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Increasing Initiations of Communication for Students with Moderate and Severe Disabilities Using a Prompt Hierarchy

Ryan Elizabeth Queenan

University of Kentucky, ryryhoover@gmail.com

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Ryan Elizabeth Queenan, Student

Dr. Melinda J. Ault, Major Professor

Dr. Melinda J. Ault, Director of Graduate Studies

INCREASING INITIATIONS OF COMMUNICATION FOR STUDENTS WITH
MODERATE AND SEVERE DISABILITIES USING A PROMPT HIERARCHY

THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in Education in the
College of Education
at the University of Kentucky

By

Ryan Elizabeth Queenan

Lexington, Kentucky

Director: Dr. Melinda J. Ault, Professor of Special Education

Lexington, Kentucky

2022

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ABSTRACT OF THESIS

INCREASING INITIATIONS OF COMMUNICATION FOR STUDENTS WITH MODERATE AND SEVERE DISABILITIES USING A PROMPT HIERARCHY

The purpose of this study was to increase initiations of communication for high school students with moderate and severe disabilities using a prompt hierarchy in the context of environmental arrangements. A multiple probe across participants design was used to evaluate the effectiveness of implementing a prompt hierarchy with an environmental arrangement. The results showed that when using a prompt hierarchy in the context of an environmental arrangement were effective in increasing initiations of communication for high school students with moderate and severe disabilities.

KEYWORDS: Moderate and severe disabilities, initiations, communication, environmental arrangements, prompt hierarchy

Ryan Elizabeth Queenan

(Name of Student)

02/22/2022

Date

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By
Ryan Elizabeth Queenan

Melinda J. Ault

Director of Thesis

Melinda J. Ault

Director of Graduate Studies

02/22/2022

Date

TABLE OF CONTENTS

LIST OF TABLES.....	v
LIST OF FIGURES	vi
SECTION 1: INTRODUCTION.....	1
SECTION 2: RESEARCH QUESTION.....	8
SECTION 3: METHOD.....	9
Participants and Instructor.....	9
Instructional Setting and Arrangement.....	13
Materials and Equipment.....	14
Dependent Variable.....	15
Experimental Design.....	15
General Procedures.....	16
Probe Procedures.....	17
Instructional Procedures.....	20
Generalization Procedures.....	23
Interobserver Reliability and Procedural Fidelity.....	23
SECTION 4: RESULTS.....	25
Reliability.....	25
Baseline.....	25
Intervention.....	26
Generalization.....	26
Prompt Level.....	27
SECTION 5: DISCUSSION.....	30
Implications for Practitioners.....	30
Future Research.....	31
Limitations.....	31

REFERENCES.....33
Vita.....36

LIST OF TABLES

Table 1 Possible Initiations in Probe Sessions.....	18
Table 2 Environmental Arrangements	19
Table 3 Possible Initiations in Instructional Sessions.....	21
Table 4 Percent of Prompt Levels Used in Prompt Hierarchy Resulting in Correct Initiations	28

LIST OF FIGURES

Figure 1 Independent Initiations of Communication 27

SECTION 1: INTRODUCTION

Communication is a key aspect of life. It is an exchange of messages between two or more individuals that may take place for a variety of reasons (Stremel, 2008). Communication enables individuals to interact with one another, express themselves, and seek knowledge to understand the environment that surrounds them. These types of interactions with others can happen anywhere at any time, and the form of communication can constantly change, including, but not limited to, the use of verbal speech, gestures, typing, social media, body language, and a variety of other ways throughout everyday life (Downing et al., 2015). For some individuals, the form of communication used is unconventional or idiosyncratic. This makes their ability to express their thoughts, communicate their needs, comment on their environment, protest things they do not want, among other communicative functions, difficult for others to understand and ineffective or inefficient (Downing et al., 2015).

Students with moderate and severe disabilities (MSD) face multiple barriers when it comes to effective communication. Their communication skills do not develop at the rate of their same aged peers due to motor, language, and cognitive deficits (Light & Drager, 2007). These individuals may not have multiple forms of communication or even the ability to access a single conventional form (Downing et al., 2015). Many students with MSD use multi-modal communication that does not include oral speech, meaning they communicate using a variety of communicative forms (e.g., body language, vocalizations, gestures). Teachers, professionals, and family members of students with MSD must attribute meaning to these types of communicative forms of the students. It is often assumed that students with MSD do not have anything to say because they do not have a clear way to express communication (Biklen & Cardinal, 1997; Jorgensen et al., 2010, as cited in Downing et al., 2015). However, the use of augmentative and

alternative communication (AAC) provides these students the opportunity to have an effective form of communication, easily understood by a variety of communication partners.

AAC refers to a field that explains different systems, instruments, and theories of adapted forms of communication for individuals with extensive communication support needs (Loncke, 2014). AAC continues to grow in displaying effectiveness for students with disabilities across age, gender, disability, and ethnicity (Blackstone et al., 2007). The purpose of AAC is to allow the user to establish a connection between their communicative intent and the communicative message (Loncke, 2014). For this connection to be successful, the student needs AAC that is accessible and available at all times. However, giving a student with extensive communication needs an AAC device does not mean they will automatically begin communicating effectively.

