

**INVESTIGATION OF AUGMENTATIVE AND
ALTERNATIVE COMMUNICATION DEVICES FOR STUDENTS
WITH DISABILITIES**

by

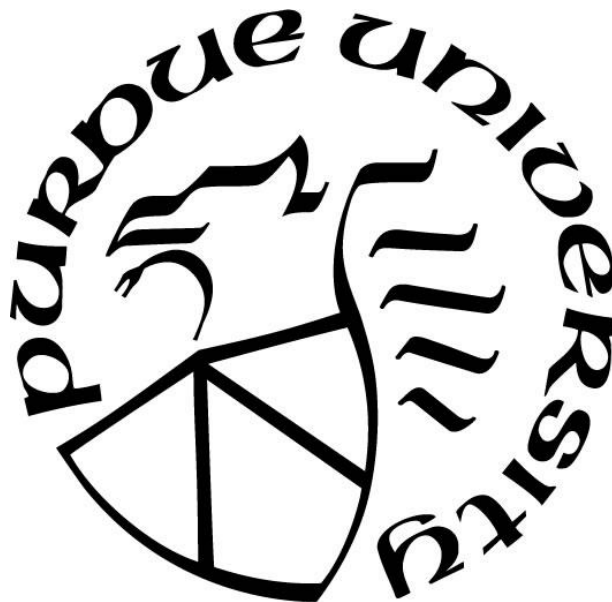
Vanessa Moyers

A Thesis

Submitted to the Faculty of Purdue University

In Partial Fulfillment of the Requirements for the degree of

Master of Science



School of Education

Fort Wayne, Indiana

May 2020

THE PURDUE UNIVERSITY GRADUATE SCHOOL
STATEMENT OF COMMITTEE APPROVAL

Dr. Jane Leatherman, Chair

School of Education

Dr. Jeong-IL Cho, Committee Member

School of Education

Dr. Rama Cousik

School of Education

Approved by:

Dr. Jane Leatherman

To my children, Levi Wyatt and Mila Danielle, this time spent was irreplaceable time I sacrificed for you both to have the future you deserve and much more. Levi, you have been my motivation through this process of completing this final step in my educational journey, and your sister soon became a part of that motivation. I pray you both grow up knowing every goal you hope for, you can reach. I love you both more than you will ever know.

To my mom, you have been my rock through this process. All the times I told you how hard this was, you kept motivating me with your encouraging words. You reminded me that I am capable of more than I could ever imagine, especially during times I did not believe in myself. I love you.

To my Husband, Wyatt, thank you for always being the shoulder I cried on during stressful times while completing this program. During our time together, it was mainly spent with me in school reaching my educational goals, and I am thankful that you understood how important this was to me. Thank you for always loving me. I love you

ACKNOWLEDGMENTS

First, I want to thank my family for always being my support system throughout my time receiving my master's degree. Your constant encouragement during this time made such a difference in the belief I had in myself. Second, I want to thank my sister, Danielle, for always being the listening ear I needed when I felt overwhelmed during my educational journey. Also, thank you for always watching Levi when I needed to go to class and Wyatt had to work, especially when you were tired from your own long day at work. Third, I want to thank my grandpa, Jedu Khalid, for always reminding me how smart I am to complete this program, no matter how difficult the work was. I love you all.

I want to thank Dr. Leatherman for her guidance and direction during this journey. Thank you for answering the countless questions I had and guiding me until the end of this phase of my education. Thank you for believing in me when I doubted myself and my ability to successfully complete this Master's Thesis and Special Project.

TABLE OF CONTENTS

GLOSSARY	7
ABSTRACT.....	8
CHAPTER 1. INTRODUCTION	9
Statement of Purpose	9
Significance.....	9
Purpose of Study	9
Literature Review.....	10
Research Questions.....	12
Methodology	13
Participants and Setting	13
Research Design and Data Collection	13
Data Analysis.....	15
Timeline.....	15
Development of Special Project	15
CHAPTER 2. LITERATURE REVIEW	17
Characteristics of Cognitive Delays/Impairments	17
Autism Spectrum Disorder	17
Down Syndrome	18
Fetal Alcohol Syndrome	19
Comparison of PECS And SGD	20
Electronic Speech Generating Devices.....	25
GoTalk	30
Button Switches	31
Picture Exchange Communication System.....	32
CHAPTER 3. METHODOLOGY	37
Participants.....	37
Role of Researcher	37
Setting	38
Research Design.....	39

Recruitment and Data Collection.....	39
Timeline	40
Ethical Issues	41
Outline for Development of the Special Project	42
CHAPTER 4. RESULTS	43
CHAPTER 5. HANDBOOK	48
CHAPTER 6. DISCUSSION.....	99
Summary of Project	99
Limitations of Survey	100
Special Project Strengths and Limitations	100
Ideas for Future Improvement	101
Reflection.....	102
Conclusion	103
APPENDIX A.....	104
APPENDIX B	105
APPENDIX C	107
APPENDIX D.....	108
APPENDIX E	109
APPENDIX F.....	110
APPENDIX G.....	115
VITA.....	117
REFERENCES	121

GLOSSARY

1. **Augmentative and Alternative Communication Devices (AAC)**-refers to any mode of communication other than speech. These include systems such as sign language, picture boards, and electronic devices with speech.
2. **Picture Exchange Communication System (PECS)**- an applied behavior analysis approach designed for nonverbal symbolic communication training.
3. **Speech Generating Device (SGD)**-high technology systems that used computer-based programs that provide ability, for those with severe speech impairments, to meet their functional communication needs.
4. **Limited Verbal Communication**-having limited verbal skills—not being able to successfully communicate or interact with others due to limited speaking skills
5. **Autism Spectrum Disorder (ASD)**- refers to a broad range of conditions characterized by challenges with social skills, repetitive behaviors, speech and nonverbal communication

ABSTRACT

Research has shown that using Picture Exchange Communication System (PECS) and Speech Generating Devices (SGD) helps in the increase of verbal communication in those with limited verbal communication. The purpose of this study was to 1.) Investigate the impact of various low-technology and high-technology on the increase in social-communicative behavior in individuals with limited verbal communication and 2.) Create a resource of PECS and SGD, and their uses, to guide teachers and other educators to determine which device best fits the student's communication needs. Qualitative and quantitative research design, surveying educators from four Northeast Indiana schools, was used in this study. The survey, which included force-choice and open-ended questions, was distributed to educators, including special teachers, paraprofessionals, and speech language pathologist, in the general and special education setting. Seven educators completed the survey. Research showed that based on the devices used within the school, teachers agreed that augmentative and alternative communication devices were beneficial for various aspects of communication for students with limited verbal communication within the classroom.

CHAPTER 1. INTRODUCTION

Statement of Purpose

One in 59 children is diagnosed with Autism Spectrum Disorder (ASD), and one-third of those children speak few to no words. Autism is a developmental disorder that is characterized by difficulty in social interaction, communication, and repetitive thoughts and behaviors. (“Autism Facts,” 2018). There are various reasons as to why a child with autism or other developmental disabilities have difficulty communicating, but there are augmentative and alternative forms of communication that can aid in the creation or increase of verbal words, such as Picture Exchange Communication System (PECS), and electronic Speech Generating Devices (SGD).

Significance of the Study

The use of communication devices is significant and needed within the classroom since 20% to 30% of children with autism are unable to communicate their wants and needs verbally; this means that 20,000 children will remain non-verbal and need augmentative and alternative devices to produce a form of communication (Lofland, 2019).

Purpose of Study

The purpose of this research was to investigate the benefits and limitations of Picture Exchange Communication System (PECS), and electronic Speech Generating Devices (SGD), and other devices in communication with minimally verbal children with disabilities. The effectiveness of these augmentative and alternative communication devices reveals the benefits

and limitations of these devices, which then determines the overall greater success rate on speech. Communication is a crucial part of development and diminishes barriers between children with disabilities and those who are typical functioning. Understanding the benefits and limitations of different forms of devices can help determine which device is better for children with disabilities based on their individual needs.

In the present paper, the benefits and limitations in communication while using PECS and SGD was compared and investigated. It is hypothesized that augmentative and alternative communication can encourage communication while also increasing social-communicative behavior but will greatly depend on which form of augmentative and alternative communication is used; using the correct form of communication will create more success in communication for students with disabilities.

Literature Review

The current literature researched the effectiveness of PECS and SGD on students in the classroom. The research presented also focuses on the comparison of both types of augmentative and alternative communication devices, while some studies focused solely on one type of augmentative and alternative communication devices. In a study by Boesch, Hsu, Subramanian, and Wendt (2013), researchers compared the effectiveness of PECS and SGD on social-communicative behavior. The aim of the study was to first introduce PECS as a form of communication, and then incorporate a SGD to see if social-communicative behavior increases when the participants learn to request using these forms of communication. The results concluded that an increase in social-communicative behavior did result in all participants. Similarly, in a study by Hill and Flores (2014), comparison of the use of PECS and an electronic device, in this case an iPad, for communication in children with autism was explored. The goal

was to move the participants through PECS communication phases for making requests. Results of this study showed that all participants had variations of increases in requesting and responding.

In a study by Fteiha (2017), the effects of electronic augmentative and alternative technology on improving communication skills in children with autism was investigated. The study aimed to create a training program based on the augmentative and alternative technology; this program focused on four language aspects: matching, receptive language, expressive language, and verbal imitation. The researcher found that the use of programs in augmentative and alternative technology worked as a reinforcer for the child, while also increasing verbal imitation and expressive language. Another study by Chung and Carter (2013), tested the effects of using a speech generating device (SGD) for promoting peer interactions in inclusive classrooms. Prior to the study taking place, very low levels of peer interactions were observed. During the study, increases in social interaction were displayed in the two students from baseline to intervention phases. Also, Xin and Leonard (2014) aimed to examine the effects of using an iPad to support students with autism in learning communication skills. The results showed that students with ASD can use the iPad application as an effective form of communication when responding to teachers and peers.

Moreover, in a study by Thiemann-Bourque, Brady, McGuff, Stump, and Naylor (2016), researchers investigated the effectiveness of a social intervention using peer-mediated approaches and PECS. The purpose of the study was to see the effects of the PECS board combined with peer-mediated interactions to increase communication between children with autism and typical functioning preschool children. Results showed the effectiveness of combining PECS with peer-mediated interactions to increase communication in the preschoolers

with autism; communication was made when a peer was requesting an object or item from another peer. Likewise, Lerna, Esposito, Conson, Russo, and Massagli (2012), aimed to test the effects of PECS on social-communicative behavior in children with autism. The study examined the effects of the first four PECS phases on social-communicative behavior. It was concluded that children who were in the PECS group showed significant improvement on the Vineland Adaptive Behavior Scores (VABS) social domain score and on most of all social-communicative abilities in an unstructured setting; this included joint attention, request, initiation, and cooperative play (Lerna, Esposito, Conson, Russo, and Massagli, 2012).

Overall, studies have similar findings in that PECS and SGD both have positive impacts in communication for children with autism. Although there were no significant differences in the effects of both augmentative and alternative communication devices, PECS and SGD target different areas of communication, such as requests or prompted communication. It can be assumed from this literature review, that augmentative and alternative communication, whether it be low-tech or high-tech, can have an impact of the increase in social-communicative behavior in children with autism or other developmental disabilities.

Research Questions

This current research regarding Picture Exchange Communication System (PECS) and electronic Speech Generating Devices (SGD) focuses on two main research questions:

- 1). What are the benefits and limitations of Picture Exchange Communication System (PECS) Board in the increase of verbal language in students with disabilities in the classroom?
- 2). What are the benefits and limitations of Electronic Speech Generating Device (SGD) in the increase of verbal language in students with disabilities in the classroom?

Methodology

Participants and Setting

The participants of this current research were general education teachers, special education teachers, specials teachers (examples including art, gym, music), and paraprofessionals who work with students with communication devices; they may also assist them in academics.

The research was conducted with professionals in the schools who work with students with augmentative and alternative communication devices in Southwest Allen County, an Indiana public school system.

Research Design and Data Collection

A survey containing forced choice and open-ended questions was distributed to general education teachers, special education teachers, specials teachers, and paraprofessionals.

A survey was given to educators to gather data on the benefits and limitations of PECS, SGD, and other devices on communicative behavior and increase verbal language in students with disabilities in the classroom. Surveys were sent out to public schools in Northeast Indiana. When the survey was created, an email to the principal was sent out including an overview of the research. The principal sent out the electronic survey link to potential participants requesting their participation in the research.

Survey Questions

The survey contains the following questions:

1. Are you a general education teacher, special education teacher, specials teacher, or paraprofessional?
2. How many students in your classroom in the past years have used assistive communication devices?

3. What types of assistive communication devices are being or were used within your school or classroom? (PECS, SGD, LAMP)

PECS

4. What are benefits of PECS on requesting basic needs? (food, water, restroom, etc.)
5. What are the benefits of PECS on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)
6. What are the benefits of PECS on academic curriculum? (requesting help, explanation, guidance, etc.)

SGD

7. What are benefits of SGD on requesting basic needs? (food, water, restroom, etc.)
8. What are the benefits of SGD on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)
9. What are the benefits of SGD on academic curriculum? (requesting help, explanation, guidance, etc.)

School Specific Device

10. What device is currently used in your school?
11. What are benefits of this device on requesting basic needs? (food, water, restroom, etc.)
12. What are the benefits of this device on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)
13. What are the benefits of this device on academic curriculum? (requesting help, explanation, guidance, etc.)

Questions for All Participants

14. Is there another device that you have used within the classroom that provided beneficial support for students?
15. What suggestions do you have for teachers on the use of communication devices?

Data Analysis

When surveys are completed, data was analyzed by identifying patterns and connections between each survey question in comparison to the others. Once this was complete, data was then interpreted. Frequency counts will be taken to create the comparisons among the answers.

Timeline

In September, the rough draft of the proposal was due. During this month, discussion of the IRB began. In October, the final draft of the proposal was due. Following this, the rough draft of the IRB was due, and then the final draft of the IRB was due. In November, the literature review and the methodology section was completed and submitted. In December, the final draft of the project was due, and the written project as well at the end of the month.

Development of Special Project

The target population of this special project was educators including specials teachers, such as music, art, and gym, and paraprofessionals who work with children who are diagnosed with disabilities and who are minimally verbal; the target setting is the classroom. The project contained a handbook pertaining to PECS, SGDs, and other devices, and discussed which is more effective in assisting the child based on their individual needs according to the pros and cons; the handbook was separated into sections. The first section introduced the two types of

augmentative and alternative communication devices and what forms they can come in. The second section was a basic comparison of PECS and SGD and their uses. The third section of the handbook was specific to the device, such as PECS and SGD, and discuss the benefits of the devices. The fourth section was specific to each device but will discuss the limitations of each device.

CHAPTER 2. LITERATURE REVIEW

Children with cognitive delays have difficulty communicating, but there are augmentative and alternative forms of communication that can aid in the creation or increase of verbal words, such as Picture Exchange Communication System (PECS), and electronic Speech Generating Devices (SGD). In the present paper, effectiveness in the increase in communication while using PECS, SGD, and school specific devices is compared and investigated. It is hypothesized that augmentative and alternative communication can encourage academic communication while also increasing social-communicative behavior, but this will greatly depend on which form of Augmentative and alternative communication is used. The following literature review attempts to validate and support this hypothesis which provides research previously conducted on PECS and SGD.

Characteristics of Cognitive Delays/Impairments

Children who have cognitive delays or impairments such as Autism Spectrum Disorder (ASD), Down Syndrome (DS), or Fetal Alcohol Syndrome (FAS) are usual recipients for augmentative communication devices. Children with developmental delays or disabilities cannot meet their communication needs due to lack of speech or not being able to fully express their language skills (Sigafos, Didden, & O'Reilly, 2003).

