. Thurlow, and Sheryl S. Lazarus

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TIES Center
University of Minnesota
215 Pattee Hall
150 Pillsbury Dr. SE • Minneapolis, MN 55455
Phone 612/626-1530
<http://tiescenter.org>
Email: tiescenter@umn.edu

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Executive Summary

Despite a growing national emphasis on the inclusion of students with the most significant cognitive disabilities in general education classrooms with typical peers, research has found that the majority of these students spend the largest part of their school day in self-contained classrooms or separate schools (Kleinert et al., 2015). They often have complex communication needs, with limited receptive and expressive communication skills. A lack of communicative competence, defined broadly, is a major factor working against full inclusion for these students in the general education classroom and curriculum. In addition, limited communication skills can also exclude students from participating in social interactions with typical peers.

There is evidence that students with the most significant disabilities can respond to communication interventions (Snell et al., 2010). The purpose of this literature review was to identify evidenced-based approaches to supporting the development of communicative competence for K-8 students in *inclusive educational settings*. Specifically, the review examined whether communication programming employing augmentative and alternative communication (AAC) is being successfully used in inclusive elementary and middle school settings, and what elements of the communication program are most likely to affect students' communicative competence.

Ten studies published between 1998 and 2018 were identified for inclusion in this review. The strength of the evidence for each study was rated according to two sets of criteria: The Scottish Intercollegiate Criteria that are recommended by the American Speech-Language-Hearing Association and the Levels of Evidence recommended in the Every Student Succeeds Act (ESSA). All 10 studies provided Moderate or Promising Evidence using the ESSA levels.

Interventions

The most frequently used interventions were peer-involvement strategies, collaborative planning or interventions, and aided communication modeling. These three interventions, either alone or in conjunction with another intervention, were the ones with the most strength (i.e., moderate evidence). The evidence-based interventions that educators, administrators, and researchers should consider when designing inclusive programs and supporting increased communicative competence for students with the most significant cognitive disabilities include the following:

Aided Language and Communications Modeling: Our review indicated this strategy to be one of the more effective strategies in an inclusive setting. Aided language or communication modeling involves communication partners using and modeling use of the AAC instrument in all interactions with the target student with complex communication needs.

Peer-mediated Interventions: The research supports the use of peer-mediated interventions to increase communicative competence of students. Approaches vary across researchers, and

include peer network strategies, peer modeling, and teaching peers the use of strategies which foster increased communication by students who use AAC. The importance of peer-mediated strategies cannot be overestimated for successful use of AAC in the classroom.

Collaboration and Teaming: The literature supports careful, consistent, collaborative planning across professionals and families involved in the school program. This means that communication programs cannot be developed in isolation, but must be created and implemented by the speech-language pathologist, the regular and special education teachers, paraprofessionals, other related service personnel as needed, and family members, all of whom regularly interact with the student.

It is of note that some of the most robust research that supported the increase in communicative competence for students with intellectual disability and complex communication needs who use AAC in an inclusive classroom has involved the careful implementation of not just one approach. Data from this review indicated that the coupling or joint use of interventions showed the strongest outcomes for students.

Conclusion

It is important for educators, related services personnel, administrators, and educational policymakers to know that there is moderately strong evidence to support several interventions to enhance the increased communicative competence of students with intellectual disability and complex communication needs who use AAC in inclusive educational settings. Additionally one of the stronger sets of evidence involves consistent, guided interactions with typically developing peers, who are readily accessible in inclusive classrooms. For programs to successfully increase communicative competence for targeted students, it is necessary for teams to work in collaboration for both planning and implementation. School schedules should include time for team members to work together. Joint training on successful, evidenced-based practices would be optimal as well, so that full teams receive the same information at the same time in order to develop strong action plans for their classrooms, and so that there is consistency within and across school districts.

The findings of this analysis of the literature suggested that overall steps should include:

- The development of training materials that embed the most successful intervention strategies (e.g., peer mediated interventions, such as peer supports, peer networks, and peer modeling; aided language modeling with the student's AAC device by communication partners; and collaborative planning).
- Access to such training materials or resources for all team members, including families.

- Further research to determine the effectiveness of such training and implementation of evidence-based practices to improve the communication competence of students with the most significant intellectual disability and complex communication needs.
- Implementation of evidenced-based strategies to increase AAC use and communicative competence with fidelity and consistency in inclusive settings.
- Regular collection of student performance data to assure effectiveness of the intervention selected.

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Introduction

Communication is a right of all persons. Janice Light (1989), a pioneer in the use of augmentative and alternative communication (AAC) for individuals with complex communication needs, has referred to communication as the “essence of human life.” Students with the most significant cognitive disabilities—who frequently exhibit complex communication needs—are at great risk of limited receptive and expressive communication, and are thus at even greater risk of being excluded from meaningful participation in most activities of daily living, such as regular classroom settings, academic curriculum exposure, and social interactions (Chung, Carter, & Sisco, 2012; Thiemann-Bourque, McGuff, & Goldstein, 2017).

Light (1989) defined communicative competence as “a relative and dynamic, interpersonal construct based on functionality of communication, adequacy of communication, and sufficiency of knowledge, judgment and skill in four interrelated domains: linguistic competence, operational competence, social competence, and strategic competence” (p. 137). In 2003, Light noted the additional importance of such factors as motivation and attitude to support the development of communication for individuals who use AAC. Most recently, Light and McNaughton (2014) cited the many changes that have occurred in the field of AAC, including the use of high and low tech AAC systems, the acknowledgement and acceptance of multi-modal expression such as gestures and facial expressions, and the expectation for *participation* in an ever-increasing circle of situations for those who use AAC. There has been an increase in the variety of communications needs so that it goes beyond simple person-to-person interactions, and now includes the use of other technology such as email or social media. As a result of these advances, Light and McNaughton have called for an expanded definition of what actually comprises communicative competence.

All of these advances and changes, however, must be addressed with the provision of functional communication skills to support individuals with complex communication needs. Still, these changes must move beyond just the expression of wants and needs to include “social closeness exchange of information” (Light & McNaughton, 2014, p. 11), as well as full participation at school, at work, with peers, in building friendships, and in self-determined activities.

A pivotal question arises. Are students with the most significant cognitive disabilities and complex communication needs being provided *programming* for the expanded opportunities that should be offered to them?

