A case study in augmentative and alternative communication: usage by an eight year old male with developmental apraxia of speech

Marie E. Maine
Rowan University

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A CASE STUDY IN AUGMENTATIVE AND ALTERNATIVE COMMUNICATION: USAGE BY AN EIGHT YEAR OLD MALE WITH DEVELOPMENTAL APRAXIA OF SPEECH

by

Marie E. Maine

A Thesis

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Approved by ____________________________ Professor

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ABSTRACT

Marie E. Maine

A CASE STUDY IN AUGMENTATIVE AND ALTERNATIVE COMMUNICATION: USAGE BY AN EIGHT YEAR OLD MALE WITH DEVELOPMENTAL APRAXIA OF SPEECH

April 30, 2001

Dr. Stanley Urban

Master of Arts in Learning Disabilities

The purpose of this study was to examine the effects of using a sophisticated electronic voice output augmentative communication device with an eight-year old male who has been diagnosed with Developmental Apraxia of Speech. The design of this research was a case study. Data collection measured the subject's academic, language, and social status before and after implementation of the augmentative communication device. Measures included standardized and criterion-referenced tests, adaptive behavior rating scales, structured observations, anecdotal data, interviews, and review of school records. Findings indicated the subject was able to participate in several assessments during the post-treatment condition that could not be administered prior to augmentative communication usage. Test results showed an improved rate of academic performance. Measures also indicated improved oral speech in terms of variety and number of sounds and words produced, increased volume, and improved fluency. School and parental data show improved social interaction with peers and family members. Parental and school personnel views of the subject's communicative competence changed over the course of the study. Prior to using augmentative communication the subject was seen as limited in the ability to adequately communicate with others. With the augmentative device, interaction and expressive communication substantially improved.
MINI-ABSTRACT

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The purpose of this study was to examine the effects of using an electronic voice output augmentative communication device with an eight-year old male who has been diagnosed with Developmental Apraxia of Speech. Findings indicated an improved rate of academic performance, improved oral speech, and improved social interaction with family and peers.
This project is dedicated to the Mackowsky family.

Thank you for your cooperation, support, and friendship.

I am privileged to know you.
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CHAPTER 1
INTRODUCTION

The American Speech-Language-Hearing Association states that communication is the “essence of human life” (ASHA, 1991a, p. 8). Our ability to convey our needs, desires, thoughts, and feelings to others is a means by which we meet our physical and emotional needs. Communicative ability provides us with a social “connectedness” and gives us independence in everyday activities.

For more than two million Americans, however, a severe communication disorder limits the ability to communicate effectively through the traditional means of speech, gestures, or writing. There are many types of disabilities which may result in a communication disorder, including congenital impairments, acquired disorders, and neurological disease. These conditions may be temporary or lifelong (ASHA, 1991b). Regardless of etiology, lack of communicative ability can infiltrate all aspects of a person’s life, resulting in the individual’s passivity, frustration, and dependence on others. Fortunately, the field of augmentative and alternative communication offers a chance at improved quality of life for those without adequate communicative means.
Background

The American Speech-Language-Hearing Association defines augmentative and alternative communication (AAC) as:

an area of clinical, research, and educational practice for speech-language pathologists and audiologists that attempts to compensate and facilitate, temporarily or permanently, for the impairment and disability patterns of individuals with severe expressive and/or language comprehension disorders. AAC may be required for individuals demonstrating impairments in gestural, spoken, and/or written modes of communication (1991a, p. 8).

AAC is subsumed under the category of “Assistive Technology” in the 1997 revised Individuals with Disabilities Education Act (IDEA). According to IDEA, Individual Education Program (IEP) teams must consider whether each child eligible for special education requires assistive technology. Furthermore, school districts are responsible for providing assistive technology services, including augmentative and alternative communication, to qualifying special education pupils (McNairn & Shioleno, 2000d).

The field of AAC is relatively new, emerging in the early 1970’s and gaining increased popularity in the 80’s and 90’s. Due to technological advances, there are many commercially available AAC devices on the market today. In addition, there is an endless variety of homemade systems. AAC systems range on a continuum from simple to complex. A simple AAC system might consist of an individual signing the word “apple” or pointing to a picture of an apple to communicate, “I want an apple, please.” Alternately, a complex system generally involves the use of computers; for example, an individual pointing to a sequence of pictures on a touchscreen to create and speak the
message, "I had a terrific weekend! What did you do over the weekend?" The objective for all augmentative and alternative communication, regardless of the complexity of the system, is to provide the user with a means of communication to express his needs, wants, thoughts, and feelings to the fullest extent possible.

**Need for the Study**

Despite the increasing popularity of augmentative and alternative communication in the arenas of special education and speech-language pathology, and federal law which requires consideration of AAC systems for special education students, there remains a significant number of professionals who lack the knowledge and resources to access AAC for their communication impaired students and clients. Beukelman and Miranda (1998) cite an AAC user describing his feelings of being unable to talk:

> If you want to know what it is like to be unable to speak, there is a way. Go to a party and don’t talk. Play mute. Use your hands if you wish but don’t use paper and pencil. Paper and pencil are not always handy for a mute person. Here is what you will find: people talking; talking behind, beside, around, over, under, through, and even for you. But never with you. You are ignored until finally you feel like a piece of furniture (pp. 5-6).

This sentiment, coupled with the number of people with severe communication disorders who do not have access to AAC, provides solid evidence of the need for professionals to explore this area.

**Value of the Study**

For the past six years this researcher has taught a self-contained class for children with multiple disabilities, ages 5-9. During this time various forms of augmentative and
alternative communication have been incorporated into daily class activities. In the past year, several students have received individual augmentative communication evaluations by an outside agency at the request of the Child Study Team. Subsequently, AAC devices have been purchased by the school district. It has been left to the researcher to implement these systems in collaboration with the speech-language therapist and the students' parents.

