EVALUATING AN AAC TRAINING FOR SPECIAL EDUCATION
TEACHERS BASED IN A LOW-RESOURCE CONTEXT

A Dissertation in
Communication Sciences and Disorders

by
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ABSTRACT

A majority of individuals with disabilities live in low and middle-income (LAMI) countries. These countries by definition are low in resources. Communication services for individuals with complex communication needs (CCN) are scarce. In addition, the number of qualified speech-language pathologists is inadequate to serve the needs of individuals with CCN. Under these conditions, training communication partners of individuals who have CCN is essential. To address this issue, the current study evaluated an augmentative and alternative communication (AAC) training program designed for special education teachers living in a LAMI country. The training was based on four key practices identified when training in LAMI countries (Muttiah, McNaughton, & Drager, 2014), strategy instruction (Kent-Walsh & McNaughton, 2005), and principles of adult learning (Bryan, 2009). This investigation implemented an interrupted time-series design with nine teacher-student dyads. Special education teachers were taught to provide evocative communication opportunities (opportunities that place the child in an active role) that consisted of: (a) asking an open ended question, commenting, or making a choice; (b) providing a means for the student to respond; and, (c) waiting five sec for a response. Following the training all nine special education teachers increased the number of evocative communication opportunities provided to students with CCN. Additionally, all nine students with CCN increased the number of communication turns taken following their teachers participating in the training. The results of this study provide key information on training communication partners living in LAMI countries.
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DEDICATION

I would like to dedicate this dissertation to all students with complex communication needs, especially those living in low and middle-income (LAMI) countries.
CHAPTER ONE

Introduction and Review of the Literature

It is estimated that globally 1.1-1.9% of the population experiences severe communication difficulties or has complex communication needs (CCN) (Bunning, Gona, Newton, & Hartley, 2014). Individuals with disabilities are overrepresented in developing or low and middle-income (LAMI) nations (Maloni et al., 2010). An estimated 85% of children with disabilities live in LAMI countries (Helander, 1993).

Children experience CCN as a result of conditions such as autism spectrum disorder, cerebral palsy, and Down syndrome (Blackstone, 1990). Individuals with CCN are restricted in their participation in educational, social, and communication activities as a result of speech “being inadequate to meet all of their communication needs” (Beukelman & Mirenda, 2005, p.4). Augmentative and alternative communication (AAC) has been reported to be beneficial for individuals with CCN (Douglas, 2012; Light & McNaughton, 2012). AAC includes both aided low (e.g., picture boards, communication books) and high technologies (e.g., speech generating devices, mobile devices), as well as unaided forms of communication (e.g., signs, gestures) (Beukelman & Mirenda, 2013).

Communication Partner Training

Children with CCN require assistance from their communication partners to learn how to communicate effectively using AAC (Binger, Kent-Walsh, Ewing, & Taylor, 2010). These communication partners, however, may not intuitively know how to alter their communication behavior to better support the communication of someone who uses AAC (Binger & Kent-Walsh, 2012). In fact, communication partners have been reported to exhibit less than ideal partner communicative behaviors: (a) dominating interactions;
(b) asking predominantly yes or no questions; (c) taking a majority of conversational turns; and (d) providing fewer opportunities for individuals who use AAC to respond (e.g., Blackstone, 1999; Kent-Walsh & Binger, 2013; Light, Collier, & Parnes, 1985). Although, it has been documented that providing communication opportunities to children who use AAC is essential, thus far there has been no discussion of specifically what kinds of opportunities should be provided. For example, providing directives and asking yes/no questions are considered communication opportunities, but these tend to place the child in a more passive role during the interaction. Caregivers of children with developmental delays tend to be more directive, as compared to the caregivers of typically developing children (Tannock, Girolametto, & Siegel, 1992). As a result, children who use AAC are passive communicators, only responding when required and infrequently initiating during interactions with their caregivers (e.g., Bornman, Alant, & Meiring, 2001; Light and Kelford-Smith, 1993). In contrast, “evocative” communication opportunities provide the child an opportunity to communicate and be active, rather than place him or her in a more passive role (Whitehurst et al., 1988). For example, asking “what” questions (open ended questions) while interacting will result in the child taking on a more active role than not asking questions or asking yes/no questions.

It is concerning that professionals such as teachers and paraeducators who work closely with children with CCN often lack the knowledge and skills required to implement appropriate AAC interventions with these children (e.g., Douglas, 2012; Patel & Khamis-Dakwar, 2005; Soto, 1997). However, studies have documented that providing AAC training to communication partners can equip them with strategies that can facilitate increasing both the frequency and quality of communication interactions with children.
with CCN. Positive outcomes reported for communication partners included: increased knowledge and skills regarding AAC (Bornman, Alant, & Lloyd, 2007; McConachie & Pennington, 1997; Patel & Khamis-Dakwar, 2005), provision of increased number of opportunities for communication (Binger et al., 2010; Bingham, Spooner, & Browder, 2007; Douglas, McNaughton, & Light, 2014; Kent-Walsh, Binger, & Hasham, 2010; Rosa-Lugo & Kent-Walsh, 2008), improved communication with individuals with CCN (Douglas et al., 2014), and increased positive attitudes regarding AAC (Patel & Khamis-Dakwar, 2005). Training communication partners has also shown to positively impact individuals with CCN. For example, children were reported to take an increased number of communication turns (Bingham et al., 2007; Bruno & Dribbon, 1998; Douglas et al., 2014; Kent-Walsh et al., 2010; Rosa-Lugo & Kent-Walsh, 2008), engage in decreased instances of challenging behaviors (Bingham et al., 2007), and produce more symbol combinations (Binger et al., 2010) when interacting with parents, teachers and paraprofessionals who had received training.

There has been a significant interest and increase in studies related to communication partner training in the AAC literature. However, when training communication partners who are adults, it is important to not only help them understand what they learn, but it is also necessary to understand how they learn (Blackstone, 1991). The research literature on adult learning informs us that adult learners bring a unique set of characteristics that may require variety in teaching methodology (Blackstone, 1991). There are several adult learning theories and models that describe how adults learn (Bryan, Kreuter, & Brownson, 2009). They share five recurring themes (Bryan et al., 2009): (a) adults need to know the reason for why they are learning something; (b) adults
are motivated to learn through the need to solve problems; (c) adults make use of their previous experiences; (d) adults need learning approaches that match their own background and diversity; and, (e) adults need to be active participants during the learning process. It is essential to recognize and incorporate these characteristics of adult learning when developing a training program for communication partners.

Communication and AAC Services in Low and Middle-Income Countries

Most research on partner training in AAC has been conducted from an Anglo-European perspective (Huer & Soto, 1996). As a result, these findings may not be applicable in LAMI countries where there are significant differences in culture, economy, education, healthcare and technology. In addition to these differences, the challenges with providing communication services in LAMI countries are significant. By definition, LAMI countries have a largely rural population; limited health, education, and technology resources; and a poorly performing economy (World Bank, 2012). Providing rehabilitation services under these conditions are challenging (Hartley, 1998; Wylie, McAllister, Davidson, & Marshall, 2013).

Insufficient access to healthcare is a challenge faced by countries all over the world, but this is an even more significant problem in LAMI countries (Emmett, 2005; Maloni et al., 2010). Two significant barriers in a large array of challenges to providing communication services in LAMI countries are the limited number of trained professionals and the lack of sufficient university training programs (Blackstone, 1990). In the United States, the number of speech-language pathologists (SLPs) serving the population in 2012 was a ratio of 43.5 SLPs per 100,000 people (ASHA, 2014). In stark contrast, a review of the number of SLPs across four countries in Africa in 2012 showed
a dismal ratio of only one SLP serving 2 to 4 million people (Wylie et al., 2012 as cited in Wylie et al., 2013). The profession itself is often still in its infancy in many LAMI countries. For example, a university in Sri Lanka initiated a Bachelor’s degree program in speech-language pathology only as recently as 2008, with the first cohort of therapists graduating with their degrees in 2012. Additionally, there are no SLPs employed in government schools and only a limited number working in private schools (Muttiah, Drager, & O’Connor, 2013). It will take many more decades for LAMI countries like Sri Lanka to reach a similar ratio of SLPs to the population as is currently present in developed countries. Specialized services for individuals with severe communication disorders are rarely available in these countries (McConkey, 2005). The limited services that exist have been estimated to reach less than 2% of the population that need communication interventions (Hartley, 1998).

**Instructing Communication Partners in Low and Middle-Income Countries**

In countries where there are a limited number of SLPs, the number of skilled professionals specializing in AAC is extremely small (Fuller, Gray, Warrick, Blackstone, & Pressman, 2009). Therefore, the responsibility of providing AAC supports often falls on the individuals’ communication partners. In a school setting, often this would be the child’s teacher. In addition, there is very limited research on AAC in LAMI countries (Srinivasan, Mathew, & Lloyd, 2011), despite a critical need for both AAC services and research. To date, the field has only a limited understanding of how best to support the development of knowledge and skills of individuals who provide AAC supports in LAMI countries (e.g., Bunning et al., 2014; Bornman et al., 2007; Crowley et al., 2013).
A recent study explored the experiences of eight experts, who conducted trainings in, or who had trained professionals from, LAMI countries (Muttiah, McNaughton, & Drager, 2014). The focus group study explored practices for conducting AAC trainings in LAMI countries. The results of the study identified four key practices to be considered when training:

**Investigate learner needs.** It is critical to know about the trainees and their learning needs prior to conducting training. This can be done in a number of ways, including conducting a needs assessment with the learners.

**Provide contextually relevant instructional content.** The content taught should be matched to learners’ knowledge, needs, and perspectives (Bryan et al., 2009). The content and materials used in training should be relevant to trainees’ contexts, for example considering the types of AAC technologies learners have access to.

**Use engaging instructional activities.** The training activities should be learner-focused, relevant to learners, and appropriate to their contexts. For example, incorporating trainees’ own experiences into the training by using videos of the individuals they work with making the training more personally relevant.

**Assess the impact of instructional activities.** It is also important to evaluate the impact of the training, both in the short-term and in the long-term. Short-term impact of the training can be assessed by: observing whether learners demonstrate strategies that were taught, collecting information from the trainees regarding their satisfaction with the training, and observing how learners share the information they learned with others. However, it is also important to assess the training in the long-term in order to promote sustainability and continued use of AAC following the training.
Although these four key practices were identified as being essential when planning AAC trainings in LAMI countries (Muttiah et al., 2014), thus far these recommendations have not been implemented to evaluate their efficacy. The current study will implement the training practices identified by Muttiah et al. (2014) for a group of special education teachers living in Sri Lanka, a low-resource LAMI country. It is critical to study the effectiveness of these training practices using an experimental research study to further inform the field and extend the current research base on communication partner training, especially that of partner training in LAMI countries. More importantly, this research informs a training model that will facilitate providing much-needed services to children with CCN living in LAMI countries who receive minimal to no communication services.

**Research Questions**

The objective of the current study was to investigate the effectiveness of an AAC training model for special education teachers living in Sri Lanka, a LAMI country. Specifically, the following research questions were examined: (1) What is the effect of an AAC training for special education teachers (living in a LAMI country) on the number of evocative communication opportunities (opportunities that place the child in an active role) provided by teachers? (2) What is the effect of an AAC training for special education teachers (living in a LAMI country) on the number of communication turns taken by students who have CCN? (3) What is the relationship between teachers’ provision of evocative communication opportunities and students’ responses to these opportunities? The alternative hypothesis for research question one was teachers would provide a higher number of evocative communication opportunities during the post-
training and maintenance phases as compared to the pre-training phase. The alternative hypothesis for research question two was students would take a higher number of communication turns during the post-training and maintenance phases as compared to the pre-training phase. The alternative hypothesis for research question three was teachers’ provision of evocative communication opportunities would be highly yoked to students’ responses to these opportunities.
CHAPTER TWO

Method

Research Design

This study used an interrupted time-series quasi-experimental design (Shadish, Cook, & Campbell, 2002). The independent variable was the provision of AAC training to special education teachers living in a LAMI country, specifically Sri Lanka. The primary dependent variable was the number of evocative communication opportunities provided by special education teachers during a naturalistic 10-min interaction. The secondary dependent variable was the number of communication turns taken by the students during a 10-min interaction. The study consisted of four phases: pre-training (O₁, O₂, O₃) training (X), post-training (O₁, O₂, O₃) and maintenance (O₁, O₂).

\[ O₁ \quad O₂ \quad O₃ \quad X \quad O₁ \quad O₂ \quad O₃ \quad O₁ \quad O₂ \]

Quasi-experimental designs are often implemented to evaluate the benefits of an intervention (Harris, 2005). An interrupted time-series design consists of one treatment group with many observations before and after treatment (Shadish et al., 2002). Measures are obtained from the same participants repeatedly at different points in time (Myers, Well, & Lorch, 2010). Shadish et al. (2002) reported that an interrupted time-series design looks at the specific point in time during which a treatment occurred. For example, if the treatment had an impact, the causal hypothesis is that the observations after provision of treatment will have a different slope or level from those measures obtained prior to the treatment. At the point at which treatment is delivered the series should show an interruption to the pre-treatment measures if the treatment was effective. Effects of a treatment can be immediate or delayed following the treatment (Shadish et al., 2002).
Immediate effects are simpler to interpret as their onset can be matched exactly to the time of intervention. Delayed effects are more challenging to interpret, unless there is a theoretical justification for how long of a delay there should be before an effect is expected. This type of design is a strong quasi-experimental alternative to randomized designs when these are not feasible (Shadish et al., 2002). Interrupted time-series designs have advantages such as being ideal when subjects are members of a population that is limited in size (as is the case with children who use AAC). These designs are more efficient as each subject is measured multiple times, and require fewer participants to achieve the same power as a between-subjects design (Myers et al., 2010).