If a student is provided any type of AAC device, they must be taught how to use the device appropriately for this type of communication to be successful. Snell et al. (2006) reviewed 40 studies, with 93 participants, that used a variety of interventions, antecedent strategies, and consequence strategies in order to teach students with disabilities how to use their AAC devices. Studies measured a variety of communicative functions, such as requesting, engaging others in social interactions, and establishing joint attention. Along with the communicative functions, researchers also measured initiations of communication, response to communicative partners, and imitative communication. Their analysis showed that many antecedent and consequence interventions, sometimes even used in combination, improved AAC communication among learners with severe disabilities across all communicative functions (Snell et al., 2006). Students with extensive communication support needs who use AAC may not initiate well with their device. Often times, students will respond to communication partners' questions or initiations, but will not initiate a communicative interaction on their own. Others may also use inappropriate behaviors

in order to initiate communication. Chung et. al., (2012) reported that out of 1,354 interactions observed among 16 elementary and middle school students with disabilities who use AAC, only 14.4% of all interactions were initiated by students with disabilities. Although the participants used AAC to interact with adults during 90% of the observations, it is clear that initiating communication with an AAC device is not easily obtained. Therefore, communicative initiations, using AAC, must be explicitly taught to students with severe disabilities.

Dattilo and Camarata (1991) used individualized treatments to teach two participants with severe motor and speech deficits to initiate communication using an AAC device. These treatments included the use of prompting and out of reach items to facilitate initiations. Results from the study show that simply presenting the device to the participants and telling them how to use it did not lead to any type of communication. However, once the intervention was in place, a shift in the target behavior occurred. Initiations using an AAC device is a difficult skill for individuals with severe disabilities to acquire without the use of systematic instruction.

Thiemann et. al. (2018) performed a study that measured rate and reciprocity (responses and initiations) of communication among 45 children with autism who use AAC. Researchers used peer-mediated interventions that consisted of trained and untrained peers interacting with the participants. If the peer was unable to elicit a response, the researcher used least-to most prompting. Results showed that teaching peers how to be a responsive communicator with children with autism can lead to significant increases in communicative responses and initiations.

Andzik et. al. (2016), measured three communication events of opportunity to respond, opportunity to initiate, and spontaneous student initiation, across 23 participants between the ages of 6-11 who use AAC. An opportunity to respond referred to when a communication partner initiated a prompt to communicate (e.g., “Use your words”). An opportunity to initiate occurred when the researchers purposefully manipulated the environment and waited 5 s for participants to elicit an initiation. A spontaneous initiation occurred when the participant produced an unprompted communicative attempt toward a specific individual. Researchers discovered that opportunities to respond was the most prevalent communication event that occurred. Meaning, students had to receive a prompt before they engaged in communication. They also discovered 22% of participants never independently initiated toward a specific individual. Researchers believed this is due to the lack of opportunities to initiate throughout the day. After 117 hours of observation, researchers did not observe any opportunities that were given for participants to engaged in communicative initiations. Students with complex communication needs who use AAC must be taught and given the opportunity to initiate communication. The development of initiation skills at a younger age allows these students to become better self-advocates in the future (Andzik et. al., 2016).

System of least prompts, also known as least-to-most prompting, is a research-based systematic instructional strategy (Shepley et al., 2019) that is used to facilitate communication using an AAC device (Finke et. al., 2017). It is a prompting procedure that begins with a naturally occurring cue and then continues with more supportive cues until the target behavior is displayed (Ault & Griffen, 2013). If the student does not respond independently to the stimulus during a wait interval, the implementer will deliver a prompt

to assist the student in engaging in the target behavior. If the student does not respond after the wait time of the second prompt, the implementer will then deliver another prompt that is either more intrusive or is the controlling prompt (Ledford et al., 2019). The order of the prompts from least intrusive to most intrusive is referred to as a prompt hierarchy. The overall goal of a prompt hierarchy is for the more intrusive prompts to no longer be used; therefore, as the student masters the skill, they will display the target behavior using the natural cue (West & Billingsley, 2005). The use of prompts should provide the student with enough information in order to display the target behavior, but they should not give away what the target behavior looks like (Downing et al., 2015).

Finke et. al., (2017) used the least-to-most prompting procedure to teach students ages 8-12 with autism to display multi-symbol messages using an AAC device. The levels of prompts used throughout the study were verbal prompting (asking a question), verbal cueing (request for production), and graphic modeling (using the device). With the use of a prompt hierarchy, all participants increased their ability to produce multi-symbol messages. DiCarlo and Banajee (2000) also taught participants with disabilities to initiate requesting using their AAC device. They used visual and verbal prompts, along with modeling, to encourage initiations within a naturally occurring event of snack time. They combined prompting with an environmental arrangement in which the items needed for snack time were place in view, but out of reach, of the participants. If a communicative attempt was not made with the presentation of the items, the researchers then provided a verbal prompting (e.g., “I have ____.”). If a communicative attempt was not made after a verbal prompt, researchers then modeled an appropriate initiation on the device. The results showed that the use of an AAC device, along with prompting and modeling, increased

initiations of communication in a natural environment. Individuals who use AAC can initiate communication, but an intervention must take place in order for this behavior to be displayed. Interventions that take place in a natural environment, in which the environment can be manipulated to encourage communicative attempts, are also key to increasing initiations of communication.