One student for whom an expensive electronic communication device has been purchased “graduated” from the researcher’s class in June 2000; he is currently enrolled in the next level of the multiply disabled program. The student’s primary language diagnosis is Developmental Apraxia of Speech. This researcher has the desire to work collaboratively with the child and his family, teachers, and therapists, to develop his communicative competence using the electronic device. This will clearly serve as a benefit for the student and his family. Additionally, the professionals involved in the study will develop a knowledge base in the field of AAC and gain practical experience in teaching children to use electronic communication devices.

On a personal level, this researcher has an interest in the field of AAC and would like to explore this area in depth. As a result, this will benefit future pupils in the researcher’s charge who require AAC.

Research Questions

Through a qualitative case study, the researcher hopes to answer the following questions:

1. Will use of an electronic augmentative communication device by an eight-year old male with Developmental Apraxia of Speech result in his improved academic performance?
2. Will use of the augmentative device result in the subject’s improved social interaction with peers?

3. Will use of the augmentative device result in the subject’s improved social interaction with family members and persons in the community?

4. How do parental and teacher views of the subject’s communicative competence change with the introduction and use of the augmentative device?

**Definition of Terms**

The following terms are used throughout this research:

**American Speech-Language-Hearing Association (ASHA)**- a professional organization in the field of speech-language pathology and audiology; ASHA encompasses the field of AAC, providing information, training, and professional guidelines.

**Assistive Technology (AT)**- (1997 IDEA definition) any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability (McNairn & Shioleno, 2000d, p. 72.).

**Augmentative and Alternative Communication (AAC) System**- an integrated group of components, including the symbols, aids, strategies, and techniques used by individuals to enhance communication. The system serves to supplement any gestural, spoken, and/or written communication abilities (ASHA, 1991b, p. 10).

**Communication**- (definition by the National Joint Committee for the Communicative Needs of Persons with Severe Disabilities) any act by which one person gives to or receives from another person information about that person’s needs, desires, perceptions, knowledge, or affective states. Communication may be intentional or unintentional, may involve conventional or unconventional signals, may take linguistic or non-linguistic forms, and may occur through spoken or other modes (Beukelman & Miranda, 1998, p.3).

**Communication Impairment**- a language disorder in the areas of morphology, syntax, semantics and/or pragmatics/discourse which adversely affects a student’s educational performance and is not due primarily to an auditory impairment. The problem shall be demonstrated through functional assessment of language in other than a testing situation and performance below 1.5 standard deviations, or the 10th percentile on at least two standardized oral language tests, where such tests are appropriate (New Jersey Administrative Code Title 6A, Chapter 14 Special Education, Section 3.5, 1998).
Developmental Apraxia of Speech (DAS) - a neurologically based disorder, in which there is difficulty in executing, coordinating, and sequencing the speech mechanism without any obvious neuromuscular involvement; 'soft' neurological signs may be present that result in difficulties with gait and coordination; clumsiness in dressing, feeding, writing; and a general overall delay in motor development (Cumley & Swanson, 1999, p. 111).

Dynamyte 3100 - an electronic communication device with synthesized speech and a dynamic (changing) display which allows the user to formulate messages from pre-selected, customized vocabulary through a direct selection technique; available through Dynavox Systems, Inc.

Dynavox - a commercial company which manufactures electronic AAC devices and accompanying software programs.

Gateway 54 - a commercially available software program for specific AAC systems; designed to meet the conversational needs of individuals with language abilities at a 4 year old level; available through Dynavox Systems, Inc.

Multimodal System - an approach which utilizes the individual's full communication capabilities, including any residual speech or vocalization, gestures, signs, and aided communication (ASHA, 1991b, p. 10).

Picture Communication Symbols (PCS) - line drawn and picture symbols adapted for use with Dynavox products; designed by Mayer-Johnson, Inc. and available through Dynavox Systems, Inc.

Prompt - stimuli presented to the learner before or during a task being taught in order to increase the chance of a correct response.

Limitations

There are several limitations to the current study; therefore, the results should be interpreted with caution. First, due to the case study (single-subject) format of this research, the number of subjects is not sufficient to make a valid generalization of the results. In addition, the qualitative nature of the research precludes sufficient quantitative data necessary for statistical validity. The specific age and disability of the subject prevents a parallel comparison to individuals of differing ages and disabilities. Finally,
the subject's progress during the study may be a result of maturation and instructional programming unrelated to AAC implementation.

**Overview**

The literature review in Chapter 2 will provide an explanation of the components of AAC assessment, vocabulary selection, symbol arrangement, and training in system use, from a standpoint of "best practice" research. Chapter 3 will detail the design of the study and the collection of data. In Chapter 4 the data will be analyzed and study results discussed. The final chapter will summarize the research findings, offer conclusions, and discuss implications for the future in the field of AAC.
CHAPTER 2
REVIEW OF THE LITERATURE

Over the years the field of special education has encountered a great many changes in terms of delivery of services, teaching methodology, and curriculum. A driving force behind this change has been the families of children with disabilities and the professionals who provide services. Dissatisfaction with current special educational practices has time after time influenced government policy makers to enact new laws for the purpose of improving special education programs and providing for the constitutional rights of all children. The field of augmentative and alternative communication (AAC) is no exception.

As the use of computers and other forms of technology gained popularity in special education classrooms, it proved inevitable that these technologies attracted attention in the legislative arena. The 1997 reauthorization of the IDEA included a definition of assistive technology (AT) which stated that all children eligible for special education services must be considered for assistive technology. Additionally, the law required schools to provide the technology when deemed appropriate and necessary. Despite these mandates to provide AT services, guidelines remained vague and innumerable IEP teams nationwide were uncertain how to properly address this area. In response, in 1997
the Council for Administrators of Special Education and the Technology and Media Division of the Council for Exceptional Children jointly published the booklet, Has Technology Been Considered? A Guide for IEP Teams (Chambers, 1997). This publication described assistive technology, detailed the role and responsibility of school districts, provided AT evaluation guidelines, and offered examples of how technology can be written into an IEP.