Extensive research on the communication status of students with the most significant cognitive disabilities (i.e., those students who participate in the states’ alternate assessments used for accountability purposes) has shown that:

- Students with the most significant cognitive disabilities may have more limited communication systems, which is a fundamental barrier to participation in general education (Kearns, Towles-Reeves, Kleinert, Kleinert, & Thomas, 2011).
- Up to 10% of students with the most significant cognitive disabilities leave high school lacking a clear, understandable form of communication (Kearns et al., 2011).
- Only about 7% of students with the most significant cognitive disabilities spend at least 40% of their day in general education classrooms (Kleinert et al., 2015); or to state it conversely, over 90% of students with the most significant cognitive disabilities spend the *majority* of their school day in self-contained classrooms or separate schools.
- There is extensive evidence that students with the most significant cognitive disabilities can successfully respond to communication interventions (Snell et al., 2010).
- There are many interventions that are considered “best practice” in providing communication intervention to students with the most significant cognitive disabilities (Calculator & Black, 2009; O’Neill, Light, & Pope, 2018).
- The use of AAC has been shown to be effective in increasing the level of communication output of students with the most significant cognitive disabilities (Biggs, Carter, Mazur, Barnes, & Bumble, 2018; Gevarter & Zamora, 2018; O’Neill et al., 2018; Reichle, Drager, Caron, & Parker-McGowan, 2016).

This review was conducted to identify evidenced-based approaches to supporting the development of communicative competence in *inclusive educational settings*. Guiding questions included:

- (a) Is communication programming employing AAC for students with the most significant cognitive disabilities and complex communication needs being successfully used in inclusive elementary and middle school settings?
- (b) If so, what elements of communication programming are the most likely to impact communicative competence for these students?

To answer these questions, a systematic review of current literature was completed.

Method

Several criteria were used to identify studies that would provide information on students with an intellectual disability and complex communication needs who are enrolled in preschool, elementary school, or middle school inclusive (regular) education classes. For a study to be in-

cluded, it needed to provide information on outcomes of interventions for increased use of AAC, symbolic communication, or functional communication with peers and adults in a school setting.

Studies pertaining only to “social interaction” were excluded, because the review was focused on the actual use of some form of AAC for communications (symbolic, functional, etc.) in an inclusive school or academic and social settings. Only articles that had a clear research design were to be included in the review.

Search Method

Data searches were conducted using Ebscohost, which included the following sites: Academic Search Complete, Open Dissertations, CINAHL and CINAHL with Full Text, Communication & Mass Media Complete, ERIC, Health Source-Consumer Education, MEDLINE, Primary Search, PsycINFO, and TOPIC search. In addition, the American Speech-Language-Hearing Association (ASHA) Practice Portal was used to identify potential studies. Year parameters were 1998–2018. Search terms included combinations of the following: Severe Disabilities, Intellectual Disabilities, AAC, and Communication Disorders combined with Inclusion, Inclusive Classroom, and Regular Classroom. In addition, searches of citations in relevant articles were also completed. Thus, the specific criteria that had to be met for a study to be included in this literature review are as follows:

- Published from 1998–2018, inclusive;
- Written in English;
- Published in peer-reviewed journal—or as a dissertation—and publicly available;
- Provided outcomes related to an intervention;
- Included students in grades pre-K–8 who were in a general education environment for at least part of the day;
- Included at least one student with a moderate or severe intellectual disability and complex communication needs; and
- Involved communication programming and AAC use in an academic setting or school-related environment (which could include recess or lunch at school).

Coding Procedures

Data were compiled and coded for the following:

- Number of participants in the study,
- Disability categories represented by participants,
- Presence of bilingual participants in the study sample,
- Educational setting/type of classroom,
- Age/grade of participants,
- Type of intervention,
- Dependent and independent variables,
- Outcome description, and
- Degree of strength.

Study quality is an assessment of the extent to which a study was designed and implemented appropriately. There is no single universally accepted set of criteria for what constitutes a high-quality study. Therefore, in this review, two measures of strength of evidence were selected: the Scottish Intercollegiate Guidelines Network and the ESSA Levels of Evidence.

First, we used an adaptation of the Scottish Intercollegiate Guidelines Network (see <https://www.sign.ac.uk/>). These coding procedures are recommended by the American Speech-Language-Hearing Association (2016). The Scottish Intercollegiate Guidelines Network system describes the type of experimental design employed in a research study, and then rates each design as one factor in determining the quality of evidence for a specific intervention or approach used in a research study. The Scottish evidence rating scale deals with treatment efficacy, ranking study quality from highest to lowest credibility (<https://www.asha.org/policy/TR2004-00001/>). It describes six levels of design quality:

- Level 1a: meta-analysis including at least one randomized controlled study
- Level 1b: randomized controlled study
- Level IIa: controlled study with without randomization
- Level IIb: quasi-experimental study
- Level III: non-experimental studies (e.g., correlation or case studies)
- Level IV: expert committee report, consensus conference, authoritative clinical opinion

For additional information and details about the Scottish Intercollegiate Guideline Network see Appendix A.

Additionally, the articles were coded for their Level of Evidence for use as an evidenced-based practice (EBP) as recommended in the Every Student Succeeds Act (ESSA) (U.S. Department of Education, 2016). With this system, specific strategies are judged as having *strong*, *moderate*, or *promising* evidence based on the quality of the research underpinning them. In addition, it addresses the use of interventions based on high-quality research findings and reflects the need for ongoing efforts to monitor the effects of chosen interventions. For additional information and details about the ESSA Levels of Evidence see Appendix B.

Results

Our initial searches yielded 118 resources. Of the 118 resources identified, our parameters identified for exclusion were as follows:

- Five studies that used AAC to teach a skill other than communication (e.g., literacy).
- Ten studies that examined aspects of inclusive education, but were not specific to communication.
- Twelve studies that represented research on developing communication and AAC use, but did not take place in an inclusive setting.
- Nine studies that were included in presentations at conferences or were presented in proceedings from conferences rather than in peer-reviewed publications.
- Six studies that dealt with teacher, peer, or parent perceptions of AAC users.
- Four studies that investigated “social interactions” rather than specifically addressing communication and AAC use in the classroom setting.
- Eighteen studies that described an intervention approach without accompanying data or evidence of success, or that described training for teachers, paraeducators, or speech/language pathologists.
- Eleven studies that described best practice or a specific philosophy for students with intellectual disability.
- Nine resources that contained pedagogical text or articles.

- Seven studies that did not indicate if the participants had intellectual disability, participants had only mild intellectual disability, or the study dealt only with one type of diagnosis (e.g., autism).
- Five studies that only included high school students or adults with intellectual disability.
- Eleven resources that were systematic reviews, but did not concern AAC in inclusive settings only.
- One study did not have full text of the resource available for review.

The remaining 10 research studies met the criteria for this review paper (Biggs, Carter, & Gustafson, 2017; Biggs et al., 2018; Chung & Carter, 2013; Chung et al., 2012; Cosby & Johnston, 2006; Hunt, Soto, Maier, Muller, & Goetz, 2002; Johnston, McDonnell, Nelson, & Magnavito, 2003; Kravits, Kamps, Kemmerer, & Potucek, 2002; Rhodes, 2016; Sonnenmeier, McSheehan, & Jorgensen, 2005). These studies were coded, along with documenting the subjects, findings, and implications. See Appendix C for details.