**Participants**

A non-probability, purposive sampling technique was used to recruit participants (Trochim, 2006). Non-probability sampling techniques do not involve random selection. Purposive sampling is done with a specific purpose in mind, meaning the researcher seeks specific participants who meet some predefined criteria for being included in the sample. The participants for this study were recruited from regular education and specialized schools in and around the Colombo area of Sri Lanka. Nominations were sought from educational professionals and school administrators in the area, some who were personal contacts of the primary investigator and others who were unknown. A power analysis was completed using G*power (Faul, Erdfelder, Lang, & Buchner, 2007) with a mid effect size of 0.5 (Cohen, 1992) to determine the appropriate sample size for this study (Appendix B). An arbitrary effect size (mid effect size of 0.5) was used to estimate the sample size, as no other training studies were found that were similar enough to justify using the effect size resulting from that particular training. The results of the
power analysis indicated that seven participant dyads were required to obtain adequate power (0.95), if each dyad was measured repeatedly eight times (three times pre, three times post and twice during maintenance).

Nine special education teachers and nine students with CCN participated in the study. Informed consent was obtained both from the teacher participants and students’ parents. Selection criteria for special education teacher participants included: (a) being a teacher who taught in a special education classroom in a regular or specialized school; (b) having a student with CCN in his/her classroom; (c) being willing to be videotaped both pre and post intervention, attend a training, and complete pre and post questionnaires; (d) being fluent in English and/or Sinhala; and, (e) being over the age of 18 years. Teachers completed a demographic questionnaire prior to the start of the study (Appendix C). Teachers had a wide range of experiences working as special educators (between 3 months - 20 years). They also differed in their special education qualifications, from some having no qualifications to others holding a special education diploma. They reported experiences with a range of diagnoses: Down syndrome, autism spectrum disorder (ASD), cerebral palsy, intellectual impairments, and physical disabilities. All teachers had limited to no training in communication interventions prior to attending the training. See Table 1 for teachers’ demographic information.
Table 1

*Demographic information for special education teachers* (Pseudonyms have been used to protect teachers’ confidentiality).

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Type of school</th>
<th>Highest Education Level Completed</th>
<th>Special Education Qualification</th>
<th>Years worked as a special educator</th>
<th>Communication Training received</th>
<th>Diagnoses of students in the classroom</th>
</tr>
</thead>
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<tr>
<td>Ms. Thilini</td>
<td>46</td>
<td>Special</td>
<td>Diploma (3-year)</td>
<td>None</td>
<td>11</td>
<td>None</td>
<td>Down Syndrome, Autism Spectrum Disorder, Hyperactivity, Down Syndrome</td>
</tr>
<tr>
<td>(T1)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Ms. Renuka</td>
<td>47</td>
<td>Special</td>
<td>Advanced-Level (High-school)</td>
<td>Course in Special Ed. (6-months)</td>
<td>2</td>
<td>None</td>
<td>Down Syndrome</td>
</tr>
<tr>
<td>(T2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Bimali</td>
<td>33</td>
<td>Special</td>
<td>Advanced-Level (High-school)</td>
<td>Special Education Certification (3-months)</td>
<td>1 ½</td>
<td>Minimal-during certification course.</td>
<td>Down Syndrome, Intellectual impairments.</td>
</tr>
<tr>
<td>(T3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Sonali</td>
<td>46</td>
<td>Special</td>
<td>Montessori Diploma and Nursing Degree.</td>
<td>Special Education Diploma (1 year)</td>
<td>3 months</td>
<td>Minimal-during nursing degree.</td>
<td>Down Syndrome, Intellectual impairments, Autism Spectrum Disorder.</td>
</tr>
<tr>
<td>(T4)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Ms. Ramya</td>
<td>36</td>
<td>Special</td>
<td>Montessori Diploma and Special Education Diploma (1 year)</td>
<td>Special Education Diploma (1 year)</td>
<td>3</td>
<td>Minimal-during special education diploma.</td>
<td>Down Syndrome, Intellectual impairments, Autism Spectrum Disorder.</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ms. Razna</td>
<td>43</td>
<td>Inclusive</td>
<td>Special Education Diploma (1 year)</td>
<td>Special Education Diploma (1 year)</td>
<td>5</td>
<td>Minimal-during special education diploma.</td>
<td>Down Syndrome, Cerebral Palsy, unknown genetic disorder</td>
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<td></td>
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</tr>
<tr>
<td>Ms. Kamini</td>
<td>27</td>
<td>Inclusive</td>
<td>Bachelor’s Degree</td>
<td>Primary school teaching Diploma (1 year)</td>
<td>4</td>
<td>Minimal-during diploma course.</td>
<td>Down Syndrome, Cerebral Palsy, unknown genetic disorder</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Waruni</td>
<td>44</td>
<td>Special</td>
<td>Certification course in Dance and Music</td>
<td>None</td>
<td>5</td>
<td>None (has had personal experiences with communication impairments because of having a student with a hearing impairment)</td>
<td>Physical disabilities, multiple disabilities and cerebral palsy</td>
</tr>
<tr>
<td>(T8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Chaturi</td>
<td>51</td>
<td>Special</td>
<td>Special Education Diploma (2 years)</td>
<td>Special Education Diploma (2 years)</td>
<td>20</td>
<td>Minimal-during special education diploma.</td>
<td>Multiple Disabilities</td>
</tr>
<tr>
<td>(T9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The students in the study met the following criteria: (a) being a student with CCN or not having functional speech to meet his/her communication needs; (b) not having a primary diagnosis of visual or hearing impairment; (c) being interested in pictures; and, (d) having a teacher who was willing to participate in the study. Parents of students in the study completed a demographic questionnaire (Appendix F). The students ranged in age from 10 - 22 years. They presented with a range of diagnoses, including cerebral palsy, Down syndrome, and an unknown genetic disorder. The Communication Matrix (Rowland, 2011) was used as the primary assessment measure of the students’ language skills (Appendix G). The teachers completed the communication matrix questionnaire. Students’ communication skills on the matrix ranged between level I-level IV. The level was determined based on the level at which the student had the most number of mastered communicative behaviors. Level I includes pre-intentional behaviors that are not under the student’s voluntary control, level II includes intentional behaviors that are not used with the intent of communicating, level III includes the use of unconventional pre-symbolic behaviors (e.g., facial expressions, simple gestures), and level IV includes conventional behaviors that are pre-symbolic (e.g., pointing, nodding). Although none of the students were classified as symbolic communicators (level V and above on the Communication Matrix), many of them were emerging symbolic communicators or were using some symbols for communication. Currently, there are no standardized language tests in English or Sinhala that have been normed for the Sri Lankan population. Therefore, formal language measures could not be utilized. The students had a range of communication modes, including vocalizations, facial expressions, gestures, and single words. None of the students were using any form of low or high tech AAC consistently prior to this investigation. See Table 2 for students’ demographic information.
Table 2

*Demographics and language levels for students* (Pseudonyms have been used to protect students’ confidentiality).

<table>
<thead>
<tr>
<th>Participant Characteristics</th>
<th>Language Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
<td><strong>Age/Sex</strong></td>
</tr>
<tr>
<td>Binara (S1)</td>
<td>14/M</td>
</tr>
<tr>
<td>Mohan (S2)</td>
<td>21/M</td>
</tr>
<tr>
<td>Nelum (S3)</td>
<td>18/F</td>
</tr>
<tr>
<td>Piyal (S4)</td>
<td>22/M</td>
</tr>
<tr>
<td>Samanmali (S5)</td>
<td>19/F</td>
</tr>
<tr>
<td>Namali (S6)</td>
<td>16/F</td>
</tr>
<tr>
<td>Tisara (S7)</td>
<td>14/M</td>
</tr>
<tr>
<td>Malini (S8)</td>
<td>10/F</td>
</tr>
<tr>
<td>Shehan (S9)</td>
<td>15/M</td>
</tr>
</tbody>
</table>
Setting and Materials

The study was conducted in the teachers’ and students’ schools. The group training for special education teachers was conducted at their individual schools. Three different types of materials were used for the study: literacy related activities (e.g., books, alphabet letters, and white boards with markers), music related activities (e.g., songs and instruments), and play related activities (e.g., painting, coloring activities, and craft activities). All books and other materials were culturally appropriate, inexpensive, and commonly used in local schools. These materials were available during the pre, post and maintenance phases of the study. During the training, teachers developed basic AAC tools such as visual schedules, picture symbols, word cards, and AAC boards (see Appendix H for examples). The AAC tools developed by teachers were used during the post-training and maintenance phases. A video camera mounted on a tripod was used to record all sessions.

Dependent Measures

Data were collected on two dependent variables for this investigation. The primary dependent measure was the number of evocative communication opportunities provided by special education teachers to students with CCN. This was measured for each 10-min interaction session between the teacher-student dyad. The definition of an evocative communication opportunity was adapted from Light et al. (1985), Douglas et al. (2014), and Whitehurst et al. (1988) as the following: (a) an open-ended question (which excluded yes or no questions), comment, or choice directed towards the student by the teacher; (b) provision of a means for the student to respond; and, (c) wait time of 5 sec or more. An evocative communication opportunity was defined as a combination of
all three of these and was counted only if all three of these criteria were met. Teachers were also given credit for an evocative communication opportunity if the student responded to an open-ended question, comment, or choice via unaided means (e.g., speech, sign, gestures), or if the student responded within the 5 sec wait time (thereby making it unnecessary to wait a full 5 sec).

The secondary dependent measure was the number of communication turns taken by the students with CCN during a 10-min interaction. The operational definition of a communication turn was adapted from Bruce and Vargas (2007) and Carter (2003). A communication turn was defined as an intentional communicative behavior that transmitted a message and was directed towards a partner. Intentionality was indicated by the student attempting to initiate or respond to a communication partner by attending to the partner and/or system through eye gaze, gesture, leaning toward, touching, or vocalizations. A communicative behavior was defined as a behavior that transmitted a message in a conventional form (speech, signs, gestures, pointing to pictures, pointing to words, use of AAC system) or non-conventional form (vocalizations or gestures). A turn was required to be both intentional and communicative to be counted as a communication turn. A communication partner speaking or a 2 sec interval between the end of one communication turn and the beginning of the next turn signaled the end of a student’s communication turn.

**Procedures**

The study consisted of four phases: pre-training, training, post-training and maintenance. Each session within the pre-training, post-training and maintenance phases lasted approximately 10 min and all these were videotaped. Sessions took place two to
three times per week in the teachers’ and students’ schools. Teachers completed a pre-
training questionnaire prior to participating in the training. The questionnaire explored
teachers’ knowledge on AAC, learning priorities, needs, and information regarding the
student’s communication abilities (Appendix D). Teachers had limited knowledge
regarding all forms of AAC. One teacher reported using a tablet with a communication
app with one of her students briefly, but this was subsequently discontinued due to
limited success. A majority of the teachers (eight out of nine) reported having used
pictures in their classrooms in the past, but most did not use these as a means for students
with CCN to use to communicate. Teachers identified their learning priorities in relation
to AAC on the pre-training questionnaire. A majority of the teachers listed the following
as their highest priorities: learning about ways to involve students with CCN in literacy
activities, learning about ways for students with CCN to participate by answering
questions, and developing materials that would help students with CCN to communicate
(see Appendix E). Although the teachers’ learning priorities with regards to AAC varied,
no additional content on AAC was requested beyond the content originally planned (see
below). Teachers identified additional content on other topics including making students
with disabilities more independent, dealing with students who have challenging
behaviors, strategies for improving memory, ways to reduce drooling, and incorporating
technology into teaching.

**Pre-training phase.** The dyads were observed and video recorded for three pre-
training sessions. All dyads had access to literacy, music, and play materials. The
participant dyads chose the activities they wanted to engage in. Each pre-training session
consisted of a 10-min naturalistic interaction between the teacher and student dyad. No
feedback was provided by the researcher to any of the dyads during this phase of the investigation.

**Training phase.** The training phase consisted of a group training for the teachers and three individual follow-ups with each teacher-student dyad. The duration of the group training was between three and a half to four hours; the three individual follow-ups were each between 20-30 min. The entire training phase was completed in approximately six hours across four days. The group training was completed in one day and the three follow-ups were completed across three days. Each group training was held at each of the schools participating in the study (three schools). School one had five teachers, school two had two teachers, and school three had two teachers who consented to participate in the study. All teacher participants at the same school attended the same group training, which also included other educators working at the school who were not part of the study. Two of the trainings were conducted in Sinhala and one was in English. The language of the training was determined by the language medium used in the school and spoken by the teachers. All the group trainings were conducted within a week of each other. The training was conducted by the researcher who is from Sri Lanka who is as a result familiar with the culture and context. Additionally, the researcher is fluently bilingual in both English and Sinhala.

**Training Content and Format.** The training content was determined based on a number of factors, a primary factor being the needs of the learners. The learner’s needs were determined based on the pre-training questionnaire that was completed prior to the training. Professionals who have conducted trainings in contexts similar to Sri Lanka have discussed the importance of determining instructional content based on the learners’
needs and knowledge (Muttiah et al., 2014). All of the special education teachers who participated in the study had minimal to no knowledge regarding communication interventions and AAC. It was therefore essential to start with discussing foundational knowledge on communication and AAC including the power of communication (Light, 1997). All trainings consisted of the same AAC content and information. However, the amount of time spent on certain topics varied based on the learning priorities identified by each teacher in their pre-questionnaires. The content of the training was planned based on a review of the communication partner training literature, specifically the commonly-used partner communication strategies and recommendations based on Muttiah et al. (2014).