According to Chambers (1997), assistive technology includes: positioning systems, self-care equipment, environmental control, assisted listening materials, visual aids, mobility equipment, equipment for physical education/play/leisure, computer access, computer based instruction, and augmentative/alternative communication. AT services school districts must provide for special education pupils include consideration for assistive technology, AT evaluations, purchase or lease of equipment, necessary adaptations, maintenance/repair/replacement of equipment, coordination of therapies with AT, and training/technical assistance for school personnel, AAC users, and their families. In providing AT services, “there must be agreed upon educational goals for the child, criteria for measuring success, opportunities for learning and documentation of the process” (Chambers, 1997, p. ii). In addition, if an IEP team decides that an AT device must be used in the home for a student to receive a free, appropriate public education, then the child must be allowed to take the equipment home on a daily basis.

As federal laws emerged in support of assistive technology access, several professional organizations concomitantly developed certification procedures, position statements, and training modules. One prominent organization is the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA). This group
provides certification for persons qualified to either evaluate for AT services or sell AT equipment, although not every state or school district requires this specific certification (Hill & Romich, 1999b).

Another organization widely recognized for its presence in realm of AT is the American Speech-Language-Hearing Association (ASHA). ASHA is a strong supporter of augmentative and alternative communication (AAC), the specialty area which focuses on helping individuals with severe communication impairments compensate for their language deficits. ASHA’s Special Interest Division 12 (SID-12) provides professionals in speech-language pathology and audiology with both training in AAC systems and professional networking opportunities (Hill & Romich, 1999b). The division’s position statement reads, “communication is the essence of human life and...all people have a right to communicate to the fullest extent possible. Furthermore, provision of augmentative and alternative communication (AAC) services is within the scope of practicing speech-language pathologists and audiologists” (ASHA, 1991a, p. 8).

The Association for Persons with Severe Handicaps (known as TASH) also acknowledges the importance of communication, focusing on those with severe disabilities and addressing the use of AAC. TASH’s “Right to Communicate” statement reads:

Every person, regardless of the severity of his/her disabilities, has the right and the ability to communicate with others, express everyday preferences and exercise at least some control over his or her daily life. Each individual, therefore, should be given the chance, training, technology, respect, and encouragement to do so (Crossley, 1999, p. 8).
With similar emphasis, the National Joint Committee for the Communicative Needs of Persons with Severe Disabilities recognizes and encourages the use of AAC in their definition of communication. This committee defines communication as:

Any act by which one person gives to or receives from another person information about that person’s needs, desires, perceptions, knowledge, or affective states. Communication may be intentional or unintentional, may involve conventional or unconventional signals, may take linguistic or non-linguistic forms, and may occur through spoken or other means (Beukelman & Mirenda, 1998, p. 2).

As federal law and professional organizations began to support AAC, an abundance of research and literature on this topic became available. Throughout the literature on augmentative and alternative communication, the act of communication itself is often described in terms of its social value (Reichle, 1997). For instance, Beukelman & Mirenda (1998) detailed an analysis of the four social purposes of communication: expression of needs/wants, information transfer, social closeness, and social etiquette. Reichle (1997) stated that persons with severe language impairments tend to participate passively in communicative experiences; this often results in exclusion from social interactions, particularly with same-age peers. Therefore, the goal of AAC is to develop an individual’s communicative competence so he is able to participate more meaningfully in home, school, and community settings (Parette & Angelo, 1996). A focal point is facilitating a “spontaneous, interactive exchange of information, feelings, and thoughts” (Hill & Romich, 1999b, p. 77).
Besides providing avenues for socialization and independence in daily activities, AAC use has been proven to decrease negative behaviors in persons with severe disabilities (Reichle, York, & Sigafoos, 1991). An article by Mirenda (1997) reviewed 21 studies in which AAC was utilized to decrease negative behaviors, such as aggression, self-injurious behavior, and self-stimulation. An “immediate and substantial reduction in the frequency of the target behavior” was shown by 85% of the participants in these studies (p. 222).

In exploring the numerous AAC devices available in the commercial sector as well as those systems designed by parents and professionals, one finds a division in terms of complexity and cost. McNairn & Shioleono (2000b) describe this dichotomy as low-tech versus high-tech.

Low-tech (or light-tech) AAC includes “simple communication devices that do not use electronic or computer parts, such as the use of pictures attached to a board or inexpensive devices that can record a voice” (p. 80). These devices are appropriate for individuals with emerging language or for young children who are being introduced to AAC. Companies that manufacture low-tech AAC or sell the materials for designing these systems include Enabling Devices, Ablenet, and Mayer-Johnson Company.

High-tech AAC includes devices that are more complex and contain electronic parts. These devices may be dedicated or integrated (McNairn & Shioleono, 2000b). Dedicated devices are designed primarily for communication. Integrated systems use a computer as the base, then add special software “to enhance the computer’s ability to function as a communication device” (p. 81). For instance, a standard laptop computer outfitted with special language software is an integrated AAC device. Additionally, high-tech systems
have either synthesized speech produced by a computer or digitized speech in which actual human voices are recorded and stored. High-tech AAC systems are available through companies such as Sunrise Medical, Inc. and Prentke Romich Company.

