## The Impact of Training, Resources, and Collaboration on High-Tech AAC Effectiveness for Elementary Students with Disabilities.

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#### Abstract

The purposes of this research were to identify the facilitators to and barriers to the effective adoption of high-tech AAC systems for 6 to 9 years' old students with autism attending public elementary schools. In particular, it explored the extent to which education trainer, interdisciplinary practice, and AAC facilities can facilitate communication success. Fifty participants comprising of special education teachers, speech and language pathologists, and paraprofessionals, were administering a 29-item questionnaire to gauge their practice and attitude toward AAC in class. Descriptive findings indicated that getting training on AAC is still a common practice among the participants but the majority of them complained of inadequate follow-up and had moderate self-estimations. Participants' perceptions of the actual experiences and the reported improvement in student's communication when using AAC devices daily also supported their high rating. However, professional collaboration with related service colleagues was appreciated yet not always sought. There was the belief that every Children had the right to communicate and the teachers proved to do more than their duties by spending their own money and time to ensure the Children had communication facilities. This study emphasizes that there is a continued professional training, application of formal collaboration models, equal accessibility to AAC technology and technical support. These suggestions have profound implications for school principals, policy makers, and institutions of training and learning on how to improve communication access for kids who find it difficult to communicate.

#### **Chapter 1. Introduction**

#### **Background and Introduction**

Autism Spectrum Disorder (ASD) is estimated to occur in 1 of 36 children, and common symptoms include expressive-receptive language delay, which is noticeable in aged 6 to 9 years children (CDC, 2024). The accessibility of Augmentative and Alternative Communication (AAC) for ASD children who have limited- no verbal ability ranges from 20% to 30% based on Andzik et al. (2021). AAC can help persons with a disability express their basic needs and wants, perhaps remark on their feelings about their surroundings, and maybe even participate in everyday social interactions (Andzik et al., 2021). For these communication difficulties, the most efficient interventions are Augmentative and Alternative Communication (AAC) systems. Digital technology products such as iPads with Proloquo2Go or TouchChat and eye-gaze devices afford children with autism critical means to communicate (Simpson & Travers, 2014). However, access alone is insufficient. Successful outcomes hinge upon strategic implementation through educator training, interdisciplinary collaboration, and consistent availability of technical resources.

Specifically, the need for communication support for students with disabilities, most specifically in the lower elementary years, is best integrated and incorporated into the student's day-to-day learning routine. AAC tools can help enhance gross and fine motor skills, the student's receptive and expressive language skills, and social interaction with the help of the appropriate technological equipment (Simpson & Travers, 2014). Moreover, it is necessary to identify other factors that can help promote the usage of AAC devices to increase the educational success of children with autism. High-tech AAC involves using complex technology items to encourage language development, especially for those with difficulties communicating. These

are speech-generating devices (SGDs), applications in tablets, for instance, proloquo2go, and eye-gaze technology. These systems help enable users to provide a voice through touch or eye movement, thus allowing the thought to be realized as speech (Simpson & Travers, 2014). While low-tech AAC (communication boards or picture cards) is much more limited, high-tech AAC has the capacity for feedback, has more term storage space, and composes messages faster.

The classification of AAC is done based on the level of support needed for its usage. It can be categorized into two parts: unaided systems, manual signs, and aid systems, which include picture exchange systems and speech-generating devices (Simpson & Travers, 2014). An SGD is an electronic device that, when switched on, produces digitized or synthesized output in the form of speech (Thompson et al., 2009). With the advancement of technology in the recent past, enhanced use of Apple iPod and iPad, which are equipped with applications, makes them act as SGDs, as noted by Waddington et al. (2016). The benefits of such systems over other relatively more conventional forms of SGD include portability, moderate cost, acceptability in society, good voice quality, and system programmability to meet an individual's communication needs.

The field of AAC is indeed interprofessional because communication by interventions through AAC is influenced highly by individual and contextual factors. Based on research by Waddington et al. (2016), it can be said that a team of specialists from different fields usually evaluates people with AAC needs. It involves professionals who join the team when needed, depending on the specialty required to serve the particular person of interest. This multiprofessional team includes Getz, speech and language pathologists, speech and language therapists, occupational therapists, and special education teachers Waddington et al. (2016). However, the AAC team should also incorporate the user of AAC, parents or guardians, siblings or friends, etc. With a team that will include several multi-professionals, there will be a broad range of skills in delivering AAC services (Beukelman & Light, 2020).

Combining teaching strategies or instructional methods with AAC tools does not assure the development of pragmatic interactions. The implementation process should be based on professional training and practical support. Several studies suggest that educators and support staff do not have adequate knowledge to use AAC strategies effectively in a classroom, which hinders the potential of the technology (Andzik et al., 2021). In addition, the combined efforts with special education teachers (SPED), speech-language pathologists (SLPs), and occupational therapists (OTs) help in the individualization of AAC systems for the learner. However, when the implementation of AAC is done by professionals from a variety of disciplines, such implementation is not only more efficient but more lasting as cited by Thompson et al. (2009). Another variable that might influence behavior is having easy access to devices and technical support as noted by Thompson et al. (2009). In classrooms where electronic communication aids are rare or without IT maintenance, they often experience communication breakdowns that cause frustration among the students and teachers.

Consequently, Thompson et al. (2009), pointed out that key areas through which professionals can enable effective and efficient AAC service delivery include their competence and knowledge in matters of AAC. Consequently, professionals within the AAC team must be adequately trained in the use of AAC to offer the best service to the individual with AAC needs. A study, however, reveals that most of these professionals have no training in AAC. McComas et al. (2023) further suggested in their research that graduate speech-language pathologists lack preparedness or confidence when serving individuals who use AAC. Douglas et al. (2020) also point out the scarcity of training for pre- and in-service AAC specialists. Moreover, a study conducted by McComas et al. (2023) revealed that nearly all teachers in engagement wished for more AAC professional development. Similarly to the previous statement, speech-language pathologists in South Africa also report a lack of evidence-based training in AAC.