The training format incorporated recommendations by Muttiah et al. (2014) and the major principles of adult learning. The format of the training was adapted from the strategy instruction model developed by Kent-Walsh and McNaughton (2005): (a) information on communication and AAC; (b) strategy description; (c) strategy demonstration; (d) practice with a visual aid; (e) controlled practice; and, (f) follow-up sessions (See Table 3 for training content and format).
Table 3

**Training Content and Format**

<table>
<thead>
<tr>
<th>Steps of the strategy instruction model</th>
<th>Training format</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Information on communication and AAC</td>
<td>- Conducting a role-play activity showing teacher participants the power of communication.</td>
</tr>
<tr>
<td></td>
<td>- Providing basic knowledge on AAC.</td>
</tr>
<tr>
<td>2. Strategy Description</td>
<td>- Providing information on evocative communication opportunities: (a) asking an open-ended question, providing a choice and making a comment; (b) providing the student with a means to respond; and (c) waiting (5 secs) for a response.</td>
</tr>
<tr>
<td>3. Strategy Demonstration</td>
<td>- Showing videos from the pilot study to demonstrate use of AAC tools and partner communication strategies.</td>
</tr>
<tr>
<td></td>
<td>- Instructor role-playing with teacher participants to model communication partner strategies.</td>
</tr>
<tr>
<td>4. Verbal Practice</td>
<td>- Watching videos of students with CCN familiar to the learners</td>
</tr>
<tr>
<td></td>
<td>- Using these students as case studies to complete the training worksheet.</td>
</tr>
<tr>
<td></td>
<td>- Developing own AAC materials.</td>
</tr>
<tr>
<td>5. Controlled Practice and Feedback (guided practice)</td>
<td>- Teacher participants role-playing with each other using AAC materials and implementing partner strategies that were learned.</td>
</tr>
<tr>
<td></td>
<td>- Evaluating leaners’ use of AAC strategies by completing the skills demonstration checklist.</td>
</tr>
<tr>
<td>6. Follow-up Sessions (advanced practice and feedback)</td>
<td>- Conducting three one-on-one follow-ups with each teacher-student dyad in their classrooms.</td>
</tr>
<tr>
<td></td>
<td>- Providing feedback to leaners as they practice AAC strategies in the natural setting with students with CCN.</td>
</tr>
</tbody>
</table>
**Information on communication and AAC.** The training began with the researcher sharing the teachers’ responses to the pre-training questionnaires, and a demonstration and discussion of the power of communication (Light, 1997). This was done in pairs, with one participant role-playing a student with CCN while the other attempted to guess the message that her partner was trying to communicate. Following this activity, participants shared the frustration they felt due to not being able to communicate their messages via speech or other alternate forms. Participants’ role-playing partners also discussed challenges at not being able to understand the message that was being communicated to them.

The next part of the training focused on dissemination of basic knowledge on AAC and communication partner strategies. Basic knowledge on AAC included a brief introduction to AAC, examples of low and high tech AAC, and information on individuals who would benefit from AAC. The examples of low and high tech AAC focused in particular on low tech AAC tools that could be easily developed and were relevant to the context of education in Sri Lanka.

**Strategy Description.** The main communication partner strategy discussed was the provision of evocative communication opportunities that allowed the child to take a more active role in an interaction. An evocative communication opportunity was described as consisting of (a) asking an open-ended question, providing a choice, or making a comment; (b) providing the student with a means to respond (e.g., picture cards, AAC board); and, (c) waiting at least 5 secs for the student to respond.

**Strategy Demonstration.** Teacher participants were shown videos of two teacher-student dyads interacting with each other. These videos were from a pilot training that
was conducted a year ago in a similar Sri Lankan special school setting. The videos demonstrated the use of low-tech AAC tools and partner communication strategies that were comparable to the current training. Teacher participants watched the videos and discussed changes they observed in the teachers’ and students’ behaviors between the pre and post-training videos following training.

The instructor modeled providing evocative communication opportunities using the same materials (literacy, music, and play) that were available to the participants. The instructor role-played the teacher, while a teacher participant role-played a student with CCN. The researcher demonstrated the use of the target strategy while using think-aloud during the role-play to show the thought process behind implementing the strategy (e.g., “I asked an open-ended question, and now I show the child the picture cards”).

**Verbal Practice.** During this stage, participants watched short video clips of students with CCN from their own classrooms (or school) that were recorded during the pre-training sessions. Using these students as case studies, participants broke into small groups (2-3 people) and completed a training worksheet (Appendix I). The training worksheet served as a form of verbal practice to guide participants to: 1) identify contexts during the day where AAC could be implemented; 2) identify three opportunities for a chosen context; 3) identify six vocabulary words specific to that context; 4) construct an AAC board and six picture cards/word cards with the six vocabulary words pertinent to that context; and, 5) follow the verbal script provided in the worksheet to facilitate implementing the AAC tools and strategies. All teacher participants completed the training worksheet and developed appropriate AAC materials for the identified contexts.
Controlled practice feedback (guided practice). In this stage, participants practiced using the AAC tools they developed by role-playing and incorporating partner communication strategies, using the script on the training worksheet as a guide. The role-plays were done in small groups. The instructor observed each group and provided feedback on the accuracy and implementation of the communication partner strategies. The researcher evaluated each teacher’s accurate implementation of partner communication strategies by completing the skills demonstration checklist (Appendix J) for each participant. A minimum criterion was set of providing at least three evocative communication opportunities. If teachers were unable to provide at least three evocative communication opportunities or implement steps of the partner strategy accurately (as shown in the checklist), the instructor would re-teach the strategies again in a smaller group. This was not required, however, as all teacher participants provided at least three evocative communication opportunities and implemented steps of the partner strategy accurately.

Follow-up sessions (advanced practice and feedback). The follow-up sessions were scheduled within two to three days of completing the group training. The goals of the follow-up sessions were to provide teachers an opportunity to practice the skills they learned during the training in a more naturalistic, familiar setting with their students with CCN. The researcher provided prompting and feedback on the implementation of the AAC tools and communication partner strategies. However, as the follow-up sessions progressed this feedback was gradually faded. The researcher completed the skills demonstration checklist for each follow up session as well. All teacher participants met
the minimum training criterion of providing three evocative communication opportunities per session.

**Post-training Phase (independent practice).** The goal of the post-training phase was to demonstrate changes in special education teachers’ and students’ behaviors as a result of the training program. No feedback was provided to any of the dyads during this phase. Data were collected for three post-training sessions. Post-training measures started within a week of completing the three one-on-one follow-ups with each teacher. All the same literacy, music, and play activities that were available during the pre-training phase were also available during this phase. In addition, teachers had access to the AAC tools they had developed during the training phase.

**Maintenance Phase.** The goal of the maintenance phase was to determine if the positive changes in teacher and student behaviors would be maintained over time following the completion of the post-training sessions. Two maintenance probe measures were collected for each dyad one and a half to two weeks following the completion of the post-training phase. These two sessions were the same duration and followed the same format as the pre-training and post-training sessions. No feedback was provided to any of the dyads during this phase. These probes were completed to measure maintenance of the two dependent variables (number of evocative communication opportunities provided by teachers and communication turns taken by students with CCN).

**Procedural Reliability**

To ensure that the researcher consistently provided the same instructional content and followed the same format for all the trainings, an administrator (from each of the schools) attending the training completed a checklist (Appendix K). The checklist
identified the content and format the instructor should have followed during training.

Procedural reliability was 100% indicating that the training content and format were the same for all three training sessions across the three schools.

**Coding**

All 10-min sessions were videotaped. The videos were then viewed and coded for the two dependent variables by the researcher based on the definition of an evocative communication opportunity and communication turn. A count was obtained for the number of evocative communication opportunities provided by teachers and for the number of communication turns expressed by students per 10-min session. A count was also obtained for whether a teacher's evocative communication opportunity was followed by a response by the student or not. These numbers were recorded on the coding sheets (Appendix L). All data were coded in English for ease of using a computer to code. A majority of the sessions were conducted in Sinhala; therefore, these were translated by the researcher in real-time and coded in English. A second coder translated the data and coded it in English on the data sheets. The second coder confirmed data translation on a randomly selected sample.

**Data Reliability**

To establish the integrity of the data that were collected, point-by-point reliability were completed by a second coder. This was done on approximately 20% (3 min of each video) of the data that were randomly selected and coded. The second coder was an undergraduate student majoring in speech-language pathology who was also a fluent bilingual (English and Sinhala). She was trained on the data coding procedures using the pilot videos until a reliability of 80% or better was achieved for both dependent
measures. An opportunity or a turn needed to be coded within a timeframe of 3 seconds to be counted as an agreement. Inter-rater agreement was calculated for the two dependent variables by dividing the number of agreements by the sum of the agreements, disagreements, and omissions. This value was then multiplied by 100 to obtain a percentage. Average reliability scores for teacher’s evocative communication opportunities were 97% (range 94% to 100%) and for students’ communication turns were 93.75% (range 90% to 97.5%).

**Data Analysis**

The data were graphed and visually inspected for changes between the pre, post and maintenance sessions. In addition, a statistical analysis was completed using a repeated measures analysis of variance (ANOVA) mixed effects model on SAS. An ANOVA was used to analyze differences in the number of evocative communication opportunities provided by special education teachers before and after the training. A similar analysis was completed to analyze differences in the number of communication turns taken by students with CCN before and after their teachers participated in the training. The relationship between teacher’s provision of evocative communication opportunities and students’ responses to these evocative communication opportunities was graphed and examined visually.

**Social Validity**

Teacher participants completed a satisfaction survey at the end of the study as a social validity measure (Appendix M).
CHAPTER 3

Results

The results for all nine teacher-student dyads are reported below. The first section presents results for the primary dependent variable, teacher-provided evocative communication opportunities. The second section presents results for the secondary dependent variable, communication turns taken by students with CCN. The third section presents the relationship between teachers’ provision of evocative communication opportunities and students’ responses to these opportunities.

Evocative Communication Opportunities provided by Teachers

Figures 1 and 2 show that the teachers increased their provision of evocative communication opportunities from pre-training to post-training. Additionally, these increases appear to be maintained during the two maintenance sessions. The number of evocative communication opportunities provided by teachers during each phase are reported in Appendix N. During the three pre-training sessions teachers provided a mean of 2.07 evocative communication opportunities per 10 min session (range 0 to 16). During the post-training sessions this increased to a mean of 13.85 (range 5 to 28) evocative communication opportunities, and a mean of 15.05 (range 8 to 38) during the maintenance sessions.

Data were explored visually using boxplots to examine the possible relationship between the variables. Figure 1 shows the relationship between the predictor variable, pre-post-maintenance, and the response variable evocative communication opportunities provided by teachers. Figure 2 shows the relationship between the predictor variable, time (clustered within pre-post-maintenance variable), and the response variable
evocative communication opportunities provided by teachers. Two teachers’ (Ms. Kamini and Ms. Waruni) data appeared to be positive outliers in this data set. Ms. Kamini (T7) presented as an outlier during both the pre-training and post-training sessions. Ms. Waruni’s (T8) data appeared as an outlier during the post-training sessions only. Both these teachers appeared to be providing a higher number of evocative communication opportunities in comparison to the other teachers.

Figure 1. Evocative communication opportunities by the pre-post-maintenance predictor variable (The box goes from the first quartile $Q_1$ to the third quartile $Q_3$, the horizontal line within the box is the median, the two vertical lines are the whiskers that show the spread of the data, and the asterisk represents outliers).
Figure 2. Communication opportunities by time predictor variable (The box goes from the first quartile $Q_1$ to the third quartile $Q_3$, the horizontal line within the box is the median, the two vertical lines are the whiskers that show the spread of the data, and the asterisk represents outliers).

A repeated measures ANOVA mixed effects model was used to evaluate differences between the number of teacher-provided communication opportunities during the pre-training, post-training and maintenance phases. The random effect in the model was the teacher subjects, and the two fixed effects were the pre-post-maintenance variable and the time variable. Prior to running the analysis, the assumptions of independence, normality, and homogeneity of variance were evaluated. The residual plot violated the homogeneity of variance. Therefore, a square root transformation was completed. The model was run using the transformed data.

The main effect for the pre-post-maintenance variable was statistically significant, $F(2,56)=174.94, p=0.0001$ (Table 4). Therefore, the number of evocative communication
opportunities provided by teachers was different across the pre, post and maintenance conditions. Partial eta squared was calculated to determine effect size, $\eta_p^2 = 0.86$ (e.g. Cohen, 1965 as cited in Lakens, 2013).

The main effect for the time predictor variable was not statistically significant, $F(5,56)=1.71$, $p=0.148$ (Table 4). Therefore, the number of evocative communication opportunities provided by teachers was not different across time (e.g., time 1, time 2 and time 3) within each pre, post and maintenance condition.