An environmental arrangement is an antecedent-based strategy in which the implementer changes the environment in such a way that creates an opportunity for a student to engage in a specific behavior (Ledford et al., 2019). Teachers, professionals, caregivers, and others that work with students who use AAC to communicate can learn how to manipulate environments familiar to the student in order to create opportunities for initiations of communication. Snell et al. (2006) reported that in 90% of the studies they analyzed, researchers arranged the environment in ways that would encourage individuals to use their AAC device. Often, it is not a matter of what the student can say, but when they can say it (Downing et al., 2015). There are a number of ways to use environmental arrangements across settings for students with MSD to teach many different skills. However, the use of physical environmental arrangements in the classroom allows for more opportunities for engagement and communication. Using highly preferred items of students in a variety of ways can produce communicative opportunities (Ledford et al., 2019). In order to teach students how to initiate communication, they must see that there is a good reason for them engage in the behavior (Downing et al., 2015). Interventions that involve using a student's environment for teaching a fundamental skill, such as communication, can allow them to become more independent and respond more often using their form of communication (Harjusola-Webb & Robbins, 2012).

Communication is a skill that teachers and professionals strive to teach throughout a student's entire educational careers. It is a skill that is taught with the intent of students maintaining the skill for the rest of their life. The purpose of this study is to determine if the use environmental arrangements plus a prompt hierarchy including expectant looking, verbal + gesture prompts, and modeling can increase initiations of communication for high school student with MSD who use AAC to communicate.

SECTION 2: RESEARCH QUESTION

The research question is as follows: (1) Is there a functional relation between the implementation of a prompt hierarchy in the context of environmental arrangements and the increase of independent initiation of communication using AAC throughout the school day with high school students with moderate and severe disabilities?

SECTION 3: METHOD

Participants and Instructor

Three students were recruited from a high school in the southeastern United States. Each of these students (a) spent a majority of the school day in a special education resource classroom, (b) were eligible to for special education services, and (c) had a primary disability of intellectual disability and/or autism spectrum disorder under Individuals with Disabilities Education Act (IDEA, 2004). Inclusion in this study was based on the following criteria: (a) educational eligibility of intellectual disability and/or autism, (b) receipt of speech therapy services, (c) use of an AAC device, (d) attendance of at least 90% of school days, (e) permission from parent/guardian to participate in the study, and (f) student assent to participate in the study.

Participants were required to demonstrate the following pre-requisite skills: (a) ability to scan AAC device, (b) fine motor skills to activate AAC device, and (c) visual and auditory acuity in order to see and hear materials and prompts. The researcher of the study was the classroom teacher for each of the three participants. Over the course of the last 2 school years, the researcher was able to observe and assess the skills for all participants. These observations took place across multiple settings and multiple scenarios. Based on these observations, the researcher identified the following three participants who met the inclusion criteria and pre-requisite skills in order to participate in the study.

Jessica

Jessica was a 16-year-old, Hispanic female student with a primary disability of intellectual disability. On the Receptive-Expressive Emergent Language Test-3 (REEL-3),

she received a score of 53, which is significantly below that of her same aged peers. Jessica also received a score on the Vineland Adaptive Behavior Scale-3 that was significantly below that of her same aged peers. She spent 40-80% of her school day in the general education setting. She attended art, physical education (PE), lunch, and other subjects in this setting. Jessica displayed strengths in the classroom that included following rules and procedures, typing from a model, using a calculator, and counting with one-to-one correspondence. Her IEP goals consisted of identifying sight words, answering WH-questions, performing next dollar, completing vocational and self-care skills, and typing. Jessica had difficulty in academic areas, such as identifying currency and writing. Jessica received speech language service through consultation. Therefore, the speech language pathologist worked with the classroom teacher to help meet any of Jessica's communicative needs, such as working on her AAC device. Because Jessica was on speech language consultative services, she did not have any communication goals. She was also easily distracted throughout the school day. Jessica independently used her AAC device to answer yes/no questions, greet, and request objects when prompted. She did not display the behavior of using her AAC to device to independently request assistance/objects, make comments, or express emotions. Jessica used an iPad with Proloquo2Go, accessed via direct selection, throughout the study. This device contained core and fringe vocabulary folders. Jessica used fringe vocabulary folders in order to access specific vocabulary needed for the study. Jessica had been using her device since late elementary school.

Trey

Trey was a 16-year-old, White male with a primary disability of autism. On the Communication Rating Scale, he received a score of 22, which is significantly below same

aged peers. Trey also received a score of 25 on the Vineland Adaptive Behavior scale. He spent 40-80% of his school day in the general education setting by participating in electives and lunch with his same aged peers. Trey had strengths in the areas of following one step directions and identifying sight words. His IEP goals included reading comprehension, next dollar, counting, and vocational/daily living skills. Trey required multiple prompts when given multi-step directions and when working in order to stay on task. He often knew what to do when working but consistently waited for a prompt before completing the next step. He is a variable responder in the areas of academic, vocational, and speech language skills. Trey received speech language service through consultation. Therefore, the speech language pathologist worked with the classroom teacher to help meet any of Trey's communicative needs, such as working on his ability to respond to different communicative interactions. Because Trey was on speech language consultative services, he did not have any communication goals. Trey could independently answer yes/no questions and request objects after being prompted using his AAC device. He did not display behaviors of independently requesting assistance/objects, initiating objects of wants/needs, making comments, or expressing emotions. Trey used an iPad with Proloquo2Go, accessed via direct selection, throughout the study. This device contained core and fringe vocabulary folders. Trey used fringe vocabulary folders in order to access specific vocabulary needed for the study. Trey had been using his device since late elementary school.