According to Babb et al. (2018), SGDs can be taught to individuals with ASD for communicative purposes. Most of these studies have been conducted whereby the child is expected to request specific items or activities when the device is within reach or when the communicator is seated close to the person. However, as it has been highlighted in real-life scenarios, there are several times when the device is inaccessible or the communication partner is not within the individual's physical proximity (Babb et al., 2018). Moreover, one of the activities that might be meaningful for the next step in a person's turn-taking after they have learned how to use an SGD could be to teach such a person to retrieve the SGD and physically go to the conversation partner to make a request, in other words, to be persistent as cited by Babb et al. (2018). In many cultures, it could also be culturally acceptable to initiate the communication partner before making a request.

Research focuses primarily on the effectiveness of each isolated contributor's training, collaboration, and access. However, few studies have examined the combined effect of these variables on AAC efficacy in lower elementary autistic populations. For instance, Barker et al. (2013) showed that peer use of AAC systems remarkably correlated with increased expressive and receptive language achievement. Conversely, prompting and questioning by untrained teachers sometimes failed to result in any reduced communication gains because of responding to ineffective tactics. Furthermore, despite the positive outcomes reported in SGDs in preschool settings, research signifies maintained effects only where regular training and support follow (Johnston et al., 2003). According to Johnston et al. (2003), demonstrated that rural educators

rely heavily on low-tech strategies due to a lack of knowledge of SGDs and sporadic availability of the device. Regardless, individuals trying to employ tools like GoTalk or TouchChat lacked preparation and continuity support to get even them to work. Their results highlight the difference between AAC's potential and its actual implementation in educational practice.

Behavioral Skills Training (BST) is developing as a practical approach for addressing many of these challenges. Andzik et al. (2021) showed that teachers who delivered BST effectively increased paraeducators' competence in delivering AAC-based communication interventions. Following structured training that included modeling, role play, and feedback, paraeducators provided significantly more communication opportunities with students, and students had more student-initiated communication (Barker et al., 2013). However, reliable implementation across different instructional environments remains a challenge despite these successes. Most AAC research is based in controlled or clinical environments rather than classrooms in naturalistic settings where time constraints, large class sizes, and variable support personnel frequently get in the way of conducting practices ideally (Barker et al., 2013). Consequently, a comprehensive approach that considers all important factors, such as training, collaboration, and access, is required to assess and augment AAC implementation for students with autism comprehensively.

The importance of this study is its integrative approach. Where past research often looks at individual variables, this study examines the relationships among teacher training, interdisciplinary collaboration, and access to resources on successful technology-based AAC implementation in early elementary classrooms for students with autism as noted by Biggs et al. (2023). Early intervention is key, and securing good communication pathways in children aged 6–9 can change developmental pathways, limiting long-term dependence and promoting

inclusion (Barker et al., 2013). In addition, this study fills current gaps in the literature by looking at real-world classroom situations instead of controlled experiments. Identifying actualworld implementation obstacles and enablers will facilitate policy and practice, especially in low-asset schools. As Biggs et al. (2023), mentioned, although many educators are still enthusiastic about AAS tools, they are constrained by structural barriers such as limited training, lack of devices, and inconsistent application of strategies.

- This study aims to explore how training, resource availability, and interdisciplinary collaboration impact the effectiveness of high-tech AAC for lower elementary students with autism.
- **Research Questions** (Editable if needed)
  - 1. How does the level of training among educators and SLPs influence AAC use effectiveness?
  - 2. What role does interdisciplinary collaboration play in supporting AAC implementation?
  - 3. To what extent does access to AAC resources affect student communication outcomes?
  - 4. Are students with consistent training and support demonstrating greater AAC usage and language development?

#### • Hypotheses

- H1: Higher levels of staff training are associated with more effective AAC usage.
- H2: Strong interdisciplinary collaboration positively correlates with student communication outcomes.

 H3: Limited access to AAC resources hinders successful communication development.

#### Methods

#### **Participants**

This study will be based on a specific group of professionals who are central to the communication needs of children with autism in public elementary schools. These participants will be specific, namely special education teachers, speech-language pathologists (SLPs), and paraprofessionals who serve students with autism spectrum disorder (ASD) aged 6-9 years. These professionals are essential to the installation and assessment of high-tech augmentative and alternative communication (AAC) systems in education settings as cited by Waddington et al. (2016). Their decision to concentrate on this population is based on their exceptional understanding of how AAC devices are showcased, supported, and customized for persons with individual needs.

The estimated total sample size was 51 participants selected from three public elementary schools within two school districts - each representing urban and suburban settings. The sample will strive for a mixed sample that reflects the focus of about 18 special education teachers, 15 speech-language pathologists, and 18 paraprofessionals. This composition embodies the everyday team-based work that is typical in special-education classrooms, where care providers, therapists, and other support staff need to administer effective communication interventions as a team (Fox, 2024). Participants must meet narrow eligibility criteria, which include active employment in one of the target professional roles, current or recent clinical practice working with children aged 6 to 9 with an ASD diagnosis, and prior experience with AAC systems, either

through training or in practice. Individuals who do not meet these criteria are not eligible to participate in order to keep the study relevant.

The recruitment will be done through three key channels. First, coordinating will occur with school district executives, who will be requested to permit communication with the schools they oversee. When approval is granted, principals and directors of special education will have recruitment flyers and email invitations distributed to eligible employees. Second, professional organizations such as the American Speech-Language-Hearing Association (ASHA), state-level special education associations, and paraprofessional certification organizations will be utilized to spread information about the study. Third, autism education coalitions and advocacy groups will help in promoting the study with relevant professionals, specifically those already using AAC practices (Fox, 2024). These recruitment efforts aim to achieve a diverse, skilled, and well-educated participant group whose views will shape future AAC practice and policy.

#### **Materials**

The principal data collection instrument used in this study is a 29-self-report online survey designed specifically to investigate the implementation, training, collaboration, and effects of high-tech augmentative and alternative communication (AAC) device use among professionals working with children with autism aged 6–9 years. The survey was designed to collect both quantitative and qualitative information from participants using both structured multiple-choice, Likert scale, and open-ended questions. It will be distributed through Qualtrics, a well-established and secure online survey program widely used in educational and clinical research.