Table 4

The main effects of pre, post, maintenance, and time predictor variables for teachers

<table>
<thead>
<tr>
<th>Effect</th>
<th>Num df</th>
<th>Den df</th>
<th>F Value</th>
<th>$p &gt; F$</th>
<th>$\eta_p^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-post-maint</td>
<td>2</td>
<td>56</td>
<td>174.94</td>
<td>*&lt;.0001</td>
<td>0.86</td>
</tr>
<tr>
<td>Time (Pre-post-maint)</td>
<td>5</td>
<td>56</td>
<td>1.71</td>
<td>0.148</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Significant at $\alpha =0.05$ level

Follow-up analyses of group differences for the pre-post-maintenance variable were accomplished with pairwise $t$-tests. Type 1 (alpha) error rate was adjusted using the Bonferroni correction to create a familywise error rate of 0.0167 ($\alpha=0.05/3$). Results are shown in Table 5.
Table 5

Pairwise comparisons between pre, post and maintenance conditions for evocative communication opportunities

<table>
<thead>
<tr>
<th>Condition</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>𝑑𝑧</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-post comparison</td>
<td>8</td>
<td>-11.33</td>
<td>*&lt;.0001</td>
<td>-3.78</td>
</tr>
<tr>
<td>Pre-maintenance comparison</td>
<td>8</td>
<td>-12.67</td>
<td>*&lt;.0001</td>
<td>-4.22</td>
</tr>
<tr>
<td>Post-maintenance comparison</td>
<td>8</td>
<td>-1.07</td>
<td>0.3166</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Significant at α = 0.0167 level

Teachers provided a statistically significant higher number of evocative communication opportunities in the post-training condition than in the pre-training condition, 𝑡(8) = -11.33, 𝑝 < .0167. Effect size was calculated using Cohen’s 𝑑𝑧 = -3.78. An effect size of 𝑑 = 0.8 is considered a large effect size (Cohen, 1992). Therefore, the calculated effect size is considered a very large effect.

Teachers also provided a statistically significant higher number of evocative communication opportunities in the maintenance condition than in the pre-training condition, 𝑡(8) = -12.67, 𝑝 < .0167. Effect size was calculated as 𝑑𝑧 = -4.22. This is considered a very large effect size.

There was no statistical difference in the number of evocative communication opportunities provided during the post-training and maintenance conditions. Therefore, the number of evocative communication opportunities provided by teachers during the post-training condition and during the maintenance condition were not different.
Communication Turns taken by Students with CCN

Figures 3 and 4 show the students’ communication turns in pre-training, post-training, and maintenance sessions. There is an increase in the number of communication turns during the post-training and maintenance phases compared to the pre-training phase. The number of communication turns taken by students during each phase is reported in Appendix O. During the three pre-training sessions students with CCN took a mean of 10.07 communication turns per session (range from 0 to 26). During the post-training sessions turns increased to a mean of 28.11 (range from 12 to 53) and to a mean of 28.16 (range from 14 to 47) during the maintenance sessions.

Data were explored visually using boxplots to examine the possible relationship between the variables. Figure 3 shows the relationship between the predictor variable, pre-post-maintenance, and the response variable communication turns taken by students. Figure 4 shows the relationship between the predictor variable, time (clustered within pre-post-maintenance variable), and the response variable communication turns taken by students.
Figure 3. Communication turns by the pre-post-maintenance predictor variable (The box goes from the first quartile $Q_1$ to the third quartile $Q_3$, the horizontal line within the box is the median, the two vertical lines are the whiskers that show the spread of the data, and the asterisk represents outliers).

Figure 4. Communication turns by time predictor variable (The box goes from the first quartile $Q_1$ to the third quartile $Q_3$, the horizontal line within the box is
the median, the two vertical lines are the whiskers that show the spread of the data, and the asterisk represents outliers).

A repeated measures ANOVA mixed effects model was used to evaluate differences between the number of communication turns taken by students during the pre-training, post-training and maintenance phases. The random effect in the model was the teacher subjects, and the two fixed effects were the pre-post-maintenance variable and the time variable. Prior to running the analysis, the assumptions of independence, normality, and homogeneity of variance were evaluated. The residual plot violated the homogeneity of variance, therefore, a square root transformation was completed. The model was run using the transformed data.

The main effect for the pre-post-maintenance variable was statistically significant, \( F(2,56)=54.8, p=0.0001 \) (Table 6). Therefore, the number of communication turns taken by students was different across the pre, post and maintenance conditions. Partial eta squared was calculated to determine effect size, \( \eta^2_p = 0.66 \) (e.g. Cohen, 1965 as cited in Lakens, 2013).

The main effect for the time predictor variable was not statistically significant, \( F(5,56)= 0.43, p=0.823 \) (Table 6). Therefore, the number of communication turns taken by students were not different across time (i.e., time 1, time 2, and time 3) within each pre, post, and maintenance condition.
Table 6

The main effects of pre, post, maintenance, and time predictor variables for students

<table>
<thead>
<tr>
<th>Effect</th>
<th>Num df</th>
<th>Den df</th>
<th>F Value</th>
<th>p &gt; F</th>
<th>$\eta_p^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-post-maint</td>
<td>2</td>
<td>56</td>
<td>54.8</td>
<td>*&lt;.0001</td>
<td>0.66</td>
</tr>
<tr>
<td>Time (Pre-post-maint)</td>
<td>5</td>
<td>56</td>
<td>0.43</td>
<td>0.823</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Significant at $\alpha=0.05$ level

Follow-up analyses of group differences for the pre-post-maintenance variable were accomplished with pairwise $t$-tests. Type 1 (alpha) error rate was adjusted using the Bonferroni correction to create a familywise error rate of 0.0167 ($\alpha=0.05/3$). Results are shown in Table 7.

Table 7

Pairwise comparisons between pre, post and maintenance conditions for communication turns

<table>
<thead>
<tr>
<th>Condition</th>
<th>df</th>
<th>t</th>
<th>p</th>
<th>$d_z$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-post comparison</td>
<td>8</td>
<td>-5.46</td>
<td>*0.0003</td>
<td>-1.82</td>
</tr>
<tr>
<td>Pre-maintenance comparison</td>
<td>8</td>
<td>-6.78</td>
<td>*&lt;.0001</td>
<td>-2.26</td>
</tr>
<tr>
<td>Post-maintenance comparison</td>
<td>8</td>
<td>-0.02</td>
<td>0.986</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Significant at $\alpha=0.0167$ level

Students took a statistically significant higher number of communication turns in the post-training condition than in the pre-training condition, $t(8)=-5.46$, $p<.0167$. Effect size was calculated using Pearson’s correlation, $d_z=-1.82$. This is considered a very large effect.
Students also took a statistically significant higher number of communication turns in the maintenance condition than in the pre-training condition, $t(8)= -6.78$, $p<.0167$. Effect size was calculated as $d_z = -2.26$. This is considered a very large effect size.

There was no statistical difference in the number of communication turns taken during the post-training and maintenance conditions. Therefore, the number of communication turns taken by students during the post-training condition and during the maintenance condition was not different.

Four of the nine teacher-student dyads completed four pre-training measures while the remaining five had only three pre-training measures. This additional fourth pre-measure for four participant dyads was collected in an attempt to stagger the training for some of the participants. Conducting the trainings in this way removed time constraints on the researcher in having to conduct 3 group trainings in three different locations simultaneously. All three group trainings were conducted within a week of each other. Data from the fourth pre-training session was included (for the four participant dyads) in the initial ANOVA model. However, the main effect of the predictor variable time (clustered within pre-post-maintenance variable) and the response variables teacher-provided communication opportunities and students’ communication turns was not statistically significant. This indicated that there were no differences between any of the measures within each pre, post, or maintenance condition. Therefore, the results of the statistical analysis described above were the same regardless of whether the fourth pre-training measure (for four of the participants) was included in the ANOVA model or not.
Data from the fourth pre-training measure were removed from the final analysis to maintain equal numbers of pre and post comparisons in the model.

**Relationship between Evocative Communication Opportunities provided by Teachers and Students’ Responses**

The relationship between evocative communication opportunities provided by teachers and students’ responses to these opportunities can be seen in Figure 5. Teacher’s provision of evocative communication opportunities appears to be yoked to students’ responses to these opportunities. Therefore, during the pre-training sessions when teachers provided fewer evocative communication opportunities, students produced fewer responses. However, during the post-training and maintenance sessions when teachers provided increased evocative communication opportunities, students produced more responses as well.

![Graph showing relationship between evocative opportunities and communication turns](image)

*Figure 5. Relationship between evocative communication opportunities provided by teachers and students’ responses to these evocative opportunities.*
Social Validity

Collecting social validity information from study participants can help realize the functional utility of an intervention in everyday life (Schlosser, 1999). All the teachers stated that they would participate in a similar training program if given another opportunity to do so. Additionally, all of them said that they would recommend this training program to other teachers. All teacher participants reported a noticeable change in the students they worked with. Teachers shared some aspects they felt were strengths of the program, including: learning about more effective ways to communicate with the student, utilizing strategies to communicate and teach, engaging in activities the students enjoyed, allowing the students to communicate more independently (e.g., expressing their needs), providing an opportunity for students hidden skills to emerge, improving the student’s cognitive skills, developing a closer relationship with the student, improving the teacher’s skills, equipping the teacher with strategies (e.g., providing choices), and identifying specific vocabulary words for each activity through completing the training worksheet. They also discussed aspects of the training that should be changed to further improve it, including: creating more materials (i.e., picture cards), using picture cards and strategies in more variety of activities, involving parents in the training, building further on these strategies, learning about early identification signs of students who may have communication difficulties, and having access to more training sessions on this topic. Teachers also shared at least one strategy they hoped to continue using with their students who have CCN, including: continuing to use the picture/word cards, continuing to use the AAC tools developed with the students (e.g., communication board), using AAC tools in similar activities as the training (e.g., singing), and continuing to implement the strategies
learned during the training (e.g., providing wait time, not answering questions on behalf of the student).
CHAPTER FOUR

Discussion

The results of the group training demonstrated positive results for both teachers and students. The training resulted in increases in the number of evocative communication opportunities provided by teachers and in the number of communication turns taken by students. A short training program of four instructional sessions, which consisted of one group training and three 1:1 individual sessions (approximately six hours in total) was successful in teaching special education teachers evocative communication strategies that facilitated the communication of students with CCN in their classrooms. In addition, all of the students increased the number of communication turns they took following the training for teachers.

Evocative Communication Opportunities provided by Teachers

All the special education teachers in the study increased the number of evocative communication opportunities they provided following the training during the post-training and maintenance sessions. Four of the teachers (Ms. Razna-T6, Ms. Kamini-T7, Ms. Waruni-T8, and Ms. Chaturi-T9) provided a higher number of evocative communication opportunities during the pre-training phase compared to the other five teachers (see Table 8). There may have been a variety of reasons as to why these four teachers were already providing some evocative communication opportunities prior to the training. Three of these teachers had completed special education or general education diplomas and had higher educational qualifications than most of the other teachers in the study. The fourth teacher (Ms. Waruni-T8) had no specific training or qualifications in special education, but had many years of experience interacting with a student with
complex communication needs, as her own child was born with a severe hearing loss. This particular teacher provided an average of 2 turns during the pre-training sessions and increased to an average of 15.5 turns following training, during the post and maintenance sessions. Even prior to the training, she used a white board to draw pictures and provided the student access to communication via pictures, a practice she continued during the post and maintenance sessions as well. Despite her natural instincts, however, there was a significant change in the types of opportunities she offered the student following her participation in the training. During the pre-training sessions she provided a higher proportion of directives and the student was forced to take on a more passive role during these communication interactions. After the training she provided more evocative communication opportunities (e.g., open ended questions/choices, provision of means, and wait time), placing the student in a more active role during interactions. After participating in the training the number of evocative communication opportunities provided by these four teachers continued to increase substantially (mean increase ranged from 9.42 to 16 turns).

There was a wide range in the increases in communication opportunities provided by teachers, ranging from a mean increase of 9.42 to 16 communication opportunities during a 10-min session (see table 8). Five of the teachers (Renuka-T2, Bimali-T3, Sonali-T4, Razna-T6, and Chaturi-T9) didn’t increase as substantially as the others. Three of these teachers (Renuka-T2, Bimali-T3 and Sonali-T4) had less than three years experience and were newer to providing special education services as compared to some of the other teachers. The remaining two teachers (Razna-T6 and Chaturi-T9) were
already providing some evocative communication opportunities during the pre-training condition, therefore, their increases may not have appeared to be as substantial.

Table 8

*Intermediate and individual level analysis of teachers’ evocative opportunities*

<table>
<thead>
<tr>
<th>Name</th>
<th>Average opportunities during pre</th>
<th>Average opportunities during post and maint</th>
<th>Increase in mean number of opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Thilini (T1)</td>
<td>0.33</td>
<td>12.58</td>
<td>12.25</td>
</tr>
<tr>
<td>Ms. Renuka (T2)</td>
<td>0</td>
<td>9.67</td>
<td>9.67</td>
</tr>
<tr>
<td>Ms. Bimali (T3)</td>
<td>1.67</td>
<td>13.33</td>
<td>11.66</td>
</tr>
<tr>
<td>Ms. Sonali (T4)</td>
<td>0.33</td>
<td>11.25</td>
<td>10.92</td>
</tr>
<tr>
<td>Ms. Ramya (T5)</td>
<td>1.00</td>
<td>16.25</td>
<td>15.25</td>
</tr>
<tr>
<td>Ms. Ramya (T5)</td>
<td>1.00</td>
<td>16.25</td>
<td>15.25</td>
</tr>
<tr>
<td>Ms. Razna (T6)</td>
<td>2.33</td>
<td>11.75</td>
<td>9.42</td>
</tr>
<tr>
<td>Ms. Kamini (T7)</td>
<td>8.33</td>
<td>24.33</td>
<td>16.00</td>
</tr>
<tr>
<td>Ms. Waruni (T8)</td>
<td>2.00</td>
<td>17.5</td>
<td>15.5</td>
</tr>
<tr>
<td>Ms. Chaturi (T9)</td>
<td>2.67</td>
<td>13.42</td>
<td>10.75</td>
</tr>
<tr>
<td><strong>Mean increase</strong></td>
<td></td>
<td></td>
<td><strong>12.38</strong></td>
</tr>
</tbody>
</table>

The four key practices identified by Muttiah et al. (2014) as being essential when providing AAC trainings in LAMI countries likely played a pivotal role in the successful outcomes seen in this investigation. First, identifying learners’ needs by conducting a needs analysis is an aspect that has been deemed important by other researchers as well (e.g., Bornman et al., 2007). Decisions on the content to be taught in the current
investigation was based on the needs analysis conducted prior to the training. This also aligns with two of the major principles of adult learning: matching learning to adults’ backgrounds and building upon their previous experiences and knowledge (Bryan et al., 2009).