Overall Characteristics of the Studies Reviewed

As indicated by the inclusion criteria, all studies focused on students in preschool, elementary, or middle school. The studies that met all inclusion criteria were published between 2002 and 2018. They had the following designs and research types: seven single case designs (e.g., multiple probes across participant) (Biggs et al., 2017, 2018; Chung & Carter, 2013; Cosby & Johnston, 2006; Johnston et al., 2003; Kravits et al., 2002; Rhodes, 2016), one observational study (Chung et al., 2012), one case study (Sonnenmeier et al., 2005), and one pre/post quasi-experimental design (Hunt et al., 2002). Of the included studies, nine were quantitative (Biggs et al., 2017, 2018; Chung & Carter, 2013; Cosby & Johnston, 2006; Hunt et al., 2002; Johnston et al., 2003; Kravits et al., 2002; Rhodes, 2016; Sonnenmeier et al., 2005) and one was a qualitative study (Chung et al., 2012).

Variables

Table 1 lists the dependent and independent variables in the nine intervention studies (Biggs et al., 2017, 2018; Chung & Carter, 2013; Cosby & Johnston, 2006; Hunt et al., 2002; Johnston et al., 2003; Kravits et al., 2002; Rhodes, 2016; Sonnenmeier et al., 2005), as well as the dependent variable for the qualitative study (Chung et al., 2012).

Table 1. Dependent and Independent Variables Included in the Intervention Studies

Study	Dependent Variables	Independent Variables
Biggs, Carter, & Gustafson (2017)	<ul style="list-style-type: none"> • Social communication with peers • AAC use • Academic engagement 	<ul style="list-style-type: none"> • Peer support arrangements • Collaborative planning • Paraprofessional training
Biggs, Carter, Mazur, Barnes, & Bumble (2018)	<ul style="list-style-type: none"> • Frequency of social/communicative peer interactions • Percentage of sessions each targeted symbol (AAC) was used 	<ul style="list-style-type: none"> • Peer network intervention • Peer-implemented aided AAC modeling
Chung & Carter (2013)	<ul style="list-style-type: none"> • Peer interaction (quantity, initiator, and number of distinct peers) • Communication modes used • Proximity to speech generating device (SGD) and peer partner • Academic engagement 	<ul style="list-style-type: none"> • Multicomponent intervention package; staff facilitation, peer initiation, and SGD access
Chung, Carter, & Sisco (2012)	<ul style="list-style-type: none"> • Percent of intervals containing communicative/social interaction; interaction characteristics (length, direction, partners, and reciprocity) 	<ul style="list-style-type: none"> • Primary disability • School level • Classroom type • Proximity (to peers, instructors, AAC device)
Cosbey & Johnston (2006)	<ul style="list-style-type: none"> • Frequency of voice output communication aids (VOCA) use • Level of prompting • Consequences of VOCA use 	<ul style="list-style-type: none"> • Naturalistic intervention consisting of creating communication opportunities, physical prompting of target behavior, facilitation of natural consequences, and collaboration
Hunt, Soto, Maier, Muller & Goetz (2002)	<ul style="list-style-type: none"> • Number of academic, social interactions • Classroom engagement as measured by Interaction and Engagement Scale • Frequency of AAC use 	<ul style="list-style-type: none"> • Collaborative school and home “Unified Plans of Support”
Johnston, McDonnell, Nelson, & Magnavito (2003)	<ul style="list-style-type: none"> • Use of AAC and vocalizations to serve targeted pragmatic functions (pretending, transition, attention) • Percentage prompted and unprompted symbolic communication 	<ul style="list-style-type: none"> • Multicomponent intervention • Creating communication opportunities, peer or teacher modeling, prompting, and natural consequences for communication behaviors

Table 1. Dependent and Independent Variables Included in the Intervention Studies (continued)

Study	Dependent Variables	Independent Variables
Kravits, Kamps, Kemmerer, & Potucek (2002)	<ul style="list-style-type: none"> • Frequency of spontaneous language (requests, comments, expansions) 	<ul style="list-style-type: none"> • Picture Exchange Communication System (PECS) instructional phases 1, 2 and 3 (Frost & Bondy, 1994), and “social skills booster sessions”
Rhodes (2016)	<ul style="list-style-type: none"> • Percent of intervals with communication initiation 	<ul style="list-style-type: none"> • Collaboratively developed peer mediated intervention
Sonnenmeier, McSheehan, & Jorgensen (2005)	<ul style="list-style-type: none"> • Increased classroom engagement and learning opportunities • Increased AAC use • Improved staff collaboration 	<ul style="list-style-type: none"> • “Beyond Access” 4-phase collaborative process for design and evaluation of supports

As described in the Methods section, studies were included only if they involved use of AAC and communication programming in an academic setting or school-related environment. Dependent variables—in addition to the increase in use of AAC that were addressed, as well in the included studies—were social interactions with and among peers, varying forms of communicative intents, type and quality of communicative output, increased learning opportunities, and classroom engagement.

The independent variables used in the studies in this review included: peer-mediated interventions (five studies including peer modeling, peer networks, peer support arrangements) (Biggs et al., 2017, 2018; Chung & Carter, 2013; Johnston et al., 2003; Rhodes, 2016), use of Aided AAC Modeling (Biggs et al., 2018; Johnston et al., 2003), collaborative planning (Biggs et al., 2017; Hunt et al., 2002; Rhodes, 2016; Sonnenmeier et al., 2005), creating communication opportunities (Cosbey & Johnston, 2006; Johnston et al., 2003), and natural consequences for communication behaviors (Cosbey & Johnston, 2006; Johnston et al., 2003). Some of the studies used more than one strategy (e.g., peer support networks *and* collaborative planning, or creating communication opportunities *and* using aided AAC modeling). Other studies used a “package” of strategies, such as teacher prompts, creating communication opportunities, environmental arrangement, and direct instruction (Kravits et al., 2002; Cosbey & Johnston, 2006).

Levels of Evidence

Scottish Intercollegiate Guidelines Network

The number of studies based on the level of evidence per *design* as judged by the adapted Scottish Intercollegiate Guidelines Network included: eight at level IIb (well-designed quasi-experimental designs) (Biggs et al., 2017, 2018; Chung & Carter, 2013; Cosbey & Johnston, 2006; Hunt et al., 2002; Johnston et al., 2003; Kravits et al., 2002; Rhodes, 2016), and two at level III (well-designed case study or well-designed observational study) (Chung et al., 2012; Sonnenmeier et al., 2005). Table C-2 in Appendix C displays the level of evidence for all 10 studies reviewed.