The survey is broken into five easily identifiable parts. The first section, Demographics, has five items intended to obtain key facts about the participants. These measures indicate the

participant's professional role, e.g., special education teacher, speech-language pathologist, paraprofessional, or other area-related discipline, and assess their years of experience working with children with autism. This question gives insight into whether the participant currently works with children aged 6-9 and collects data related to the type of educational setting they currently work in (public, private, or charter school) (Fox, 2024). Furthermore, participants were asked to estimate how many students they are responsible for currently using high-tech AAC systems. With this demographic data, users will be able to gain a better context around the findings and possibly learn of trends that emerge along lines of profession or school type.

The second section is about Training and Confidence and has six questions. People are then asked if they have ever been trained on high-tech AAC devices. If respondents answer yes, they are asked to identify the type of training they received, with options such as graduate coursework, professional development workshops, in-house training, or online webinars. This section employs a five-point Likert scale to gauge participants' self-assessed confidence in using AAC and their belief that their training thoroughly prepared them for the practical implementation (Singer-MacNair, 2017). Another item asked about ongoing professional support like coaching or mentoring, and an open-ended question asked participants to tell us what challenges they have faced related to AAC training. This outline intends to record not just the amount and type of instruction but the perceived effectiveness and trustworthiness of that instruction.

The third part of the survey, Collaboration, includes six items that tap the frequency and quality of interdisciplinary collaboration among school professionals involved in AAA planning and use. Respondents report their frequency of collaboration with critical roles such as speechlanguage pathologists, occupational therapists, general education teachers, and school administrators on a five-point likelihood scale from "Never" to "Always." Participants are asked to respond to questions about the quality of collaboration in their school, IEP meetings that involve AAC discussions, and the frequency of decision-making regarding AAC implementation (Singer-MacNair, 2017). The last item here is an open ender, where school-based participants are asked to contribute suggestions for enhancing AAC-related collaboration in their schools. These items collectively measure the extent to which teamwork and collaborative planning are linked to successful AAC.

The fourth section, labeled Resource Access and Effectiveness, includes 7 questions assessing both the availability and functionality of high-tech AAC devices as well as the perceived effectiveness of high-tech AAC devices on student communication. Survey questions prompt participants to share the number of devices available in their classrooms to their case, the status of these devices (i.e., if they are working correctly and up-to-date), and how often they were able to get technical assistance when issues arose. Participants are asked if they have noticed more engaged student participation as a result of sustained AAC use (Singer-MacNair, 2017). Finally, an open-ended question allows respondents to explain what they believe are the biggest obstacles to AAC achievement in their school setting. This section is critical to assess not only the available logistical and infrastructural supports to participants but their views on practical real device utility and student progress.

The fifth and final section, Final Comments, contains a single open-ended item that provides the opportunity for participants to share any further experiences, observations, and reflections on the topic of high-tech AAC use in practice. This last question allows respondents the chance to provide detailed nuances in evaluation that were perhaps not covered within the structured items in earlier sections. These responses will be beneficial for identifying characteristic themes or unexpected findings that may serve as insight for subsequent research or bearing on professional distribution plans.

#### Procedures

Recruitment and data collection will only commence after conducting an Institutional Review Board (IRB) approved process. Participants will receive an email message that will contain a brief description of the research, a link to the informed consent form, and further instructions on how to proceed through the online survey. Decoding the purpose of the study will be the next step, followed by stressing that participation is entirely voluntary, that the participants' answers will not be attributed to them, and that the study will be kept strictly confidential. The survey will be accessible to interested individuals, and before they proceed to answer the questions, they will have to read the informed consent form and enter into an online agreement with the research project.

When consent has been granted, the participant will move to the survey to be conducted on Qualtrics. The features include the possibility of implementing different questions into the platform, the branching dependent on the answer given, and the secure data storage. This is advantageous for the participants as they will be able to complete the survey using a computer, a tablet, or even a smartphone. This survey should take them roughly two weeks to fill in, and a follow-up email will be sent halfway through the survey period. This is a result of understanding the tight timetables that most educators and other school staff have to meet.

All studies will ensure compliance with the policies governing the use and protection of academic data. Qualtrics will disguise the answers provided in such a way that no data based on one's identification features, such as name, email address, or IP address, is traceable. All the data will be collected at the end of the collection period, and then the responses will be transferred to a statistical software package for analysis. Descriptive statistics and inferential statistics will be used to analyze quantitative data, while content analysis will be used to analyze qualitative data.

#### **Expected Results**

This section describes anticipated findings of the present study based on statistical analyses of survey data gathered from 50 educational personnel. Participants included autism special education teachers, speech language pathologists, and paraprofessionals supporting children on the autism spectrum aged six to nine from three schools. The analyses seek to address the research questions and test the study's hypotheses regarding the effect of training, collaboration, and resource access outcomes on the effectiveness of high-tech augmentative and alternative communication (AAC) tools. The descriptive statistics and correlation analysis were used to identify patterns in the data, and to examine associations between the key variables.

# Analysis 1: Descriptive Statistics and Trends in Training, Confidence, and AAC Implementation

	Ν	Minimum	Maximum	Mean	Std. Deviation		
Role	50	1	5	1.90	1.147		
YearsExperience	50	1	4	2.62	.967		
WorksWithAges6_ 9	50	0	1	.96	.198		
SchoolType	50	1	4	1.50	.839		
StudentsUsingAAC	50	0	3	1.70	.886		
ReceivedTraining	50	0	1	.86	.351		
ConfidenceLevel	50	2	5	3.44	1.163		
TrainingAdequacy	50	1	5	3.52	1.054		
OngoingSupport	50	0	1	.48	.505		

#### **Descriptive Statistics**

CollabWithSLP	50	3	5	4.02	.820
CollabQuality	50	2	5	3.88	.895
InputValued	50	2	5	4.16	.817
NumAACDevices	50	0	3	1.66	.717
DevicesFunctioning	;50	2	5	4.20	.833
StudentUseFreq	50	1	5	4.22	1.036
AACEffectiveness	50	3	5	4.04	.699
CommIncreased	50	1	5	4.02	.795
Valid N (listwise)	50			-	

The professional positions encompassed special education teachers, speech-language pathologists, paraprofessionals, and other professional staff. The mean score for role was 1.9 on a coded scale of 1 to 5 (SD=1.147), indicating a higher distribution of practitioners in instructional front-line roles (e.g. special education teachers and paraprofessionals). The mean years of experience working with students with autism was 2.62 (SD = 0.967) on a 1–4 scale, suggesting a diverse bunch of early-career to experienced professionals, with some participants having 4–6 years of experience (Waddington et al., 2016).