Andrew

Andrew was a 15-year-old, White male with a primary disability of intellectual disability. He received a score of 36 on the Vineland Adaptive Behavior Scale-3 test, which is significantly below his same aged peers. Andrew also received a score of 55 on the Clinic

Evaluation of Language Fundamentals-5 (CELF-5) Pragmatics Profile, which is in the less than 0.1 percentile. He spent 40%-80% of his school day in the general education setting by going to physical education (PE), art, library, and lunch throughout the day. Andrew had academic strengths including identifying sight words and generalizing his ability to identify them on his AAC device, answering comprehension questions, and using a calculator. His individualized education program (IEP) goals included counting, identifying money, typing sentences, completing vocational skills, reading sight words, and answering reading comprehension questions. Andrew had difficulty using more than one-word verbal phrases. He could become upset throughout the school day if he was frustrated by working or if someone left his environment and did not state where they were going. He would engage in behaviors that included kicking, biting, hair pulling, property destruction, or following individuals that left his area. These behaviors could occur at a high frequency rate and the function of the behavior varied over the course of the school year. Andrew was a symbolic level communicator. He received speech language services where he worked on goals that included communicating his emotions throughout various settings and scenarios. Allan did not have communication related to communicative initiations. However, he was able to initiate the use of his AAC device in order to (a) request an object, (b) request recurrence, and (c) name objects or places. Andrew could express emotions, greet and part, and request assistance when prompted to do so. However, Andrew did not use his AAC device to make something stop, refuse an object/task, or make comments. Andrew used an iPad with Proloquo2Go, accessed via direct selection, throughout the study. This device contained core and fringe vocabulary folders. Andrew

used fringe vocabulary folders in order to access specific vocabulary needed for the study. He had been using his device since late elementary school.

Others

The participants' special education teacher served as the researcher throughout this study and conducted all baseline and instructional training sessions. She held a bachelor's degree in Special Education-Moderate and Severe Disabilities from a local university and was pursuing a master's degree in Teacher Leadership in Special Education. The teacher was familiar with using prompt hierarchies in classroom settings. The researcher's co-teacher collected reliability and procedural fidelity data throughout the study. The co-teacher has a bachelor's degree in Special Education-Moderate and Severe Disabilities and a master's degree in Teacher Leadership in Special Education as well. A paraeducator in the researcher's classroom facilitated generalization sessions while the teacher collected data.

Instructional Setting and Arrangement

This study was conducted at the high school in which all students were enrolled. The school served 2,100 students where 57% of the students were White, 19% Black, 13% Hispanic, and 7% Asian. Thirty-seven percent of students qualified for free/reduced lunch, and 9% of the students qualified for special education. All sessions took place in the special education resource classroom in each student's individual workspace. These workspaces were spread out throughout the classroom due to its large capacity. The classroom was divided into two rooms that were separated by double doors. Room 1 measured 9.6 m by 6.9 m, while Room 2 measured 10.5 m by 6.9 m. All sessions were conducted using a one

on-one instructional format. There were no more than four other students and four other adults in the classroom during all sessions. The researcher controlled for distractions by conducting sessions at the individuals' workspace during a time when only half of the class was in the resource classroom, and the other students were in the adjoining room receiving instruction from paraprofessionals. Some students were out of the classroom participating in elective classes.

Materials and Equipment

The researcher used preferred items in all sessions for each student. Preferred items were selected based on interviews with students, parents, and staff members and with reinforcer preference assessments for each student. These items were used in setting up environmental arrangements for the students. The preferred items chosen based off interviews and preference assessments remained constant throughout all sessions.

The materials used in all sessions were specific to the environmental arrangement set up for each student. As stated above, the researcher identified the highest preferred item for each student, and other preferred or neutral items were used throughout the study in order to set up the environmental arrangements. Sessions took place at each student's individual work area, functional skills area in Room 2, or in a specific area in Room 1 in which a participant liked to take breaks. Many of the materials were consistent for all sessions across participants, such as an iPad with Proloquo2Go, student table and chair, and individual student schedules. Students would be seated or standing at their table (2.1 m by 1.2 m), functional skills area in Room 2, or in break area in Room1. All AAC devices were turned on and ready for use and student schedules were always in the working area. Other materials included: visual timer, baseline data sheet, intervention data sheet,

classroom doorbell. There were many materials used throughout each participant's sessions, such as milk and straw, juice and straw, eating utensils, clothing hangers, papers and paper organizers, and name stamps. When the co-teacher was present to collect reliability and procedural fidelity data, he also had access to a data sheet and writing utensil.

Dependent Variable

The dependent variable was the percent of independent communicative initiations using an AAC device. The target behavior for Andrew that was associated with the environmental arrangement of interesting materials was to independently initiate comments regarding the materials. For example, when he was presented with an iPad, he used his device to say, "I like this" or "This is fun". The target behavior for Jessica and Trey was to independently initiate wants/needs based on the materials that were out of reach. For example, if they needed their respective name stamp before completing a task presented, they used their device to state, "I want name stamp".