ESSA Levels of Evidence

Using the ESSA Levels of Evidence recommended by the U.S. Department of Education, we judged all of the 10 studies reviewed to be of Moderate or Promising evidence. No studies were identified that had Strong evidence. Table 2 presents the targeted behavior, intervention strategies employed, and outcomes of each of the 10 studies.

Table 2: Interventions with Moderate or Promising Evidence

Study	Targeted Behavior	Intervention Strategies Employed	Outcome
Biggs, Carter, & Gustafson (2017)	<ul style="list-style-type: none"> • Communication to and from peers • AAC use 	<ul style="list-style-type: none"> • Collaborative planning • Peer support arrangements 	<ul style="list-style-type: none"> • Increase in communication to and from peers and increase in student AAC use
Biggs, Carter, Mazur, Barnes, & Bumble (2018)	<ul style="list-style-type: none"> • Interactions with peers • Use of AAC and symbolic communication 	<ul style="list-style-type: none"> • Peer network intervention alone • Peer-implemented aided AAC modeling 	<ul style="list-style-type: none"> • Peer networks alone increased peer interactions but not symbolic communication • Peer-implemented aided modeling increased symbolic communication and AAC use
Chung & Carter (2013)	<ul style="list-style-type: none"> • Peer interaction using SGD • Academic engagement 	<ul style="list-style-type: none"> • Multicomponent intervention package; staff facilitation, peer initiation, and SGD access 	<ul style="list-style-type: none"> • Increase in peer interactions (with high variability between classrooms and sessions) • Use of SGD increased • Percent of intervals peers were in close proximity increased • No changes in academic engagement observed

Table 2: Interventions with Moderate or Promising Evidence (continued)

Study	Targeted Behavior	Intervention Strategies Employed	Outcome
Chung, Carter, & Sisco (2012)	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Non-intervention study 	<ul style="list-style-type: none"> • Students with AAC had few initiations and relied on non-verbal output rather than AAC; adults may have inadvertently reduced peer-to-peer communication access to students
Cosbey & Johnston (2006)	<ul style="list-style-type: none"> • Increased VOCA use • Decreased prompt dependence 	<ul style="list-style-type: none"> • Naturalistic intervention consisting of creating communication opportunities, physical prompting of target behavior, facilitation of natural consequences, and collaboration 	<ul style="list-style-type: none"> • Increase in unprompted VOCA use for all participants
Hunt, Soto, Maier, Muller, & Goetz (2002)	<ul style="list-style-type: none"> • Academic interactions • Social interactions • Classroom engagement • Increased AAC use 	<ul style="list-style-type: none"> • Collaborative school and home "Unified Plans of Support" 	<ul style="list-style-type: none"> • Improvements in academic and social interactions, classroom engagement, and AAC use
Johnston, McDonnell, Nelson, & Magnavito (2003)	<ul style="list-style-type: none"> • Increased AAC use 	<ul style="list-style-type: none"> • Creating communication opportunities; peer or teacher modeling, prompting, and natural consequences for communication behaviors 	<ul style="list-style-type: none"> • Increased functional communication behaviors using AAC for all three participants
Kravits, Kamps, Kemmerer, & Potucek (2002)	<ul style="list-style-type: none"> • Spontaneous language generation via AAC or other modes • Frequency of social interactions 	<ul style="list-style-type: none"> • PECS instructional phases 1, 2, and 3 (Rost & Bondy, 1994); Social skills sessions 	<ul style="list-style-type: none"> • Increase in use of spontaneous language in multiple school settings • Evidence of increased duration of social interactions in some settings
Rhodes (2016)	<ul style="list-style-type: none"> • Increased AAC use • Other communication output 	<ul style="list-style-type: none"> • Collaboratively developed peer-mediated intervention 	<ul style="list-style-type: none"> • Increase in use of AAC and other modes of communication across all 4 students with intellectual disability and complex communication needs
Sonnenmeier, McSheehan, & Jorgensen (2005)	<ul style="list-style-type: none"> • Increased learning opportunities • Increased engagement • Increased AAC use 	<ul style="list-style-type: none"> • "Beyond Access" 4-phase collaborative process for design and evaluation of supports 	<ul style="list-style-type: none"> • Increased student engagement • Improved AAC outcomes

Successful Interventions for Students with Intellectual Disabilities

As shown in Table 2, the most *frequently used* interventions were peer-involvement strategies (Biggs et al., 2017, 2018; Johnston et al., 2003; Rhodes, 2016), aided communication modeling (Biggs et al., 2018; Cosbey & Johnston, 2006; Johnston et al., 2003), and collaborative planning or interventions (Biggs et al., 2017; Hunt et al., 2002; Rhodes, 2016; Sonnenmeier et al., 2005). In addition, these three interventions, either alone or in conjunction with another intervention, were those *with the most strength* (i.e., moderate evidence).

Peer-mediated Approaches

Peer-involvement or peer-mediated strategies varied across studies, but typically included teaching typical peers to use or model the AAC system with the student with complex communication needs. Other strategies included specific training for school personnel on how to initiate and sustain interactions with students using AAC or how to function in peer support networks.

Aided Language and Communications Modeling

There is strong evidence provided in previously published literature for modeling the use of AAC by communication partners (Sennott, Light, & McNaughton, 2016). Our review indicated this strategy to be one of the more effective strategies in an inclusive setting. Aided language or communication modeling involves communication partners using and modeling use of the AAC instrument in all interactions with the target student with complex communication needs.

Collaboration

Four studies included the use of collaborative planning that involved school teams or school teams plus home involvement. Approaches varied, as did members of the collaboration teams. Collaboration, when coupled with other effective interventions, were especially successful.

Combined Approaches

Several studies actually employed more than one intervention approach. It is important to note that combining the most effective interventions resulted in very positive outcomes. Two studies (Hunt et al., 2002; Sonnenmeier et al., 2005) that used well-designed *collaboration programs* yielded promising results, but when collaboration models were coupled with peer-support arrangements (Biggs et al., 2017) or peer training (Rhodes, 2016), results had moderate strength.

Biggs et al. (2018) compared the effectiveness of peer network strategies to peer network strategies coupled with peer use of aided-communication modeling. These researchers found that while improved peer interactions occurred with peer network strategies, increased symbolic

communication and AAC use occurred *only* when aided-communication modeling by peers was added to the intervention. Again, the use of aided-communication modeling was more successful in increasing use of AAC by students with intellectual disability and complex communication needs. Two studies used several interventions in a “package” intervention. Cosbey and Johnston, (2006) used a combination of teacher prompting, direct instruction, environmental arrangement, and collaboration successfully. Although the focus of the study by Kravits et al. (2002) was the effectiveness of the PECS approach to increase communicative output from a student with autism and intellectual disability, this approach was coupled with social skills training, natural environments, and direct instruction as well.