Another element of AAC is the language representation method used in the system. There are three methods commonly used. Pictures with a single meaning can be used with students who are unable to read but can recognize pictures. Words can be added to the pictures for those with pre-reading or reading abilities. Second, traditional orthography (spelling) can be used with students who are able to spell and read messages. The third method is semantic compaction, also known as “Minspeak.” Minspeak is designed to enable the user to make an almost infinite number of messages with a minimum number of keystrokes (Beukelman & Mirenda, 1998). The technique involves choosing a series of two or more symbols in which “the specific meaning of each icon is a function of the context in which it is used” (Hill & Romich, 1999b, p. 79). Spelling or reading skills are not required. According to Hill & Romich (1999b), Minspeak is the most widely used language representation method in AAC.

Yet another consideration when exploring augmentative and alternative communication is the selection technique, which is how a device is accessed by the user. Direct selection occurs when “the AAC user indicates the desired item directly” from a set of choices, for instance by pointing to a picture or word with a finger or a headstick (Beukelman & Mirenda, 1998, p 99). On the other hand, scanning occurs when an electronic cursor or another individual provides a series of choices, “allowing the learner to signal when the desired symbol appears” (Reichle, York, & Sigafoos, 1991, p. 2). Direct selection is usually a faster technique but requires consistent motor movement.
Scanning, while slower, is a better option for individuals with limited or inconsistent mobility (Reichle, York, & Sigafoos, 1991).

As with the entire world of technology, changes in AAC are rapid and ongoing; this is especially true of high-tech systems. Advances in memory capacity, display features, and voice output intelligibility are just a few of the numerous improvements enjoyed by consumers over the years (ASHA, 1991b; Beukelman & Mirenda, 1998; McNairn & Shioleono, 2000a).

A tenet of augmentative and alternative communication that emerges in the professional literature is the multi-modal system or total communication approach (Huer & Lloyd, 1990; McNairn & Shioleono, 2000b; McNairn & Shioleono, 2000d; Reichle, York, & Sigafoos, 1991; Shane, 1996). This concept involves having an AAC user utilize a variety of means to improve communication, rather than just a single approach or device. For example, a student may use a combination of oral speech, gestures, sign language, picture boards, and a computerized voice output device. This allows the student to choose the mode of communication with which he is most comfortable and which is most appropriate in a given situation. For instance, it may be appropriate to use a high-tech computer at school or in a restaurant, but this would be impractical at a public swimming pool. In this environment, picture boards, sign language, and oral speech are more suitable. Another advantage to using a multi-modal approach occurs when high-tech devices malfunction or break. In such situations users require alternate communication modes until the devices are repaired; the multi-modal approach makes this possible.
The field of augmentative and alternative communication is multidisciplinary in many respects. It includes the expertise of special education teachers, speech-language therapists, occupational therapists, physical therapists, psychologists, early childhood educators, vocational rehabilitation specialists, cognitive scientists, computer designers and programmers, and mechanical engineers (Reichle, 1997; Schlosser & Lloyd, 1991). Each of these domains makes a unique and important contribution to this rapidly growing field, from system design through implementation.

The multidisciplinary concept applies to AAC evaluation teams, too (McNairn & Shioleno, 2000d). In the school-age population in the state of New Jersey, consideration for an augmentative and alternative communication evaluation generally begins with the Child Study Team, often at the request of a teacher, speech-language therapist, or parent. Once an AAC evaluation is deemed necessary for a student, a person or persons with knowledge and expertise in the field conducts a formal AAC assessment. The evaluator may be an employee of the school district. If there is no one in the school system with AAC expertise, however, the law requires referral to a professional trained in AAC (Hill & Romich, 1999b; Parette, Hourcade, & VanBiervliet, 1993). Outside evaluations may be conducted by public or private agencies.

Chambers (1997) outlines a thorough AAC assessment model. According to this model, entitled SETT, the following factors should be considered in the assessment process:

The Student's strengths and weaknesses in all domains, especially language and motor skills.

The Environments the pupil encounters, including school, home, and community.
The **Tasks** the student is required to perform.

The **Technology**, including tools and strategies, which will best assist the student in daily functioning and meaningful participation in activities (pp. 27-28).

Other experts in AAC suggest additional considerations in the AAC assessment process. McNairn & Shieleno (2000b) believe AAC evaluators should appraise: the vocabulary and icons (pictures) to be used in a system; a device’s weight, appearance, portability, and ease of programming/use; funding requirements and sources; available technical support from the manufacturer; family/cultural issues. Parette, Hourcade, & VanBiervliet (1993) feel it is important to consider availability of equipment and a device’s reliability and repair record, while McNairn & Shieleno (2000c) emphasize considering the future needs of the child. Although cognitive ability is often a major consideration in AAC evaluation, research supports that there is no cognitive prerequisite for AAC use (Schlosser & Lloyd, 1991).

Once an AAC evaluation is completed and the Child Study Team determines a system is educationally relevant, it is the school’s responsibility to purchase the equipment necessary for implementation. The following step involves the selection of appropriate vocabulary and messages for communication. In the professional research this question is addressed according to the student’s cognitive level and current/potential literacy abilities.

Students who are **literate** are “able [to use a device] to formulate messages on a letter-by-letter or word-by-word basis and [also] to retrieve complete messages” (Beukelman & Mirenda, 1998, p. 31). The vocabulary approach for a literate user is *developmental*; the goal is to encourage language use and understanding through syntactic development.
AAC vocabulary may consist of any combination of letters, words, or pictures. In Beukelman & Mirenda (1998), it is suggested that words from the following semantic categories be included:

* Substantive words (i.e., people, places, things)
* Relational words (e.g., big, little)
* Generic verbs (e.g., give, get, make)
* Specific verbs (e.g., eat, drink, sleep)
* Emotional state words (e.g., happy, scared)
* Affirmation/negation words (e.g., yes, no, not)
* Recurrence/discontinuation words (e.g., more, all gone)
* Proper nouns for people
* Single adjectives first (e.g., hot, dirty) and their polar opposites later (e.g., cold, clean)
* Relevant colors
* Relevant prepositions (p. 30).