Autism Spectrum Disorder

One in 59 children is diagnosed with Autism Spectrum Disorder (ASD), and one-third of those children speak few to no words. Autism is a developmental disorder that is characterized

by difficulty in social interaction, communication, and repetitive thoughts and behaviors. (“Autism Facts,” 2018). Children with autism are well educated like their typically developing peers within the classroom, but the limitations they hold affect their success, such as lack of communication and social skills due to having limited verbalizations (Watkins, et.al., 2019). Those affected exhibit non-responsiveness to communication and have less frequent initiations, due to the lack of pragmatic language; the absence of practical language leads to perseveration of words or phrases (Martin, et.al., 2018). Language impairment is a strong defining factor of a diagnosis of autism, as it is the earliest observed symptom. Within the population of those diagnosed with ASD, 25%-61% of children have a total absence of verbal communication. Various research has been focused on developing interventions for improving communication in children with ASD. These interventions focus on the areas of verbalizations where children with ASD lack, such as length of utterances and spontaneous use of language (Ramdoss, et.al., 2010).

Down Syndrome

Down Syndrome (DS), the speech characteristics typical with this cognitive disability is consistent with motor speech impairments. Research has shown that motor speech dysfunction is independent of cognitive functioning. Children with DS may have an association with Childhood Apraxia of Speech (CAS), which is a motor planning/programming disorder. Since children with DS may also have CAS, they have difficulties in sequencing articulatory movements, phonemes, and syllables, and having inconsistent consonant or vowel substitutions, which result in the lack of speech or communication (Rupella, et.al., 2016).

Along with CAS, children with DS may also have Childhood Dysarthria (CD) connected to their main diagnosis of down syndrome. Childhood Dysarthria is a disorder of speech neuromuscular control and motor execution; this causes distortions in language in

communication in those with DS. These impairments cause fast, short, or irregular speech rate, small bursts of speech, changes in pitch and volume, and voice quality. When CD is also diagnosed in a child with DS, there is a lack of speed and range of movement to produce the amount of intra-oral pressure needed to create speech. Also, children with DS have different oral structures, such as a hard palate, then those of their typical developing peers, and this contributes to speech difficulties and limitations. Lastly, another common reason as to why it is difficult for children with DS to produce language is due to the overlapping use of consonants, making articulation of words more challenging (Rupella, et.al., 2016).

Fetal Alcohol Syndrome

Children with Fetal Alcohol Syndrome (FAS) can communicate, if not having associating diagnoses such as ASD, they have difficulty interactively communicating with peers in the classroom. Children with FAS display various neurobehavioral problems that can create deficits in areas such as socialization and language; social communicative behavior is the one of the defining characteristics of FAS. Due to prenatal alcohol exposure, consequences such as coordinated development of the brain, has a great impact on social performance and communication. The greatest difficulty children with FAS have with language is using speech in conversations and narratives. Also, children display challenges creating language that takes into consideration the listener's perspective and knowing how to correctly respond to assumptions made about common knowledge. During social interactions, communication is interrupted due to link between syntax and language use (Olswang, Svensson, & Astley, 2010).

Due to the past rates of children with cognitive delays, such as autism, down syndrome, or fetal alcohol syndrome, communication devices play an important role of creating an alternate way to communicate when verbal language skills are limited or absent. Limited language

abilities due to cognitive delays can greatly affect peer and adult relationships, social behavior, and academics. Augmentative and alternative communication devices can guide students in areas they are lacking in due to communication deficits, which will then produce overall greater outcomes for future needs.

Comparison of PECS And SGD

In a study by Boesch, Hsu, Subramanian, and Wendt (2013), researchers compared the effectiveness of PECS and SGD on social-communicative behavior. Researchers stated that the aim of the current study was to first introduce PECS as a form of communication, and then incorporate a SGD to see if social-communicative behavior increases when the participants learn to request using these forms of communication. The authors state that the study mainly addresses one research question, which is “what are the comparative effects of PECS versus SGD on enhancing social-communicative behavior and natural speech production?” (Boesch, et al., 2013, p. 198). It was hypothesized that the participants would show greater social-communicative behavior in the PECS condition than in the SGD condition. The sample consisted of three students who received a diagnosis of autism who scored in the severe range on the Childhood Autism Rating Scale (CARS); all three students do not use spoken verbal language.

The results of the study by Boesch et al. (2013) supported the research question in that increase in social-communicative behavior did increase in all three participants, but there was no clear distinction on which augmentative and alternative communication helped greater. To support the hypothesis, it was found that there was a slightly higher number of social-communicative behavior in the PECS condition because the physical act of having to exchange picture cards when communicating. In Phase II of the study, which requires the children to move across the room to request a preferred item, social-communicative behavior occurred more

frequently than in Phase I and III; greater eye contact was documented in this phase due to the engagement needed to request items. Results showed less eye contact in the participants during Phase I and III, which involved the SGD, because of the minimal demands to engage or locate the communicative partner. Results also showed that there was less social behavior in the SGD condition, which may have been due to the issue of the participants being more focused or distracted by the features of the device, such as the buttons (Boesch, et al., 2013).

The results of the study did support the hypothesis that augmentative and alternative communication does aid in the increase in frequency of social-communicative behavior, but there were limitations discussed. The first limitation was that the rate of wanted behaviors occurring was not recorded and doing so could have aided in the effective comparisons among the participants. Another limitation was that two out of the three participants' intervention was conducted in a contrived setting, and one was done in a naturalistic setting; within the settings, the tangibles or reinforcing items present may have affected the behavioral outcomes. An addition limitation was that there were not attempts made to use the speech-output in the SGD. The data may have been greater in this condition since speech-output does aid in skill acquisition (Boesch, et al., 2013).

Similarly, in a study by Hill and Flores (2014), comparison of the use of PECS and an electronic device, in this case an iPad, for communication in children with autism was explored. It is stated that the purpose of this study was to consider the developing options that can possibly facilitate communication while creating greater positive outcomes; this study focused on using a high-tech AAC iPad and a low-tech paper AAC PECS board. The goal was to move the participants through PECS communication phases for making requests. The sample consisted of two preschool students diagnosed with developmental delay, and the three other students who

were diagnosed with autism. The participants were enrolled in an extended school year service and were selected based on the need to develop functional communication skills (Hill and Flores, 2014).

The results of the study by Hill and Flores (2014) showed that all participants had variations of increases in requesting and responding. One of the participants ended with more independent initiations and requests while using PECS, while another demonstrated these behaviors while using the iPad. Two of the other participants also showed greater requests while using the iPad. The last participant was unlike from the others in that the student began to say words and phrase out loud in the PECS phrase. Since there was no great difference between the use of the PECS and the iPad, since the results showed that a low-tech communication device can be as or more effective than a high-tech communication device. One limitation is that one of the participants moved off from the screen he needed to be on, and explored other applications, which limited the number of unprompted requests. It would be recommended that participants master using the PECS board before introducing the iPad because of the difficulty of providing automatic reinforcement due to participants continuously tapping the same word to be said aloud (Hill & Flores, 2014).

The study by Ganz, Heath, Rispoli, and Earles-Vollrath (2009), researched use of a multi-treatment single case design to compare the effects of PECS with a verbal modeling intervention on four different communicative behaviors: picture requests, imitated verbalizations, picture discrimination, and related speech for a child with autism. The current study focused on four questions. The first question was “will PECS or a verbal modeling/noncontingent reinforcement procedure result in an increased use of pictures for requesting and will these results generalize to use with untrained items?” The second question was “will PECS or a verbal modeling/non-

contingent reinforcement procedure result in an increased use of imitated verbalizations for requesting and will these results generalize to use with untrained items?” The third question was “will PECS or a verbal modeling/non-contingent reinforcement procedure result in increased picture discrimination and will these results generalize to use with untrained items?” The fourth question was “will PECS or a verbal modeling/non-contingent reinforcement procedure result in an increase in any related speech (Ganz, et.al, 2009, p. 182)?”

The results of the study by Ganz, et.al. (2009) concluded that the PECS training led to an increase of picture requests, and the results were continued during the verbal modeling intervention phase. Although there were no changes seen in imitated verbalizations, during the verbal modeling phase, the participant did show an increase in picture discrimination and related speech for the PECS and verbal modeling phases. It was reported by the participants teacher, that while the verbal imitation phase was in place, the participant began spontaneously imitating words without prompting. The first limitation of the study was that it focused on a single participant, and not a greater number of children. Also, due to limited availability of time, maintenance data was not recorded on the participants picture request. The last limitation was returning to baseline during the two intervention phases, and then use the most effective intervention in the final phase (Ganz, et.al, 2009).

Lastly, in the study by Ali, McFarland, and Umbreit (2011), researchers used tangible items with PECS to teach requesting to four participants; this was also done to test adaptable training. The current study aimed to examine the effectiveness of combining tangible symbols and using strategies from PECS to teach requesting skills to participants who lack in reading and writing skills; participants had various disabilities and visual impairments.

The study was divided into four parts: reinforcer assessment, baseline, training in the three PECS phases, and maintenance. The reinforcer assessment was used to determine preferred and non-preferred items of the participants. During the baseline condition, a trainer worked with each participant individually and were presented with tangible symbols or pictures paired with tangible symbols; this was done instead of exchanging pictures due to participants visual impairments. The baseline included allowing the participants to touch preferred items, moving preferred items closer to the participants, present the items with accompanying noise, and allowing participants to smell the preferred item. For the PECS phases, there was three goals to be reached. In the first phase, the main goal was to have the participant pick up the tangible symbol, then reach towards the communicative partner, and then give the symbol to the partner's hand. In phase two, the goal was the same as in phase one, but the tangible symbol was placed further away from the participant; this was done to help participants learn to communicate with others who are further than an arm's length away. In the last phase, the goal was for the participants to select the correct tangible symbol that represented their preferred item from two tangible symbols represented high-reinforcer and non-preferred items. During maintenance, the trainer conducted 10 trials without prompting, training, or error correction; participants moved on to maintenance if they met the criterion for phase three (Ali et.al., 2011).

The results of the study by Ali et.al. (2011) showed that the efficacy of using PECS to teach requesting skills to participants was a positive outcome. The study has shown that using PECS, while using tangible items, can be a successful communication system for students with various disabilities and visual impairments. Data from the results show that the number of correct responses increased during each phase, and during the maintenance phase, it showed that these skills were generalized successfully in other opportunities. One limitation of this study was

that the participants were taught to exchange tangible items in response to a prompt and were not fully initiating the request independently. Another limitation was that the study took place in controlled environments, which may have shown differently in classrooms (Ali et.al., 2011).

Electronic Speech Generating Devices

In a study by Fteiha (2017), the effects of electronic augmentative and alternative technology on refining communication skills in children with autism was explored. The significance of the study was also theoretical and practical. In theoretical terms, the study aimed to create a training program based on the augmentative and alternative communication technology; this program focused on four language aspects: matching, receptive language, expressive language, and verbal imitation. It also aimed to direct other researchers' attention on new educational trends that can benefit children with autism who have limited communication. In the practical aspect, the study aimed to create an educational program based on augmentative and alternative technology. The overall study focused on answering two questions. First, "is there any effect of using the training program based on the assistive technology to develop the language skills in children with autism?" Second, "do the effects of the training program based on the assistive technology have a negative impact on developing the language skills among children with autism?" The sample consisted of 43 children with autism; 13 had simple autism, 22 had mild autism, and 9 had severe autism (Fteiha, 2017, p.37).

The results of the study by Fteiha (2017) supported the aim of the study, which was recognizing the effectiveness of augmentative and alternative technology, in that there were no recognized negative impacts. The researcher found that the use of programs in augmentative and alternative technology worked as a reinforcer for the child. After the study was completed, a post-test was administered and there was an increase in verbal imitation and expressive language.

It was also concluded that there was a statistical significance in the increase in matching and receptive language. The results also showed that the augmentative and alternative technology training program, which was based on applied behavioral analysis, worked as a communicative teaching aid, in that it reinforces the receptive and expressive proficiencies of the participants. The training program also was seen to increase the likelihood of interactions with others, while decreasing unwanted behaviors due to the difficulties attributed to communicating (Fteiha, 2017). One recommendation of the study was the use of various augmentative and alternative technology devices and compensatory devices as ways to increase communication in children with autism. Another recommendation provided was the effectiveness of augmentative and alternative technology in developing independent skills for children diagnosed with autism. An additional recommendation is assessing the technological obstacles while using the augmentative and alternative technology training program (Fteiha, 2017).

In a study by Chung and Carter (2013), researchers tested the effects of using a speech generating device (SGD) for promoting peer interactions in inclusive classrooms. The current study focused on two questions. The first question was “what the effects of the intervention package are incorporating paraprofessional facilitation, peer initiation, and SGD access on the peer interactions of students with severe disabilities in general education classrooms?” Second, “to what extent are goals, procedures, and outcomes of the intervention considered socially valid by students, peers, teachers, parents, and paraprofessionals?” The sample consisted of two focus students, one male and one female (Chung, et.al., 2013, p. 95).

Chung and Carter (2013) concluded that prior to the study taking place, very low levels of peer interactions were observed. During the study, increases in social interaction were displayed in the two students from baseline to intervention phases. As for the focus students’

peer-initiated interactions, which included reciprocal peer interaction, there were changes in both level and stability of this behavior; SGD was used more often when peer interaction was initiated. Also, there were minor increases in the number of different peers the participants interacted with. One limitation of the study was the researchers did not dynamically involve special educators or speech language pathologists. Another limitation was integrating supplementary measures in the study, such as peers' support behavior when the participants were interacting (Chung & Carter, 2013).

Next, in a study by Thiemann-Bourque, McGuff, and Goldstein (2017) researchers focused on training peer partners on using speech generating devices (SGD) with classmates who have Autism Spectrum Disorder (ASD). The purpose of the study was to examine the effects of a peer-mediated intervention that included training on the use of a SGD for preschoolers with severe autism and their peers who have no disabilities. Researchers aimed to explore changes in child communication in different contexts, such as toys and snacks, and examine the effects on the "balance of communication exchanges", such as initiations and responses, following peer training and instruction on the use of a SGD (Thiemann-Bourque, et.al., 2018).

During this study, researchers focused on rates of communication, reciprocity, and engagement of the three participants with autism and the three without disabilities. While in the training sessions, the children were provided activities, such as art, that were planned by the lead teacher. During this time, the focus child and the peer sat on the floor within the therapy room or at a table near other classmates; there were other adults in the classroom who were engaging with other students on the same activities provided to the focus child and peer. This was done to examine the child's preferred cause and effect toy.

In order to track the focus children's communication towards peers, total frequency of act within a 6-minute interval period of social activity was recorded; during the various time periods where communication was tracked, researchers added a toy or a snack to see whether communication would increase with the peer; peer communication towards the focus children was tracked with the same frequency and interval period.

Following this, a child was placed with a peer, and a SGD was placed on the table in between them; no training was given, but the SGD was appropriate to age of both participants. During peer-mediated SGD interaction within the classroom, the focus child and the peer were given an activity; it was modeled on how to engage in a reciprocal interaction. If there was no interaction for thirty-seconds, the adult prompted the peer or focus child to initiate a interaction using the SGD; least-to-most hierarchy was used with prompting such as using a full verbal prompt or using hand-over-hand to guide in the selection of a symbol on the SGD to create communication with the participants (Thiemann-Bourque, et.al., 2018).

Results of the study showed that typically developing children could successfully be taught the same SGD system used by their peers with severe autism. It was seen that there was an increase in initiation in all three ASD participants; some initiated more than their typically developing peer partners. Results also showed an increase in the focus children's ability to participate in back-and-forth social and communication changes with their peers. At the start of the study, the three participants with ASD showed no interest in communication with peers, once the SGD was introduced, it gave the children an opportunity to engage in communication behaviors in activities they were greatly interested in (Thiemann-Bourque, et.al., 2018). As for the limitations in the study, researchers reported the length of the baseline intervention was long,

but it was due to child absences. The last limitation was the cause-and-effect toys and snack contexts were not evaluated within an experimental design.

Furthermore, Xin and Leonard (2014) aimed to examine the effects of using an iPad to support students with autism in learning communication skills. The purpose of this study was to determine the effects of the iPad, used as a communication device, on spontaneous functional communication responses in school setting, such as the classroom and recess. The current study focused on two research questions. First, “will the students with ASD increase their expressive communication, e.g. initiating requests, responding to questions, and making social comments when using the iPad?” Second, “with a least-to-most prompting hierarchy, will these students increase spontaneous communication with their teacher and peers when an iPad is applied” (Xin & Leonard, 2014, p. 4155)? The sample consisted of three students, one female and two males, diagnosed with ASD who attend a public school.