Experimental Design

A multiple probe design across participants was used to determine the effects of a prompt hierarchy on the increase of independent initiations of communication by the teacher in a high school special education resource classroom. The study used this design in order to display direct replication of intervention across three participants. Three or more replications were needed in order to meet single case research design standards (Ledford & Gast, 2018). This design was chosen due to the fact that the target behavior is irreversible (i.e., once learned, it will not return to baseline levels).

An initial probe condition took place for all participants. Experimental control was demonstrated by (a) controlling for threats to internal validity prior to the start of the study, (b) observing behavior change only when the intervention is introduced in each tier, and (c) having three demonstrations of effect at three different points in time. Intervention was introduced to the first participant when a stable pattern of responding was present for all participants. Once the participant in the first tier reached criterion of 50% above baseline levels, the intervention was then introduced for the second tier. This procedure applied to tier three as well.

The researcher ensured certain steps were taken in order to control for threats to internal validity. Attrition threats were controlled for by recruiting four participants to the study, in the event one of the students dropped out of participating. The participants were randomly assigned to each tier in which intervention would be introduced. Multiple probe designs are insensitive to behavioral covariation, so sessions were in a separate classroom from the other participants. This took place in order to ensure the participants were not learning from one another.

General Procedures

The purpose of this study was to evaluate the effectiveness of environmental arrangements and a prompt hierarchy (expectant looking, verbal + gesture prompts, modeling) on increasing independent initiation of communication using AAC throughout the school day for students with MSD. First, probe sessions were conducted in order to determine baseline levels of the target behavior using only environmental arrangements. Probe sessions took place in the special education resource classroom at the students' individual working area (i.e., students' assigned desk). These sessions were conducted

almost every school day and occurred during mornings for some sessions and afternoons for others. Each session consisted of four or five opportunities to initiate. Then, once a stable pattern of responding was displayed by all participants, the independent variable was presented to the first participant. Upon the first participant reaching at 50% above baseline levels for the target behavior, the independent variable was then presented to the second participant. This continued until the independent variable was presented to the third participant. Intermittent probes for untrained participants were conducted once per week while trained participants received instruction.

Probe Procedures

During probe procedures, the researcher arranged the environment specific to each student. For Jessica and Trey, items needed during tasks throughout the day were placed in sight but out of reach of the students. An independent initiation for Jessica and Trey was defined as using their device to name the object that was in sight but out of reach. The researcher accepted the name of the item or a full sentence (“I want _____.”) as a correct initiation. Examples of items and environmental arrangements used throughout the school day were a straw with juice or milk during breakfast, a straw with milk during lunch, student name stamps to put name on work during reading, alternate assessment, and transition work, and hangers to hang up clothes during functional skills. The researcher used straws, utensils, and name stamps during opportunities for every session because breakfast, lunch, and work were naturally occurring throughout the school day. Students were familiar with these environments and materials. For Andrew, interesting materials were given to him in a naturally occurring event. An example would be, if Andrew earned a break, he would make a choice from one of his preferred items (i.e., iPad, videos,

magazines, favorite food). An independent initiation for Andrew was defined as using his AAC device to make a comment from a premature comment folder made by the classroom teacher and speech language pathologist (SLP). The folder contained four buttons that spoke multi-word messages. Each student’s AAC device was easily accessible before the researcher began each session.

Four probe sessions were conducted for all participants where four to five opportunities were given for each session. An opportunity consisted of the environmental arrangement was set up, student was engaged in the task, researcher waited 10 s for student initiation, researcher recorded initiation, and researcher provided consequences described in Table 1. The researcher observed each student in their working area and recorded any initiations of communication that took place, if any. Opportunities took place all throughout the school day, between the hours of 8:30 a.m.-3:00 p.m. The possible initiations for probe sessions are described in Table 1, while the environmental arrangements used during probe and instructional sessions are described in Table 2.

Table 1

Possible Initiations in Probe Sessions

Possible Student Initiations	Definition of Initiation	Teacher Consequence Following the Initiation
Correct Initiation	Student initiates communication on AAC device that is related to the activity in which he/she is completing	Record a + on the data sheet, say, “Great job! I love how you used your voice to tell me ____.” Communication partner responds by honoring initiation, give behavior descriptive praise

Incorrect Initiation	Student Initiates communication on AAC device, but it is unrelated to the activity he/she is completing	Record a – on the data sheet and say nothing
No Initiation	Student does not initiate communication on AAC device during or at completion activity	Record a 0 on the data sheet and say nothing

Table 2

Environmental Arrangements

Student	Environmental Arrangement (EA)	Description of EA
Jessica	Out of reach	Desired items will be in sight, but out of reach during sessions in order to encourage communication initiation using AAC
Trey	Out of reach	Desired items will be in sight, but out of reach during sessions in order to encourage communication initiation using AAC
Andrew	Interesting materials	Items of interests used during sessions in order to encourage commenting behavior using AAC

Instructional Procedures

The instructional procedure used throughout the study was a treatment package that included environmental arrangements and a prompt hierarchy consisting of (a) expectant looking (holding up hands and shrugging shoulders while looking at AAC device), (b) verbal + gesture prompt (pointing to AAC device and saying, “What can you ask/tell me?” or “Use your voice”), and (c) modeling (saying, “You could say...”, while modeling an appropriate initiation on the AAC device). The goal was to complete one session per day for all participants during each school day, where 4-5 opportunities were conducted throughout the school day and that counted for a session. Instruction began by the researcher setting up the environmental arrangement that corresponded to each student, identical to how it was performed in baseline. Once the environment was set up, the researcher gained and ensured the student’s attention and stated, “Are you ready?”. Once the student was at his/her designated work area and joint attention was established, the researcher gave the antecedent statement related to the routine activity (i.e., “Time for lunch” or “Oh, you are watching a video about bowling.”).