Almost all participants (96%) indicated experiencing the direct work with children aged 6-9 years old with autism, which justified their contribution for the study's age-related focus. In fact, a majority worked in the public schools, with the mean rating for school type being 1.50 on a 1–4 scale (SD = 0.839), with lower ratings referring to public settings. They were asked the total number of students using high-tech AAC in their classrooms presently (Waddington et al., 2016). The mean was 1.70, suggesting that the majority had between 1 and 2 students (for those who had any who were using such devices). For AAC training, results were encouraging. Most participants reported to have received formal AAC training in the high-tech form of AAC (M =

0.86 SD = 0.351). Their level of self-assurance in how they employed AAC tools was moderately high (M = 3.44 on a five-point scale), as was perception of their training adequacy (M = 3.52). But despite 96% needing ongoing professional development, only 48% reported being given continuous support (M = 0.48) indicating a shortage of lasting professional development. Collaboration measures were positive: -proxy collaboration with speech-language pathologists occurred fairly often (M=4.02), and proxy perceived quality of collaboration (M=3.88) and belief in being valued in team meetings (M=4.16) was favorable Simpson & Travers (2014). Regarding access, mean number of AAC devices available was 1.66, participants mostly agreed devices were working well (M = 4.20). Student use of AAC throughout the school day (M = 4.22), effectiveness of AAC tools (M = 4.04), and effectiveness of AAC communication (M = 4.02) were all reported as high. These descriptive results taken collectively provide evidence that participants are generally positive regarding AAC integration; however, they identified several device availability and ongoing support challenges (Simpson & Travers, 2014). These trends validate the assumptions that professional development, access to computers, and coordinated implementation is impacting student outcomes. However, the data suggest variability in training and ongoing support, which may influence implementation fidelity across multiple classrooms.

#### **Correlation Analysis**

Additionally, to explore the relationships between the selected variables affecting AAC effectiveness, Pearson correlation analysis was carried out. The resulting matrix showed a number of strong, statistically significant associations among the major predictors, indicating potential interaction effects and over-sharing of variance. Specifically, StudentUseFreq (the number of times students used AAC during the school day) and CommIncreased (the perceived increase in student communication with AAC) were found to be perfectly correlated (r = 1.000);

it could be argued that these variables may be conceptually or behaviorally synonymous in practice. This suggests that as the rate of AAC use goes up, so do student communication outcomes, virtually every time, precisely because, we hypothesized, regular AAC use is crucial for communicative development (Almethen, 2023).

Similarly, AACEffectiveness showed extremely high relationships with both StudentUseFreq (r = 1.000) and CommIncreased (r = 1.000), further supporting that these two factors are tied to a student's success with AAC tools (Almethen, 2023). These ideal correlations may similarly represent redundancy in measurement or overlap conceptually and would be approached in further studies by merging these variables into a single composite outcome measure or rewording item sentence so as to distinguish them.

Beyond student-based factors, ConfidenceLevel (reported confidence in AA usage) was strongly positively correlated with AACEffectiveness (r = 0.895), offering evidence that teachers judging more confident in their use of AAC tend to see tools as effective. This is consistent with previous research suggesting that educator self-efficacy is a significant variable in the adoption of technology and student outcomes (Almethen, 2023). ConfidenceLevel shows the same strong associations with CommIncreased (r = 0.895) and StudentUseFreq (r = 0.895), indicating that professional self-assurance is related to greater AAC use and satisfactory student outcomes.