Following the participants being taught how to use the application on the iPad to communicate, baseline data was taken. During the baseline, none of the participants expressed themselves or gravitated towards the iPad to produce communication. During the study, all participants became receptive to instruction in both academic and social settings. Following the study, results showed an increase in initial request of their needs by touching the icon on the iPad with a reduced number of prompts given. Although number of requests were increased, participants responses to questions using expressive language was low. While students were engaging in academic lessons, the iPad was used to scan and touch the vocabulary provided to respond to the teacher’s questions; two of the participants reached independence without prompting. Overall, the results showed that students with ASD can use the iPad application as an effective form of communication when responding to teachers and peers (Xin & Leonard, 2014).

An implication of the study is that many electronic augmentative and alternative communication devices are expensive, but an iPad can be a less expensive alternative since speech and communication applications can be downloaded.

GoTalk

In a study by Tönsing (2015), the researcher compared the effectiveness of a SGD, an iPad with GoTalk Now application, to a communication board with two-symbol combinations by children with limited speech during a shared reading setting; the participants had various diagnoses such as cerebral palsy, apraxia of speech, and dysarthria.

The study began with a baseline phase which included exposing the participants to both the iPad GoTalk Now application and the communication board. During this time, the researcher read the story to the participant, while also showing the story illustrations; there were different target response combinations needing to be met. The researcher would put emphasis on certain parts of the story that had the target phrase, such as *a dog running*; the researcher would point and verbalize the target by saying “*oh look!*.” The participants were given ten seconds to form any response using either the SGD or the communication board. If no response was given during that time frame, the researcher moved on to the next target response. Following this, the intervention phase was completed. This phase was similar to the baseline where participants had access to both communication devices, but they were prompted through to create a response if no response was given during the ten second time frame. The participants could respond in various ways while prompted, such as pointing to a symbol on the communication board or clicking the right cell section on the GoTalk Now, that was relevant to the target phrase read by the researcher. During the maintenance phase of this study, first level prompting, such as pointing, was given during all three stories (Tönsing, 2015).

The results of the study by Tönsing (2015) showed that all participants increased their constructions of two-symbol combinations using either the iPad with the GoTalk Now application or the communication board. The results also show that children with developmental disabilities and motor speech disorders can be taught to produce symbol combinations, while using a SGD or communication board, to communicate. Even though there is limited evidence that a communication board would limit a child's learning in forming symbol combinations, the participants who moved on to further phases steadily chose the SGD (Tönsing, 2015). Limitations of the study was the limited time allotted to collect data and the minimal number of participants.

Button Switches

In an article by Shaefer and Andzik (2016), teaching students with disabilities to use button switches is discussed. Like a SGD, switches can also be used to access computer software and the internet to open various “educational, social, and recreational opportunities” (Shaefer and Andzik, 2016); there are switch-based games on the internet to create greater independence for the students. Switches are very simple tools for students to use since it contains an electrical circuit used to activate other powered tools such as lights and electric toys (Shaefer and Andzik, 2016).

Button switches come in various forms, whether it is a head switch, cushion grip switch, foot switch, finger switch, or a BIGmack switch (Shaefer and Andzik, 2016). A head switch can be activated by an any other body part, such as the arm or the leg; this device is more commonly used for students who use a wheelchair. A cushion grip switch fits to the needs of one's hand size and is rolled on a table or grasped to activate. The foot switch is activated by pushing down like peddle, while the finger switch is connected to a finger and needs minimal movement to be

activated. The BIGmack switch is the most commonly used switch and can be programmed very easily; this switch is activated by one simple push (Shaefer & Andzik, 2016).

Various research has supported the use of button switches for students with different ranges of disabilities. One study taught students with a wide range of disabilities to use the switch to activate toys, video messages, games, etc. The results of that study showed that students with profound disabilities could independently, and successfully press the switches (Mechling, 2006 as stated in Shaefer & Andzik, 2016). In another study, students with severe disabilities were taught to request preferred items using a switch to activate a SGD. Once this was mastered, researchers faded out the SGD speech input while shaping student vocalizations. Eventually, both the switch and the SGD were faded out to promote independence of vocalization preferred wants (Sigafoos, Didden, and O'Reilly, 2003 as cited in Shaefer & Andzik, 2016).

Picture Exchange Communication System

In a study by Thiemann-Bourque, Brady, McGuff, Stump, and Naylor (2016), researchers investigated the effectiveness of a social intervention using peer-mediated approaches and PECS. The purpose of the study was to see the effects of the PECS board combined with peer-mediated interactions to increase communication between children with autism and typical functioning preschool children. The current study focused on one research question, which was “Does teaching peers to be responsive communication partners using PECS affect rates of functional communication of nonverbal or minimally verbal preschoolers with autism?” (Thiemann-Bourque, et.al, 2016, p. 1135). The sample consisted of four preschool children with ASD and seven peers without disabilities.

Following the study by Thiemann-Bourque, et.al, (2016), results showed the effectiveness of combining PECS with peer-mediated interactions to increase communication in the preschoolers with autism. It was noticed that greater communication was made when a peer was requesting an object or item from another peer. For two of the children with autism, they displayed constant levels of engagement and increased social interaction when the setting was changed to snack time. Overall, all children showed improvement in peer-directed communication, while the other two children previously mentioned, had the greatest increase which occurred during snack time. Each participant, who has autism, primarily communicated by using picture symbols to request what they wanted, and the peer responded with verbal language. Lastly, all four children with autism showed increased improvement in social interactions. One limitation of the study was the absence of formal measurement of social validity through peers, parents, teachers report of changes to the quality and quantity of peer social-communicative interaction (Thiemann-Bourque, et.al, 2016).

Moreover, in a study by Genc-Tosun and Kurt (2017), researchers aimed to examine the effectiveness of an iPad-based speech-generating device plus an intervention package for multi-step requesting in children with autism spectrum disorder (ASD). The study focused on two research questions: “What is the effect of a multi-component instructional package incorporating use of an iPad-Based SGD on the level of correct responses for multistep requesting for children with ASD?” “What are the views of participants’ parents and teachers about the focus and outcome of the study?” (Genc-Tosun & Kurt, 2017, p. 214).

The research began by conducting a preference assessment to assess preferred and non-preferred items such as toys, snacks; behavioral responses towards these items were tracked to determine likes and dislikes. The target behavior of multi-step requesting was taught using an

iPad Air 2 equipped with a Touch and Speak software. On each page of the iPad, there were symbols for toy and snack. When the participants chose toy and snack, it made them able to access three other pages with toy and snack symbols which included preferred and non-preferred items of those two categories. In order to access the preferred item wanted, the participants had to initially go through six steps to get to what they wanted. Once the participants saw the preferred item, they had to press on the home button of the iPad, unlock the screen, select the category of the desired object (snack and toy), scrolling the page, activating the sound by touching the symbol for the desired object, and then taking the requested object (Genc-Tosun & Kurt, 2017).

The findings of the research by Genc-Tosun and Kurt (2017) indicated that using an iPad-based SGD was effective in teaching multi-step requesting child the participants with ASD. The participants maintained the skills taught after 1, 2,4, and 12 weeks after the training sessions; these skills were generalized across different tools and people. One limitation of the study was focusing only on requesting skills. Another limitation mentioned was that none of the phases completed were done in natural life contexts. The last limitation was lack of planning for the relation to the requesting of objects in other categories or requesting a greater number of objects while the skill was being taught (Genc-Tosun & Kurt, 2017).

Lastly, Lerna, Esposito, Conson, Russo, and Massagli (2012), aimed to test the effects of PECS on social-communicative behavior in children with autism. Children using PECS were compared with children receiving Conventional Language Therapy (CLT). The study conducted an experimentally controlled group investigation to examine the effects of the first four PECS phases on social-communicative behavior. Researchers collected psychometric data and functional measures of adaptive data, by using standardized tasks, to observe social-

communicative skills in an unstructured setting through observation of the participants free-play with an adult. The sample consisted of 18 children diagnoses with autism; 17 of them were male and one was female.

Results of the study by Lerna et.al, (2012) showed that the two groups, the PECS and CLT, did not differ during the pre-treatment assessment. In the post-assessment, children who were in the PECS group showed significant improvement on the Vineland Adaptive Behavior Scores (VABS) social domain score and on majority of all social-communicative abilities in an unstructured setting; this included joint attention, request, initiation, and cooperative play. Overall, the findings of this study showed that PECS can improve social-communicative skills in children with autism; the improvement was greatly seen in adaptive behaviors in an unstructured setting. One limitation of the study was the lack of randomization of treatment considering the sample size. Another limitation was not collecting observational data on interactions with the children and the adults in their everyday environment (Lerna, et. al, 2012).

Overall, studies have similar findings in that PECS and SGD, which includes GoTalk and Button Switches, both have positive impacts in communication for children with autism. Although there were no significant differences in the effects of both augmentative and alternative communication devices, PECS and SGD target different areas of communication, such as requests or prompted communication; it was seen that PECS should be introduced before an electronic application for augmentative and alternative communication. It can be assumed from literature reviews, that augmentative and alternative communication, whether it be low-tech or high-tech, can have an impact of the increase in social-communicative behavior in children with autism. Future research may want to focus on first introducing PECS before an SGD since children should master the act of requesting in its simplest form.

This current research regarding Picture Exchange Communication System (PECS) and electronic Speech Generating Devices (SGD) focuses on two main research questions: 1). What are the benefits and limitations of Picture Exchange Communication System (PECS) Board in the increase of verbal language in students with disabilities in the classroom? 2). What are the benefits and limitations of Electronic Speech Generating Device (SGD) in the increase of verbal language in students with disabilities in the classroom?

CHAPTER 3. METHODOLOGY

Participants

The participants of this study were five special education teachers, who provide special education services to students in the general education environment, one general education teacher, and one speech language pathologist. The participants were selected because they teach at the IRB approved school (Appendix A). This researcher obtained general demographic information regarding the professionals' student caseload with the use of augmentative and alternative communication devices, and the types of communication devices used during their years of teaching.

Role of Researcher

Currently, I work as a Registered Behavioral Technician (RBT) at a autism clinic, which provides various other pediatric services along with Applied Behavior Analysis (ABA) such as occupational therapy, speech therapy, and feeding therapy. Due to my experience working with children with Autism Spectrum Disorder (ASD), I also work with various communication devices to help children, who have limited verbal or no verbal abilities to communicate their basic needs and wants. I am an advocate for the use and knowledge of augmentative and alternative communication devices for children who are not able to communicate for themselves because of my experience working with children with low-functioning autism.

Setting

The study was conducted at four suburban schools in southwest Indiana. The high school consists of 2,424 students, ninth through twelfth grade. The student population is made up of 7 American Indians, 111 Asian Indian, 120 Black, 132 Hispanic, 95 Multiracial, 1 Native Hawaiian or Pacific Islander, and 1,958 White students. Student enrollment defined by Free/Reduced price meals consists of 350 students receiving free meals, and 2,074 who pay for their own meals. The assigned school grade is an A, with 2,229 students in general education and 195 students (8.04%) in special education (IDOE).

The middle school consists 1,038 students, sixth through eighth grade. The student population if made up of 2 American Indian, 54 Asian, 77 blacks, 59 Hispanic, 61 Multiracial, 2 Native Hawaiian or Pacific Islander, and 783 White students. Student enrollment defined by Free/Reduced meals consists of 192 students receiving free meals, and 846 students paying for their meals. The assigned school grade is an A, with 959 students in general education, and 79 students in special education (IDOE).

One elementary school consisted of 418 students, kindergarten through fifth grade. The student population is made up of 1 American Indian, 11 Asian, 16 Black, 22 Hispanic, 21 Multiracial, and 347 White. Student enrollment defined by Free/Reduced meals consists of 81 students who receive free meals, and 337 students who pay for their meals. The assigned school grade is an A-. Out of the total population in the school, 369 students are in general education, and 49 students are in special education (IDOE).

The second elementary school consists of 854 students, kindergarten through fifth grade. The student population is made up of 1 American Indian, 24 Asian, 101 Black, 46 Hispanic, 45 Multiracial, 1 Native Hawaiian or Pacific Islander, and 636 White students. Student enrollment defined by Free/Reduced meals consists of 189 students who receive free meals, and 665

students who pay for their meals. The assigned school grade is an A-. Out of the population of the school, 771 students are in general education, and 83 are in special education (IDOE).

Research Design

This research is a survey assessment consisting of open and close ended questions as well as forced-choice regarding Picture Exchange Communication System (PECS) and electronic Speech Generating Devices (SGD), and other devices for communication focused on two main research questions: 1). What are the benefits and limitations of Picture Exchange Communication System (PECS) Board in the increase of verbal language in students with disabilities in the classroom? 2). What are the benefits and limitations of Electronic Speech Generating Device (SGD) in the increase of verbal language in students with disabilities in the classroom? A survey was distributed, and the survey used quantitative, “forced choice” responses questions for questions 1 through 9, and 11 through 13. The qualitative questions that require narrative responses are 10, 14. and 15. The survey questions were determined based on the research found for this study. Specific survey questions were available from a link in Google Documents to four suburban schools (Appendix B). The data received from the quantitative and qualitative questions were collected at the same time and the information undertook a comprehensive analysis to answer to the two research questions.

Recruitment and Data Collection

The Director of Special Education for a district in Northeast Indiana completed the first step of recruitment by giving permission for this study to take place in the schools (Appendix C). By using the staff emails provided on the publicly available school websites, the general education teachers, special education teachers, specials teachers, and paraprofessionals were

recruited by an email letter sent out by the building principals (Appendix D). The letter provided in the email states the purpose of the survey. It informs all participants that the survey is voluntary and confidential. If they do not wish or feel comfortable answering a provided question. The survey was available for two weeks. Due to the low number of responses, a second email was sent out to the building principals asking for the email to be resent to the staff with a new closing date for the survey.

When the survey was closed, data was analyzed to address the two research questions. The results of the data were used to determine what aspects of devices need to be focused for the increase in communication to be able to develop a resource handbook for teachers and paraprofessionals.

Timeline

September

- Rough draft of proposal 9/4/19

October

- Final draft of Special Projects proposal 10/2/19
- IRB rough draft due 10/9/19
- IRB submitted 10/31/2019
- Create survey in Google Documents

November

- IRB approved 11/1/19
- Send out survey 11/5/19
- Literature review 11/6/2019
- Close Survey 11/19/2019
- Methodology 11/20/19
- Feedback form from faculty

December

- Draft of final project 12/4
- Final project Chapters 1, 2, and 3 due with Appendices

January

- Analyze Data

February

- Using data analysis, gather evidence-based resources for handbook
- Finalize and edit handbook
- Complete project draft

March

- Final Project copy to Faculty

April

- Present findings and handbook to school staff
- Present findings and handbook to PFW special education faculty

Ethical Issues

Ethical issues can occur in various circumstances while conducting research. The first ethical issue was receiving prior permission from the schools, Director of Special Education for the county, and participants before beginning the research. This was attained by becoming certified in CITI group 2 coursework (Appendix E), obtaining a letter of permission from the Director of Special Education, gaining approval from Purdue IRB, and assuring participants that the survey is anonymous and voluntary.

To be courteous of the education process, the recruitment letter, with a link to the Google Documents survey in it, was sent out by email to all principals provided by the Director of Special Education. Teachers were asked to complete this during their own available time.

When the study was finalized and completed, a meeting took place to share the research findings and provide the teacher staff with a hard copy of Augmentative and Alternative Communication Devices that could be used with their students. The data was reported truthfully and without bias. The researcher gained authorship and adhere to the APA guidelines for writing structure.

Outline for Development of the Special Project

The project contained a handbook pertaining to PECS, SGDs, and other devices, and discussed which is more effective in assisting the child based on their individual needs according to the pros and cons; the handbook will be separated into sections. The first section introduced the two types of augmentative and alternative communication devices and what forms they can come in. The second section was a basic comparison of PECS and SGD and their uses. The third section of the handbook was specific to the device, such as PECS and SGD, and discuss the benefits of the devices. The fourth section was specific to each device but will discuss the limitations of each device.

CHAPTER 4. RESULTS

Recent studies have shown the benefits of introducing and using augmentative and alternative communication (AAC), whether it be speech generating devices (SGD) or picture exchange communication systems (PECS), for students with developmental disabilities. The use of communication devices aid in communication in various forms for students and children who are minimally verbal; these devices help in peer communication, social-communicative behavior, and academic requesting to an adult. Teachers reported the benefits of the use of these devices for students to be successful in their education within the classroom with added supports.