Once the antecedent statement was delivered, the researcher waited 10 seconds for a student initiation. If an initiation was not given, or the student gave an incorrect initiation, the researcher provided a prompt of expectant looking and waited 10 seconds. If the student gave an incorrect or no response, the researcher provided a verbal + gesture prompt and waited 10 seconds. If an incorrect or no response was given, the researcher used the most intrusive prompt of modeling and waited 10 seconds. At any time in this sequence the student responded correctly, the researcher would say, “Thank you for telling me...!” and

the activity would continue. The environmental arrangement that each student received is listed and described in Table 2.

There were four different types of initiations possible for this study. First, an independent (I) initiation was recorded if a student independently initiated communication using his/her device within 10 seconds and the communication was related to the environmental arrangement. When an independent initiation was given, the researcher recorded a “I” on the data sheet and said, “Thank you for telling me...!”, along with behavior descriptive praise, and continuation of the activity. Second, an expectant look (E) initiation was recorded if a student initiated communication using his/her device within 10 seconds if the researcher provided an expectant look. When an initiation was given after an expectant look, the researcher recorded a “E” on the data sheet and said, “Thank you for telling me...!”, along with behavior descriptive praise, and continuation of the activity. Next, a verbal + gesture (VG) initiation was recorded if a student initiated communication using his/her device within 10 seconds if the researcher provided a verbal + gesture prompt. When an initiation was given after a verbal + gesture prompt, the researcher recorded a “VG” on the data sheet and said, “Thank you for telling me...!”, along with behavior descriptive praise, and continuation of the activity. Lastly, a model (M) initiation was recorded if a student initiated communication on his/her AAC device within 10 seconds if the researcher modeled an appropriate initiation. When an initiation was given after a model prompt, the researcher will record a “M” on the data sheet and said, “Thank you for telling me...!”, along with behavior descriptive praise, and continuation of the activity. The possible initiations for instructional sessions are described in the table below.

Table 3

Possible Initiations in Instructional Sessions

Possible Student Initiations	Definition of Initiation	Teacher Consequence Following the Initiation
Independent (I)	Student initiates communication on AAC device within 10 seconds that is related to the environmental arrangement.	Record an I on the data sheet, say, “Thank you for telling me...!”, give behavior descriptive praise, and continue the activity
Expectant Looking (E)	Student initiates communication on AAC device within 10 seconds of researcher giving an expectant looking prompt. Ex. *Researcher says nothing, hold up hands, and shrugs shoulders*	Record an E on the data sheet, say, “Thank you for telling me...!, give behavior descriptive praise, and continue the activity
Verbal + Gesture (VG)	Student initiates communication on AAC device within 10 seconds of the researcher giving a verbal + gesture prompt. Ex. *Researcher points to device (not a specific button) * and says, “Use your voice”.	Record a VG on the data sheet, say, “Thank you for telling me...!”, give behavior descriptive praise, and continue the activity

Modeling (M)	Student initiates communication on AAC device within 10 seconds of the researcher modeling an appropriate initiation.	Record an M on the data sheet, say, “Thank you for telling me...!”, give behavior descriptive praise, and continue the activity
	Ex. *Researcher will use students’ device to model an appropriate initiation*	

Generalization Procedures

Generalization sessions were conducted by one of the paraeducators delivering the antecedent statement and acting as the communicative partner for the participant. The classroom teacher set up the environmental arrangement and reviewed procedures with the paraeducator prior to each session. The classroom teacher also monitored all opportunities and recorded initiations on a generalization sessions data sheet while standing out of sight of the participant. All sessions were identical to instructional sessions with the exception that the paraeducator was the communicative partner.

Interobserver Reliability and Procedural Fidelity

The co-teacher that worked alongside the researcher collected interobserver (IOA) reliability and procedural fidelity (PF) data. The researcher trained the reliability observer until IOA data and PF were at least at 80%. To conduct the training, the researcher had a paraeducator act as a student while the researcher was implementing the intervention. Acting as the student, the paraeducator displayed a mix of correct, incorrect, and no initiations, and the researcher delivered the corresponding consequences. This allowed the co-teacher to see an example of each initiation and for the researcher to explain the possible

initiations, what each of the initiations looked like, and the teacher consequences. The researcher also gave the co-teacher a document with information regarding student initiations and their definitions, teacher consequences, examples, non-examples, and the procedures.

The acceptable levels of agreement for inter-observer agreement (IOA) were at least 80%. IOA was conducted in each condition for at least 20% of sessions per condition per participant. The researcher and co-teacher used the point-by-point agreement formula to calculate IOA: $(\# \text{ of agreements} / (\# \text{ of agreements} + \# \text{ of disagreements})) \times 100$ (Ledford & Gast, 2018).