Successful Interventions for Students with the Most Significant Cognitive Disabilities Who Participate in or are Eligible for the AA-AAS

In this section, we focus on those students identified as participating in or determined by their Individualized Education Program (IEP) teams to be eligible for participating in their states’ alternate assessments based on alternate achievement standards (AA-AAS). Although this approach eliminates studies focused on younger students (not yet in the grade 3–8 range where AA-AAS are implemented), it provides a useful additional way to look at the evidence base for interventions.

Three studies explicitly indicated that the students they included were participants in their states’ AA-AAS or that the students’ IEP teams had indicated that they were eligible for the AA-AAS (Biggs et al., 2017, 2018; Chung et al., 2012). Biggs et al. (2017) examined the impact of a collaborative planning process to promote communication along with peer modeling of AAC use for four middle school students participating in their state’s AA-AAS. Biggs et al. (2018) examined peer networks with and without peer-aided AAC modeling for four elementary students who also participated in the state alternate assessment. Finally, Chung et al. observed 16 students who used AAC in naturally occurring social/communicative interactions in general education classrooms.

In the two intervention studies, researchers found that the interventions generally increased students’ communication with peers or adults. Biggs et al. (2017) and Biggs et al. (2018) found a substantial increase in unprompted communication to and from peers with the use of peer-aided modeling of AAC. However, this communication did not always involve the use of the AAC device. In some cases, students may have lacked the required symbols on their AAC devices or may not have been able to find the symbols needed to participate in an activity so they relied on other forms of communication (Biggs et al., 2017). In these two studies, students were positive about their interactions with peers and their engagement with classmates increased. In some cases, the general education peers also indicated that they enjoyed the interactions with their classmate who had a significant cognitive disability (Biggs et al., 2018). In both of the studies,

paraprofessionals facilitated the peer interactions due to their greater availability for a research study, but general education teachers were aware of the interventions and believed that the interventions were beneficial and did not require a substantial investment of time.

The Chung et al. (2012) qualitative study of interactions in the general education classroom found that the students who used AAC initiated few interactions. Further, most interactions were with staff personnel, usually paraprofessionals or special educators. In this study, students who used AAC also tended to more often use facial expressions and gestures than they did their AAC. The authors suggested that providing an environment with greater opportunities for interactions would support initiation as well as commenting, refusing, asking questions, sharing, etc.

When AAC Should Be Initiated

Research on the characteristics of students participating in the AA-AAS indicated that 10–12% of these elementary students are described as “pre-symbolic” and another 20% are described as communicating, but do not have a communication system to support the use of symbolic language; further, up to 10% of students with the most significant cognitive disabilities are leaving high school lacking a clear, understandable form of communication (Kearns et al., 2011). These data support the need for implementation of AAC by at least the time that the child is in preschool.

Only one study that involved preschool students met the inclusion criteria of this current literature review (Johnston et al., 2003). One other study with 71 preschool students requiring AAC (Barker, Akaba, Brady, & Thiemann-Bourque, 2013) was found, but the majority of subjects in that study were not in inclusive settings, and thus that study was not included in this review. Both the Barker et al. and Johnston et al. studies indicated that preschool students could successfully use AAC when provided peer and teacher modeling, prompting, and natural consequences for communicative behaviors.

Despite their limitations, the findings of the preschool studies are important because:

- The best time to include students with multiple or intellectual disabilities is preschool and kindergarten through grade 2, when typically they are not yet identified for participation in an alternate assessment, and therefore are not identified as having a “significant cognitive disability.” If students go without a clear communication system until they are identified for the alternate assessment in 3rd grade, then a great amount of time and opportunity to build communicative competence is lost.
- Early AAC use improves communication and does not limit speech development. In fact, speech development is improved, debunking a fairly common misconception that early AAC use (preschool to grade 3) limits speech development, which in turn means that students do not have a means to communicate until grade 3.

- Delaying the determination of a need for AAC until grade 3 exacerbates the potential to miss some vital access to, and use of, AAC needed to optimize inclusive opportunities with peers, family, and others.

Impediments to Use of AAC in the Inclusive Setting

Although several studies included in this review dealt with the target of increasing use of AAC by students with AAC and complex communication needs, Chung et al. (2012) chose to look first at the communicative behaviors of such students in an inclusive setting in an attempt to determine factors that supported or impeded use of AAC in the classroom. Their findings reflect potential target areas for improving AAC use. In general, the students made few initiations, and typically used non-verbal or non-symbolic forms of communication, even though they had access to AAC. The lack of initiation by AAC users is often cited in the literature, perhaps as a result of the primary focus of communication interventions on the functions of responding or requesting only, rather than offering the student a richer menu of communicative opportunities which would support initiation as well as commenting, refusing, asking questions, sharing etc.

Another important finding of Chung et al. (2012) was that the often-used strategy of having dedicated adult support (typically a one-on-one paraprofessional) for students with intellectual disability and complex communication needs in inclusive settings can actually limit or “block” access of the target student and his peers from one another. In an attempt to be helpful, the adult answers for the student with complex communication needs, and thus inadvertently acts as a physical barrier between the student and his or her classroom peers.

Discussion

Use of AAC in Inclusive Settings

Since full participation in an inclusive educational setting can only occur if the student is able to initiate, respond, ask, greet, refuse, share, as well as request, we have focused only on those studies specifically designed to increase or support communicative competence with the use of AAC. Without this competence, the student with complex communication needs may have only physical presence in a regular education classroom. While that student may socially interact with peers in some way, he or she is not meaningfully involved in classroom curricula and task-related interactions when lacking a clear means of communication.

As described in the Results section, this literature review identified 10 studies designed to increase the use of AAC and communicative competence in fully inclusive educational settings. Nine studies reported increased use of AAC for communication in the inclusive setting. The

tenth study (Chung et al., 2012) used observational data to determine the characteristics of communication by students with complex communication needs in an inclusive setting. The three most frequently successful interventions were use of peer-mediated interventions (Biggs et al., 2017, 2018; Johnston et al., 2003; Rhodes, 2016), aided AAC modeling (Biggs et al., 2018; Johnston et al., 2003), and collaborative planning (Biggs et al., 2017; Cosbey & Johnston, 2006; Hunt et al., 2002; Rhodes, 2016; Sonnenmeier et al., 2005). These intervention strategies were used separately or in conjunction with each other, or with an additional strategy in these studies. Johnston et al. (2003) used an intervention package that included peer or teacher modeling of communication/AAC devices coupled with modeling, prompting, and natural consequences to communications. All three children in that study showed strong gains in communication, though authors did not determine which intervention was the strongest. One study compared the use of peer-mediated interventions with the use of aided language modeling by peers, two of the three most frequently successful intervention strategies, on the use of AAC in an inclusive setting. Although the peer-mediated strategies alone increased *social interactions* of students using AAC, the actual *use of AAC increased only when peers used aided language modeling as well*.