The purpose of the survey was to examine the benefits teachers believe these devices have in aiding verbal or nonverbal language development of students who are minimally verbal. Teachers were also asked to explain the benefits of the school specific device used that have helped students with their communication skills. The survey consisted of twelve forced choice questions, and three open-ended questions to gain information on various communication devices and their benefits. Four suburban schools in Northeast Indiana were asked to complete an electronic survey. Data on the participants use of communication devices and their perceptions of the benefits of these communication devices are stated and analyzed.

Demographic Information

Seven surveys were completed by five special education teachers, one general education teacher, and one speech language pathologist. Three participants reported having 0-2 students, in their classroom in the past years, use AAC devices. Three participants reported having 3-6 students in the past use AAC devices in their classrooms. One reported have 10 or more students who used AAC devices.

Types of Assistive Communication Devices

Participants were asked the forms of devices used within the classroom whether it was a SGD, PECS, or other. Three participants reported using SGD, two reported SGD and PECS, and one participant stated using all forms listed but to include iPad with communication app download.

Benefits of PECS

Forced-choice questions with the option of additional comments were asked over PECS and SGD and the specific device's benefits on requesting basic needs, peer and adult communication, and academic curriculum. No responses were reported for PECS.

Benefits of SGD

Participants were asked the benefits of SGD on requesting basic needs; options provided were food, water or beverage, restroom, clothing, sleep or rest time, location requests, and other. Participants were given the option to select all that apply. Three responses were reported for this question. All three participants reported that SGD are good for requesting basic needs for food and water or beverage. Two of those participants reported requesting for restroom. One out of the three participants chose clothing, sleep or rest time, and location requests. One participant reported leisure activities and feelings, and another reported requesting a break.

Participants were asked the benefits of SGD on peer and adult communication; options provided were initiating requests, communicating unwanted effects, academic help, conversational requests, sharing information, understanding others, and expressing thoughts. Three responses were reported for this question. All three participants agreed that initiating requests and communicating unwanted effects were a benefit. Two of the three participants chose

academic help and sharing information. One out of three participants selected conversational requests, understanding others, and expressing thoughts.

Participants were asked the benefits of SGD on academic curriculum; options provided were requesting help, further explanation, guidance, and customized instruction. Three responses were reported. All three participants agreed that SGD were useful for providing customized instruction. Two out of three participants reported SGD being beneficial for requesting help, further explanations, and guidance.

Current Uses

All participants were asked to report the specific device used within their schools. Six responses were provided. Four participants stated the Tobii Dynavox, which is an iPad-based device, is used with their schools. Three participants reported using PECS in their classrooms. Two participants stated using iPad communication applications. Two participants expressed using button switches, and one specified it being “2 and 3 button switches.” One participant stated using Big Mac and Step by Step devices within the school. One participant reported the use of the GoTalk within the school.

Based on the school specific device reported by the participants, they were asked to choose the benefits of this device on requesting basic needs; six responses were given. All participants agreed that their school specific device was useful for requesting food and water or beverage. Three of the six participants believed their school specific device was beneficial for students requesting to use the restroom, clothing, sleep or rest time, and location requests. One participant added the device was needed for requesting the need for leisure activities.

Participants were asked to select benefits of the school specific device on peer and adult communication; six responses were given. All participants agreed that the devices used within

their schools were beneficial for students initiating requests and sharing information. Four participants reported the device is useful for conversational requests and expressing thoughts. Three participants stated the devices were helpful for academic help. Two participants conveyed that the communication device used within their school was beneficial for understanding others. One participant reported the devices supports students when communicating unwanted effects.

Participants were asked to report the benefits of the school device on academic curriculum; six responses were received. Five participants expressed the devices were useful for customized instruction. Four participants stated that the devices were beneficial for requesting help during academic times. Three participants reported the device is best used for guidance during academic instruction. Two participants conveyed that the device used at the school was beneficial for further explanation on academic lessons.

Benefits of other Devices

Other than the devices used currently within the school, participants were asked if there were other devices they used within the classroom in the past that provided beneficial support for students. No responses were given.

Suggestions for the Use of Communication Devices

Participants were asked if there were any other suggestions for teachers on the use of communication devices; three responses were given. Participant 6 stated, "Create communication opportunities; make sure it's always available; teach child to take ownership of it." Participant 7 expressed "consistency, both learning together, do your research on the

device beforehand.” Participant 1, who is a special education teacher, stated ”Be creative and flexible. Be open minded.” The third response by Participant 4, who is a speech language pathologist, added:

“With increased use of technology within the classroom I often stress that equipment used for communication be set aside only for use as a communication device. Students can do lots of school related activities on an iPad, for instance, but it has been our experience and research bears out that an iPad used for communication should only be used for communication. Sometimes parents and school staff want to/are required to use one device for many functions- what student wants to be told put away that game you are playing on your iPad so we can answer questions about reading. If your device is your voice it should only be your voice not also your entertainment, break time, assignment submission, etc.”

Overall, the results of the study showed that the participants agreed greatly on the individual benefits of Speech Generating Devices (SGD) for requesting basic needs, peer and adult communication, and academic curriculum. Responses showed that participants had more knowledge about SGD rather than PECS, mainly due to the higher used of SGD in the classroom or in the past. When asked about school specific devices, most participants reported using different types of speech generating devices to help students with communication, and only three reported using PECS. It is understood by the results that the use of communication devices help break the barrier between student and adult due to the ability to communicate in various forms. Based on the responses given, SGD that produce speech or a “voice” for the students were known and used by the participants’ school.

**CHAPTER 5.
HANDBOOK**

Augmentative and Alternative
Communication Devices for
Students with Developmental
Delays

*A Guide of Communication Devices: How to get
them and How to Use Them*

Augmentative and Alternative Communication Devices for Students with Developmental Delays

**A Guide of Communication Devices: How to get
them and How to Use Them**

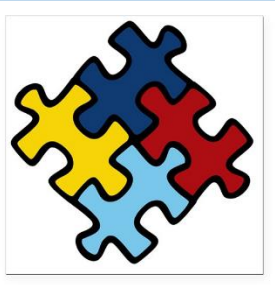


Table of Contents

My Story	51
Introduction.....	52
How to Use	53
What is Augmentative and Assistive Communication?.....	54
How Do You Get Started?	55
Picture Exchange Communication System	58
PECS Phases	60
Speech Generating Device	84

My Story

My journey started with receiving my bachelor's degree in Psychology. I knew I had an interest in understanding the way people think and why. I was not sure the path I wanted to take with my degree. Soon after graduating, I began working at the Bowen Center with children and adults who needed guidance for resources in the community to help with creating coping skills for their daily needs.

After working with adults and children, I found out my passion was working with only children. I began working at Possibilities Northeast Pediatric and Autism Services with children from ages two to five. The children had vast differences in their communication abilities, but each difference was unique to them. I firsthand saw how beneficial Picture Exchange Communication System (PECS) and Speech Generating Devices (SGD) on communication for children with autism and varying levels of speech abilities.

I began working on my master's degree in Education with a major in Special Education when my son was nine months old. Although it was difficult balancing life, I am thankful I have found my true passion in education to begin working with students who need that extra push to get them where, I believe, they are capable of.

Introduction

This contents of this handbook is aimed to be a guide for general education and special education teachers who have students with varied speech needs. For students who are minimally verbal or nonverbal, our goal is to create an outlet for communication to help them express their needs and wants in ways that are appropriate for their individual needs. It is our responsibility as educators to understand and know effective ways to reach those goals of communication for each child.

This is where the handbook comes in. There are various communication devices that fall into different groups, whether they are Picture Exchange Communication Systems (PECS) or Speech Generating Devices (SGD). This handbook is aimed to work as a guide for these devices, how to use them, and the diverse forms these devices come in. Why augmentative and alternative communication devices? If teachers are knowledgeable over these devices, students can have a more fulfilled education because they can receive an outlet of communication that is unique and made to their communication needs. Often, basic forms of communication devices are used because knowledge over more high-tech or even low-tech options are lacking, and this guide is aimed to open the door to a few well-known options that have been shown to be effective.

How to Use

This handbook focuses on various low-technology and high-technology augmentative and alternative communication devices (AAC). The handbook begins with how to attain an AAC device, whether through insurance or the school. Following this section, a guide of how to use a Picture Exchange Communication System (PECS) is provided. Multiple pages of ready to use PECS are included as well. This handbook also includes information on Speech Generating Devices (SGD) followed by various types of SGD that may be useful for a student the classroom. This is a reference tool that will make it easier to guide you through the most popular augmentative and alternative communication devices that can benefit your students.

What is Augmentative and Assistive Communication?

Augmentative and assistive technology (AAC) is used to enhance and support communication with children with autism, or other developmental delays. AAC devices can benefit learners of all ages by encouraging independence, increasing social communication, and expanding communication.

Reminder: Limited speech does not mean a child with autism, or another developmental disability, has less to say. The goal of using AACs is to take a learner's communication a step further than just requesting basic needs and wants.

There are various forms of assistive communication, and that is where training comes in, to determine the best fit communication device for the students in need of that extra assistance.

How Do You Get Started?

Follow These **Four** Steps:

Step One: Complete a Communication Assessment

- ✚ All learners have different strengths and needs
- ✚ Meet with an evaluation team to complete a Communication or AAC assessment, this includes specialists such as therapists, doctors, and teachers
- ✚ During this meeting, it should include the student with autism, or another developmental or cognitive delay, speech-language pathologist
- ✚ Training increases effective use of AAC devices

Step Two: Choosing a Device and Communication System

- ✚ Various options of AAC devices to fit the needs of all students
- ✚ Make the choice of which AAC device complements the strengths of the student
 - ❖ Low-Tech → lowest cost, minimal training, emphasizes social exchange and request
 - Picture Exchange Communication System, communication boards or books
 - ❖ Mid-Tech → speech generating device, extra training, fixed display, customizable
 - Voice output aides, Go Talk

- ❖ High-Tech → Speech generating devices with dynamic displays, applications, customizable
 - iPads, Dynavox, tablets with applications

✚ There are two systems: Dedicated and Open

- Dedicated is specifically for communication only
- Open is for communication and other services such as Wi-Fi

Step Three: Funding Pathways for Assistive Communication

✚ If going through the **school district** → **Remember:** Students who receive special education services have the right to AAC assessments and supports to meet their individual communication needs

- AAC assessment needs to be requested from the student's school district
- Work with speech language pathologist to complete the assessment and decide the best strategy
- Update IEP to include this modification—AAC use for all hours of the day, list software and apps that will be used

✚ If going through **private insurance** → it may cover a medically necessary AAC device with a prescription from a speech language pathologist or medical provider

- Request insurance company to request a policy on assistive technology or Durable Medical Equipment (DME)—Speech Language Pathologist or medical provider can make the request
- Meet with speech language pathologist to complete assessment for AAC to determine best fit strategy
- Documents needed to submit include → proof of medical necessity or letters of recommendation by medical provider or speech language pathologist

✚ If going through **Medicaid** → will cover if medically necessary with prescription from a speech language pathologist or medical provider

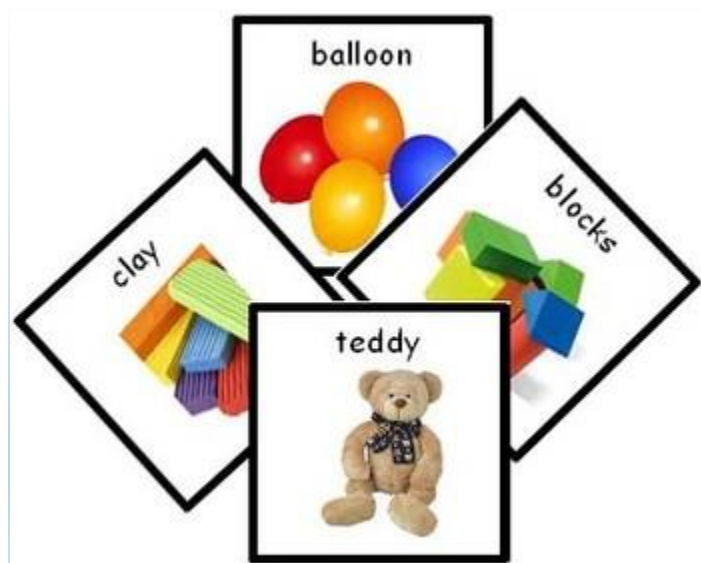
1. Contact Medicaid case worker to learn how to apply for AAC device
2. Provide proof of medical necessity
3. Caseworker can help find speech language pathologist to complete AAC assessment

Step Four: Training for Successful Use

✚ Work with speech-language pathologist or behavioral therapist to receive correct training for the student, caretakers, and service providers

1. Be consistent by including the AAC device in all settings of communication such as school, home, and community
2. Update and improve access to AAC devices
3. Monitor and adjust the strategy used by making updates to the device as needed

Picture Exchange Communication System¹



What is a Picture Exchange Communication System?

The Picture Exchange Communication System (PECS) is a modified applied behavioral analysis program for early nonverbal symbolic communication system.

The goal of PECS is not to create speech in children, but it is indirectly encouraged; some children in the PECS program begin to spontaneously use speech.

Where do PECS take place? PECS take place during daily activities in a natural environmental setting such as the classroom or home.

Training techniques while using PECS includes chaining, prompting, and modeling.

There are six phases of PECS

¹ <https://www.iidc.indiana.edu/pages/What-is-the-Picture-Exchange-Communication-System-or-PECS>

Who Can Use PECS?

PECS training is not based on age but built on certain criteria. Those who meet the criteria for using PECS are those who are an intentional communicator. An intentional communicator is aware of their need to communicate a message to someone, even if the way it is communicated is limited. If a child or adult does not look for an adult while trying to attain something they want, they are not an intentional communicator, and may need a different approach to encouraging communication.

The individual must have personal preferences. PECS main goal is to teach alternative communication, and without preferences, it may be hard to reach that goal of creating an alternative form of communication. Since testing preferences is the initial step in PECS training, this will be known early on; trial and error can determine preferences and dislikes on things such as food, activities, or objects.

Those who have picture discrimination may make faster progress than others in the initial stages of training. These individuals may be able to discriminate pictures, but they show a greater understanding of how to use pictures to communicate their desires.

PECS are greatly used for individuals who are nonverbal but can also be used with those who are echolalic, meaning they repeat what they hear others say.

PECS Phases

PECS Phases

Phase I

How to Communicate

- Spontaneous Requesting
- 2-Person Prompt Procedure
- Pick up, reach, release



Phase II

Distance and Persistence

- Travel to Communicative Partner
- Carry PECS Book
- Persistence across obstacles



Phase IIIA

Simple Discrimination

- Highly-preferred vs. non-preferred
 - 1/2 second rule
- 4-Step Error Correction Procedure



Phase IIIB

Conditional Discrimination

- Correspondence Checks
- 4-Step Error Correction Procedure
- Find pictures in book



Phase IV

Sentence Structure

- Construct and exchange Sentence Strip
- Backstep Error Correction Procedure
- Constant Time Delay to encourage speech



Attributes

Descriptive Vocabulary

- Request specific items
- Size, Color, Shape, etc.
- Action words



Phase V

Answering, "What do you want?"

- Maintain spontaneous requesting
- Progressive Time Delay



Phase VI

Commenting

- Responsive Commenting
- Commenting versus requesting
- Spontaneous Commenting



www.pecs.com

©2012, Pyramid Educational Consultants

"FLEX your PECS!"