Procedural fidelity (PF) data were collected by the co-teacher throughout the study. The acceptable levels of accuracy were the same as IOA with at least 80% accuracy. PF data were collected for at least 20% of sessions per condition per participant. The formula used to measure fidelity was as follows: $(\# \text{ of interventionists behaviors observed} / \# \text{ of interventionists behaviors planned}) \times 100$ (Ledford & Gast, 2018). The co-teacher collected data on the researcher's ability to implement experimental conditions. He recorded data on the researcher's following behaviors: (a) ensure students' attention, (b) provide environmental arrangement, (c) wait 10 seconds upon setup of environmental arrangement, (d) prompt to evoke a correct initiation, and (e) provide correct consequence. The correct consequences were the delivery of the next prompt level or praise for providing an initiation.

SECTION 4: RESULTS

Reliability

To measure PF and IOA, the calculation described in the reliability and fidelity procedures was used and data were collected throughout all sessions during baseline, probe, instruction, and generalization conditions. Baseline PF and IOA was conducted for 25% of sessions for all participants. Intermittent probe sessions took place for Trey and Andrew where PF and IOA was measured for 40% of Trey's sessions and 33% of Andrew's sessions. During instruction, PF and IOA was measured for 23.5% of Jessica's sessions, 23.8% of Trey's sessions, and 26.7% of Andrew's sessions. Generalization sessions were conducted with Jessica near the end of the study where PF and IOA were measured for 25% of the sessions. The mean interobserver reliability percentage across all participants was 100% during baseline, while the mean was 90.7% (range: 82.6%-100%) during intervention. All disagreements were discussed and resolved after sessions. During baseline sessions, the mean procedural fidelity across all participants was 100% for all behaviors. For intervention sessions, the mean procedural fidelity across all participants was 96.6% (range, 94.9%-100%). It was 100% for the behaviors of providing attentional cue and ensuring attentional response. The behaviors of providing the antecedent statement and providing correct consequence occurred on average 94.9% of the opportunities, while the behavior of waiting the 10 s delay occurred for 98.3% of the measured opportunities. These data shows that intervention procedures were applied consistently during the study.

Baseline

The percent of independent initiations using an AAC device for Jessica, Trey, and Andrew are presented in Figure 1. During baseline, data were stable as all three participants

did not demonstrate initiations using their AAC device when the environmental arrangement alone was presented. Four sessions were conducted in order to ensure a stable pattern of responding.

Intervention

After the fourth session, intervention began with Jessica where she displayed an increase in the target behavior after the first instructional session was conducted. Her performance increased to 40% correct initiations before falling to 20% for two consecutive sessions due to being out of school for a long weekend. Then, an abrupt increase in the target behavior occurred as Jessica demonstrated 100% correct initiations using her AAC device to request objects for eight consecutive sessions. She fell to 80% in one session before returning to 100% for the remaining sessions.

Once Jessica reached 50% above baseline levels, three consecutive probe sessions were conducted with the next participant, Trey. Trey did not display the target behavior in baseline or probe sessions prior to intervention. Once the intervention was implemented, Trey had an increasing trend where he averaged 43% correct initiations (range, 0%-67%). However, during sessions 28-35, his initiations were variable. Trey was ill throughout this time, which led to him missing many days of school and instruction. Once Trey was back in school, and able to receive consistent instruction, he began to show an increasing trend in the target behavior, starting at session 35, using his AAC device to request objects for 75% of the opportunities prior to the end of the semester.

When Trey reached 50% above baseline levels, three consecutive probe sessions were conducted with Andrew. Andrew did not display the target behavior in baseline or

probe sessions prior to the intervention. Once the intervention was implemented, Andrew’s progress was slightly variable before an abrupt change in the data took place. Andrew then displayed an increase in using his AAC device to initiate comments when interacting with interesting materials and was able to respond with 100% correct initiations for three consecutive sessions.

Generalization

Three generalization sessions were conducted. Jessica averaged 90% (range, 80%-100%) correct initiations during these sessions lead by the paraeducator.