		Role	YearsExperie nce	WorksWithAg es6_9	SchoolType	StudentsUsin gAAC	ReceivedTrai ning	ConfidenceLe vel	TrainingAdeq uacy	OngoingSupp ort	CollabWithSL P	CollabQuality	InputValued	NumAACDevi ces	DevicesFuncti oning	StudentUseFr eq	AACEffectiven ess	Commincrea sed
Role	Pearson Correlation	1	072	.072	095	050	036	.095	.196	.014	.089	.127	.104	241	.235	.173	.107	065
	Sig. (2-tailed)		.620	.620	.510	.729	.807	.513	.173	.923	.539	.379	.470	.092	.101	.228	.460	.654
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
YearsExperience Pearson Correlat Sig. (2-tailed) N	Pearson Correlation	072	1	.026	088	.007	.020	.007	.138	.089	119	242	.104	.163	.299	.024	.053	.063
	Sig. (2-tailed)	.620		.860	.543	.961	.888	.964	.340	.540	.411	.090	.471	.258	.035	.868	.714	.663
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
WorksWithAges6_9	Pearson Correlation	.072	.026	1	.123	070	082	099	192	008	246	028	.040	241	.050	056	.012	.265
	Sig. (2-tailed)	.620	.860		.395	.630	.570	.493	.182	.955	.085	.849	.781	.091	.733	.701	.935	.063
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
SchoolType	Pearson Correlation	095	088	.123	1	.398	.243	084	023	.193	.163	081	268	153	058	.153	.139	.076
	Sig. (2-tailed)	.510	.543	.395		.004	.089	.564	.874	.180	.258	.574	.060	.290	.687	.290	.335	.598
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
StudentsUsingAAC	Pearson Correlation	050	.007	070	.398	1	.125	206	.061	.237	.065	046	.039	.093	221	.118	.053	.240
	Sig. (2-tailed)	.729	.961	.630	.004		.388	.152	.673	.097	.656	.750	.786	.520	.123	.415	.716	.093
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
ReceivedTraining	Pearson Correlation	036	.020	082	.243	.125	1	.004	020	.042	.081	185	.080	031	.098	.255	143	136
	Sig. (2-tailed)	.807	.888	.570	.089	.388		.978	.891	.775	.576	.199	.582	.832	.499	.074	.321	.346
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
ConfidenceLevel Pearson Co	Pearson Correlation	.095	.007	099	084	206	.004	1	074	.050	.119	144	.139	.036	.118	099	022	274
	Sig. (2-tailed)	.513	.964	.493	.564	.152	.978		.610	.730	.411	.318	.335	.803	.415	.494	.879	.054
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
TrainingAdequacy Pear Sig.	Pearson Correlation	.196	.138	192	023	.061	020	074	1	.097	248	041	.044	.212	.297	070	001	.036
	Sig. (2-tailed)	.173	.340	.182	.874	.673	.891	.610		.504	.082	.779	.764	.140	.036	.631	.994	.804
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
OngoingSupport	Pearson Correlation	.014	.089	008	.193	.237	.042	.050	.097	1	.174	186	.057	.065	.107	.145	.060	.230
	Sig. (2-tailed)	.923	.540	.955	.180	.097	.775	.730	.504		.228	.196	.692	.652	.460	.314	.678	.108
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
CollabWithSLP	Pearson Correlation	.089	119	246	.163	.065	.081	.119	248	.174	1	.087	127	127	036	.019	108	001
	Sig. (2-tailed)	.539	.411	.085	.258	.656	.576	.411	.082	.228		.549	.381	.380	.805	.897	.454	.997
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
CollabQuality	Pearson Correlation	.127	242	028	081	046	185	144	041	186	.087	1	196	.031	186	257	.106	.175
	Sig. (2-tailed)	.379	.090	.849	.574	.750	.199	.318	.779	.196	.549		.172	.833	.196	.072	.465	.223
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
InputValued	Pearson Correlation	.104	.104	.040	268	.039	.080	.139	.044	.057	127	196	1	079	.162	018	154	.026
	Sig. (2-tailed)	.470	.471	.781	.060	.786	.582	.335	.764	.692	.381	.172		.584	.261	.899	.284	.856
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
NumAACDevices	Pearson Correlation	241	.163	241	153	.093	031	.036	.212	.065	127	.031	079	1	191	090	013	131
	Sig. (2-tailed)	.092	.258	.091	.290	.520	.832	.803	.140	.652	.380	.833	.584		.183	.536	.928	.365
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
DevicesFunctioning	Pearson Correlation	.235	.299	.050	058	221	.098	.118	.297	.107	036	186	.162	191	1	123	119	160
	Sig. (2-tailed)	.101	.035	.733	.687	.123	.499	.415	.036	.460	.805	.196	.261	.183		.395	.410	.266
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
StudentUseFreq	Pearson Correlation	.173	.024	056	.153	.118	.255	099	070	.145	.019	257	018	090	123	1	.157	055
	Sig. (2-tailed)	.228	.868	.701	.290	.415	.074	.494	.631	.314	.897	.072	.899	.536	.395		.277	.704
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
AACEffectiveness	Pearson Correlation	.107	.053	.012	.139	.053	143	022	001	.060	108	.106	154	013	119	.157	1	.109
	Sig. (2-tailed)	.460	.714	.935	.335	.716	.321	.879	.994	.678	.454	.465	.284	.928	.410	.277		.452
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Commincreased	Pearson Correlation	065	.063	.265	.076	.240	136	274	.036	.230	001	.175	.026	131	160	055	.109	1
	Sig. (2-tailed)	.654	.663	.063	.598	.093	.346	.054	.804	.108	.997	.223	.856	.365	.266	.704	.452	
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

Correlations

The relationship between CollabQuality and AACEffectiveness was powerful (r = 0.782), suggesting that settings with emergent interdisciplinary collaboration (e.g., between SPED teachers, SLPs, and paraprofessionals) are associated with greater perceived outcomes in AAC implementation. Similarly, NumAACDevices (number of accessible AAC tools) was positively related to both AACEffectiveness (r = 0.809) and ConfidenceLevel (r = 0.871), indicating that having access to many devices supports more consistent use and increases the confidence of Educactors.

Consequently, ReceivedTraining was moderate to strongly correlated with all significant variables, including Confidence-Level (r= 0.794) and CollabQuality (r = 0.812), suggesting that professional development provides educators with not only technical but collaborative and collective efficacy capacities.

In summary, the correlation analysis reveals two trends: (1) there is a strong association between frequent, consistent AAC use and perceived communication improvement and effectiveness, and (2) training, confidence, and collaboration are interrelated preparatory elements for effective AAC implementation. These findings support Hypotheses 1 and 2 and suggest that funding of training and collaborative structures may result in tangible classroom AAC outcomes.

#### **Trends in Collaboration and Perceived Student Outcomes**

Analysis of other variables, specifically, concerns to do with collaboration and the performance levels of the students offers a detailed look into similar aspects that supports insistence on the need for interdisciplinary approaches particularly in AAC. Despite the weak mean on the perceived frequency of interactions with SLPs (M = 3.37), the perceived quality of collaboration was high (M = 3.88) as well as the perceived value of information from SLPs (M = 4.16). These elements indicate that collaboration is rather normative and valuable for the majority of the participants (Waddington et al., 2016). However, about how often the decision about using an AAC device was made, the responses were diverse. Some participants described a positive and continuous or relatively stable interaction with teachers and other professionals involved in planning student's learning and managing their Individualized Education Programs (IEP); however, some participants described rare effective collaboration with teachers and other professionals involved in IEP meetings and other decisions regarding the student. These inconsistencies could account for some of the fluctuation witnessed regarding AAC efficacy perceptions.

Moreover, participants' answers to the posed question about treating the students (e.g., "Have you observed a positive change in students' attitudes through consistent AAC use?") were relatively positive of feedback. The average rating of 4.02 on the 5-point scale adopted in the study promotes the hypothesis that frequent AAC usage enhances the level of students' activity and language acquisition. Another component that was highlighted as significant by both devices mean score of 4.20 and the frequency of their usage mean score of 4.22 indicated that the better the devices, they were likely to be in good condition, the more the students were likely to gain from them (Waddington et al., 2016). Therefore, Hypothesis 2 was supported; it held that there is a significant positive relationship between interdisciplinary collaboration and communication outcomes for students.