PECS PHASE I



PECS phase I includes three individuals while training: the child (or adult) who transmits the message, the person who receives the message, and the facilitative adult who assists the message sender to make the targeted response. The goal is to have 80 exchanges throughout the day

Below are the steps in order while implementing a PECS training in phase I:

1. Adult presents a preferred object or foods to the learner
2. When the learner begins reaching for the object or food, physically assist the learner to pick up a picture that represents the desired item—make sure the message receiver is physically close to the learner to allow for an easy exchange
3. The adult who is receiving the picture of the desired item should not say anything until the picture is offered
4. Once the picture is given to the adult, the adult should respond appropriately. If the learner hands a picture of a toy train, the adult should respond with saying “oh, you want the train,” and follow through by giving that desired item to the learner

PECS PHASE II



- ✚ This phase is all about increasing independence by continuous exchanges
- ✚ The adult or facilitator is still there if the learner needs assistance
- ✚ At this point, the student has learned to remove the picture from the PECS board to continue an exchange
- ✚ More physical movement needs to be made on the learner's part to complete the communication exchange with the facilitator
- ✚ Have the child or adult learner be responsible for their own PECS board; they should be the ones carrying it with them from place to place

PECS PHASE III



- ✚ In this phase, it is important to present a wide array of pictures in different forms. The learner is beginning to understand how to select the one target they prefer from an array of many objects
- ✚ Error correction strategies may be used if the learner picks an incorrect response
 - Example of Error Correction:
 1. Student picks incorrect response
 2. Restate original SD
 3. Use least-to-most prompting to lead learner to correct response
 4. Put card back down
 5. Do distractor trial—show me clapping, touch your head
 6. Repeat SD

PECS PHASE IV



- ✚ This is when the learner begins making requests, to the communicator, in the form of a sentence by first selecting the phrase “I want,” and then choosing the desired picture

PECS PHASE V



- ✚ Facilitator: “What do you want?”
- Learner: picks “I want,” and then the desired item such as the dog picture
- ✚ This step in this process comes towards the end because at this point the exchange should be automatic

PECS PHASE VI



- ✚ This phase is where the learner begins responding to other forms of questions instead of just “what do you want.” The learner should be able to respond to questions such as “what do you have” or “what do you see?”
- ✚ This focuses on commenting behavior—making comments as learner selects response



The following pages are PECS, that may be useful to your students, that are readily available for use since it is time consuming to accumulate all the PECS needed for a student. Print the page, laminate, and cut, and the PECS are ready to go on a Velcro board.



pound and play



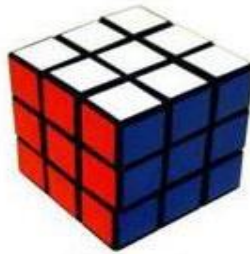
drum



basketball hoop



yo-yo



rubik's cube



rainmaker



lacing beads



play-doh



bean bag toss



marble run

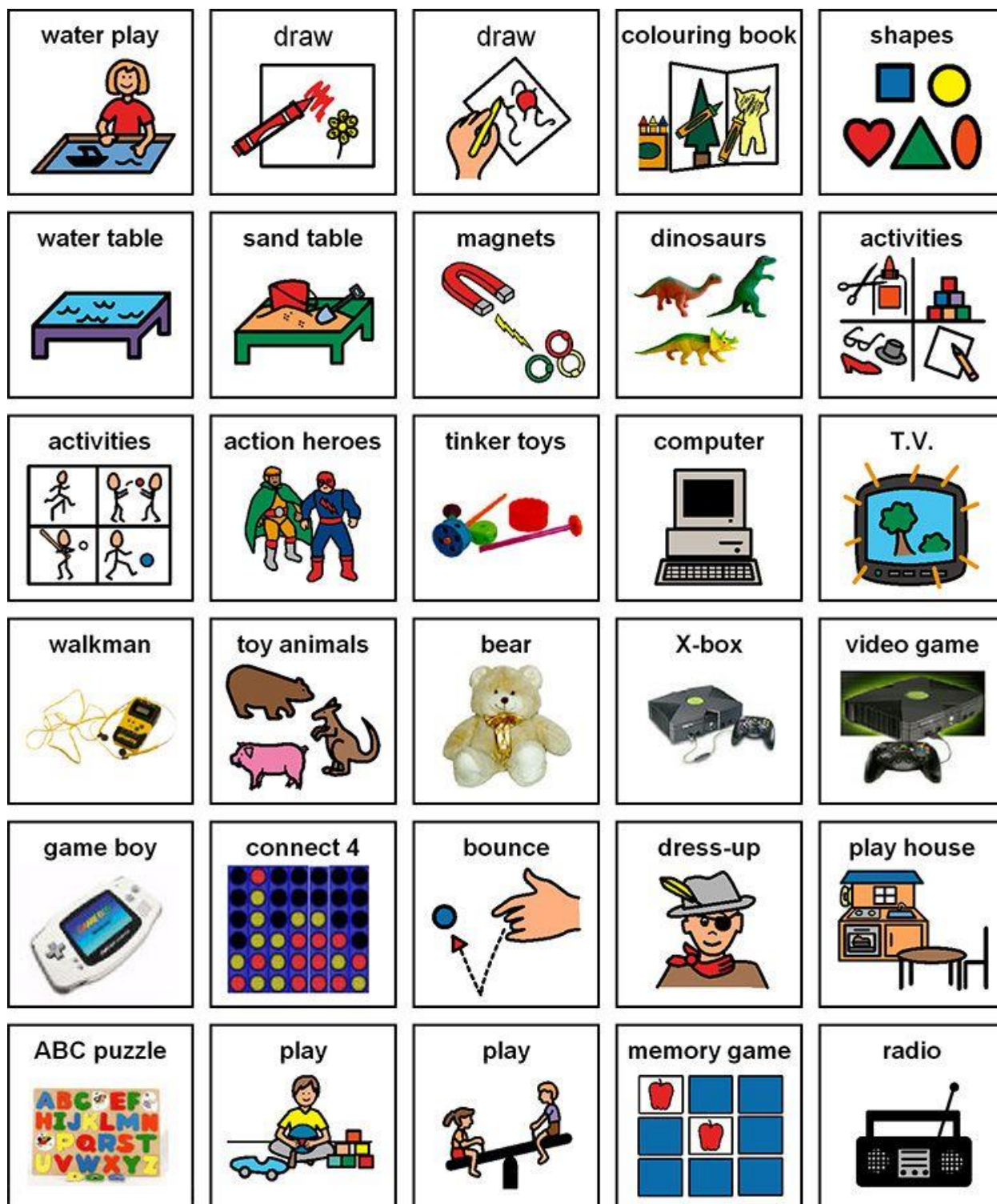


magna doodle



abacus

<https://www.pinterest.com/pin/233624299395156827/>



<https://www.pinterest.com/pin/210543351303272432/>



dresser



bed



pillow



bathtub



Sink



toilet



refridgerator



dozen eggs



milk



tree



"birdhouse"



bird



plastic cup



milk



"orange juice"



Pants



t-shirt



shoes



baseball bat



baseball



"baseball glove"



"chair"



couch



"coffee table"



doghouse



dog



leash



lined paper



pencils



marker



key



car



"lock"



eye



nose



Mouth



popcorn



Mixing bowl



microwave



spoon



ice cream



cereal



plate



drinking glass



fork



hammer



nail



toolbox



toothbrush



toothpaste



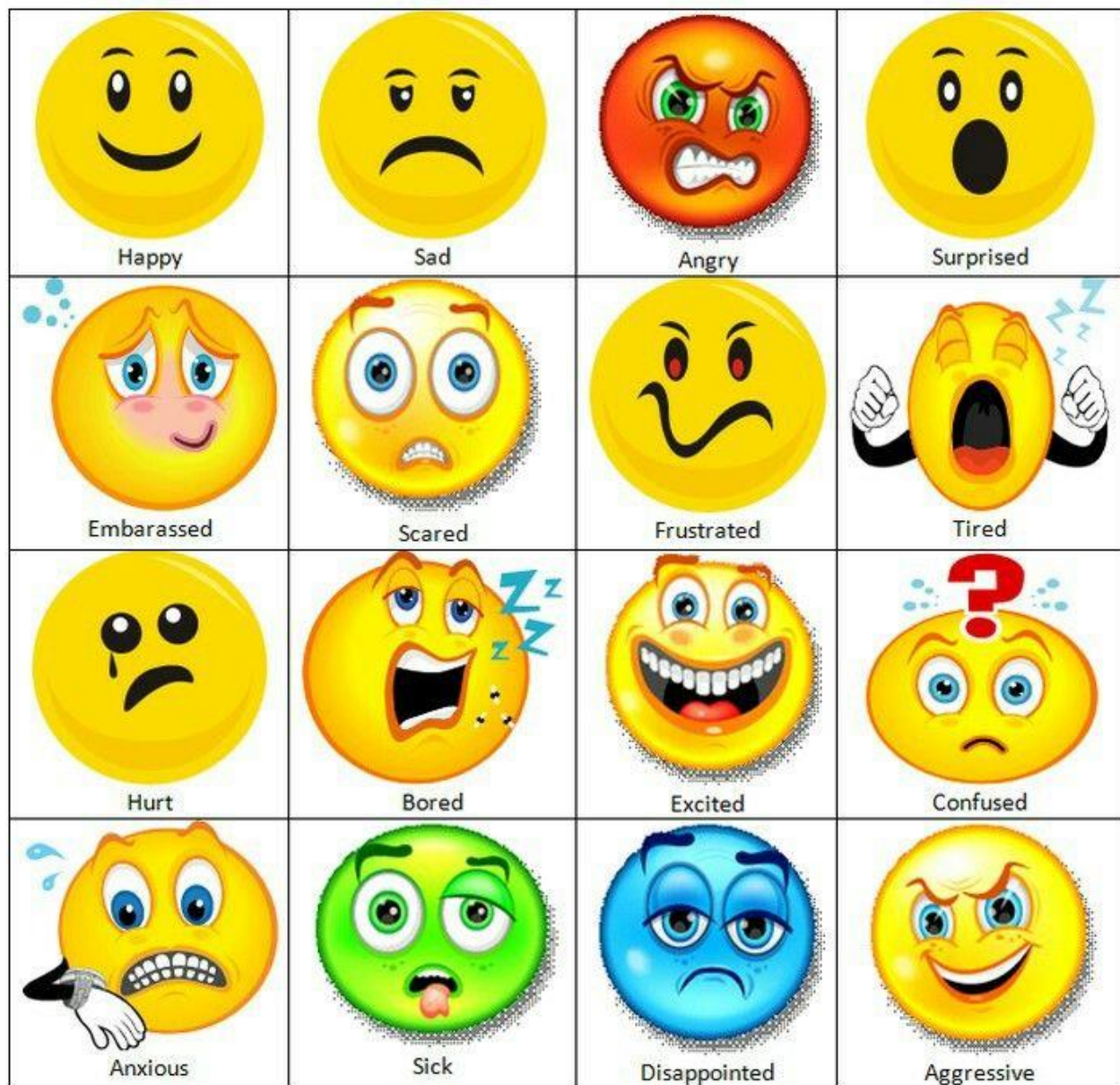
shoes



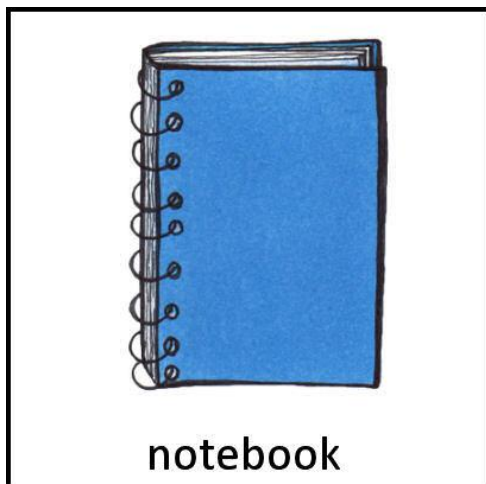
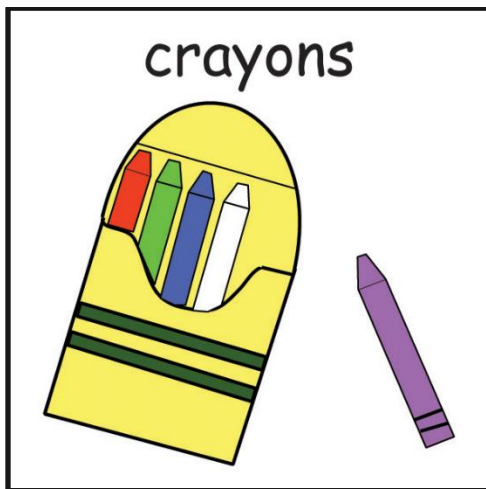
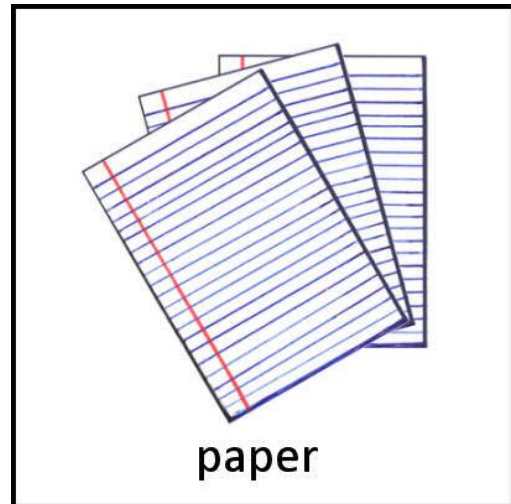
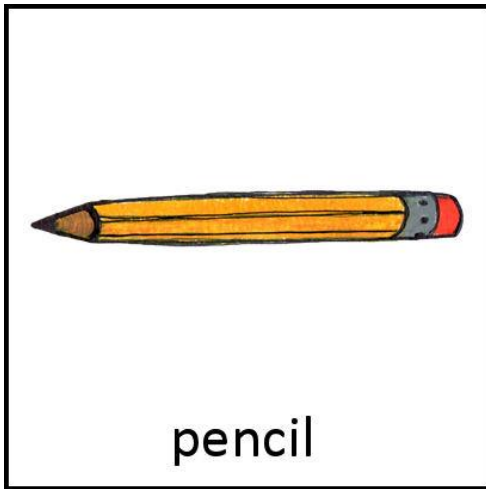
socks

<http://www.practicalautismresources.com/printables>

Feelings Chart



<https://www.pinterest.com/pin/294845106840231755/>



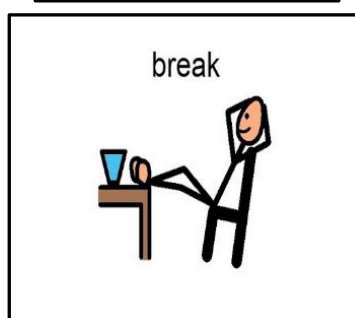
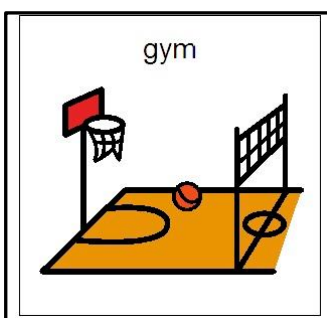
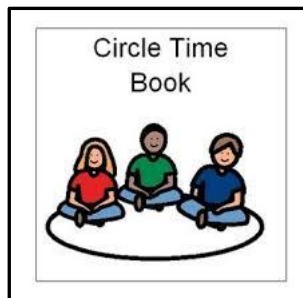
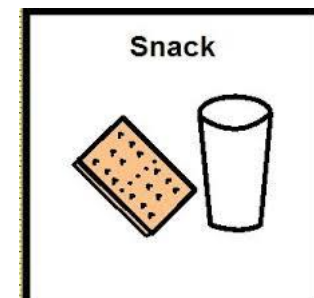
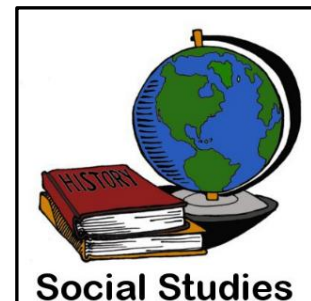
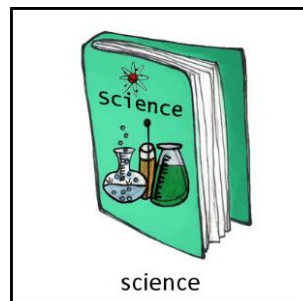
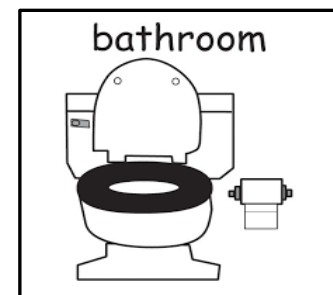
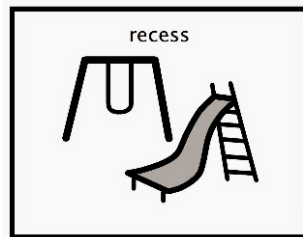
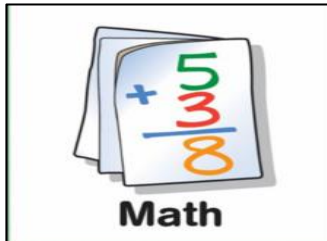
PECS Arranged by Vanessa Moyers