What Works

Of the 10 studies included in this review, all of them provided evidence of Moderate Evidence or Promising Evidence using the ESSA levels of strength indicator for their respective interventions (independent variables) for the use of AAC by students with intellectual disability and complex communication needs in inclusive settings (Biggs et al., 2017, 2018; Chung & Carter, 2013; Chung et al., 2012, Cosbey & Johnston, 2006; Hunt et al., 2002; Johnston et al., 2003; Kravits et al., 2002; Rhodes, 2016; Sonnenmeier et al., 2005). There was also one study that was an observational study that described the environmental elements that appeared to support or detract from the use of AAC by students with intellectual disability and complex communication needs (Chung et al., 2012). The relative strength of the evidence found in this review is clearly supportive of the use of AAC in inclusive settings with students having an intellectual disability and complex communication needs. Table 2 describes these studies, their components, and the strength of their findings.

Implications for Program Design

The results of this evidence-based review indicate that increased use of AAC by students with intellectual disability and complex communication needs in regular classroom settings is indeed possible. Based on the ESSA levels of evidence, three approaches—aided language/communication modeling, peer-mediated approaches, and collaboration in both planning and implementation—showed moderate evidentiary strength. Further, the evidence indicates that greater direct interaction between peers with and without disabilities is highly desirable in the inclusive educational setting.

Use of Evidenced-based Interventions

This section lists the evidence-based interventions that educators, administrators, and researchers should consider using when designing programs that are inclusive, and support increased communicative competence and use of AAC for students with intellectual disability and complex communication needs.

Aided Language and Communication Modeling

A full description and tutorial for the evidenced-based intervention of aided communication/language modeling is beyond the scope of this paper. But in brief, aided language and communication modeling involves the use of the student's AAC device by peers and adults when interacting with the student. The use of aided language or communication modeling, especially by peers, when interacting with students who use AAC rose to the top in this literature review (Biggs et al., 2018; Johnston et al., 2003). In general, there is a large amount of very current data for the use of aided communication modeling in the literature on AAC (though not specifically in inclusive settings). These studies provide extensive evidence for the effectiveness of this intervention (Biggs et al., 2018; O'Neill et al., 2018; Sennott et al., 2016). Indeed, one study in the literature by Barker et al. (2013) studied 71 preschool students with developmental disabilities in preschool settings (though not necessarily inclusive classrooms). These researchers found that there was stronger language growth when partner-augmented use of AAC devices by peers was used versus teacher prompting.

The student who uses AAC can feel different and excluded when that student is the only person in the class using a different form of communication. By having others use the student's device when communicating with the student, the student is included and most importantly, receives constant, consistent, modeling for AAC use within natural interactions and in true communication settings. The inclusive setting is the most logical place for this to occur. It is awkward for typical peers to use AAC when they are only with that student on an occasional basis during "peer" time. The inclusive setting allows for frequent, natural interactions, as well as opportunities for a great variety of communicative intents (beyond requesting!) that occur in both academic and social situations.

Peer-mediated Interventions

The research supports the use of peer-mediated interventions to increase communicative competence of students with intellectual disability and complex communication needs. Approaches vary across researchers and include peer network strategies, peer modeling, and teaching peers the use of strategies that foster increased communication by students who use AAC (Biggs et al., 2017, 2018; Rhodes, 2016). There are several recent research articles (e.g., Thiemann-Bourque,

Feldmiller, Hoffman & Johner, 2018; Thiemann et al., 2017) that reflect the importance of peer support and training in increasing social interaction and AAC use for students with complex communication needs. Although these studies were not identified as being conducted in inclusive classroom settings, they provide strong support for engaging peers in assisting our target students in increasing communicative interactions. The ease of access to peers in inclusive classrooms can enhance the usability of such intervention strategies. An inclusive educational placement guarantees access to typical peers required for such interventions. The importance of peer-mediated strategies cannot be overestimated for successful use of AAC in the classroom.

Collaboration and Teaming

The third evidenced-based strategy to support programs to increase communicative competence for students with intellectual disability and complex communication needs who use AAC is that of careful, consistent, collaborative planning across professionals and families involved in the school program. This means that communication programs cannot be developed in isolation, but must be created and implemented by the speech-language pathologist, the regular and special education teachers, paraprofessionals, other related service personnel as needed, and family members, all of whom regularly interact with the student (Biggs et al., 2017; Cosby & Johnston, 2006; Hunt et al., 2002; Rhodes, 2016; Sonnenmeier et al. 2005). This planning not only applies to the target student's communication system, but also to the development of curricular materials, assistive technology, peer training, family inclusion, and a classroom-wide or district-wide shared philosophy. Training of personnel *as teams*, in regard to both the planning and content of interventions, is needed. This, of course, requires some set time for team interaction, and administrative support is thus crucial.

Integration of Evidenced-based Practices: What Works!

It is of note that some of the most robust research that supported the increase in communicative competence for students with intellectual disability and complex communication needs who use AAC in an inclusive classroom has involved the careful implementation of not just one approach. Data from this review indicated that the coupling or joint use of interventions showed the strongest outcomes for students. Traditional, good teaching practices, such as prompting, environmental arrangement, and direct instruction, when coupled with aided language and communication modeling or peer-mediated interventions, were successful. This reflects the importance of collaboration across professionals who come to the table with a variety of intervention approaches, rather than just a “one-size-fits-all approach.”

Teams can no longer decide that because a student has a specific diagnosis, a single designated approach to communication will be used, regardless of student characteristics, learning preferences, or needs. No single approach is sufficient for enhancing successful communication

competence. The literature on “best practice” for communication programming for students with severe intellectual disability and complex communication needs is rife with successful intervention strategies. Calculator and Black (2009) completed a review of the literature on best practice for supporting AAC services to students with severe disabilities who attend inclusive classrooms. Eight experts reviewed and rated 91 practices. It is of interest that their findings mirror those in this current paper’s evidence review. A qualitative analysis of experts’ comments revealed seven major themes, most of which support the element of collaboration and team planning for successful support of AAC use by students in an inclusive setting and the importance of AAC as a support for true participation with peers in typical settings, just as this paper does.

The specific themes reported in Calculator and Black by experts stressed first, the importance of promoting overall inclusive values and the importance of AAC fostering *membership in the community with an emphasis on friendships with peers*. In addition, the following themes were represented and included: collaboration between general and special education teachers; collaboration between educators and related services providers; family involvement; embedded instructional strategies in the *classroom* rather than pull-out treatment; assessing and reporting student progress; scheduling, coordinating, and delivering inclusive services with the use of AAC *throughout the curriculum rather than as a separate AAC or communication goal* [emphasis added]; choosing and planning what to teach; and allowing for various forms of communication as dictated by the demands of the variety of curriculum and functional needs of the student (Calculator & Black, 2009, p. 336).