These vocabulary words can be organized in an AAC system by category (semantic or grammatical) or by activity/context. Words can also be displayed in alphabetical order. In practice a combination of organizational techniques is commonly used. Because constructing sentences from scratch is often time-consuming and tiring, it is also important to enhance the timing of messages. Commonly used phrases, urgent messages, and etiquette routines should be accessible with a minimum of effort. Storing entire messages (such as, “I need to use the bathroom.”) on a high-tech device is a way to accommodate this need (Beukelman, McGuinnis, & Morrow, 1991).
For individuals who are non-literate and unable to construct novel messages independently, the goal is not to teach syntactical structure but rather “to meet…daily ongoing communication needs in a variety of environments” and to expand the use of words and concepts (Beukelman & Mirenda, 1998, p. 31). This is best accomplished through a functional approach in which the user is given a variety of single words or whole messages (usually in the form of pictures or line drawings) that are gender and age-appropriate (Beukelman & Mirenda, 1998). Initial vocabulary should be of high personal interest, have the potential for frequent use, and reflect the “here and now” (Beukelman, McGuinnis, & Morrow, 1991). Examples include: having an adolescent point to a picture of a television to communicate, “I want to watch t.v.”; depressing a switch that speaks the message “break” to communicate “I want to take a break.”, and signing the word “more” to indicate more of an activity, food, or object.

Students who are pre-literate do not yet have the ability to read or spell but have the potential to do so. These users should be given a system that includes single words and complete messages to communicate needs. Their systems should also include vocabulary organized by category or context to encourage the development of language structure through using combinations of two words or more (Beukelman & Mirenda, 1998).

In the AAC literature there is a distinction among core versus fringe vocabulary. Core vocabulary includes general words used in many contexts and with a variety of communication partners (Beukelman, McGuinnis, & Morrow, 1991). According to Hill & Romich (1999a), “approximately 85 percent of what we say in daily situations consists of a few hundred core words” (p. 67). Good resources for obtaining core vocabulary include published word lists from AAC users, ESL students, and curriculum guides;
written or spoken language samples from age-appropriate peers may also prove helpful (Beukelman, McGuinnis, & Morrow, 1991). *Fringe* or *extended vocabulary* relates to a specific activity (McNairn & Shioleno, 2000b) or is unique to an individual. Examples include names of family and friends, favorite activities, and unique expressions. Fringe vocabulary personalizes the AAC system and is best obtained from families, caregivers, teachers, and friends of the user through interviews or written checklists (Beukelman & Mirenda 1998). It is best practice to gather vocabulary from multiple informants to ensure all contexts the student encounters are assessed for vocabulary needs. It is also important to consider the AAC user himself as a valuable informant, whenever possible (Beukelman, McGuinnis, & Morrow, 1991; Schlosser & Lloyd, 1991); this is especially true in light of the following statement quoted in Beukelman & Mirenda (1998):

They (people who use AAC) are unable to create spontaneously their own lexicon and must operate with a vocabulary selected by someone else or preselected, not spontaneously chosen by themselves (p.29).

It is therefore of utmost importance to choose vocabulary that is relevant for the individual. In selecting vocabulary it is also important to remember that language use and growth is a dynamic, changing process. Due to an individual student’s interests and life experiences, it is necessary to adjust vocabulary, periodically adding new words and deleting those that are unused (Beukelman & Mirenda, 1998). Vocabulary selection should be viewed as a life-long process, rather than a one-time event.

After initial vocabulary and message selection, the student must be taught to use his AAC system in an effective manner. Traditional practice has used direct instruction to teach AAC use; in recent years there has been a focus on teaching students to use
augmentative and alternative communication in natural environments and in naturally occurring situations. Initial communication training should involve an activity where there is a joint focus between the student and the instructor (Reichle, 1997). The student should be taught to make a single communicative attempt; this should be immediately followed by an appropriate response on the part of the listener. Training should occur by modeling the target communication and by using a series of prompts (verbal, gestural, physical, positional) (Mirenda, 1997). Over time, the goal is for the user to initiate, maintain, and terminate interactions “to establish a back and forth exchange that has a logical beginning and end” (Reichle, York, & Sigafoos, 1991, p. 134). This is especially true for students who have the potential to construct novel phrases and sentences. In training a student to use AAC, Reichle (1997) believes it is imperative to respond to all the child’s communicative attempts so he will understand the natural consequences of communication. Another teaching strategy used by many AAC programs involves special activities that encourage system use in a fun and socially rewarding manner. Ice cream socials, AAC camps, picnics, and “Make & Take” AAC parties are a few of the many activities that have been planned for students to gain experience in using AAC (Hill & Romich, 1999a).

An important skill to address early in AAC training involves how the student handles breakdowns in communication. When “listening” the trainer should always indicate when he does not understand the student’s communication. Then the trainer should encourage repair strategies through modeling and prompting. The multi-modal approach becomes crucial at this point as the student can learn to reword a message or use another part of his “system” to improve listener understanding.
As the teaching process unfolds, the trainer should pay special attention to the learner's generalization skills and spontaneity of communication (Reichle, 1997; Reichle, York, & Sigafoos, 1991). Generalization is most likely to occur when teaching is conducted in natural environments, such as teaching a student to request food and make light conversation during mealtime. Furthermore, if a student makes requests only when he is prompted, then he is not truly expressing his wants and needs (Reichle, York, & Sigafoos, 1991). For this reason, prompts should be used in a least to most hierarchy and should be faded gradually (Mirenda, 1997).

In the research on AAC there has been a recent focus on the importance of family issues. According to Parette & Angelo (1996), “family members have been recognized as the most significant communication partners” of AAC users, and “family acceptance of AAC devices is an important variable in predicting intervention outcomes” (p. 78). While theory supports family members' integral participation in all aspects of the AAC process, in everyday practice this collaboration is not always evident (McNairn & Shiolen, 2000d). Parette & Angelo (1996) poignantly state possible beneficial outcomes of AAC: augmentative and alternative communication may result in “the reduced demand on family members to anticipate or interpret the child’s communication” and may allow “the child to be cared for or attended to by non-family members,” thereby reducing family stress (p. 89).