Morning	

Afternoon	

Note: Use these schedule templates to Velcro example PECS in the boxes to create a visual schedule

Cut and Laminate these PECS to use for your students' visual schedule



PECS and Charts Arranged by Vanessa Moyers

Arrival at School

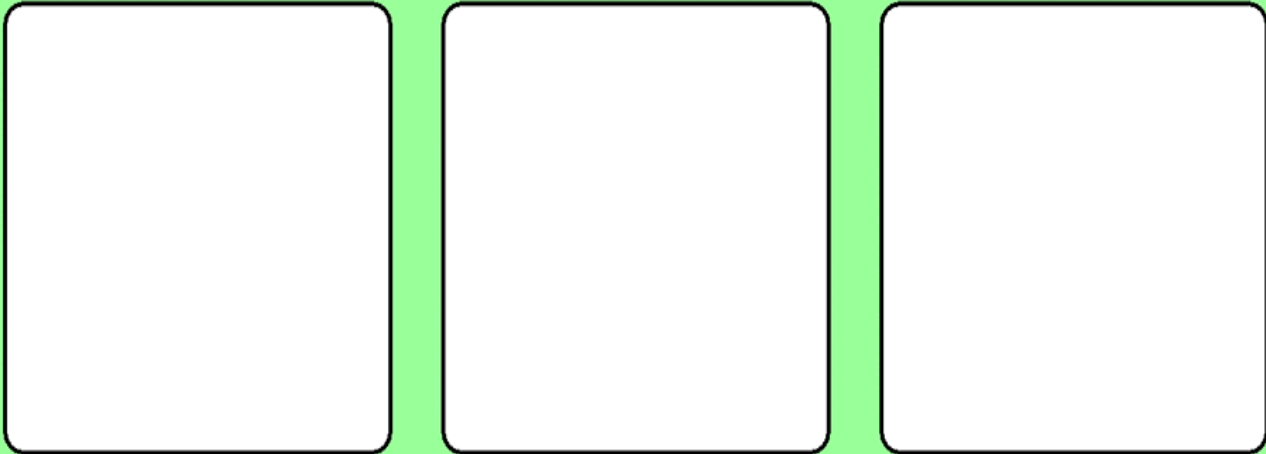
1		Take off Coat
2		Hang up Coat
3		Open Backpack
4		Take out work
5		Take out lunch
6		Put Away Backpack

Use this visual schedule at the start of the day. Have the student put the correct PEC on the board as he or she is going through this schedule. Below are the PECS needed.



PECS arranged by Vanessa Moyers

CHOICE BOARD

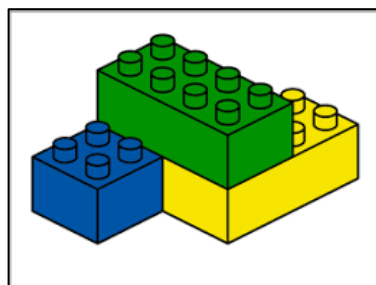
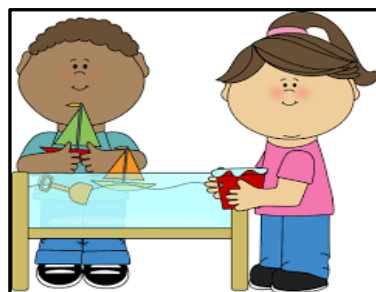
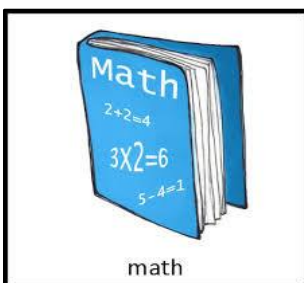
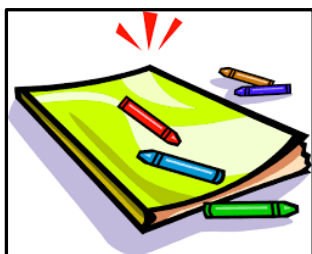
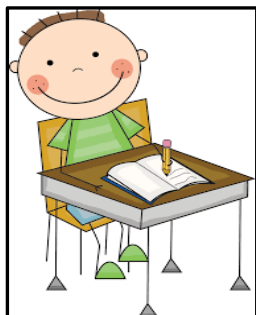


A choice board template consisting of a light green rectangular background with rounded corners. At the top center, the words "CHOICE BOARD" are written in a large, bold, black, sans-serif font. Below the title, there are three identical, empty white rectangular boxes with rounded corners and black outlines, arranged horizontally in a row. These boxes are intended for placing images or text representing different activities or choices.

Note: Place three highly preferred activities on choice board and have student pick which one to work for

Autismag.org

Below are PECS that can be used for the choice board and first then board. PECS from previous pages can be used as well:



Speech Generating Device



What is a Speech Generating Device?

- + Speech Generating Devices (SGD) are high technology systems that use computer-based programs that provide the ability, for those with severe speech impairments, to meet their functional communication needs.
- + These devices are activated in various ways such as touch, a body part, or gaze.
- + SGD produce speech by using word-by-word production of phrases or sentences.
- + Speech can be generated in a couple ways:
 1. Digitized speech output → prerecorded or preprogrammed messages
 2. Synthesized speech output → message needs to be created by spelling from the use of physical contact with the device
 3. Synthesized speech output → various ways to create a message and different ways to access the device

Language Through Acquisition Motor Planning (LAMP)

What is it?

- ✚ An approach based on neurological and motor learning principals
- ✚ Main goal is to promote independence and spontaneous communication for those who are nonverbal or have limited verbal capabilities

How does it help communication?

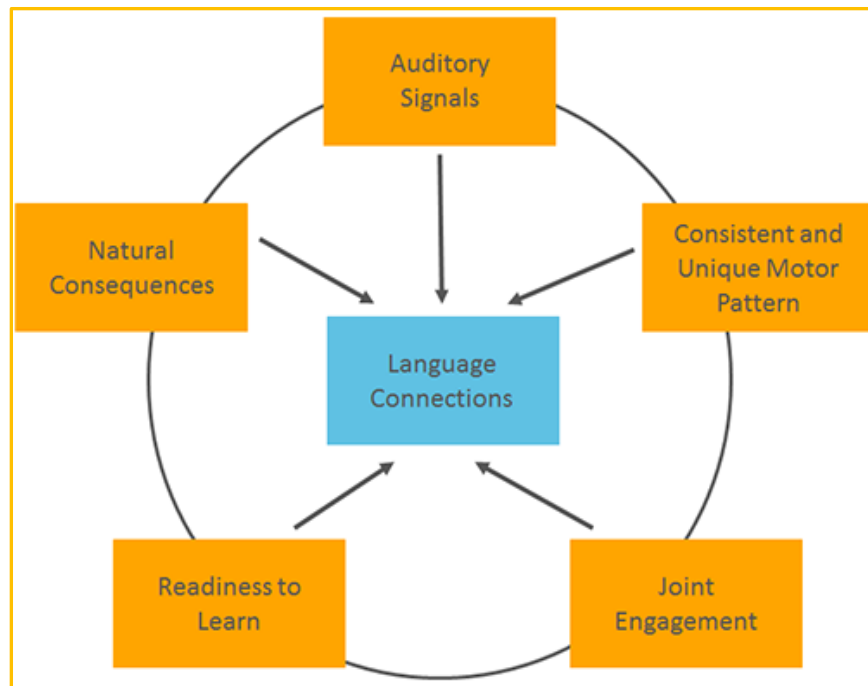
- ✚ It uses visual learning to create structure
- ✚ Addresses main deficits in communication while improving spontaneous and reproductive communication
- ✚ Lamp imitates the neurological processes that is associated with typical speech development
- ✚ Pairs constant motor movement with consistent auditory feedback while receiving natural responses

What does LAMP improve overall?

- ✚ Natural vocalizations
- ✚ Use of different communicative functions
- ✚ Receptive vocabulary
- ✚ Combination of words
- ✚ Spontaneous communication in different settings
- ✚ Mean Length of Utterance (MLU)
- ✚

See if there is a training on LAMP near you by going to this website: <https://www.aacandautism.com/training>

How to Know if Someone is Ready to Use the LAMP²

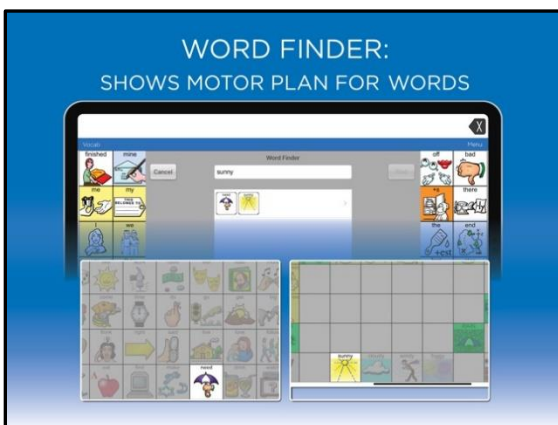
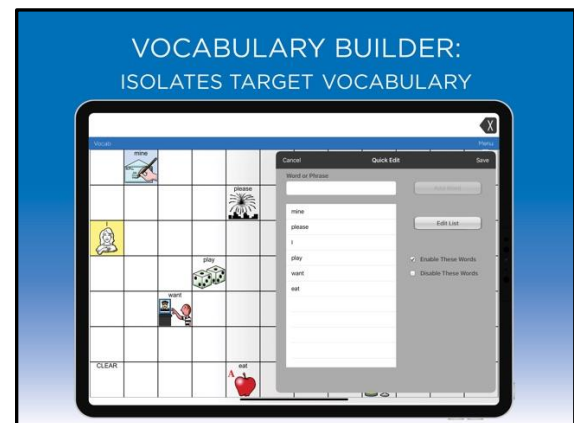
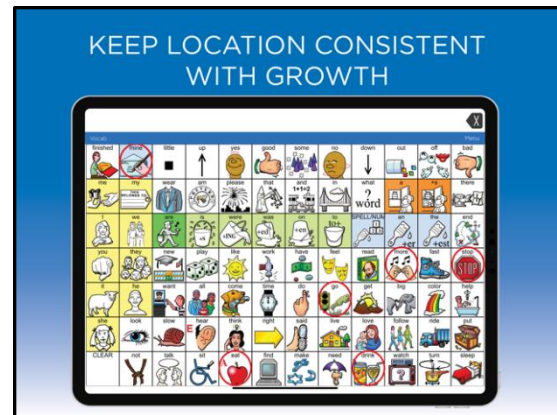


- ✚ An individual is ready to begin using the LAMP once they are in an arousal state that is compatible for attending and learning
- ✚ To keep interest, LAMP must include vocabulary that interests the child to communicate
- ✚ For effective communication, the individual must have the ability to monitor his or her environment, listen to the speaker, and follow the flow of the conversation → needs to be able to cognitively attend to the icons on the device

Remember: Joint engagement is needed for this to be effective. The listener needs to follow the individual's needs while expanding and introducing language based on the individual's interests

² <https://www.aacandautism.com/lamp/components>

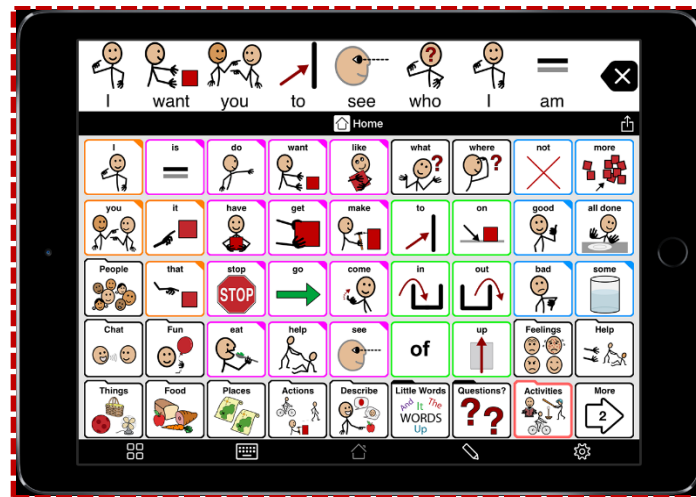
What Does it Look Like?



These are screenshots from LAMP Words For Life→This iPad application can be found on the app store for \$299.99

<https://apps.apple.com/us/app/lamp-words-for-life/id551215116>

Proloquo2go



What is it?

- ✚ Symbol-based AAC that supports various fine motor and visual skills
- ✚ Text-to-Speech
- ✚ IOS app--\$249.99

Who is it designed for?

- ✚ Non-verbal individuals with autism, down syndrome, cerebral palsy, other diagnoses, or speech impairments such as apraxia and dysarthria

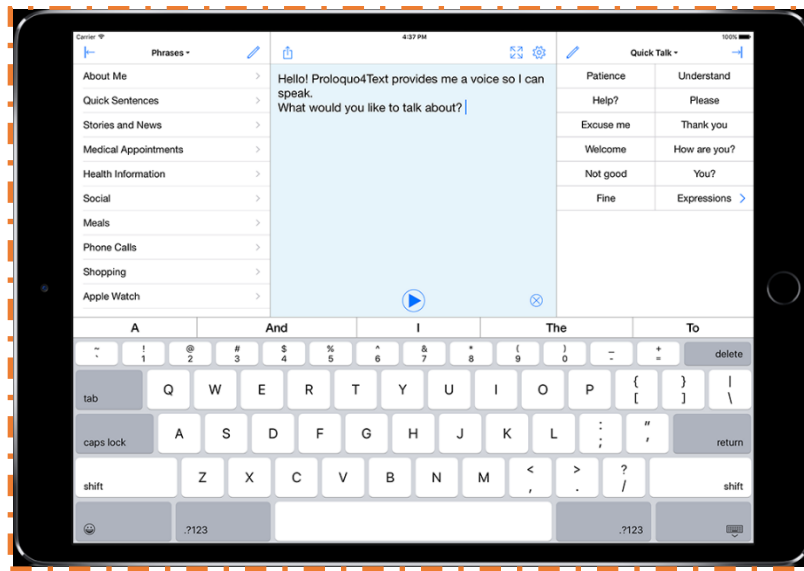
How it works:

- ✚ Users can practice language grow skills by developing from single words to full grammatical sentences
- ✚ Core words stay in the same spot throughout the growth of vocabulary to keep aid motor planning
- ✚ Add own buttons that are typical in daily life→symbols can be customized with own photos

Features:

- ✚ Customizable vocabulary levels
- ✚ Customizable folder organization of where symbols are located
- ✚ Changeable grid sizes


Proloquo4text





What is it?

-  Text-to-Speech App
-  Available through IOS app store for \$119.99



Who is it designed for?

-  Individuals with autism, cerebral palsy, ALS, and other diagnoses who can write

How does it work?

-  As the user writes, the app predicts what the user might be trying to say and finishes out the remainder of the sentence
-  Create own phrases, and group them for easier access

Features:

-  9 languages
-  130 voices

GoTalk 9+



What is it?

- ✚ AAC device that helps individuals with limited to no verbal speech

Features:

- ✚ Records and stores up to 45 messages in five levels, up to 8.25 minutes in total
- ✚ Nine programmable buttons allows the individual to personalize each level with pictures and vocal recordings
- ✚ Includes three additional core buttons for commonly used words or phrases across all five levels
- ✚ Offers chronological recording for fast set-up and re-recording

Note: This device comes in a Lite Touch version and a version with four programmable buttons with related features → GoTalk 9+ Lite Touch, GoTalk 4+

GoTalk 32+



What is it?

- ✚ 160 message AAC device that supports individuals with limited or no verbal communication

Features:

- ✚ Records and stores 160 messages in five levels, up to 19.5 minutes in total
- ✚ 32 programmable buttons allow the individual to personalize each level with pictures and vocal recordings
- ✚ Includes three additional core buttons for commonly used words or phrases across levels
- ✚ Offers chronological recording for quick set-up and re-recording

GoTalk 32 Express



What is it?