Limitations

There are several limitations that should be noted for this review. First, variation of interventions and delivery of services occurred across the literature reviewed. For example, the studies included interventions delivered by adults, peers, or a combination of adults and peers. The interventions themselves varied and involved in some cases collaborative planning, or in other cases direct work with the student. Thus, it was not always possible to directly compare the effectiveness of the studies reviewed. Second, inclusion and exclusion criteria may have eliminated some useful evidence. For example, because this review was focused on elementary and middle school aged students in inclusive educational settings, studies were eliminated if subjects included only high school aged students or focused only outside the classroom setting or in self-contained educational settings.

Further, the use of terminology may have inadvertently excluded some articles. Several articles dealt with “peer interactions” but did not indicate the *type* of interactions (i.e., whether use of AAC was involved and whether interactions were focused on increasing type and variety of communicative intents versus simple exposure, participation in activities, or interactions with typical peers). The identification of subjects in several studies was at times vague (e.g., indicating

that students had autism spectrum disorder, but not indicating whether they also had intellectual disability). Those studies were eliminated, but may have had useful information.

As found in this literature review, there is a relatively limited number of studies that have examined increasing communicative competence of students with significant intellectual disability and complex communication needs in inclusive classrooms. A larger number of these studies is needed if practitioners are to have clear guidelines for effective strategies, and if students are to derive maximum benefit from inclusive settings.

Conclusion

It is important for educators, related services personnel, administrators, and educational policymakers to know that there is moderately strong evidence to support several interventions to enhance the increased communicative competence of students with intellectual disability and complex communication needs who use AAC in inclusive educational settings. Additionally one of the stronger sets of evidence involves consistent, guided interactions with typically developing peers, who are readily accessible in an inclusive classroom. For programs to successfully increase communicative competence for targeted students, it is necessary for teams to work in collaboration for both planning and implementation, and that school schedules include time for team members to work together. Joint training on successful, evidenced-based practices would be optimal as well, so that *full teams* receive the same information at the same time in order to develop strong action plans for their classrooms, and within and across school districts.

The findings of this analysis of the literature suggest that overall steps should include:

- The development of training materials that embed the most successful intervention strategies (e.g., peer mediated interventions, such as peer supports, peer networks, and peer modeling; aided language modeling with the student's AAC device by communication partners; and collaborative planning).
- Access to such training materials or resources for all team members, including families.
- Further research to determine the effectiveness of such training and implementation of evidence-based practices to improve the communication competence of students with the most significant intellectual disability and complex communication needs.
- Implementation of evidenced-based strategies to increase AAC use and communicative competence with fidelity and consistency in inclusive settings.

- Regular collection of student performance data to assure effectiveness of the intervention selected.

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Appendix A

Experimental Design Rating (Adapted Version of the Scottish Intercollegiate Guidelines)

For a description of the Scottish Intercollegiate Guidelines Experimental Design Ratings see:

Scottish Intercollegiate Guidelines Network (SIGN): <https://www.sign.ac.uk/>

Cochrane: <http://www.cochrane.org/>

The Scottish Intercollegiate Guidelines is the suggested measure of evidence quality by the American Speech-Language-Hearing Association (ASHA) Recommendations for Assessing the Evidence Based Practices.

<https://www.asha.org/Research/EBP/Evidence-Based-Practice/>

Level	Description
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Ia	Well-designed meta-analysis with >1 randomized controlled trial
Ib	Well-designed randomized controlled study
IIa	Well-designed controlled study without randomization
IIb	Well-designed quasi-experimental study
III	Well-designed non-experimental studies, i.e., correlational and case studies
IV	Expert committee report, consensus conference, clinical experience of respected authorities

Appendix B

Levels of Evidence (U.S. Department of Education in the Every Student Succeeds Act [ESSA])

Source:

U.S. Department of Education. (2016, September). *Non-regulatory guidance: Using evidence to strengthen education investments*. District of Columbia: U.S. Department of Education Office of Elementary and Secondary Education. Retrieved from <https://ed.gov/policy/elsec/leg/essa/guidanceusesinvestment.pdf>

WHAT IS AN “EVIDENCE-BASED” INTERVENTION?

(from section 8101(21)(A) of the 2015 reauthorization of the Elementary and Secondary Education Act—known as ESSA, p. 7)

“...the term ‘evidence-based,’ when used with respect to a State, local educational agency, or school activity, means an activity, strategy, or intervention that –

(i) demonstrates a statistically significant effect on improving student outcomes or other *relevant outcomes* based on –

(I) *strong evidence* from at least one well-designed and well-implemented experimental study;

(II) *moderate evidence* from at least one well-designed and well-implemented *quasi-experimental study*; or

(III) *promising evidence* from at least one well-designed and well-implemented correlational study with statistical controls for selection bias; or

(ii) (I) *demonstrates a rationale* based on high-quality research findings or positive evaluation that such activity, strategy, or intervention is likely to improve student outcomes or other *relevant outcomes*; and

(II) includes ongoing efforts to examine the effects of such activity, strategy, or intervention.

Appendix C

Data Tables

Table C-1: Studies Included in Literature Review and Their Characteristics

Authors	Purpose	Research Method & Design	Participants	Primary Educational Setting	Intervention Setting	Dependent Variables	Independent Variables	Outcomes
Biggs, Carter, & Gustafson (2017)	To evaluate the efficacy and social validity of peer support arrangements planned and implemented by collaborative teams	Quantitative Single-subject, multiple probe across participants with baseline	4 middle school students with severe disabilities, Intellectual Disability who qualified for AA-AAS	All students took at least one general education course, but received most instruction in Special education setting	General education classroom	Social communication with peers AAC use academic engagement	Peer support arrangements Collaborative planning Paraprofessional training	Increase in communication to and from peers and increase in student AAC use
Biggs, Carter, Mazur, Barnes, & Bumble (2018)	Evaluate the effects of a peer network intervention on AAC use	Quantitative Multiple-probe-across-participants design A-B-BC single subject design	4 elementary students in grades 3–4 with Intellectual Disability (ID) or Autism Spectrum Disorder (ASD) who qualified for AA-AAS	Two typically taught in general education setting, two typically taught in special education setting	Inclusive educational settings including but not limited to recess, lunch, and other non-classroom settings	Frequency of peer social/communicative interactions Percentage of sessions each targeted symbol (AAC) was used	Peer network intervention Peer-Implemented Aided AAC Modeling	Networks increased peer interactions but not symbolic communication; Peer-implemented Aided Modeling increased symbolic communication and AAC use