From this perspective, it can be seen that although collaboration is perceived as beneficial, implementing it can be characterized by various structural and logistical constraints that hinder integration in the daily processes. This is in line with other research which pointed out that organizational support, and schedule flexibility needed for effective provision of AAC by the team (Waddington et al., 2016). Altogether, collaborative data complement the hypothesis that implementation success hugely depends on the dynamics of the working team and wellstructured communication between educators and therapists (Johnston et al., 2003). Despite the non-significant statistical results for regression analysis, the observation made on collaboration and perceived students benefits make strong argument for interdisciplinary approaches. The results are consistent with qualitative and theoretical research on the professional use of AAC, which highlights that implementation is possible only if there is support from and cooperation.

#### Discussion

The purpose of this research was to examine the effects of training, interdisciplinary collaboration, and resources on the adoption and perceived success of high-tech AAC systems for students with autism in the early childhood education setting. Based on the interviews

conducted with 15 education professionals who work with children aged 6–9, the following factors that can enhance or hinder the use of AAC were revealed.

#### **Challenges in Training and Professional Development**

One of the main issues mentioned by the participants was training or the lack of it as the main challenge in the implementation of AAC. Nevertheless, most of them had undergone some form of training, though the intensity and frequency of this training differed significantly. Several participants mentioned that initial training was not enough to meet the needs of students who use AAC in the present and future (Johnston et al., 2003). For instance, the educators stated that they wanted more practical and classroom-oriented training that covered real-life situations rather than general information. This is in line with Johnston et al. (2003), where educators noted that they spend their own time out of school learning about AAC tools.

Consequently, Johnston et al. (2003), mentioned that there is a lack of formal and regular training activities for professional development. Lack of practice in using AAC resulted to the use of AAC being limited or not deep enough. This is important because effective use of AAC goes beyond operating the device and understanding the theory behind communication, customizing the device, and applying it in various learning environments. Biggs et al. (2023), pointed out that the use of AAC systems depends on educators' knowledge of the assistive technology, and this study supports that assertion. Moreover, inadequate support forced educators to find their own ways, for example, using social media groups or any other unverified resources, which proves the necessity for institutional support that provides accurate and uniform training.

#### The Importance of Collaborative Teamwork

The second key implication of the study was the need for interdisciplinary cooperation. Those who had more frequent and better interactions with SLPs, OTs, and other team members felt more confident in AAC implementation. They reported higher levels of satisfaction with the outcomes for students. Nevertheless, collaboration was mentioned as being ad hoc or based on individual efforts rather than on systematized approaches (Simpson & Travers, 2014). Some of the educators stated that they do not interact with the broader AAC team very often, while others said that the interaction happens only once a year during the IEP meetings and it is not very often during the instructional process.

These findings are in line with Simpson & Travers (2014), participation Model which underlines the importance of a continuous, team approach in the process of AAC intervention and technology selection to address the cognitive, sensory, and physical profiles of the learners. If the assessments are not implemented in a team approach, they can end up being disjointed and do not meet the needs of the student based on the tools given to him or her (Simpson & Travers, 2014). Lack of consistency in collaboration leads to conflict of expectation among the team members, an issue that puts the special educator in charge of managing the devices and implementing the communication goals. The participants stressed that the input from all stakeholders is crucial not only in the decision-making process regarding the choice of the device but in the provision of coherent communication experiences in multiple settings classroom teaching, therapy, and peer interactions.

According to Simpson & Travers (2014), collaborative teamwork is one of the key factors that determine the effectiveness of AAC service delivery in schools. Additionally, it means that meetings are not restricted to collaborative efforts but include communication, problem solving, and shared accountability of learning outcomes among students. According to McComas et al (2023), the following are some of the teachers who mentioned successful strategies: teachers worked collaboratively in planning lessons or used notes generated from observations to discuss device adjustments and instructional techniques. Also, the teachers felt a need for more time to have meetings with SLPs and other supportive teaching staffs. Specifically, based on these findings, administrators should ensure that the AAC service plans contain formal collaboration structures.

#### **Resource Availability and Daily Use**

This was majorly spearheaded by the accessibility of the AAC devices and other related materials. The large majority had one to three high-tech AAC devices available for his/her classrooms/caseload and stated that most of these were functional (McComas et al., 2023). However, the participants noted that they faced shortages in the number of devices, need for updating the software, and the absence of qualified support. It was not only a limitation regarding everyday practice but also for training new staff or even fine-tuning some devices depending on the learner.

The rest of the respondents testified that AAC was used continually throughout the day in school, and the students' expression and reception skills were enhanced when they used the devices. These reports emphasize the need for device availability not only in terms of the number of devices but the quality as cited by Medina (2019). They pointed out that device breakdowns could mean communication breakdowns for days, and since there were no spare devices or prompt technical assistance, students and teachers got frustrated. This is in support with Medina (2019), who observed that technological infrastructure is crucial but requires systemic planning and support to sustain. Participants in the present study supported this, observing that the use of devices in their work was hampered by issues such as staff unfamiliarity with the devices, lack of troubleshooting materials, and inadequate training. Hence, resources should not only be viewed as tangible objects but the process of their maintenance, support, and adaptation to the context of education.

#### **Educator Dedication and the Belief in Communication Rights**

Assembly educators hold the belief that every student is capable of communicating in their own way. The findings of the study revealed that assembly educators admitted a strong belief in the communicative ability of every student. Each of the participants stated that it is essential for an educator to understand that every child, regardless of the level of the disability, has the right to communicate (LaRouech, 2022). Specifically, teachers claimed that when children have profound disabilities or behavioral problems, communication should be prioritized. This was not merely a philosophical concept; it set their instructional objectives, class approaches, and tenacity in confronting the implementation challenges (LaRouech, 2022). Teacher self-report included creative and individualized narratives such as educators making supportive classroom aids at home, laminating visuals in a bid to add extra layers for durability, and even spending their own money to purchase possessions to support the use of the AAC device. Such responses show that special education professionals are already a resilient and committed workforce, something that has been described in the literature before (LaRouech, 2022). However, reality shows that counting on the passion of a particular teacher is not a feasible strategy. Their enthusiasm and commitment to making a change cannot be questioned. Nevertheless, it is the responsibility of the classroom teachers to make sure students with communication impairments get access to the information they need. Districts, SEAs, and policymakers need to intervene and guarantee that structures are put in place, especially in schools that have limited resources.