- ✚ AAC device supports those with limited to no speech with a sequencing “express” option for linking messages

Features:

- ✚ Records and stores 160 messages in five levels, eight seconds per message, up to eight messages in a sequence
- ✚ 32 programmable buttons allow the individual to personalize each level with pictures and vocal recordings
- ✚ Includes the standard *GoTalk* function and express function
- ✚ Optional 1.5 second auditory cue for each button

Tobii Dynavox I-Series



What is it?

- ✚ A gaze-enabled speech generating device with eye tracker

Who is it designed for?

- ✚ Individuals with cerebral palsy, ALS, Rhett Syndrome, aphasia, or spinal cord injury
- ✚ Can mount to wheelchair for easier use

How does it work?

- ✚ Uses Windows program to communicate and control their environment with their eyes
- ✚ Device picks up on individual's eye movement of where eye contact is being made with specific icon or icons

Features:

- ✚ Can be customized to be touch or switch
- ✚ Eye gaze accessible Adaptive Buttons

Tobii Dynavox EM-12



What is it?

- ✚ Tablet-based speech generating device

Who is it designed for?

- ✚ Individuals with cerebral palsy, ALS, Rhett Syndrome, aphasia, or spinal cord injury

How does it work?

- ✚ Has all-in-one eye tracking, high-quality speakers, speech recognition, and switch access for scanning the device
- ✚ Hands-free mobile computing

Features:

- ✚ Multiple input methods → eye tracking, voice control, switch input, and touch
- ✚ 4-array microphone for optimal speech recognition

Tobii Dynavox I-110



What is it?

- ✚ Touch-based speech generating device

Who is it designed for?

- ✚ Individuals with cerebral palsy, ALS, Rhett Syndrome, aphasia, or spinal cord injury

How does it work?

- ✚ To make communication easier, it includes various software applications, various voices, and support, to help diverse communication needs
- ✚ Has a built-in kickstand making it wheelchair friendly, while including different compatibility access methods such as touch, switch scanning, head-mouse, and touch with keyguards

Features:

- ✚ Water resistant
- ✚ Gorilla glass that can handle spills and drops
- ✚ Outward facing speakers for powerful sound, and produces clear speech

Big Talk



What is it?

- ✚ One message communicator

Who is it designed for?

- ✚ Those with visual impairments, physical disabilities, or speech difficulties who need a larger target area

How does it work?

- ✚ The Big Talk connects to an external device, which plays the message recorded by the user
- ✚ This creates an outlet for simple communication

Features:

- ✚ 20 seconds of recording time
- ✚ Activated by external switch or act as a switch

Big Talk Triple Play Sequencer



What is it?

- ✚ Communicator that provides single, sequential, and random message abilities
- ✚ Sequential capability is beneficial for storytelling
- ✚ Random capability is aimed towards learning through game play

Who is it designed for?

- ✚ Individuals with varying speech impairments

How does it work?

- ✚ A jack connects and activates with an external switch
- ✚ Output jack allows activating external device while the message plays
- ✚ Communicate want for item by pushing corresponding button switch

Features:

- ✚ 4 levels of communication
- ✚ 75 seconds of record time per each level
- ✚ Auditory click and tactile feedback

Cheap Talk 6 for VI



What is it?

- ✚ 6 level communicator

Who is it designed for?

- ✚ Individuals with speech impairments or visual impairments → black border around buttons makes it easier for visually impaired to select button

How does it work?

- ✚ Individuals select which preferred item or activity they want by pressing the corresponding button
- ✚ Icons can be switched out for more options
- ✚ Icon label is available for purchase to allow users to create and print their own icons → follow the link at the bottom, select accessories, and label maker can be purchased

Features:

- ✚ 6 levels
- ✚ 225 seconds of total record time

CHAPTER 6.

DISCUSSION

Summary of Project

Although educators have knowledge about augmentative and alternative communication devices that are used within their school, results of this overall project showed that the information known is minimal and focused only on what they have used in the past years. It is important for educators to be knowledgeable of various types of communication devices that could work for a range of students with diverse communication needs. Research results showed that Picture Exchange Communication Devices (PECS) and Speech Generating Devices (SGD) were effective in breaking barriers in communication between learner and adult. PECS and SGD assists in nonverbal communication that could promote children to communicate independently while fading out the use of assistive technology. A handbook was developed to create a guide for educators of the various communication devices, and how to use them appropriately. The handbook includes examples of PECS that could be helpful for numerous students and their needs.

The data received from the survey was supported from research by Ali et.al. (2011), in that the study explored the benefits of PECS and the requesting skills demonstrated by participants. Results showed that participants were successful in requesting items using PECS, like the survey responses explaining the benefits of PECS for requesting basic, academic, and social-communicative needs.

As for SGD, participants responded within the survey that the devices used within the classrooms were beneficial for communicating needs, whether it be academic guidance or

requesting basic needs. The data was supported from a study by Chung and Carter (2013), in which the researchers explored the benefits of SGD and interactions within an inclusive classroom. Results showed that social interactions in various forms was increased from the use of a SGD.

Limitations of Survey

The survey had its strengths, but weaknesses as well that affected data. The first weakness was the amount of responses received. The survey was initially sent out to four schools in one school system, and I initially received four responses. I emailed the principals an additional time to re-send the survey one more time. I ended up with a total of seven responses. The limited amount of responses gave me limited amount of data, which made it hard to analyze data with the minimal amount of information I received.

Another limitation was regarding the survey questions over school specific devices: What are the benefits of this device on peer and adult communication? What are the benefits of this device on requesting basic needs? What are the benefits of this device on academic curriculum? When it came to responses about the benefits of that specific device, I did not know which device was being answered about since each participant listed multiple devices; it may have been that they were applying their answers to all the devices. If this question was open-ended asking to include these benefits and the device name, I would have received greater device specific information.

Special Project Strengths and Limitations

There are various resources to gain information over augmentative and alternative communication devices that benefits different groups of individuals based on their needs. This

specific handbook is valuable as a starter guide to AAC devices for people who are not very familiar with devices or how they can be used. The handbook encompasses a handful of devices while keeping it simple enough where it is not overwhelming and easy to understand. Speech Generating Devices (SGD) are usually the most challenging to use since there are various options to choose from that lead to more specific options the learner wants to communicate; this handbook breaks it down step by step to make the device more approachable. The one limitation of the handbook is the limited examples of SGD due to the minimal responses given, and the participants using the same or similar devices. The goal for the handbook was to be a vast guide of numerous communication devices, but it ended up being less than what was planned for.

The “Handbook of Augmentative and Alternative Communication,” by Sharon Glennen and Denise DeCosta, published in 1997, is a text-based handbook over the need of AAC devices and their practical uses. This handbook has more in-depth information of the use of augmentative and alternative devices, but it does not include an actual handbook of devices. The handbook does not include sections of specific low-technology and high-technology devices, with pictures, that can be used for students or individuals with varying communication needs. The handbook does not include how to use them, or special features to help educator easily decide which device would fit their students’ needs.

Ideas for Future Improvement

As for future improvements to advance the field of knowledge, it would have been beneficial to survey more school to research a greater variety of augmentative and assistive communication devices. Another idea for advancement is receiving more feedback from speech language pathologists since they are more knowledgeable over the various types and uses of AAC devices. Also, it would be valuable to interview speech language pathologists about what is

appropriate and needed for different populations of students based on their individual communication needs. Last, it would be useful to interview parents about how they feel augmentative and alternative communication devices have benefited their children and their communication increases or improvements.

Reflection

The overall experience with the development of the special project was overwhelming but fulfilling. Although we were guided throughout this project, majority of it was done without our hands being held, and that created its challenges. Throughout school, students become accustomed to having a set outline of how coursework needed to be completed, and this project was the opposite. With the provided outline of what sections needed to be included within this project, it was our jobs as students to make sure those sections had all the details necessary. The amount of work, which mostly came from the literature reviews, created a level of exhaustion that I was not used to, but with each day, it became easier. Even though the work was constant and exhausting, Dr. Leatherman did a great job keeping us organized and motivating us by reminding us of our abilities to complete this project. Without her countless edits on our papers, we would have been overly stressed with fixing every detail on our own.

At the start of this project our Professor, Dr. Leatherman, told us that we will develop close friendships. During this time, my classmate Sabrina and I, developed a close friendship that will continue for a lifetime. Sabrina has been one of my motivators throughout this journey of completing this project.. We would remind each other of goals that needed to be done in order to meet deadline dates. Since the beginning of this project, we would spend numerous hours on FaceTime helping each other with each section of our papers and giving suggestions on how to

make it all flow together. Before submission dates, we would email each other our papers to receive extra feedback and corrections that would improve the quality of our work.

There were times during this project where I felt like I needed a long break from anything school related, but I pushed through because the end goal was so close. At the beginning of this Thesis and Special Project, my son was nine months old and he is now a little over two years old. Balancing raising my son, working full time as a Registered Behavioral Technician at an autism clinic, and going to school made this journey that much more overwhelming. Although it was challenging, it helped me create a good balance in my life to attend to everything I needed and that needed me, while still putting equal amount of attention into each part.

Conclusion

Educators struggle to serve students with communication needs due to their lack of exposure to augmentative and alternative communication devices. Augmentative and alternative communication devices promote learning and communication in the school setting for children with disabilities while creating an overall positive education. The handbook found in Chapter 5 will be distributed to special education and general education teachers who serve children with communication needs. My goal is for the handbook to positively encourage teachers to gain the knowledge they need to better promote their students' communication and educational needs.

APPENDIX A

Date: 12-3-2019

IRB #: IRB-2019-525

Title: Investigation of Assistive Communication Devices for Students with Disabilities

Creation Date: 10-23-2019

End Date:

Status: **Approved**

Principal Investigator: JANE LEATHERMAN

Review Board: Exempt Reviewer

Sponsor:

Study History

Submission Type	Initial	Review Type	Exempt	Decision	Exempt
-----------------	---------	-------------	--------	----------	---------------

Key Study Contacts

Member	JANE LEATHERMAN	Role	Principal Investigator	Contact	jleather@purdue.edu
Member	Vanessa Moyers	Role	Primary Contact	Contact	vdickow@purdue.edu

APPENDIX B

Survey for Augmentative and Alternative Communication

The survey contains the following questions:

1. Are you a general education teacher, special education teacher, specials teacher, or paraprofessional?
2. How many students in your classroom in the past years have used assistive communication devices?
3. What types of assistive communication devices are being used within your school?
(PECS, SGD, Other)

PECS

4. What are benefits of PECS on requesting basic needs? (food, water, restroom, etc.)
5. What are the benefits of PECS on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)
6. What are the benefits of PECS on academic curriculum? (requesting help, explanation, guidance, etc.)

SGD

7. What are benefits of SGD on requesting basic needs? (food, water, restroom, etc.)
8. What are the benefits of SGD on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)
9. What are the benefits of SGD on academic curriculum? (requesting help, explanation, guidance, etc.)

What is the device currently used in your school ?

10. What are benefits of this device on requesting basic needs? (food, water, restroom, etc.)

11. What are the benefits of this device on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)

12. What are the benefits of this device on academic curriculum? (requesting help, explanation, guidance, etc.)

Questions for All Participants

12. Is there another device that you have used within the classroom that provided beneficial support for students?

13. What suggestions do you have for teachers on the use of communication devices?

APPENDIX C



October 23, 2019

Principals:

This letter confirms that I, as an authorized representative of MSD Southwest Allen County Schools (SACS), allow Vanessa Moyers to conduct the study Investigation of Assistive Communication Devices for Students with Disabilities in SACS. Mrs. Moyers is a student at Purdue University Fort Wayne and will be conducting a survey of educators including: special education, general education, special areas teachers, and paraprofessionals in the building. Individuals' participation will be voluntary, at their own discretion, and will not contain identifiable information.

I confirm that I am authorized to approve research conducted in SACS. I understand that the data collected will remain confidential and will not be provided to anyone outside the research team.

Respectfully,

Dr. Patricia Hartman, BCBA

Director of Special Education

(260) 431-2040 / (260) 431-2047 fax

phartman@sacs.k12.in.us

Preparing today's learners for tomorrow's opportunities. Preparing today's learners for tomorrow's opportunities.

Dr. Patricia Hartman, BCBA ♦ Director of Special Education
4824 Homestead Road ♦ Fort Wayne, Indiana 46814 ♦ (260) 431-2040 ♦ phartman@sacs.k12.in.us

APPENDIX D

Dear Participants,

My name is Vanessa Moyers, I am currently enrolled in a Thesis and Special Project Class at Purdue University Fort Wayne. I am conducting the study Investigation of Assistive Communication Devices for Students with Disabilities. I am interested in the language increase students receive from the use of communication devices. Please consider completing this Assistive Communication Devices Survey, as I am confident that your responses will be valuable in the completion of my study. This survey will take approximately 10-15 minutes to complete.

You will not be asked to attach your name to your survey responses. Individual responses will be used for research purpose only and will be confidential. There will be no indefinable information within this survey. This survey is voluntary, and not all questions need to be answered if not comfortable. Once the surveys are gathered, they will be destroyed in May 2020. Upon completion of the study, the surveys will be destroyed. The Director of Special Education for MSD Southwest Allen County Schools (SACS), Patricia Hartman, has approved this research.

If you have any questions about this survey, you can contact me at 260-494-5654 or email me at dickvd01@pfw.edu. You may also contact my professor Jane Leatherman, Ph.D. at 260-481-5742 or email leatherj@pfw.edu.

I would like to sincerely thank you all for your time and participation in this project.

APPENDIX E



APPENDIX F

Survey Questions	Responses
1. Are you a general education teacher, special education teacher, specials teacher, or paraprofessional?	1. Participant 1-Special Education Teacher Participant 2-Special Education Teacher Participant 3-Special Education Teacher Participant 4-Other: Speech Language Pathologist Participant 5-General Education Teacher Participant 6-Special Education Teacher Participant 7-Special Education Teacher
2. How many students in your classroom in the past years have used assistive communication devices?	2. Participant 1: 3-6 Participant 2: 0-2 Participant 3: 0-2 Participant 4: 10 or more Participant 5: 0-2 Participant 6: 3-6 Participant 7: 3-6
3. What types of assistive communication devices are being or were used within your school or classroom? (PECS, SGD, etc.)	3. Participant 1-Other: PECS and SGD Participant 2-No Response Participant 3-Speech Generating Device (SGD) Participant 4-Other: I would like to indicate all of these and put iPad with communication app download in the other column Participant 5-Speech Generating Device (SGD) Participant 6-Speech Generating Device (SGD) Participant 7- Other: Speech generating device and PECS

4. What are the benefits of PECS on requesting basic needs? (food, water, restroom, etc.)	4. Participant 1-No Response Participant 2-No Response Participant 3-No response Participant 4-No Response Participant 5-No Response Participant 6-No Response Participant 7-No Response
5. What are the benefits of PECS on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)	5. Participant 1-No Response Participant 2-No Response Participant 3-No response Participant 4-No Response Participant 5-No Response Participant 6-No Response Participant 7-No Response
6. What are the benefits of PECS on academic curriculum? (requesting help, explanation, guidance, etc.)	6. Participant 1-No Response Participant 2-No Response Participant 3-No response Participant 4-No Response Participant 5-No Response Participant 6-No Response Participant 7-No Response
7. What are benefits of SGD on requesting basic needs? (food, water, restroom, etc.)	7. Participant 1-No Response Participant 2-No Response Participant 3- Food, Water or beverage, Restroom, Clothing, Sleep or rest time, Location requests, Other: Break Participant 4- No Response Participant 5- Food, Water or beverage, Restroom Participant 6- Food, Water or beverage, Other: leisure activities; feelings Participant 7-No Response