Figure 1

Independent Initiations of Communication

Prompt Level

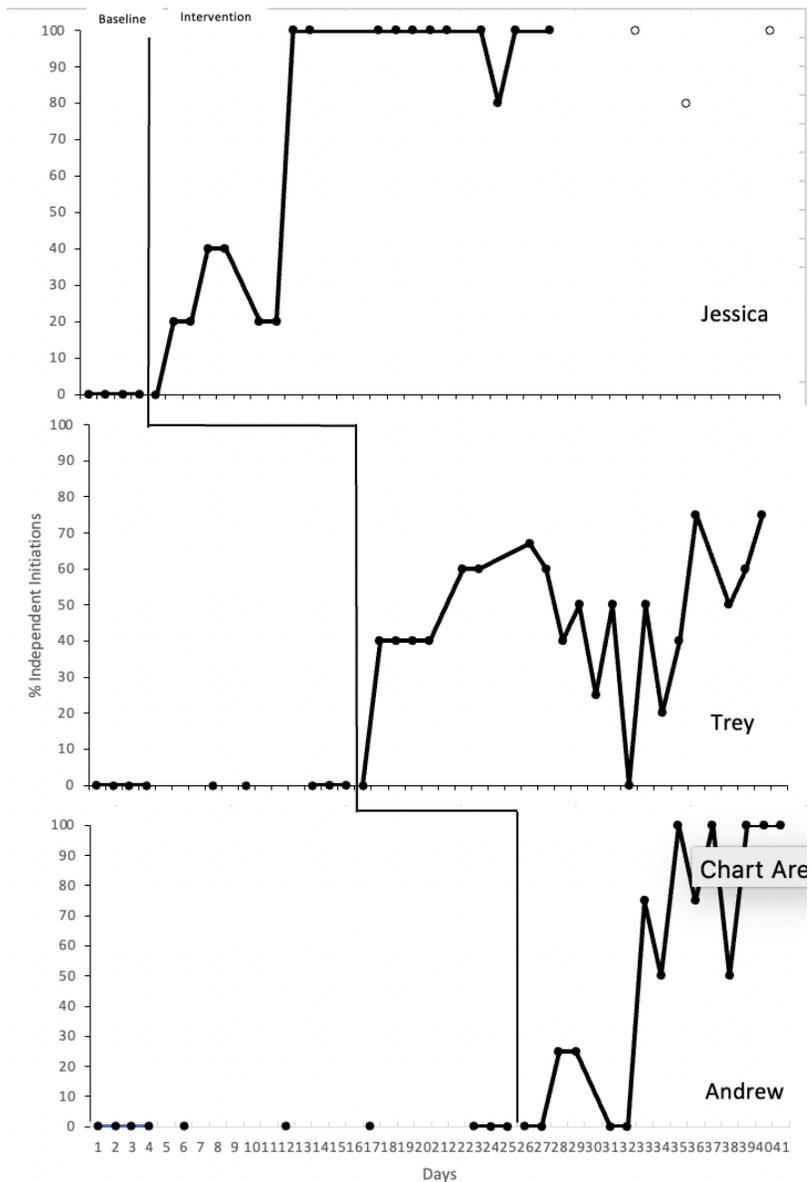


Table 4 shows the percent of prompts that were used to evoke the correct initiations of each participant. Throughout the study, participants displayed a correct initiation after all prompt levels were provided. Some participants initiated correctly after the use of certain prompts more than others. Before participants were able to perform initiations of communication independently, the most common prompt level that evoked a correct initiation was a VG prompt. The least common prompt level used was an E prompt across all participants.

Table 4

Percent of Prompt Levels Used in Prompt Hierarchy Resulting in Correct Initiation

Participant	Percent of Prompts Resulting in Correct Initiations
Jessica	I= 66% E= 10% VG= 14% M= 10%
Trey	I= 42% E= 5% VG= 27% M= 25%
Andrew	I= 33% E= 0% VG= 27% M= 3%

Note. I=Independent, E=Expectant look, VG=Verbal + Gesture, M=Model

SECTION 5: DISCUSSION

For students with MSD, initiating communication with an AAC device is not an automatic skill. However, when given support and interventions that model how to appropriately initiate, students who use AAC can learn this skill in order to open more doors to interactions with communicative partners. The results of this study suggest that the use of environmental arrangements along with the implementation of a prompt hierarchy was effective in teaching students with MSD to initiate communication using an AAC device. This agrees with previous research related to teaching students with disabilities to initiate, with or without an AAC device. Similar to Andzik et. al. (2016) and Thiemann-Bourque et. al. (2018), students must be taught, using systematic methods, how to make communicative initiations using an AAC device. This study extends the research provided by the authors above by implementing strategies to teach initiation with high school students with MSD rather than elementary school aged children.

Implications for Practitioners

This intervention can be beneficial to classroom teachers who want to teach their students to initiate communication with an AAC device. Most special education MSD teachers have daily schedules and routines that are consistent and strictly followed throughout the school day. By implementing this intervention into their daily schedule, teachers can manipulate their environments to facilitate communication, along with adding promoting strategies specific to their students. The use of prompting procedures is already taking place in the classroom throughout the school day. Therefore, the use of prompting can be added to naturally occurring events while the teacher arranges the environment in such a way that promotes initiations of communication.

Setting up environments and creating opportunities for communication can be accomplished by working with a SLP. By having a SLP come into a classroom and observe the daily schedule and routine, the professionals can identify appropriate opportunities to embed communication opportunities during the students' daily schedule. This will ensure the opportunity for students to communicate across a variety of activities, environments, and communicative partners.

Future Research

This study showed improvements in communicative initiations using AAC; however, future research studies should include planned generalization measures and extend to other communicative functions. This intervention proved to be successful in the classroom and participants' work environment with the classroom teacher. However, additional research is needed to determine generalization of effects of the intervention to other individuals including teachers, family members, friends, and classmates, as well as across other school, community, and home environments.

Limitations

Although the results of this study appear successful, there are limitations to consider. First, there were no measures of spontaneous initiations collected throughout the course of the study. However, the researcher did observe instances in which Jessica used her device to spontaneously request the bathroom during the school day. Then, social validity data were not collected during this study. Therefore, it is unclear if goals, procedures, and outcomes were judged to be important and acceptable. Another limitation was the lack of initiations when using the expectant looking prompt. Some of the

participants have a learning history of being prompted frequently, which means they were never given the chance to perform skills independently. Therefore, a more explicit prompt may have needed to be utilized. Finally, although internal validity was evident in this study, replications need to take place in order to establish external validity with these procedures.

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VITA

Ryan E. Queenan

University of Kentucky 2015-2018
Bachelor of Science in Special Education