Ultimately, AAC use may result in a user’s greater degree of independence and sense of accomplishment. It is therefore necessary for IEP teams to assist and support families in the AAC decision-making process, helping them choose a system which will have practical use and which will easily assimilate into daily routines and activities. Since the
technical aspects of many systems may be intimidating, teams should address this issue in a positive manner, too. It is also important to help families develop realistic communication expectations for their children since not all AAC users will develop true ongoing communicative interaction (Parette & Angelo, 1996).

A common fear among parents is that using augmentative and alternative communication will result in a child’s lack of speech development or regression of language skills (Hirsch, 1996; McNairn & Shiolen, 2000d; Reichle, 1997). This is an erroneous assumption. In fact, research supports improvements in both language development and oral speech when AAC is implemented. This fact should be shared with parents although many families may take some time in accepting the idea of AAC. McNairn & Shiolen (2000d) suggest, “It’s never too soon to introduce AAC to a family. AAC plants a seed. It may take a long time for it to take root or it may grow immediately. All families come with different dynamics” (p. 77).

Another family issue involves culture. “In working with culturally diverse populations, it is important for professionals to respect the values, beliefs, traditions, expectations, experiences, and priorities of families” (Parette & Angelo, 1996, p. 87). Clearly, if family and cultural issues are not addressed in an informative and compassionate manner, then there is a greater chance any AAC implementation will fail to be carried over in the home.

There are several ways to involve families with the AAC process once a system is under consideration or initiated. Linking parents with support groups, parent advocacy groups, professional organizations, and social service organizations may provide them with much needed support (Parette & Angelo, 1996). There are also on-line
communities, such as ACOLUG (Augmentative Communication On-Line User Group), which offer guidance and inspiration. It is also possible to acquire a mentor family who has been through the AAC process and can provide a first hand perspective (Hill & Romich, 1999a).

As with family issues, there is a wealth of literature available on augmentative and alternative communication from a user perspective and from the perspective of peers. Huer & Lloyd (1990) reviewed 187 articles in which AAC users were interviewed about their communicative experiences. Through content analysis the authors were able to pinpoint several significant themes. Users overwhelmingly voiced their frustration prior to AAC use; one user was quoted, “I was extremely frustrated because I could understand everything but could not respond” (p. 244). Users also reinforced the importance of having professionals who are knowledgeable in the field of AAC. Additionally, users commented on the negative characteristics of specific technologies; for instance, users complained that voice output often sounded too artificial and that many devices were too heavy to encourage portability. Fortunately, such critiques have led the companies that manufacturer AAC to improve their systems (McNairn & Shioleno, 2000a).

Regarding peers of AAC users, Beck, Fritz, Keller, & Dennis (2000) write that “without communicative partners who are willing to engage in communicative interactions, communicative competence cannot be fully realized” (p. 13). Furthermore, positive communication with peers results in users’ increased self-esteem and sense of acceptance. Unfortunately, however, children who use AAC are often seen as “different” by their peers; this may lead to negative attitudes toward those who use augmentative and alternative communication systems. Thus, it is important to design and implement
disability awareness and AAC information activities for “typical” peers. It is also vital to create opportunities for positive social interactions between users of augmentative and alternative communication and their non-disabled peers (Beck, Fritz, Keller, & Dennis, 2000).

There are several professional articles that specifically examine AAC use with individuals diagnosed with Developmental Apraxia of Speech (DAS). DAS “is a syndrome-like motor speech condition characterized by a cluster of symptoms associated with oral motor control difficulties” (Cumley & Swanson, 1999, p. 111). Individuals with DAS exhibit decreased expressive language abilities; their oral speech shows inconsistent articulation errors, including repetitions and omissions (Cumley & Swanson, 1999). Extreme difficulty is seen with longer words and conversational speech (Culp, 1989). Individuals with DAS also exhibit an increased incidence of cognitive impairment. In addition, they generally show “soft” neurological signs, such as poor overall motor coordination and unsteady gait; this causes problems with self-help skills and with other fine motor tasks, such as writing (Cumley & Swanson, 1999).

Traditional therapy for DAS involves activities that focus on the development of articulatory proficiency; unfortunately, these activities are often inadequate, and many persons with DAS continue to exhibit life-long expressive language problems. In fact, “research has shown that after eight years of age it becomes less likely that a child will show any significant improvement” with traditional therapy (Hirsch, 1996, p. 56). Cumley & Swanson (1999) state that children with DAS often have “few successful communication strategies and, due to their communication frustration, may develop behavioral problems and/or poor self-esteem” (p. 111). For these reasons, individuals
with DAS are excellent candidates for multi-modal augmentative and alternative communication systems.

A 1989 study by Culp examined AAC use by an eight-year old female diagnosed with DAS. The child was trained to express herself using a combination of facial expressions, gestures, vocalizations, sign language, a picture communication book, and word approximations. The child’s mother and teachers were instructed how to support her communicative attempts. Results of the study indicated improvements in the child’s spontaneous communication and intelligibility. The subject also contributed more equally in conversation, rather than relying on communication partners to ask questions.

A more recent study by Cumley and Swanson (1999) examined the use of augmentative and alternative communication with three subjects: a preschool student, an elementary-aged student, and a junior high student. Theme-specific language boards and high-tech voice output devices supplemented oral speech and gestures. Positive outcomes shown by the subjects included increased mean length of utterance (MLU), increased community involvement, and decreased difficulties with behavior. One subject was able to transition to a less restrictive educational setting, with AAC as a contributing factor. At the junior high level, several teachers incorporated language boards into their mainstream classes for use by all students which facilitated peer acceptance.