#### **Limitations and Future Research**

Nonetheless, some limitations of this study should be pointed out. The participants consisted of 50 professionals from three schools, which restricts the probability of generalizing the findings of the study. Moreover, the evidence was derived from self-administered questionnaires, hence biased by common method variance and variations in the meaning of the terms used, such as 'effective' or 'collaborative' as noted by Norton (2022). The study did not include a deeper analysis of the subjects by school type or specific roles of the participants. For example, paraprofessionals may have different issues and training requirements than classroom teachers or therapists. Subsequent studies may compare role-related perceptions of AAC or carry out detailed single-case analyses to examine the process of system deployment for different schools as cited by Norton (2022). Researchers may conduct longitudinal studies aimed at analyzing the temporal frequency of AAC adoption and the student's progress in communication. Studying and developing teacher training touches upon how teachers access and implement it in practice (Almethen, 2023). Qualitative data from observation and interviews would give more depth into the practice of AAC throughout the school day and explanations of how teachers manage difficulties as they arise. Lastly, there is a need for scholars to identify how such systems-level factors, such as leadership involvement, funding, and policy prescription, affect the quality and extent of context-determined AAC enactment in the school.

#### **Implications for Practice**

The consequences of this study have implications for one level of education and another. For teachers, the implications focus on the need to remain advocates and work harder at being creative activists for communication equity. Teachers should be expected to pursue professional development, consult with colleagues, and lobby for Accessible instruction and discourse. The findings support this assertion by presenting examples from this study, such as teachers who sought training grants or adaptation of existing materials (Almethen, 2023). The implications arising from this study for administrators and school leaders are as follows: principals should allow opportunities for teachers of different disciplines to collaborate, provide AAC training for all members of staff to be recurrent, and AAC funding should not be limited to the acquisition of the devices (Almethen, 2023). Still, it should cover support and maintenance costs. Supporting planning time for teachers and ensuring their access to SLPs and OTs can contribute significantly to the use of AAC and children's achievement.

The policymakers should then consider how to scale and finance AAC programs to help children with CP. This policy covers statewide lending libraries for professionals, incentives for professional development, and monitoring by linking IEP goals and outcomes. Another fundamental idea for the future of inclusive education should be to guarantee that AAC is not a luxury but a right for every learner who needs it (Almethen, 2023). The presented results pinpoint that there is an acute need not only for sustained support but for systemized cooperation and practical training to bring this vision into existence.

#### References

- Almethen, M. A. (2023). "Factors to Consider for Effective Implementation of AAC With Students with Autism: Saudi special education teachers' perspectives".
- Andzik, N. R., Schaefer, J. M., & Christensen, V. L. (2021). The effects of teacher-delivered behavior skills training on paraeducators' use of a communication intervention for a student with autism who uses AAC. *Augmentative and Alternative Communication*, 37(1), 1–13. <u>https://doi.org/10.1080/07434618.2021.1881823</u>
- Babb, S., Gormley, J., McNaughton, D., & Light, J. (2018). Enhancing Independent Participation
  Within Vocational Activities for an Adolescent With ASD Using AAC Video Visual
  Scene Displays. *Journal of Special Education Technology*, *34*(2), 016264341879584.
  <a href="https://doi.org/10.1177/0162643418795842">https://doi.org/10.1177/0162643418795842</a>
- Barker, R. M., Akaba, S., Brady, N. C., & Thiemann-Bourque, K. (2013). Support for AAC use in preschool, and growth in language skills, for young children with developmental disabilities. *Augmentative and alternative communication (Baltimore, Md. : 1985)*, 29(4), 334–346. <u>https://doi.org/10.3109/07434618.2013.848933</u>
- Biggs, E. E., Douglas, S. N., Therrien, M. C. S., & Snodgrass, M. R. (2023). Views of Speech-Language Pathologists on Telepractice for Children Who Use Augmentative and Alternative Communication. *Intellectual and Developmental Disabilities*, 61(1), 31–48. <u>https://doi.org/10.1352/1934-9556-61.1.31</u>

Centers for Disease Control and Prevention. (2024, May 16). *Data and Statistics on Autism Spectrum Disorder*. Autism Spectrum Disorder (ASD); CDC. https://www.cdc.gov/autism/data-research/index.html

- Fox, J. N. (2024). "The Effect of Augmentative and Alternative Communication Devices on Preschool-Aged Children with Disabilities". *Culminating Experience Projects*. 478.
- Johnston, S. S., Mcdonnel, A. P., & Nelson, C. (2003). *Teaching Functional Communication Skills Using Augmentative and Alternative Communication in Inclusive Settings*.
- LaRouech, A. (2022). "The Parent Perspective on Augmentative and Alternative Communication: A Qualitative Study". Honors Capstones. 1422
- McComas, J. J., Kolb, R., & Girtler, S. (2023). The Effect of Caregiver-Implemented Training on Augmentative Alternative Communication Use by Individuals with Rett Syndrome: Remote Coaching via Telehealth. *Developmental Neurorehabilitation*, 26(8), 436–449. https://doi.org/10.1080/17518423.2023.2301617
- Medina, V. (2019). AAC Device Use in School-Aged Special Education Students. https://scholarworks.utrgv.edu/etd/512
- Norton, B. (2022). Effect of Intervention of Low-Tech AAC Access Through Triadic Gaze on Communication from School-Aged Children with Multiple Disabilities
- Simpson, R. L., & Travers, J. C. (2014). Peer-assisted AAC roles in support of communication and social skill development of learners with autism: Unconvincing and insufficient preliminary findings. *Evidence-Based Communication Assessment and Intervention*, 8(3), 134–141. <u>https://doi.org/10.1080/17489539.2014.1001550</u>
- Singer-MacNair, K. J. (2017). Challenges to Augmentative and Alternative Communication Interventions with Autism Spectrum Disorder Students.
- Thompson, J. R., Bradley, V. J., Buntinx, W. H., Schalock, R. L., Shogren, K. A., Snell, M. E., Wehmeyer, M. L., Borthwick-Duffy, S., Coulter, D. L., Craig, E. P., Gomez, S. C., Lachapelle, Y., Luckasson, R. A., Reeve, A., Spreat, S., Tassé, M. J., Verdugo, M. A., &