The second key practice that was implemented was that of providing contextually relevant instructional content and material, including equipping the trainees with strategies that facilitated the use of AAC to support everyday communication with their students who have CCN. For example, locally available, inexpensive materials were used to develop AAC tools during the training. In addition, using case studies of students from the teachers’ own classrooms enhanced the applicability of the training, as seeing videos of themselves interacting with students in their classrooms made the training more personal. This was an effective way of addressing the “why” component of adult learning (Bryan et al., 2009).

The trainees were equipped with strategies to support everyday communication with the students in their classrooms. The primary focus of the training was targeting the provision of evocative communication opportunities. This is an important skill, as communication partners of children who have CCN have been documented as exhibiting less than ideal communicative behaviors, such as providing fewer communication opportunities for children who use AAC to participate (Blackstone, 1999). In addition, teaching partners to provide children with a means to participate and waiting for a response have been documented as being important skills to target when training communication partners of individuals who have CCN (e.g., Kent-Walsh et al., 2010).

Positive outcomes seen in this investigation of teaching partners to provide
communication opportunities to children with CCN are consistent with the findings of other studies as well (e.g., Binger et al., 2010; Douglas et al., 2014; Kent-Walsh et al., 2010).

The third key practice, using engaging instructional activities, was also essential to ensure success. This training was based on steps of the strategy instruction model introduced by Kent-Walsh and McNaughton (2005). Modeling communication partner strategies, providing opportunities for controlled practice and feedback, providing opportunities for advanced practice and feedback, and independent practice in the learners’ own settings are all steps of the strategy instruction model that have previously been documented as being successful in other partner training studies as well (Binger et al., 2010; Kent-Walsh et al., 2010; Rosa-Lugo & Kent-Walsh, 2008). Opportunities for role-playing and developing their own AAC materials during the training are examples of adults being active participants in their own learning process as recommended by the adult learning literature (Bryan et al., 2009). Furthermore, using case studies of students from the teachers’ own classrooms effectively addressed the need for adult learners to develop solutions for regularly observed challenges.

The fourth key concept, assessing the impacts of instructional activities, was also deemed as being an important component. The short-term impacts of the training were evaluated by observing learners demonstrate partner communication strategies during the training and completing a checklist to ensure they met criteria. Additionally, learners completed a satisfaction survey that encouraged them to self-reflect on content they had learned during the training. Sustainability was promoted by asking learners to reflect on one specific strategy or aspect of the training they hoped to continue to use with the
students in their classrooms. All of the teacher participants listed at least one thing they hoped to continue to use with their students.

**Communication Turns taken by Students with CCN**

All students with CCN in the study increased their communication participation following the training for their teachers. This provides evidence that training teachers to provide more evocative communication opportunities resulted in positive changes in students’ communication as well. This finding is consistent with other studies in the AAC training literature (Binger et al., 2010; Douglas, Light, & McNaughton, 2012; Kent-Walsh et al., 2010; Rosa-Lugo & Kent-Walsh, 2008).

Six of the nine students (Binara-S1, Nelum-S3, Namali-S6, Tisara-S7, Malini-S8 and Shehan-S9) were already communicating a higher number of communication turns (mean ranging from 9 to 15.67 turns) in comparison to the other students in the study prior to their teachers participating in the training (see Table 9). After their teachers participated in the training, the number of communication turns taken by all six of these students increased further (mean increase ranged from 5 to 26.92 turns). There may have been a variety of reasons as to why these six students had a higher number of communication turns during the pre-training sessions. A majority of these students scored at a higher level (in comparison to the remaining students in the study) on the communication matrix that was completed prior to the start of the study. In addition Namali (S6), Tisara (S7), Malini (S8), and Shehan’s (S9) teachers were documented as providing a higher number of evocative communication opportunities to their students during the pre-training sessions.
As with the teachers, the students too had a wide range in the communication increases that were observed, ranging from a mean increase of 5 to 26.92 communication turns during a 10-min session (see table 9). The mean increases for four of the students (Binara-S1, Namali-S6, Tisara-S7 and Shehan-S9) were not as substantial (mean increase ranged from 5 to 15.58 turns) as the increases seen in the remaining five students in the study (mean increase ranged from 20.41 to 26.92). The limited increase in their turns could be attributed to three reasons. First, three of the four children (Binara-S1, Tisara-S7 and Shehan-S9) were already expressing a higher number of communication turns during the pre-training sessions. Second, since the children’s communication turns appeared to be yoked to their evocative communication opportunities provided by their teachers, teachers who didn’t increase substantially also had students who didn’t increase as much in their communication responses. For example, Namali (S6) and Shehan’s (S9) teachers demonstrated less substantial increases in the number of evocative communication opportunities offered. Third, children who started off at higher levels on the communication matrix (level IV) such as Binara (S1), Namali (S6), Tisara (S7) and Shehan (S9) didn’t show as many gains after their teachers participated in the training. A majority of these children also had a higher number of communications turns during the pre-training condition. However, this explanation was not applicable to all the children. For example, Malini (S8) showed significant increases in communication turns, despite having a high number of communication turns during the pre-training condition and scoring at a higher level on the communication matrix.
<table>
<thead>
<tr>
<th>Name</th>
<th>Average communication turns during pre</th>
<th>Average communication turns during post and maint</th>
<th>Increase in mean number of communication turns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binara (S1)</td>
<td>14.00</td>
<td>25.33</td>
<td>11.33</td>
</tr>
<tr>
<td>Mohan (S2)</td>
<td>3.33</td>
<td>30.25</td>
<td>26.92</td>
</tr>
<tr>
<td>Nelum (S3)</td>
<td>9.67</td>
<td>30.08</td>
<td>20.41</td>
</tr>
<tr>
<td>Piyal (S4)</td>
<td>1.33</td>
<td>23.08</td>
<td>21.75</td>
</tr>
<tr>
<td>Samanmali (S5)</td>
<td>7.33</td>
<td>31.5</td>
<td>24.17</td>
</tr>
<tr>
<td>Namali (S6)</td>
<td>9.00</td>
<td>14.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Tisara (S7)</td>
<td>15.00</td>
<td>30.58</td>
<td>15.58</td>
</tr>
<tr>
<td>Malini (S8)</td>
<td>15.33</td>
<td>42.08</td>
<td>26.75</td>
</tr>
<tr>
<td>Shehan (S9)</td>
<td>15.67</td>
<td>26.33</td>
<td>10.66</td>
</tr>
<tr>
<td>Mean increase</td>
<td></td>
<td></td>
<td>18.06</td>
</tr>
</tbody>
</table>

Solely providing students with CCN with communication opportunities would be unproductive if they were not also provided with some means to respond, especially since none of these students were consistently using any form of aided AAC prior to participating in this study. During the pre-training sessions many of the students were observed attempting to communicate, but were unsuccessful because teachers were not able to understand them due to poor speech intelligibility and not having any AAC forms to support their speech. Following the training, teachers provided the students with a
variety of low-tech AAC forms such as picture cards, word cards, pictures drawn on a white board, and written word choices on a white board. Other studies have also discussed the importance of providing children with CCN a means to respond (Douglas et al., 2012). In addition, a majority of the students also appeared to be attempting to produce more speech during the post-training and maintenance sessions. These findings are consistent with research reporting that AAC does not hinder speech; that, in fact it may actually support speech production (Millar, Light, & Schlosser, 2006; Schlosser & Wendt, 2008).

Along with providing a means for the students to respond, it is important to provide sufficient wait time for a response to occur as well. Prior to participating in the training, many of the teachers did not provide sufficient wait time for the students to respond after provision of an opportunity. Most often, it was observed that teachers would ask the students question after question without providing wait time or an opportunity for the student to respond. After the training, teachers were observed to wait longer for a response from the students. The additional wait time may have also contributed to students producing more communication turns during the post-training and maintenance sessions. Many studies have documented how crucial it is for communication partners to wait, providing children with the time needed to respond (Binger, Kent-Walsh, Ewing, & Taylor, 2010; Douglas et al., 2014; Kent-Walsh et al., 2010).

**Relationship between Evocative Communication Opportunities provided by Teachers and Students' Responses**
As indicated in the results, students were highly responsive to evocative communication opportunities provided by teachers. The relationship between evocative communication opportunities being provided and communication turns were yoked. Therefore, as the number of evocative communication opportunities provided by teachers increased following the training, the students’ responses to these evocative opportunities also increased. This signifies the importance of communication partners providing children with CCN appropriate opportunities to participate and communicate. These findings are consistent with other training studies that focused on training the communication partner but reported positive results in children with CCN as well (Binger et al., 2010; Bingham et al., 2007; Douglas et al., 2012).

Prior to participating in the training a majority of the teachers provided the students with frequent directives such as pointing to pictures in a book in response to instructions like “Show me…” or “Where is the….” Although these types of directives allowed these students to participate, their participation in communication interactions was more passive. Directives do not place any significant expressive communication demands on children. These types of communicative behaviors are common among caregivers of children with developmental delays (Tannock et al., 1992). Asking children with CCN open-ended questions, commenting, and providing choices allows children with CCN an opportunity to take more responsibility and actively participate in the communication interaction. This is consistent with past research highlighting that communication partners may not intuitively know how to alter their behavior to better support the communication of individuals with CCN (Binger & Kent-Walsh, 2012).
This study adds to the current research base on AAC partner communication training. Specifically, it adds to the scarce research base on AAC training in LAMI countries. The positive results of this study are preliminary evidence that the training model developed by Muttiah et al. (2014) considering four key practices for conducting AAC trainings in LAMI countries may be an effective model for training in these low-resource contexts. In addition, this investigation adds to the limited research base on group training in the AAC training literature, although a majority of these trainings did not include behavioral data on the acquisition of the targeted interaction skills (e.g., Bunning et al., 2014; Bornman et al., 2007). In addition, although the positive results of implementing the principles of adult learning have been widely documented in other fields and have been discussed in the AAC literature (e.g., Thiessen & Beukelman, 2013), this is one of the first studies that took these principles into consideration when training communication partners of students who use AAC.

**Clinical Implications**

The results of the present investigation provide preliminary evidence supporting the implementation of the four key practices identified by Muttiah et al. (2014) when conducting trainings in LAMI countries. The positive results emerging from this investigation were the outcome of a relatively short-term training that resulted in teachers providing more evocative communication opportunities to students with CCN. As a result of training teachers, the students of these teachers also increased their communication participation during naturalistic interactions in the classroom. Teachers observed these positive changes in the students as reported in their social validity questionnaires. These findings are extremely promising given that the intervention did not directly target the
students with CCN. Additionally, the training utilized locally available educational materials and constructed low-tech AAC tools that were inexpensive, adding to the ecological validity of the study. Furthermore, teachers who participated in the study reported that they would continue to use the AAC tools they developed and strategies they learned during the training.

Based on these results it appears that this training program could be effective for a range of different teachers and students with CCN. The special educators in the study had a wide range of ages (27-51 years), none to minimal experience with communication training, a range of educational backgrounds (from completion of high school to completion of a college level degree), and a range of classroom experiences (3 months-20 years). Similarly, student participants in the study encompassed a wide age range (10-22 years), a range of diagnoses (Down syndrome, cerebral palsy, and unknown genetic disorder), and a wide range of language abilities (from level I to level IV on the Communication Matrix).

This study adds to the limited research base on AAC in LAMI countries. Additionally, it is the first partner training model developed specifically for communication partners living in low-resource LAMI countries. It is important to consider the needs and contexts of LAMI countries as they may be significantly different to trainings and research done in developed countries (Wickenden et al., 2003). Based on the positive findings of this study, it appears that this training model may be effective for other LAMI countries with similar low-resource contexts. These findings are significant, as the literature documents how inadequate communication services are for individuals with complex communication needs living in LAMI countries (Hartley, 1998). Effective
trainings for communication partners of individuals with CCN can help bridge the huge chasm in communication service provision in these countries. It can also be a more immediate solution to the vastly inadequate number of trained SLPs in these places (Blackstone, 1990).

**Limitations and Future Research**

Although positive results emerged from this study, there are certain limitations that need to be considered when interpreting the results. This study utilized a quasi-experimental design. Therefore, threats to internal validity that are associated with these types of designs need to be considered. The major threat to validity in this investigation is history. History refers to the possibility that forces other than the treatment under investigation influenced the dependent variable at the same time at which the intervention was introduced (Shadish et al., 2002). Although history is a probable threat in these types of designs, there were not any significant and consistent external events that occurred during the course of this study that may have accounted for the changes seen in either the teachers and/or students’ behaviors following the training. The addition of a control group in future research can help counteract the threat of history and validate whether the changes seen in both the teachers and the students really did occur as a result of the training.

A second threat or bias was that the primary researcher coded the videos for both the dependent variables. This could have introduced an additional bias since the researcher was not blinded to the hypotheses of the study and was aware of the pre versus post-training sessions. Future studies should ensure that the individual coding the videos
for the dependent variables is blinded to the hypotheses of the investigation and unaware of which videos were pre versus post-training.

The training focused on teaching evocative communication opportunities. An evocative communication opportunity was considered provision of an opportunity (asking an open ended question, making a comment, or providing a choice), providing a means to respond, and waiting. Therefore, it is impossible to tease apart which specific strategy among these three had the most significant impact or if all three components were truly required to facilitate communication for students who have CCN. The training also encompassed a variety of components (for example, the inclusion of both the group and 1:1 individual follow-ups). Therefore, it is not possible to identify which of these had the most significant impact. A future investigation examining the outcomes of each individual component of the training, for example measuring teacher’s provision of communication opportunities following the group training and following each individual 1:1 follow up, may be helpful to identify if the training needed to include both the group and individual components.