From the wealth of literature available on augmentative and alternative communication it is evident this field is becoming increasingly popular in educational and rehabilitation circles. AAC enables individuals with severe expressive language disorders to communicate their wants, needs, thoughts, and emotions. This can lead to
more meaningful participation in daily activities and can allow persons with communication impairments to have a "voice" in society, often for the first time.
CHAPTER 3
DESIGN OF THE STUDY

This study will examine the effects of using a high-tech voice output augmentative communication device with an eight-year old male who has been diagnosed with Developmental Apraxia of Speech. The subject will heretofore be referred to as “Joel” to protect his identity.

Subject Profile

Joel is an eight year, one month old male with an educational classification of multiply disabled (neurologically impaired and communication impaired), pursuant to the New Jersey Special Education Code. He attends a public elementary school in Southern New Jersey where he is enrolled in a self-contained classroom for children with multiple disabilities, ages 8-12.

Medical and Developmental History

Joel was the product of a full-term pregnancy, delivered by a routine caesarean section with health at birth reported as normal. At the age of approximately eight months Joel developed difficulties with congestion as a result of sleep apnea. At the age of 14 months he underwent surgery for removal of adenoids and correction of strabismus. From the ages of 9-16 months he experienced recurrent ear infections, which were treated with
antibiotics. Since this age there have been no significant medical concerns. Recent vision and hearing assessments are reported as normal.

Several developmental milestones are reported as delayed. Joel walked at 16 months; although his receptive language at this time was good, his expressive language was severely delayed. An early intervention evaluation identified fine and gross motor delays in addition to expressive language deficits. These delays have continued through the present time.

**Educational History**

Joel has a history of special education placements. He first attended an early intervention program at a private school for children with disabilities. He then transitioned to a preschool disabled class in his local school district. Upon reaching school age, Joel entered the researcher's self-contained class for children with multiple disabilities (Level 1), ages 5-8, which is located in his local school district. He remained in this class for three years. Currently, Joel is enrolled in his first year of the multiply disabled class (Level 2), ages 8-12. Over the years Joel has received intensive speech and language therapy, occupational therapy, and physical therapy services. Joel's academic performance at the beginning of the study will be detailed in Chapter 4.

**Motor Abilities**

An occupational therapy report dated April, 2000 indicates Joel has difficulty with hand strength and finger isolation. These deficits interfere with the successful performance of academic tasks such as gluing, cutting, and writing; they also impede tasks such as dressing and the ability to use sign language accurately. Joel made
moderate progress in O.T. during the 1999-2000 school year; his hand strength improved, and he learned to write most uppercase letters, albeit with improper form and orientation.

A physical therapy report, also dated April, 2000, indicates Joel made steady progress in the gross motor area during the 1999-2000 school year. Improvements are noted in trunk rotation and ball skills; he continues to exhibit difficulties with eye-hand coordination, visual tracking, and motor planning. Ambulation and effective navigation of the environment occur in an age-appropriate manner.

**Speech and Language Abilities**

A speech and language evaluation conducted in February, 2000 reports that Joel’s therapy focused on developing oral motor skills, breath control, and sound production. Joel is able to produce a number of vowel and consonant sounds; however, vocalizing on command is difficult. He is able to orally produce some simple words, such as *yes, no, mom, home, bye*, and *me*. Additionally, using the *Lindamood Phoneme Sequencing Program*, he is able to combine CV, VC, and CVC sounds in response to modeling and the presentation of mouth pictures. Despite intensive therapy, sound production continues to be slow and laborious. To augment verbal speech, Joel uses sign language approximations and gestures; he has begun to combine two to three signs at home to communicate with his mother.

Since Joel’s expressive language did not adequately meet his needs as of the February, 2000 evaluation, he was referred for a professional augmentative and alternative communication (AAC) assessment. Further details of Joel’s speech and language status at the beginning of the study will be detailed in Chapter 4.
Augmentative and Alternative Communication Evaluation

An AAC assessment was conducted by the Technology for Life and Learning Center in Trenton, New Jersey during the period of March 29, 2000 to May 3, 2000. There was an initial evaluation session followed by a trial period with an AAC device. At the initial session Joel was evaluated by a speech-language pathologist and an occupational therapist who were both trained in AAC. Several communication devices of varying complexity were presented to Joel, and his responses were noted. Results are as follows.

Motor and Access Skills

Postural control and gross and fine motor skills were adequate enough to enable Joel to access the communication systems using direct selection with his index fingers and thumbs.

Sensori-Perceptual and Attending Skills

Joel was able to cross midline with both of his eyes; this enabled him to scan all quadrants of the systems. He required minimal to moderate visual and verbal prompts to maintain attention and to locate desired pictures and symbols.

Augmentative and Alternative Communication System Evaluation

Five communication systems were presented at the initial evaluation session: Tech Talk, Alphatalker, Green Macaw, Dynamo, and Dynamyte 3100. Joel used each of these systems to request various activities. He was able to access all the systems, although he experienced difficulty with the symbol sequencing systems (Minspeak).

The evaluators felt the most appropriate system for Joel was the Dynamyte 3100 with a Gateway 54 application program and a Picture Communication Symbols (PCS) application. At the initial evaluation session Joel easily learned the Dynamyte’s page
linking features; he was also able to find the pictures he wanted for communication. In addition, Joel utilized the message feature, which placed his chosen words in a message bar, thereby allowing him to build simple and complex sentences for communication. This device was also chosen for Joel because of its large memory capacity and extensive picture dictionary, which permit the expansion of vocabulary. In addition, the size dimensions (8” x 7” x 2”) and weight (3.2 pounds) of the device encourage portability.