<p>8. What are the benefits of SGD on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)</p>	<p>8. Participant 1-No Response Participant 2-No Response Participant 3- Initiating requests, Communicating unwanted effects, Academic help, Sharing information, Understanding others, Expressing thoughts Participant 4-No Response Participant 5-Initiating requests, Communicating unwanted effects Participant 6: Initiating requests, Communicating unwanted effects, Academic help, Sharing information Participant 7-No Response</p>
<p>9. What are the benefits of SGD on academic curriculum? (requesting help, explanation, guidance, etc.)</p> <p>10. What device is currently used in your school?</p>	<p>9. Participant 1-No Response Participant 2-No Response Participant 3- Requesting help, Further explanation, Guidance, Customized instruction Participant 4-No Response Participant 5- Requesting help, Further explanation, Guidance, Customized instruction Participant 6- Customized instruction Participant 7-No Response</p> <p>10. Participant 1- iPad Tobii Dynavox. Two button box Cards for PECS Participant 2-No Response Participant 3- GOTalk, 2 and 3 button switches, Pecs Participant 4- PECS, switches, boardmaker, speech devices from several companies and a few different iPad apps Participant 5- tobi Participant 6- Tobii; Big Mac; Step by Step; Communication App on Ipad Participant 7- Tobii and another one that I am not sure the name of</p>

<p>14. Is there another device that you have used within the classroom that provided beneficial support for students?</p>	<p>14. Participant 1-No Response Participant 2-No Response Participant 3-No Response Participant 4-No Response Participant 5-no Participant 6-No Response Participant 7-n/a</p>
<p>15. What suggestions do you have for teachers on the use of communication devices?</p>	<p>13. Participant 1- Be creative and flexible. Be open minded. Participant 2-No Response Participant 3-No Response Participant 4- With increased use of technology within the classroom I often stress that equipment used for communication be set aside only for use as a communication device. Students can do lots of school related activities on an iPad, for instance, but it has been our experience and research bears out that an iPad used for communication should only be used for communication. Sometimes parents and school staff want to/are required to use one device for many functions-what student wants to be told put away that game you are playing on your iPad so we can answer questions about reading. If your device is your voice it should only be your voice not also your entertainment, break time, assignment submission, etc. Participant 5-none Participant 6- Create communication opportunities; make sure it's always available; teach child to take ownership of it Participant 7- consistency, both learning together, do your research on the device before hand</p>

APPENDIX G

Survey Question	Source
What are the benefits of PECS on requesting basic needs? (food, water, restroom, etc.)	Ali, E., MacFarland, S. Z., & Umbreit, J. (2011). Effectiveness of Combining Tangible Symbols with the Picture Exchange Communication System to Teach Requesting Skills to Children with Multiple Disabilities Including Visual Impairment. <i>Education and Training in Autism and Developmental Disabilities</i> , 46(3), 425–435. Retrieved from http://search.ebscohost.com.ezproxy.library.pfw.edu/login.aspx?direct=true&db=eric&AN=EJ942511&site=ehost-live&scope=site
What are the benefits of PECS on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)	Chung, Y.-C., & Carter, E. W. (2013). Promoting Peer Interactions in Inclusive Classrooms for Students Who Use Speech-Generating Devices. <i>Research and Practice for Persons with Severe Disabilities</i> , 38(2), 94–109. Retrieved from http://search.ebscohost.com.ezproxy.library.pfw.edu/login.aspx?direct=true&db=eric&AN=EJ1045093&site=ehost-live&scope=site
What are the benefits of PECS on academic curriculum? (requesting help, explanation, guidance, etc.)	Lerna, A., Esposito, D., Conson, M., Russo, L., & Massagli, A. (2012). Social-Communicative Effects of the Picture Exchange Communication System (PECS) in Autism Spectrum Disorders. <i>International Journal of Language & Communication Disorders</i> , 47(5), 609–617. https://doi.org/10.1111/j.1460-6984.2012.00172.x
What are benefits of SGD on requesting basic needs? (food, water, restroom, etc.)	Genc-Tosun, D., & Kurt, O. (2017). Teaching multi-step requesting to children with autism spectrum disorder using systematic instruction and a speech-generating device. <i>AAC: Augmentative and Alternative Communication</i> , 33(4), 213–223. https://doi.org/10.1080/07434618.2017.1378717
What are the benefits of SGD on peer and adult communication? (initiating requests, communicating unwanted effects, etc.)	Thiemann-Bourque, K. S., McGuff, S., & Goldstein, H. (2017). Training peer partners to use a speech-generating device with classmates with autism spectrum disorder: Exploring communication outcomes across preschool contexts. <i>Journal of Speech, Language, and Hearing Research</i> , 60(9), 2648–2662. https://doi.org/10.1044/2017_JSLHR-L-17-0049

What are the benefits of SGD on academic curriculum? (requesting help, explanation, guidance, etc.)	Xin, J. F., & Leonard, D. A. (2015). Using iPads to Teach Communication Skills of Students with Autism. <i>Journal of Autism and Developmental Disorders</i> , 45(12), 4154–4164. https://doi.org/10.1007/s10803-014-2266-8
What device is currently used in your school?	Schaefer, J. M., & Andzik, N. R. (2016). Switch on the Learning. <i>Teaching Exceptional Children</i> , 48(4), 204–212. https://doi.org/10.1177/0040059915623517 Tönsing, K. (2016). Supporting the Production of Graphic Symbol Combinations by Children with Limited Speech: A Comparison of Two AAC systems. <i>Journal of Developmental & Physical Disabilities</i> , 28(1), 5–29. https://doi.org/10.1007/s10882-015-9425-5
What are the benefits of this device on requesting basic needs?	Schaefer, J. M., & Andzik, N. R. (2016). Switch on the Learning. <i>Teaching Exceptional Children</i> , 48(4), 204–212. https://doi.org/10.1177/0040059915623517 Tönsing, K. (2016). Supporting the Production of Graphic Symbol Combinations by Children with Limited Speech: A Comparison of Two AAC systems. <i>Journal of Developmental & Physical Disabilities</i> , 28(1), 5–29. https://doi.org/10.1007/s10882-015-9425-5
What are the benefits of this device on peer and adult communication?	Schaefer, J. M., & Andzik, N. R. (2016). Switch on the Learning. <i>Teaching Exceptional Children</i> , 48(4), 204–212. https://doi.org/10.1177/0040059915623517 Tönsing, K. (2016). Supporting the Production of Graphic Symbol Combinations by Children with Limited Speech: A Comparison of Two AAC systems. <i>Journal of Developmental & Physical Disabilities</i> , 28(1), 5–29. https://doi.org/10.1007/s10882-015-9425-5
What are the benefits of this device on academic curriculum?	Schaefer, J. M., & Andzik, N. R. (2016). Switch on the Learning. <i>Teaching Exceptional Children</i> , 48(4), 204–212. https://doi.org/10.1177/0040059915623517 Tönsing, K. (2016). Supporting the Production of Graphic Symbol Combinations by Children with Limited Speech: A Comparison of Two AAC systems. <i>Journal of Developmental & Physical Disabilities</i> , 28(1), 5–29. https://doi.org/10.1007/s10882-015-9425-5

VITA

Vanessa D. Moyers

EDUCATION

Purdue University Fort Wayne

Master of Science in Education-Major in Special Education

May 2020

Indiana-University Purdue-University Fort Wayne

Bachelor of Arts: Psychology

Degree Awarded: Fall 2016

Cumulative GPA: 3.3

CERTIFICATIONS

- Safety Crisis Management (SEM)

EXPERIENCE

Summit Middle School

January-February 21, 2020

Practicum/Student Teaching

- Observations
- Grading papers
- Teaching
- One-on-one teaching
- Attending conferences
- Attending staff meetings

Possibilities Northeast

April 2018-Present

Registered Behavioral Technician (RBT)

- Administer client-specific treatment plans-adjusted to any changes made in intervention plan
- Work to maintain positive atmosphere for clients, while utilizing creative methods to fulfill therapeutic programs
- Adjust to several clients ranging from lower to higher functioning in the Autism Spectrum
- Collect and record daily client data in daily notes, ABC data charts, and task analysis sheets
- Discuss client's daily progress and behaviors with parents/guardians

Child's Play Autism Center

January 2018-April 2018

Applied Behavioral Analysis (ABA) Therapist

- Trained to become a Registered Behavioral Technician
- Administer client-specific treatment plans-adjusted to any changes made in intervention plan
- Work to maintain positive atmosphere for clients, while utilizing creative methods to fulfill therapeutic programs
- Adjust to several clients ranging from lower to higher functioning in the Autism Spectrum
- Collect and record daily client data in daily notes, ABC data charts, and task analysis sheets
- Discuss client's daily progress and behaviors with parents/guardians

The Bowen Center

February 2017-August 2017

Rehabilitation Service Provider

- Used evidence-based practices to work through goals listed in clients individualized plan
- Provided transportation in the community
- Worked with clients in school
- Linked clients to community resources

Firehouse Subs

August 2014-February 2017

Shift manager

- Leading employee
- Managing workers
- Place store orders
- Counting money
- Product orders

Children's Autism Center

August 2015-December 2015

Internship under the supervision of Dr. Young at IPFW

- Observed clients and programs
- Learned to pair with clients as well as understand how to communicate with each client differently
- Completed observation logs each day to reflect on what I learned
- Worked with behavioral therapists while observing clients
- Helped create block stacking patterns to use for programs

Jersey Mike's Subs

March 2014-August 2014

Shift leader

- Managing workers
- Counting money/deposits

SKILLS AND STRENGTHS

- Microsoft Office: Excel, Word, and PowerPoint
- Managing workers
- Strong interpersonal and communication skills
- Excellent organization and time management
- Able to effectively work in a team-oriented environment
- Scheduling
- Ability to work proficiently under supervisor

HONORS AND RECOGNITIONS

- Dean's and Semester Honors list- 2012, 2013, 2014
- Nominated for PFW Top 50 Spring 2020

REFERENCES

- Ali, E., MacFarland, S. Z., & Umbreit, J. (2011). Effectiveness of Combining Tangible Symbols with the Picture Exchange Communication System to Teach Requesting Skills to Children with Multiple Disabilities Including Visual Impairment. *Education and Training in Autism and Developmental Disabilities*, 46(3), 425–435. Retrieved from <http://search.ebscohost.com.ezproxy.library.pfw.edu/login.aspx?direct=true&db=eric&AN=EJ942511&site=ehost-live&scope=site>
- “Autism Facts and Figures.” *Autism Speaks*, www.autismspeaks.org/autism-facts-and-figures.
- Boesch, M. C., Wendt, O., Subramanian, A., & Hsu, N. (2013). Comparative efficacy of the Picture Exchange Communication System (PECS) versus a speech-generating device: Effects on social-communicative skills and speech development. *AAC: Augmentative and Alternative Communication*, 29(3), 197–209. <https://doi.org/10.3109/07434618.2013.818059>
- Chung, Y.-C., & Carter, E. W. (2013). Promoting Peer Interactions in Inclusive Classrooms for Students Who Use Speech-Generating Devices. *Research and Practice for Persons with Severe Disabilities*, 38(2), 94–109. Retrieved from <http://search.ebscohost.com.ezproxy.library.pfw.edu/login.aspx?direct=true&db=eric&AN=EJ1045093&site=ehost-live&scope=site>
- Fteiha, M. A. (2017). Effectiveness of assistive technology in enhancing language skills for children with autism. *International Journal of Developmental Disabilities*, 63(1), 36–44. <https://doi.org/10.1080/20473869.2015.1136129>
- Ganz, J. B., Heath, A. K., Rispoli, M. J., & Earles-Vollrath, T. L. (2010). Impact of AAC versus verbal modeling on verbal imitation, picture discrimination, and related speech: A pilot investigation. *Journal of Developmental and Physical Disabilities*, 22(2), 179–196. <https://doi.org/10.1007/s10882-009-9176-2>
- Genc-Tosun, D., & Kurt, O. (2017). Teaching multi-step requesting to children with autism spectrum disorder using systematic instruction and a speech-generating device. *AAC: Augmentative and Alternative Communication*, 33(4), 213–223. <https://doi.org/10.1080/07434618.2017.1378717>

- Hill, D. A., & Flores, M. M. (2014). Comparing the Picture Exchange Communication System and the iPad™ for Communication of Students with Autism Spectrum Disorder and Developmental Delay. *TechTrends: Linking Research and Practice to Improve Learning*, 58(3), 45–53
- Indiana Department of Education (2019). School Enrollment by Ethnicity and Free/Reduced Meal Price Status. Retrieved from <https://www.doe.in.gov/sites/default/files/accountability/school-enrollment-ethnicity-and-free-reduced-price-meal-status-2006-19.xlsx>
- Indiana Department of Education (2019). School Enrollment by Special Education and English Language Learners (ELL). Retrieved from <https://www.doe.in.gov/sites/default/files/accountability/school-enrollment-ell-special-education-2006-19.xlsx>
- Lerna, A., Esposito, D., Conson, M., Russo, L., & Massagli, A. (2012). Social-Communicative Effects of the Picture Exchange Communication System (PECS) in Autism Spectrum Disorders. *International Journal of Language & Communication Disorders*, 47(5), 609–617. <https://doi.org/10.1111/j.1460-6984.2012.00172.x>
- Martin, G. E., Bush, L., Klusek, J., Patel, S., & Losh, M. (2018). A Multimethod Analysis of Pragmatic Skills in Children and Adolescents With Fragile X Syndrome, Autism Spectrum Disorder, and Down Syndrome. *Journal of Speech, Language & Hearing Research*, 61(12), 3023–3037. https://doi.org/10.1044/2018_JSLHR-L-18-0008
- Olswang, L. B., Svensson, L., & Astley, S. (2010). Observation of classroom social communication: Do children with fetal alcohol spectrum disorders spend their time differently than their typically developing peers? *Journal of Speech, Language, and Hearing Research*, 53(6), 1687–1703. [https://doi.org/10.1044/1092-4388\(2010/09-0092\)](https://doi.org/10.1044/1092-4388(2010/09-0092))
- Ramdoss, S., Lang, R., Mulloy, A., Franco, J., O'Reilly, M., Didden, R., & Lancioni, G. (2011). Use of Computer-Based Interventions to Teach Communication Skills to Children with Autism Spectrum Disorders: A Systematic Review. *Journal of Behavioral Education*, 20(1), 55–76. <https://doi.org/10.1007/s10864-010-9112-7>
- Rupela, V., Velleman, S. L., & Andrianopoulos, M. V. (2016). Motor speech skills in children with Down syndrome: A descriptive study. *International Journal of Speech-Language Pathology*, 18(5), 483–492. <https://doi.org/10.3109/17549507.2015.1112836>

- Schaefer, J. M., & Andzik, N. R. (2016). Switch on the Learning. *Teaching Exceptional Children*, 48(4), 204–212. <https://doi.org/10.1177/0040059915623517>
- Sigafoos, J., Didden, R., & O'Reilly, M. (2003). Effects of speech output on maintenance of requesting and frequency of vocalizations in three children with developmental disabilities. *AAC: Augmentative and Alternative Communication*, 19(1), 37–47. <https://doi.org/10.1080/0743461032000056487>
- Thiemann-Bourque, K., Brady, N., McGuff, S., Stump, K., & Naylor, A. (2016). Picture Exchange Communication System and Pals: A Peer-Mediated Augmentative and Alternative Communication Intervention for Minimally Verbal Preschoolers With Autism. *Journal of Speech, Language & Hearing Research*, 59(5), 1133–1145.
- Thiemann-Bourque, K. S., McGuff, S., & Goldstein, H. (2017). Training peer partners to use a speech-generating device with classmates with autism spectrum disorder: Exploring communication outcomes across preschool contexts. *Journal of Speech, Language, and Hearing Research*, 60(9), 2648–2662. https://doi.org/10.1044/2017_JSLHR-L-17-0049
- Tönsing, K. (2016). Supporting the Production of Graphic Symbol Combinations by Children with Limited Speech: A Comparison of Two AAC systems. *Journal of Developmental & Physical Disabilities*, 28(1), 5–29. <https://doi.org/10.1007/s10882-015-9425-5>
- Watkins, L., Ledbetter-Cho, K., O'Reilly, M., Barnard-Brak, L., & Garcia-Grau, P. (2019). Interventions for students with autism in inclusive settings: A best-evidence synthesis and meta-analysis. *Psychological Bulletin*, 145(5), 490–507. <https://doi.org/10.1037/bul0000190>
- Xin, J. F., & Leonard, D. A. (2015). Using iPads to Teach Communication Skills of Students with Autism. *Journal of Autism and Developmental Disorders*, 45(12), 4154–4164. <https://doi.org/10.1007/s10803-014-2266-8>