Although all teachers increased the number of evocative communication opportunities provided to students, there were differences in the amount of increases seen for individual teachers. Some showed more increases than others following the training. Some of the differences may have been due to the range of experiences in teacher’s educational experiences and backgrounds. Future investigations should attempt to create more homogenous groups that may result in findings that are more representative of all the participants in the group. However, the fact that all teachers provided an increased
number of opportunities following the training was an indication that the training was successful despite the wide range of experiences and skills.

Another limitation is that only teachers’ evocative communication opportunities were coded as opportunities since these allowed the students to be more active communicators during communication interactions. Other opportunities such as asking yes or no questions and directives were not coded as communication opportunities in this investigation. Although broadly defined these are considered communication opportunities, they were not coded, as the purpose of this training was to promote teachers to engage in providing students with evocative or more “active” communication opportunities. Therefore, teachers likely presented students with more opportunities to communicate than the number represented in the results.

The current study collected maintenance data but this was limited to short-term maintenance data. Future studies should look at exploring longer-term effects of this training by measuring maintenance over a time period of 3 months and longer to examine if teachers continued to use the strategies that were learned during the training.

Additionally, the current study looked only at the frequency of students’ communication turns. The analysis didn’t assess what preceded the occurrence of a communication turn. For example, was it always preceded by an evocative communication opportunity? Also, were there changes to this after the training, did the students become less dependent on the occurrence of an evocative communication opportunity provided by an adult and more likely to initiate a communication turn independently? These would be interesting research questions to look at in a future study.
Another important aspect for future research would be to replicate this training model in other LAMI countries, to identify whether this is a viable training model for other countries with similar contexts. Additionally, expanding the training to include other communication partners such as parents, peers, siblings, SLPs and other professionals, is essential; teachers in their social validity questionnaires suggested this as well. The current study focused on providing communication opportunities during three specific activities: literacy, music and leisure activities. As suggested by some of the teacher participants in their social validity questionnaire it would be important to generalize the use of the learned strategies to other activities as well. In addition, although this study was a group design the sample size was small (n=9) limiting the generalizability of these findings, replicating this study with a larger sample size would be an important next step.

Conclusions

The current study contributes valuable information on evaluating the effectiveness of an AAC training program on the number of evocative communication opportunities provided by special education teachers living in a low-resource LAMI country. Results of this investigation provided preliminary evidence that the training was effective in increasing the number of evocative communication opportunities offered by teachers to students with CCN. In addition, the training also positively benefited the students with CCN by resulting in an increase in their communication participation during naturalistic interactions with teachers. These results are indicative that this training model may be beneficial for other LAMI countries with similar contexts. This investigation adds to the limited research base on AAC in LAMI countries. Specifically, it adds to the even scarcer
research base on AAC partner training in LAMI countries. Furthermore, the results of this study can have a profound impact on communication service delivery for individuals with CCN living in LAMI countries, where the numbers of SLPs are severely inadequate and communication services are significantly insufficient for individuals with CCN.
References


Appendix A – Introduction and Literature Review

An estimated 15% of the world’s population, approximately one billion people, experiences some type of disability (World Health Organization and The World Bank, 2011). Generally, individuals with disabilities are overrepresented in low and middle-income (LAMI) nations (Maloni et al., 2010). The prevalence of disability in low-income countries among people aged 60 years and above is 43.4%, compared to 29.5% in higher income countries (World Health Organization and The World Bank, 2011). Additionally, an estimated 85% of children with disabilities live in LAMI countries (Helander, 1993).

It is estimated that globally 0.2-0.6% of the school-age population experiences complex communication needs (CCN), as a result of conditions such as autism spectrum disorder, cerebral palsy, and Down syndrome (Blackstone, 1990). Individuals with CCN are restricted in their participation of education, social, and communication activities as a result of speech “being inadequate to meet all of their communication needs” (Beukelman & Mirenda, 2005, p.4). Worldwide prevalence numbers for individuals with specific disabilities such as communication disabilities are scarce (Olusanya, Ruben, & Parving, 2006). However, there are some estimates, for example, Hartley and Wirz (2002) reported that between 38-49% of people who sought rehabilitation services in Pakistan, Uganda, and Zimbabwe were found to have communication difficulties. Better epidemiological data on the numbers of individuals presenting with communication impairments is critical, otherwise individuals with communication disorders will continue to be denied their human rights more than any other disability group (Wickenden, 2013). Beyond being denied the right to access education, work, participation in the community, healthcare, social protection and justice, having a communication impairment also means
they are denied personhood (Wickenden, 2013). In order to plan for appropriate service provision, accurate epidemiological data on the numbers of individuals who have communication disorders is urgently needed (Mulhorn & Threats, 2008).

Augmentative and alternative communication (AAC) has been reported to be beneficial for individuals with CCN (Douglas, 2012; Light & McNaughton, 2012). AAC includes both aided low (e.g., picture boards, communication books) and high (e.g., speech generating devices, mobile devices) technologies, as well as unaided forms of communication (e.g., signs, gestures) (Beukelman & Mirenda, 2013). However, providing appropriate AAC supports can be a challenging process, and provision of an AAC system alone to an individual with communication difficulties does not necessarily guarantee the ability to communicate successfully (Schepis & Reid, 2003).

**Communication Partner Training**

Children with CCN require assistance from their communication partners to learn to communicate effectively using AAC (Binger, Kent-Walsh, Ewing, & Taylor, 2010). These communication partners are usually family members, care providers, peers, teachers and paraeducators (Douglas, McNaughton, & Light, 2014). Both researchers and clinicians have acknowledged how important it is to work with communication partners (Binger & Kent-Walsh, 2012). However, these communication partners may not intuitively know how to alter their communication behavior to better support the communication of someone who uses AAC (Binger & Kent-Walsh, 2012). It is concerning that professionals such as teachers (e.g., Patel & Khamis-Dakwar, 2005; Soto, 1997) and paraeducators (e.g., Douglas, 2012) who work closely with children with CCN
often lack the knowledge and skills required to implement appropriate AAC interventions with these children.

There is evidence that individuals interacting with clients who use AAC do not naturally provide supportive opportunities for communication (Blackstone, 1999; Kent-Walsh & Binger, 2013; Kent-Walsh & McNaughton, 2005; Light, Collier, & Parnes, 1985). In fact, communication partners have been reported to exhibit less than ideal partner communicative behaviors. These include: (a) dominating interactions; (b) asking predominantly yes or no questions; (c) taking a majority of conversational turns; (d) providing fewer opportunities for individuals who use AAC to respond; (e) interrupting; (f) focusing on the technology or technique being used rather than the individual; and, (g) not always confirming the content of the message. The communication process is often controlled almost entirely by caregivers, with the children assuming only minimal responsibility during the interaction (Blackstone, 1999; Light et al., 1985). As a result, children who use AAC are often passive communicators, only responding when required and infrequently initiating during interactions with their caregivers (e.g., Bornman, Alant, & Meiring, 2001; Light and Kelford-Smith, 1993). Similarly, children with developmental delays have been found to initiate fewer times and their caregivers tended to be more directive, as compared to the caregivers of typically developing children (Tannock, Girolametto, & Siegel, 1992). Many adults that interact with individuals who use AAC typically have not completed any formal education or professional preparation in AAC, therefore, these communication partners may require training in order to learn how best to support and facilitate the communication of individuals with CCN (Binger et al., 2010; Thiessen & Beukelman, 2013).
There has been a significant interest and increase in studies related to communication partner training in the recent literature. These studies have documented that providing AAC training to communication partners can equip them with strategies that can facilitate increasing both the frequency and quality of communication interactions with children with complex communication needs. Positive outcomes reported for communication partners included: increased knowledge and skills in AAC (Bornman et al., 2007; McConachie & Pennington, 1997; Patel & Khamis-Dakwar, 2005), provision of increased number of opportunities for communication (Binger et al., 2010; Bingham, Spooner, & Browder, 2007; Douglas et al., 2014; Kent-Walsh, Binger, & Hasham, 2010; Rosa-Lugo & Kent-Walsh, 2008), improved communication with individuals with CCN (Douglas et al., 2014), and increased positive attitudes regarding AAC (Patel & Khamis-Dakwar, 2005). Training communication partners has also positively impacted individuals with CCN. For example, children were reported to take an increased number of communication turns (Bingham et al., 2007; Bruno & Dribbon, 1998; Douglas et al., 2014; Kent-Walsh et al., 2010; Rosa-Lugo & Kent-Walsh, 2008), engage in decreased instances of challenging behaviors (Bingham et al., 2007), and produce more symbol combinations (Binger et al., 2010) when interacting with parents, teachers, and paraprofessionals who had received training.

Although these intervention studies reported considerably positive results, they differed on several elements of the training, including what was taught (content), how it was taught (format), and to whom the training was provided (participants). The training programs targeted different content, including: increasing knowledge on AAC, identifying appropriate activities, accessing and positioning for AAC, increasing
operational competence, providing communication opportunities, providing wait time for the children to respond, modeling AAC, responding to children’s attempts at communication, prompting use of AAC system, and teaching partners to empower AAC users. See Table 10 for a summary of the content areas targeted in each of the studies.

There were also a wide variety of instructional formats that were utilized to deliver instruction. Kent-Walsh and McNaughton (2005) developed a strategy instruction model based on a model by Ellis and colleagues (1991). Many partner training studies incorporated some or all of the steps of the strategy instruction model suggested by Kent-Walsh and McNaughton (2005). The eight steps in the instructional model include: pretest and commitment to participate in the instructional program (e.g., conducting a needs analysis), strategy description (e.g., verbal instruction or lectures), strategy demonstration (e.g., modeling the strategy), verbal practice of strategy steps, controlled practice and feedback, advanced practice and feedback (practice with a child with CCN), posttest and commitment to long-term use of strategy, and generalized use of the target strategy. A few studies incorporated all eight-steps of the strategy instruction model. See Table 11 for a summary of the instructional formats utilized in each of the studies.

The duration of the training also varied between the studies. This ranged from relatively short trainings lasting a little over two hours (Kent-Walsh et al., 2010) to longer and more spread out training sessions, for example, a workshop consisting of five 90-min sessions that was over 10-12 weeks (McConachie & Pennington, 1997).
Table 10

Communication partner content and strategies taught during trainings from the past literature

<table>
<thead>
<tr>
<th>Study</th>
<th>Increasing knowledge</th>
<th>Identifying appropriate activities</th>
<th>Accessing and positioning for AAC</th>
<th>Increasing operational competence</th>
<th>Providing communication opportunities</th>
<th>Providing wait time</th>
<th>Modeling AAC</th>
<th>Responding to children</th>
<th>Prompting use of AAC system</th>
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<th>Study</th>
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Table 11

*Instructional formats used to deliver instruction from the past literature*

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<th>Study</th>
<th>Pretest and commitment to participate in the instructional program</th>
<th>Strategy description</th>
<th>Strategy demonstration</th>
<th>Verbal practice of strategy steps</th>
<th>Controlled practice and feedback</th>
<th>Advanced practice and feedback</th>
<th>Posttest and commitment to long-term use of strategy</th>
<th>Generalizing use of the target strategy</th>
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Participating communication partners in trainings have included parents (Bruno & Dribbon, 1998; Kent-Walsh et al., 2010), special educators (Patel & Khamis-Dakwar, 2005), paraeducators (Binger et al., 2010; Douglas et al., 2014; Douglas et al., 2012), school teams (McConachie & Pennington, 1997), and primary healthcare nurses (Bornman et al., 2007). Trainings have also been conducted with partners who interacted with adults with CCN. These partners included staff working at activity centers, institutions, and group homes (Granlund, Terneby, & Olsson, 1992).

The research literature on adult learning informs us that adult learners bring a unique set of characteristics that may require variety in teaching methodology (Blackstone, 1991). When training communication partners who are adults, it is important to not only help them understand what they learn, but it is also necessary to understand how they learn (Blackstone, 1991). There are several adult learning theories and models that describe how adults learn (Bryan et al., 2009). They share five recurring themes (Bryan et al., 2009): (a) adults need to know the reason why they are learning something; (b) adults are motivated to learn through the need to solve problems; (c) adults make use of their previous experience; (d) adults need learning approaches that match their own background and diversity; and, (e) adults need to be active participants during the learning process. It is essential to recognize these characteristics of adult learning when developing a training program for communication partners.

**Communication and AAC Services in Low and Middle-Income Countries**

The fields of AAC and partner training have grown exponentially in the last few years. However, most research has been conducted from an Anglo-European perspective (Huer & Soto, 1996). As a result, these findings may not be applicable in LAMI countries
where there are significant differences in culture, economy, education, healthcare, and technology. Transferring “western theory” to “non-western practices” (Wickenden, Hartley, Kariyakaranawa, & Kodikara, 2003) may be inappropriate. In many LAMI countries around the world there is limited to no understanding of AAC among the general population, medical professionals, educators, speech-language pathologists, and other professionals working with individuals who experience CCN (Fuller et al., 2009). In addition, the challenges faced by individuals with disabilities living in a LAMI country may be unique compared to those in a developed country.

The challenges with providing communication services in LAMI countries are significant. By definition, LAMI countries have a largely rural population, limited health, education, and technology resources, and a poorly performing economy (World Bank, 2012). Providing any kind of rehabilitation services under these conditions is challenging (Hartley, 1998; Wylie, McAllister, Davidson, & Marshall, 2013). Access to communication services can be hindered due to a number of different barriers, including legal and institutional barriers, financial barriers, attitude barriers, and environment and access barriers. These are barriers faced by individuals with disabilities living around the world, but appear to be more pertinent to those living in LAMI nations.