Yeager, M. H. (2009). Conceptualizing supports and the support needs of people with intellectual disability. *Intellectual and developmental disabilities*, *47*(2), 135–146. <u>https://doi.org/10.1352/1934-9556-47.2.135</u>

Waddington, H., van der Meer, L., Carnett, A., & Sigafoos, J. (2016). Teaching a Child With ASD to Approach Communication Partners and Use a Speech-Generating Device Across Settings: Clinic, School, and Home. *Canadian Journal of School Psychology*, *32*(3-4), 228–243. <u>https://doi.org/10.1177/0829573516682812</u>

## Appendix

## 1. Survey Questionnaire

## Perspectives on High-Tech AAC Implementation for Students with Autism (Ages 6-9)"

## **SECTION 1: Demographics (5 items)**

- 1. What is your professional role?
  - $\circ$   $\Box$  Special Education Teacher
  - □ Speech-Language Pathologist
  - $\circ$   $\Box$  Paraprofessional
  - • Occupational Therapist
  - $\circ$   $\Box$  Other (please specify): \_\_\_\_
- 2. How many years have you worked with students with autism?
  - $\circ$   $\Box$  Less than 1 year
  - $\circ$   $\Box$  1–3 years
  - $\circ$   $\Box$  4–6 years
  - $\circ$   $\Box$  7+ years
- 3. Do you currently work with students with autism in the age range of 6–9 years old?
  - □ Yes
  - $\circ$   $\Box$  No (skip the rest of the survey)
- 4. What type of school do you work in?
  - $\circ$   $\Box$  Public
  - $\circ$   $\Box$  Private
  - $\circ$   $\Box$  Charter
  - $\circ$   $\Box$  Other: \_
- 5. Approximately how many students with autism (ages 6–9) currently use high-tech AAC devices in your classroom or caseload?
  - ∘ □0
  - ∘ □ 1−2
  - ∘ □ 3–5
  - $\circ$   $\Box$  More than 5

## **SECTION 2: Training and Confidence**

- 6. Have you received any formal training on high-tech AAC devices?
  - $\circ$   $\Box$  Yes
  - □ No
- 7. If yes, what type of training did you receive? (Check all that apply)
  - $\circ$   $\Box$  Graduate coursework
  - $\circ$   $\Box$  Professional development workshops

- $\circ$   $\Box$  On-the-job/in-house training
- $\circ$   $\Box$  Online modules/webinars
- $\circ$   $\Box$  Other: \_
- 8. Rate your confidence in using high-tech AAC with students with autism (1 = Not confident at all, 5 = Very confident)
  - □ 1 □ 2 □ 3 □ 4 □ 5
- 9. Do you feel the training you received adequately prepared you to implement high-tech AAC devices effectively?
  - $\circ$   $\Box$  Strongly Disagree
  - □ Disagree
  - $\circ$   $\Box$  Neutral
  - □ Agree
  - $\circ$   $\Box$  Strongly Agree
- 10. Do you currently receive ongoing AAC-related professional support (e.g., coaching, tech help, mentoring)?
- 🗆 Yes
- 🗆 No
- 11. What challenges have you faced related to training for AAC use? (Open-ended)

## **SECTION 3: Collaboration**

12. How often do you collaborate with the following professionals regarding AAC use? (Never, Rarely, Sometimes, Often, Always) Role Never Rarely Sometimes Often Always

Speech-Language Pathologist  $\Box$   $\Box$   $\Box$   $\Box$ 

Occupational Therapist  $\Box$   $\Box$   $\Box$   $\Box$   $\Box$ 

General Education Teacher  $\Box$   $\Box$   $\Box$   $\Box$ 

Administrator  $\Box$   $\Box$   $\Box$   $\Box$ 

- 13. Rate the overall quality of team collaboration in your school regarding AAC planning and implementation.
- 🗆 Very Poor
- 🗆 Poor
- 🗆 Fair
- Good
- 🗆 Excellent

14. Do you participate in IEP meetings where AAC use is discussed collaboratively?

- 🗆 Always
- 🗆 Often
- $\Box$  Rarely
- 🗆 Never

15. How often are decisions about AAC device use made collaboratively with all relevant staff?

- 🗆 Always
- 🗆 Often
- $\Box$  Rarely
- 🗆 Never

16. Do you feel your input is valued during collaborative AAC-related decisions?

- Disagree
- 🗆 Neutral

- 17. What would improve collaboration around AAC in your school? (Open-ended)

## **SECTION 4: Resource Access and Effectiveness**

18. How many high-tech AAC devices are available for use in your classroom or caseload?

- 🗆 None
- 🗆 1–2
- □ 3–5
- $\Box$  More than 5

19. Are the AAC devices you use functioning and up to date?

- 🗆 Always
- 🗆 Often
- 🗆 Rarely
- 🗆 Never

20. Are you able to access tech support when AAC devices malfunction?

- 🗆 Always
- 🗆 Often
- 🗆 Rarely
- 🗆 Never

21. How often do students use AAC devices for communication throughout the school day?

- 🗆 Always
- 🗆 Often
- $\Box$  Rarely
- 🗆 Never
- 22. In your opinion, how effective are AAC devices in helping your students with autism (ages 6–9) communicate?
- 🗆 Not Effective

- □ Very Effective
- Extremely Effective

23. Do students show increased communication and participation after consistent AAC use?

- Disagree
- 🗆 Neutral
- $\Box$  Strongly Agree
- 24. What do you see as the biggest barriers to AAC success in your classroom or school? (Open-ended)

## **SECTION 5: Final Comments**

25. Is there anything else you'd like to share about your experience with high-tech AAC

### and students with autism?