Table C-1: Studies Included in Literature Review and Their Characteristics (continued)

Authors	Purpose	Research Method & Design	Participants	Primary Educational Setting	Intervention Setting	Dependent Variables	Independent Variables	Outcomes
Chung & Carter (2013)	Evaluate effects of intervention (including adult facilitation, peer initiation and access to SGD's) on proximity, peer interaction, communication modes used and academic engagement	Quantitative Multiple baseline across subjects design	Two students age 12 and 11 respectively, both with ID and both take AA-AAS; one used Pro-lowquo2go and the other used Vantage lite; AAC in some settings; student two is likely EL (home language Spanish)	Not provided, required that students attend at least one general education class	General education class	Peer interaction (quantity, initiator, and number of distinct peers) Communication modes used Proximity to SGD and peer partner Academic engagement	Multicomponent intervention package; staff facilitation, peer initiation and SGD access	Increase in peer interactions (with high variability between classrooms and sessions) Use of SGD increased Percent of intervals peers were in close proximity increased No changes in academic engagement observed
Chung, Carter, & Sisco (2012)	Explore social interactions of students with disabilities who use AAC via observational methods in general education settings	Qualitative Observational and coding of behaviors	16 elementary and middle school students with ASD or ID; all students eligible for the AA-AAS	Students had variable levels of participation in general and special education classes	General education classrooms	Percent of intervals containing social/communicative interaction Interaction characteristics (length, direction, partners and reciprocity)	Primary disability School level Classroom type Proximity (to peers, instructors, AAC device)	Students with AAC had few initiations, relied on non-verbal output rather than AAC; adults may inadvertently reduce peer-to-peer communication access to students

Table C-1: Studies Included in Literature Review and Their Characteristics (continued)

Authors	Purpose	Research Method & Design	Participants	Primary Educational Setting	Intervention Setting	Dependent Variables	Independent Variables	Outcomes
Cosbey & Johnston (2006)	Examining effects of an intervention using preference training, prompt fading and time delay to social interactions using a VOCA.	Quantitative Multiple baseline across participants	3 students ages 3–6 years old, moderate cognitive disabilities and Cerebral Palsy (CP)	Fully inclusive pre-school or kindergarten classrooms depending on student age	Same as primary educational setting	Frequency of VOCA use Level of prompting Consequences of VOCA use	Naturalistic intervention consisting of creating communication opportunities, physical prompting of target behavior and facilitation of natural consequences, and collaboration	Increase in unprompted VOCA use for all participants
Hunt, Soto, Maier, Muller, & Goetz (2002)	Evaluate the effectiveness of a team collaboration process for supporting students who use AAC	Quantitative Pre/Post quasi-experimental	3 students grades K, 1, and 5, moderate cognitive disabilities and CP	Inclusive general education classroom	Same as primary educational setting	Number of Academic, social interactions Classroom engagement as measured by Interaction and Engagement Scale Frequency of AAC use	Collaborative school and home “Unified Plans of Support”	Improvements in academics, social interactions, classroom engagement and AAC use

Table C-1: Studies Included in Literature Review and Their Characteristics (continued)

Authors	Purpose	Research Method & Design	Participants	Primary Educational Setting	Intervention Setting	Dependent Variables	Independent Variables	Outcomes
Johnston, McDonnell, Nelson, & Magnavito (2003)	Examine the effectiveness of an AAC intervention (including, modeling, prompting, and consequences) on preschool children	Quantitative Single-case design	3 preschool students; DD and severe, multiple disabilities for one student	Preschool classroom enrolling both students with and without disabilities	Same as primary educational setting	Use of AAC and vocalizations to serve targeted pragmatic functions (pretending, transition, attention) Percentage prompted and unprompted symbolic communication	Multicomponent intervention; creating communication opportunities, peer or teacher modeling, prompting and natural consequences for communication behaviors	Functional communication increased using AAC for all three participants
Kravits, Kamps, Kemmerer, & Potucek (2002)	Examine the effects of PECS spontaneous communication of a student in home and school settings	Quantitative Multiple-baseline across settings	1 student, six years old with ASD	Mainstream half-day kindergarten class	Same as primary educational setting	Frequency of spontaneous language (requests, comments, expansions) Duration of social interactions	PECS instructional phases 1, 2 and 3 (Rost & Bondy, 1994) and social skills sessions	Increase in total frequency of spontaneous language in multiple school settings using PECS Evidence of increased duration of social interactions in some settings

Table C-1: Studies Included in Literature Review and Their Characteristics (continued)

Authors	Purpose	Research Method & Design	Participants	Primary Educational Setting	Intervention Setting	Dependent Variables	Independent Variables	Outcomes
Rhodes (2016)	Examine the effects of a collaboratively developed peer-mediated intervention on social communication skills	Quantitative Single-case design	12 students in four triads (2 typical and 1 with DD, ASD, or ID) in elementary and middle school	Special Education classroom for approximately 80% of the day	Mainstream general education classroom	Percent of intervals with communication initiation	Collaboratively developed peer-mediated intervention	Increase in use of AAC and other modes of communication across all 4 students with ID and complex communication needs
Sonnenmeier, McSheehan, & Jorgensen (2005)	Describe implementation challenges and outcomes of "Beyond Access" a model for planning student supports and AAC	Quantitative Well-designed case study	1 student, 10 years old with ASD and ID	Parallel curriculum implemented in general education class	Same as primary educational setting	Increased classroom engagement and learning opportunities Increased AAC use Improved staff collaboration	"Beyond Access" 4-phase collaborative process for design and evaluation of supports	Increased student engagement and improved AAC outcomes

* Adapted from the Scottish Intercollegiate Guidelines Network: <http://www.cochrane.org/>

** Quality of Evidence per ESSA criteria, USDE, November 29, 2016 (81 FR 86076).

Table C-2: Evidence Analysis of Research Studies on AAC Use in the Inclusive Classroom Setting

Authors	Scottish Level of Evidence	ESSA
Biggs et al. (2017)	IIb	II Moderate evidence
Biggs et al. (2018)	IIb	II Moderate evidence
Chung & Carter (2013)	IIb	II Moderate evidence
Chung et al. (2012)	III	III Promising evidence
Cosbey & Johnston (2006)	IIb	II Moderate evidence
Hunt et al. (2002)	IIb	II Moderate evidence
Johnston et al. (2003)	IIb	II Moderate evidence
Kravits et al. (2002)	IIb	II Moderate evidence
Rhodes et al. (2016)	IIb	II Moderate evidence
Sonnenmeier et al. (2005)	III	III Promising evidence
TOTAL: 10		

* Adapted from the Scottish Intercollegiate Guidelines Network: <http://www.cochrane.org/>

** Quality of Evidence per ESSA criteria, USDE, November 29, 2016 (81 FR 86076).

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