Although many countries have adopted policies such as “Education for All” advocating for inclusive education and services for all children (Yokotani, 2001), these are not often implemented in many LAMI countries (World Health Organization and The World Bank, 2011). Despite most LAMI countries having policies and laws in place that protect individuals with disabilities (Yokotani, 2001), many children with disabilities continue to be denied the right to an education, and many adults with disabilities denied
the right to employment and autonomy (World Health Organization and The World Bank, 2011). This is even more so for individuals with communication disorders and CCN. Without a voice to advocate for their rights, there is an urgent need for LAMI countries to adopt and implement policies that will protect all individuals with disabilities, especially those with CCN who are often the most vulnerable. Without appropriate implementation of policies and legislature, individuals with disabilities will continue to be denied their most basic human rights (Wickenden, 2013).

The financial barriers faced by individuals living in LAMI countries are substantial. It is estimated that those with disabilities live on incomes less than $2.50 USD a day (Shah, 2013) and a majority of these individuals live in extreme poverty on less than $1.25 USD per day (World Bank, 2012). Poverty and disability go hand in hand and appear to be cyclical, both the cause and consequence of having a disability (Department for International Development, 2000). Poverty and disability reinforce each other. Heightened exposure to risks and environmental hazards associated with poverty can increase the chances of congenital and acquired disabilities, while disability in turn reinforces poverty due to difficulties in accessing education and employment (Lyngegard, Donahue, Bornman, Granlund, & Karina, 2013). Disability exacerbates poverty, not just by increasing the economic strain on a particular individual, but also on his or her entire family (Department for International Development, 2000). The vicious poverty-disability cycle is even more evident in LAMI countries where poverty is extensive and resources are scarce (Lyngegard et al., 2013). This is a significant issue for individuals with CCN who require AAC. Access to expensive AAC technology is limited (Seligman-Wine, 1987), intervention services for individuals with severe communication difficulties may
be too expensive (Alant, 1996) and the burden of financing AAC equipment falls solely on individuals with disabilities and their families due to limited or no government funding to purchase equipment (Alant, 2007; Emmett, 2005; Fuller et al., 2009).

Negative societal attitudes towards individuals with disabilities in LAMI countries have also contributed towards denying access to much needed services (Blackstone, 1989). In certain societies having a disability is associated with deep-seated stigma, resulting in the isolation of both the individual and his or her family (Seligman-Wine, 1987). Discrimination, stigma, and social isolation impact not just the quality of life of the individual with a disability, but can also limit access to services and in turn limit the individual and the family’s capabilities (Emmett, 2005). The World Report on Disability (World Health Organization and The World Bank, 2011) highlights the fact that individuals with the more “visible disabilities” such as physical or vision impairments tend to be less isolated from society than those who present with cognitive, communication, or behavioral impairments (Wickenden, 2013). Individuals with CCN are usually among the most severely disabled. Sometimes even parents of these children may not see the value in educating and providing services to those with such severe impairments (Kalyanpur, 2011).

Environmental and access barriers are significant in these areas of the world as well. Even in countries where AAC services are beginning to emerge, these services are mostly in urban settings (Fuller et al., 2009). Services continue to remain elusive for persons with disabilities living in rural or remote areas (Crowley et al., 2013). Often, there are no services in these remote areas and transportation access is limited for these individuals to travel to larger cities to access services (Wylie et al., 2013).
Insufficient access to healthcare is a challenge faced by countries all over the world, but this is even more significant in LAMI countries (Emmett, 2005; Maloni et al., 2010). Specialized services for individuals with severe communication disorders are rarely available in these countries (McConkey, 2005); the limited services that exist have been estimated to reach less than 2% of the population that need communication interventions (Hartley, 1998). Globally, SLPs have been recognized as the specialist professionals who support individuals with communication difficulties (Bunning et al., 2014). Rehabilitation services such as speech language pathology services are often not available in many LAMI countries (World Health Organization and The World Bank, 2011). Main barriers to providing communication intervention services in LAMI countries are: the limited number of trained professionals and the lack of sufficient university training programs (Blackstone, 1990). In the United States in 2012, the number of speech language pathologists (SLPs) serving the population was a ratio of 43.5 SLPs per 100,000 people (ASHA, 2014). In stark contrast, a review of the number of SLPs across four countries in Africa in 2012 showed a dismal ratio of only one SLP serving 2 to 4 million people (Wylie et al., 2012 as cited in Wylie et al., 2013). Often, the profession itself is still in its infancy in many LAMI countries. For example, a university in Sri Lanka initiated a bachelor’s degree program in speech-language pathology only as recently as 2008, with the first cohort of therapists graduating with their degrees in 2012. Additionally, there are no SLPs employed in government schools and only a limited number of them working in private schools (Muttilah, Drager & O’Connor, 2013). It will take many more decades for LAMI countries like Sri Lanka to reach a similar ratio of SLPs to the population as is currently present in developed countries.
In countries where there are a limited number of SLPs, the number of skilled professionals specializing in AAC is extremely small (Fuller et al., 2009). Vanderheiden (1991) discussed the importance of training parents and significant others in the child’s environment. This is especially important in contexts where there are a limited number of professionals competent in AAC. A survey exploring special education practices in Sri Lanka revealed that parents overwhelmingly reported their child’s teacher as being the sole provider of communication support at school (Muttiah, Drager, & O’Connor, 2013). This was primarily due to the limited number of SLTs working in education in Sri Lanka. However, it brings into question how teachers were providing these communication services since they had not received specific training in this area. A key responsibility for AAC specialists should be to share their expertise and knowledge with targeted groups in the community, such as educators (McConkey, 2005). This further emphasizes the need for more special education teachers to acquire knowledge in the area of AAC (Locke & Mirenda, 1992), otherwise children with complex communication needs in educational settings will continue to go unserved (Muttiah, Drager, & O’Connor, 2013).

There is little research done on AAC in LAMI countries (Srinivasan, Mathew, & Lloyd, 2011), although there is a critical need for these services. To date, there is only a limited understanding of how best to support the development of knowledge and skills of individuals who provide AAC supports in LAMI countries (e.g., Bornman et al., 2007; Crowley et al., 2013; Muttiah et al., 2014).

**Instructing Communication Partners in Low and Middle-Income Countries**

A small number of studies have discussed the impact of providing targeted trainings in LAMI countries. For example, Bornman and Alant (1999) trained three
teachers to facilitate communication with children diagnosed with autism spectrum disorder using digital voice output devices at a school in South Africa. This study reported that teachers provided more communication opportunities to children following the training. Additionally, teachers in the study reported that the children showed an increase in their vocalizations and attempts at speech. Bornman, Alant and Lloyd (2007) conducted a group training for primary healthcare nurses in South Africa. Following the group training the trainers followed up individually with each trainee in their own settings giving the participants an opportunity to interact with the trainer one-on-one. The results of this study indicated that training helped increase partners’ knowledge, awareness, and skills related to AAC. Crowley and colleagues (2013) trained staff and parents at a local school in Ghana to develop cards that children with CCN could use in the market to purchase food. They also conducted workshops for teachers, taught them how to develop AAC materials, and use them during academic activities throughout the day (Crowley et al., 2013), though this training was not conducted as a systematic research experiment. Finally, Bunning, Gona, Newton, & Hartley (2014) provided an AAC intervention for home-based caregivers who had children with CCN in a rural part of Kenya. Caregivers were provided with AAC materials during a home visit that lasted between 60-90 mins. The visit included an explanation and demonstration of how to use the materials. Monthly visits were conducted to track progress and to review the intervention. Parent perceptions were measured based on a communication assessment completed before and after implementing the intervention. Following the intervention, parents viewed communication activities as being more prevalent and their children’s
deficits as being less severe. This intervention facilitated the natural context for both the child and caregiver by being implemented in the home.

The evidence in this area is limited (Srinivasan, Mathew, & Lloyd, 2011). However, the positive findings of these studies provide preliminary evidence that AAC trainings can be successfully conducted in LAMI countries to train communication partners. It is not possible to generalize these findings to training a group of special educators living in a LAMI country. Additionally, there is no one training model that has been developed so far that has proven to be effective in all, or even most, LAMI countries. Given the large number of individuals with complex communication needs requiring services in LAMI nations, there is a need to identify key features of training that may be effective in these countries. This will help develop the knowledge and skills of communication partners that support the communication of individuals who require AAC. A recent study explored the experiences of eight experts who conducted trainings in or who had trained professionals from LAMI countries (Muttiah et al., 2014). This focus group study explored practices for conducting AAC trainings in LAMI countries. The results of this study identified four key features to be considered when training: investigate learner needs, provide contextually relevant instructional content, use engaging instructional activities, and assess the impact of instructional activities.

Investigate learner needs. It is critical to know about the trainees and their learning needs prior to conducting training. This can be done in a number of ways, including conducting a needs assessment with the learners. This is consistent with step one of Kent-Walsh and McNaughton’s (2005) strategy instruction model that suggested conducting a pretest measure to understand participants’ knowledge and spontaneous use
of strategies in natural contexts. This aligns with the principle of adult learning of taking into consideration and building upon adults’ previous experiences (Bryan et al., 2009).

In addition, asking the trainees their opinions on content they wanted to learn about can be considered a form of social validity. Completing the pre-training questionnaire prior to the training is a way of ensuring that the trainees are learning about subject matter they are interested in. In a majority of past research social validity is completed at the conclusion of the study, however, there is value to completing it prior to conducting the study (Goldstein, in press). This way information shared by the participants can be used to inform intervention development making the study stronger (Goldstein, in press).

It is not enough to just know your trainee audience, it is equally important to understand the individuals and families to whom the learners provide services. Talking to and observing the individuals in their natural setting provides insights into their lives and the everyday challenges they face. This will ensure that the instructional content is relevant not just to the learners, but that it is also suitable to their broader context, including the individuals whom they serve.

**Provide contextually relevant instructional content.** The content taught should be matched to the learners’ knowledge, needs and perspectives (Bryan et al., 2009). It is important to share foundational knowledge on communication and AAC. Specifically, learners need to understand concepts such as the “power of communication.” The content and materials used in training should be relevant to trainees’ contexts, for example, considering the types of AAC devices learners have access to (i.e., low tech only, or a combination of low and high tech devices).
Additionally, trainees should be instructed on communication strategies that will help facilitate the everyday use of AAC to support communication. Communication partner strategies that have been focused on most often in the literature include: (a) providing communication opportunities, (b) providing a means for the individual to communicate, and, (c) providing sufficient wait time for the individual to respond (see table 8). Teaching communication partners strategies is consistent with “strategy description,” step two of Kent-Walsh and McNaughton's (2005) model. Additionally, using case studies drawn from the learners’ own contexts addresses the “why” component of adult learning (Bryan et al., 2009), focusing on specific content and strategies that most closely matches the learners’ situations and the needs of the individuals to whom they provided services.

**Use engaging instructional activities.** The research base on communication partner training discuses a wide variety of training activities that have been used in past trainings. The training activities should be learner-focused, relevant to learners, and appropriate to their contexts. For example, incorporating trainees’ own experiences into the training and using videos of the individuals they work with can make the training more personally relevant.

Kent-Walsh and McNaughton (2005) discuss specific steps and activities that should be considered. First, the strategy is demonstrated or modeled. Next, trainees are given the opportunity to practice the strategy while being provided feedback (guided practice). Finally, learners practice the strategy in more natural contexts with the individuals they work with (independent practice). Adults are motivated to learn by their need to solve problems (Bryan et al., 2009). Having participants engage in discussions
regarding their case studies promotes learning from each other and developing appropriate solutions for challenging situations. Adults being actively involved in their own learning process through activities such as developing their own AAC materials, engaging in discussions, and role-playing using materials from their context are all consistent with best practices for adult learning (Bryan et al., 2009).

**Assess the impact of instructional activities.** It is also important to evaluate the impact of the training, both in the short-term and in the long-term. Short-term impact of the training can be assessed by observing learners demonstrating strategies that were taught, collecting information from the trainees regarding their satisfaction with the training, and observing learners sharing the information they learned with others. However, it is also important to assess the training in the long-term in order to promote sustainability and continued use of AAC following the training. One way this can be done is by asking participants to self-reflect on the things they learned during the training. This was echoed by Kent-Walsh and McNaughton (2005) in the posttest step of their strategy instruction model.

Although these four key practices were identified as being essential when planning AAC trainings in LAMI countries, thus far there has been no translational research implementing these recommended practices in a low-resource context. The current study will evaluate the effectiveness of implementing the training practices identified by Muttiah et al. (2014) in Sri Lanka, a low-resource LAMI country. It is critical to study the effectiveness of these training practices using an experimental research study to further inform the field and extend the current research base on communication partner training, especially that of partner training in LAMI countries.
More importantly, this research will inform a training model that in turn will facilitate providing much needed services to children with CCN living in LAMI countries who receive minimal to no communication services. Additionally, a majority of training studies in the current literature base were conducted as single-case experiments. There are only a handful of documented communication partner training group designs (Bornman et al., 2007; McConachie & Pennington, 1997; Pennington & McConachie, 1996; Romski et al., 2010). Training a group of communication partners is more efficient than conducting individual trainings. Therefore, the current study will explore the feasibility of training a group of professionals (i.e., special education teachers) who have limited to no experience in AAC. Providing AAC training to professionals such as special education teachers could bridge a huge chasm in communication service delivery to children in educational settings in Sri Lanka, where there are only a handful of qualified SLPs.
Appendix B - Power analysis to calculate sample size

Test family: F tests
Statistical test: ANOVA: Repeated measures, within factors

Type of power analysis: A priori: Compute required sample size - given α, power, and effect size

Input parameters:
- Effect size f: 0.5
- α err prob: 0.05
- Power (1-β err prob): 0.95
- Number of groups: 1
- Number of measurements: 8
- Corr among rep measures: 0.5
- Nonsphericity correction ε: 1

Output parameters:
- Noncentrality parameter λ: 28.0000000
- Critical f: 2.2370793
- Numerator df: 7.0000000
- Denominator df: 42.0000000
- Total sample size: 7
- Actual power: 0.9663691
Appendix C – Teacher’s Demographic Questionnaire

1. Name/Age – ________________

2. Language/s of instruction - 
____________________________________________________

3. Highest Educational Qualification - 
____________________________________________

4. Specify special education training received - 
____________________________________________

5. Number of years working as a teacher - 
____________________________________________

6. Number of years working as a Special Education teacher - ______________

7. Current grade level you are teaching - 
____________________________________________

8. Diagnoses of the students in your classroom - 
____________________________________________

9. Number of students in current class you teach - 
____________________________________________

10. Please describe your prior experiences working with students with severe communication disabilities (e.g. types of disabilities, number of years working with these students etc.)
____________________________________________
Appendix D - Pre-Training Questionnaire for Teachers

1. Are you aware of the term Augmentative and Alternative Communication (AAC)? (If you answer no, please move on to question 3)
   - Yes
   - No

2. Please briefly discuss what you know about AAC?

3. Prioritize on a scale of 1 to 5 (1 being least important and 5 being most important) what you would like to learn about at the training workshop (Use a check mark to indicate your priority learning needs).

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am interested in learning more about literacy activities I can do with a student who has severe disabilities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I am interested in learning about implementing AAC during literacy activities for a student with severe disabilities. (e.g. reading).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I am interested in learning more about leisure activities I can do with a student who has severe disabilities (e.g. play activities, music).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I am interested in learning about implementing AAC during leisure activities for a student with severe disabilities (e.g. play activities, music).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. It is important for students with severe communication needs in my classroom to be able to participate by answering questions.</td>
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</tr>
<tr>
<td>6. It is important for students with severe communication needs in my classroom to be able to express choices.</td>
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</tr>
<tr>
<td>7. I would like to develop my own AAC materials to use with my students.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>8. Please discuss other content you would like to learn about at the workshop?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Are there times during the day when he/she is most successfully able to communicate with you?

5. Are there ever times during the day when he/she wants to tell you something and is unable to?
Appendix E - Information from Teacher’s Pre-questionnaire

<table>
<thead>
<tr>
<th>Questions</th>
<th>Learning Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am interested in learning about ways to involve students with severe communication needs in literacy (e.g. reading).</td>
<td>3 1 5</td>
</tr>
<tr>
<td>2. I am interested in learning about ways to involve students with severe communication needs in leisure activities (e.g. play activities, music).</td>
<td>1 2 5 1</td>
</tr>
<tr>
<td>3 I am interested in learning about ways for students with severe communication needs (in my classroom) to participate by answering questions.</td>
<td>1 2 6</td>
</tr>
<tr>
<td>4. I am interested in learning about ways for students with severe communication needs (in my classroom) to participate by expressing choices.</td>
<td>1 1 5 2</td>
</tr>
<tr>
<td>5. I would like to develop materials that will help students with severe communication needs (in my classroom) communicate.</td>
<td>1 8</td>
</tr>
</tbody>
</table>
Appendix F – Children’s Demographic Questionnaire

Participant code/initials: ______________________________
DOB: __________________
Date at start of study: ______
Age at start of study: ______
Date at end of study: ______
Age when left study: ______
Primary Disability: _________________________________________

Communication

1. How do you communicate with ________?
   □ Using sentences
   □ Using single words
   □ Gestures and speech

2. How does ________ communicate with you?
   □ Body postures / facial expressions
   □ Pointing / gestures
   □ Vocalizations
   □ Pictures
   □ Sign Language
   □ Sentences
   □ Single words
   □ Speech generating device/Other assistive technology

3. Approximately how many words does he/she currently use? ____________

4. Does he/she use a variety of types of words? (e.g. – nouns, verbs, adjectives, etc.)
   ___________________________________________________________________

Gross Motor Skills

5. How does ________ move around?
   □ Walks independently
   □ Walks with assistance
   □ Wheelchair
   □ Other

Fine Motor Skills

6. Which hand does _________ prefer to use?
   □ Right
   □ Left
   □ Both
7. Is he/she able to point or isolate his/her finger? ____________

Hearing and Vision
8. What is his/her hearing status? ________________
9. What is his/her vision status? ________________

Family Information
11. Who lives at home with him/her?

______________________________________________

School Information
12. Type of school (special vs. inclusive) ___________
13. School grade? _______
14. What subjects does he/she receive services in a resource room?

______________________________________________
15. What subjects is he/she included with other typically developing students?

______________________________________________
Appendix G - Communication Matrix
Appendix H - Examples of AAC Boards and Picture cards
Appendix I - Training Worksheet

Teacher’s Name: _____________________________________

Name of student for whom worksheet is being completed for: _____________________________________

1). Identify 3 contexts during the day where you could implement the discussed AAC strategies? (e.g. – art)
   i) _______________________________
   ii) _______________________________
   iii) _______________________________

2). Choose one of these contexts: discuss three specific opportunities you can provide and identify the vocabulary you would incorporate in the AAC display.
   Context: Art

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Do you want to color with blue or green?</td>
<td>Blue, Green.</td>
</tr>
<tr>
<td>Question</td>
<td>1.</td>
</tr>
<tr>
<td>Comment</td>
<td>2.</td>
</tr>
<tr>
<td>Choice</td>
<td>3.</td>
</tr>
</tbody>
</table>

   **Script to implement the worksheet:**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Call the student’s name to get his or her attention.</td>
<td>Sunil</td>
</tr>
<tr>
<td>2. Label each picture card and place it on the board (e.g. green).</td>
<td>Green, blue, yellow, sun, tree, sky.</td>
</tr>
<tr>
<td>3. Provide the student with an opportunity.</td>
<td>Do you want to color with blue (point to blue color card) or green? (point to green color card)</td>
</tr>
<tr>
<td>4. WAIT at least 5 secs for the student to respond.</td>
<td>Place the board in front of the student and wait.</td>
</tr>
<tr>
<td>5. If the student touches or looks at one of the pictures, respond by naming it and give it to the student.</td>
<td>“You want to color with blue, let’s color with blue”</td>
</tr>
<tr>
<td>6. If the student does not respond after waiting 5 secs, hold the board (with pictures) closer to the student and repeat steps 2 and 3.</td>
<td>Do you want to color with blue (point to blue color card) or green? (point to green color card) and wait.</td>
</tr>
<tr>
<td>7. If the student still does not respond, provide a different opportunity.</td>
<td>What do you want me to draw? (point to picture of sun and then point to tree).</td>
</tr>
</tbody>
</table>
Appendix J - Skills Demonstration Checklist

Teacher’s name: __________________________

<table>
<thead>
<tr>
<th>Teacher Behavior</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4 or more</th>
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</thead>
<tbody>
<tr>
<td>1. At least 3 evocative communication opportunities were provided</td>
<td>Q</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Co</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Ch</td>
<td></td>
<td></td>
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<tr>
<td>2. Waited 5 secs following each opportunity</td>
<td></td>
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<tr>
<td>3. Provided the student a means to respond</td>
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</table>
Appendix K - Checklist for Procedural Reliability of Training

Please indicate with a ✓ if the instructor completed this during the training. If the instructor did not complete this during the training please indicate this with x.

<table>
<thead>
<tr>
<th>Training Content</th>
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<tbody>
<tr>
<td>1. The instructor provided knowledge regarding AAC (power point).</td>
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<tr>
<td>2. The instructor discussed communication partner strategies (power point).</td>
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<td>3. The instructor role-played to demonstrate communication partner strategies and use of AAC (role play with participants).</td>
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<tr>
<td>4. The learners watched video clips of students from their own classrooms and then discussed appropriate tool and strategies for these students (small groups).</td>
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<td>5. The learners developed their own AAC materials (small groups).</td>
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<tr>
<td>6. The learners demonstrated use of AAC and practiced implementing communication partner strategies (learners role play with each other).</td>
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</tbody>
</table>
Appendix L - Coding Sheet

Teacher Participant’s name: __________________ Student Participant’s name: __________________

Date of session: ______________  Session number: _____________

Opportunities will be coded as:
1. Open-ended questions (Q), choices (Ch) and comments (C) that are directed towards the student.
2. Provision of means for student to respond.
3. Wait time of 5 secs or more.

Turns will be coded according to mode:
V (vocalization), SP (speech), G (gesture), S (sign), P (pictures), W (written words).

<table>
<thead>
<tr>
<th>No.</th>
<th>Context (Name of song/activity)</th>
<th>Opportunity (Teacher)</th>
<th>Time of opport.</th>
<th>Communication turn</th>
<th>Time of turn</th>
<th>Mode</th>
<th>Opport. was followed by a turn (Y/N)</th>
<th>Turn was preceded by an opport. (Y/N)</th>
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<tr>
<td>No.</td>
<td>Context (Name of song/activity)</td>
<td>Opportunity (Teacher)</td>
<td>Time of opport.</td>
<td>Communication turn</td>
<td>Time of turn</td>
<td>Mode</td>
<td>OPPORT. was followed by a turn (Y/N)</td>
<td>Turn was preceded by an opport. (Y/N)</td>
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</table>

Total number of evocative communication opportunities:
Total number of communication turns:

Number of evocative communication opportunities followed by a response from the student:
Number of evocative communication opportunities followed by no response from the student
Appendix M - Satisfaction Survey for Teachers

Directions: We are very interested in your experience with the intervention.

1. Would you participate in a similar training program again if given the opportunity? ________________________________________________________________

2. Would you recommend this training program to other special education teachers? ____________________________________________________________

3. What are the strengths of the training program?
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

4. What suggestions would you make to further improve this training program?
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

5. What is one thing you learned from this training that is relevant to your context and to the students with severe communication needs whom you teach?
   ________________________________________________________________

6. Did you notice any changes in the communication of the student you worked with?
   ________________________________________________________________

7. As a result of this training what is one strategy or AAC tool that you hope to continue using?
   ________________________________________________________________

Thank you!
If you have any questions or concerns about this survey, or about any part of the study, you can contact me at the information below.

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Department of Communication Sciences and Disorders
308N Ford Building, Penn State University, University Park, PA, USA 16802.
E-Mail: nam242@psu.edu
Phone: (419) 575-8034 (USA)/0722160400 (Sri Lanka)
## Appendix N – Number of Evocative Communication Opportunities provided by Teachers

<table>
<thead>
<tr>
<th>Name</th>
<th>Pre-Training</th>
<th></th>
<th></th>
<th></th>
<th>Post-Training</th>
<th></th>
<th></th>
<th></th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-1</td>
<td>Pre-2</td>
<td>Pre-3</td>
<td>Post-1</td>
<td>Post-2</td>
<td>Post-3</td>
<td>Maint-1</td>
<td>Maint-2</td>
<td></td>
</tr>
<tr>
<td>Ms. Thilini</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>13</td>
<td>12</td>
<td>14</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Ms. Renuka</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>11</td>
<td>9</td>
<td>14</td>
<td>8</td>
<td></td>
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<td>Ms. Bimali</td>
<td>3</td>
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<td>12</td>
<td>12</td>
<td>17</td>
<td>13</td>
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</tr>
<tr>
<td>Ms. Sonali</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>10</td>
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<tr>
<td>Ms. Ramya</td>
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<td>1</td>
<td>1</td>
<td>14</td>
<td>20</td>
<td>14</td>
<td>17</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Ms. Razna</td>
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## Appendix O – Number of Communication Turns taken by Students

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</table>
Vita
Nimisha Anya Muttiah

Education

2015 Doctor of Philosophy, Communication Sciences and Disorders
The Pennsylvania State University; University Park, Pennsylvania

2008 Master of Science, Speech-Language Pathology
Bowling Green State University; Bowling Green, Ohio

2006 Bachelor of Science, Speech-Language Pathology and Audiology
Bangalore University; Bangalore, India.

Certification

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  American Speech-Language-Hearing Association (ASHA)
• Speech-Language Pathology License
  State Board of Examiners in Speech-Language Pathology and Audiology

Research Funding & Scholarships

• ASH Foundation Graduate Student Scholarship – Scholarship for International
  Students (2014) American-Speech-Language Hearing Foundation
• The University Office of Global Programs (UOGP) Graduate Travel Grant Award
  (2014) The Pennsylvania State University
• 2014 Emerging Research Travel Award (2013 - 2014)
  International Society for Augmentative and Alternative Communication (ISAAC)
• The Maryann Peins Memorial Graduate Scholarship in Speech Pathology (2012)
  The Pennsylvania State University

Publications

AAC in LAMI countries. Manuscript submitted for publication.

snapshot of three provinces. Manuscript submitted for publication.

on nonspeech oral motor treatments and evidence-based practice. American
Journal of Speech-Language Pathology, 20, 47.

Selected Presentations at Scientific and Professional Meetings

Muttiah, N., McNaughton, D., & Drager, K. (2014, July). Planning Augmentative and
Alternative Communication (AAC) Trainings in Low-Resource Developing
Countries. Paper presented at the International Society of Augmentative and
Alternative Communication (ISAAC), Lisbon, Portugal.

Display Intervention for young children with complex communication needs.
Paper presented at the International Society of Augmentative and Alternative
Communication (ISAAC), Lisbon, Portugal.