At the end of the initial session the vocabulary on the **Dynamyte 3100** was customized for Joel; he was then permitted to use the device for a trial period of three weeks. During this time Joel’s teachers, speech therapist, and parents observed him using the device both in school and at home. He was able to communicate his wants and needs, put together simple sentences, write spelling words, play board games with regular education peers, and participate in calendar activities (most of these tasks were accomplished with mild to moderate prompting). In addition, he vocalized more loudly and demonstrated better breath control when using the device. At the conclusion of the trial period, Joel’s progress in using the Dynamyte was reported to the AAC team.

In their report, the AAC examiners recommended purchasing the device and all appropriate application programs. They also suggested training be provided for Joel’s family and for school personnel. Additionally, the evaluators recommended Joel have a manual system for times when the device is unavailable. Upon receipt of the written evaluation, Joel’s school district purchased all the recommended equipment at the cost of approximately $7,000. The equipment and software was delivered in early September, 2000. At this time Joel’s mother took the device to the evaluation center where a copy of
his trial program was installed. The researcher then began instructing Joel in using the
device.

**Subject Selection**

The subject of this study was chosen for several practical reasons. First, the
researcher had a good working relationship with the child, his parents, and his current
teachers and therapists. Second, Joel’s family gave permission for his participation in the
study and showed enthusiasm in the project. Finally, as an integral part of the subject’s
prior education and the AAC evaluation, the researcher desired to provide continued
assistance in implementation of the system. Due to these methods of subject selection,
however, the results of this research should be interpreted with caution.

**Research Design**

The design of this research is a case study. This format will provide an in-depth
exploration of a single subject in pre-treatment, treatment, and post-treatment conditions.
Due to the nature of the study, it is possible that variables may fluctuate over its course.
According to Leedy & Ormrod (2001), “the qualitative research process is more holistic
and ‘emergent,’ with the specific focus, design, measurement instruments (e.g.
interviews), and interpretations developing and possibly changing along the way” (p.
102).

During the treatment condition the researcher will provide the subject with direct
instruction in language, math, and writing activities, with a focus on using the
augmentative communication device; this instruction will take place in the subject’s
home and will occur on a weekly basis. Training will be accomplished through
demonstration, modeling, and prompting. The researcher will consult with the subject’s
mother on a weekly basis to discuss device programming and implementation as well as
the subject's progress. In the school setting the researcher will provide ongoing
consultation with the classroom teacher, speech and language therapist, classroom
assistant, and other personnel, as appropriate, to encourage device usage. Anecdotal
records will be kept of all tutorial and consultation sessions.

**Collection and Analysis of Data**

To assess the results of the study the following measures will be utilized in relation to
each research question:

*Research Question 1: Will use of an electronic augmentative communication device by
an eight-year old male with Developmental Apraxia of Speech result in his improved academic performance?*

Baseline and post-intervention academic achievement levels will include:

1. Assessment data from a 3/21/00 Learning Evaluation
   a. *Jerry Johns Basic Reading Inventory Early Literacy Assessment*
      *Pre-primer reading* subtest
   b. Examiner observation data

2. Assessment data from a 2/2000 Speech and Language Evaluation
      Selected subtests:
      *Word Classes*
      *Word Structure*
      *Sentence Structure*
      *Listening to Paragraphs*
b. **Durrell Analysis of Reading Difficulty**- Third Edition

   *Listening* subtest

c. Examiner observation data

3. **Kaufman Survey of Early Academic Learning Skills (K-SEALS)**

   Administered by the researcher as a functional measure

4. Classroom teacher reports

5. Speech and language therapist reports

6. Structured classroom observation conducted by the researcher

7. Anecdotal records of tutorial sessions

**Research Question 2: Will use of the augmentative device result in the subject's improved social interaction with peers?**

Baseline and post-intervention data regarding peer interactions will include:

1. **Vineland Adaptive Behavior Scales (VABS)**

   Parent and Teacher versions, Selected portions

   Administered by the researcher

**Research Question 3: Will use of the augmentative device result in the subject's improved social interaction with family members and persons in the community?**

Baseline and post-intervention data regarding family and community involvement will include:

1. Parent interview
Research Question 4: How do parental and teacher views of the subject’s communicative competence change with the introduction and use of the augmentative device?

Baseline and post-intervention data regarding teacher and parental views of the subject’s communicative competence will include:

1. Interviews of parent, classroom teacher, and speech and language therapist

As a result of the case study format of this research, the investigator will begin data analysis during the collection process. "Preliminary conclusions are likely to influence the kind of data...[the researcher]...seeks out and collects in the later parts of the study" (Leedy & Ormond, 2001, p. 150). At the conclusion of the study the research questions will be answered in narrative form, providing specific illustrative examples.
CHAPTER 4

ANALYSIS AND INTERPRETATION OF DATA

The purpose of this study is to determine the effects of using a voice output electronic augmentative communication device with an eight-year old male with multiple disabilities, including a severe communication impairment. This chapter will discuss the procedures used to implement the AAC device and will report and analyze study findings.

AAC Implementation

At the beginning of this research Joel’s Dynamyte 3100 augmentative communication device contained 13 pages with approximately 350 word/symbol cells. To access all of the pages Joel was required to link two pages. At the end of the study vocabulary had expanded to over 50 pages with approximately 1,400 word/symbol cells. To access all of the pages Joel was required to link up to four pages. (See Appendix for Dynamyte pages.)

The vocabulary on the Dynamyte was arranged by category. For example, the People page linked to choices such as Mom, Dad, brother, and the names of specific individuals. The Places page linked to choices such as school, home, zoo, and McDonald’s. The Foods page linked to choices such as hamburger, apple, chips, and egg. The Doing
Words page linked to verbs such as eat, walk, ride, and laugh. Special pages were created for school, including opening exercises and occupational therapy. Pages were also designed for literacy activities during tutorial sessions and speech therapy. In addition, a Star Wars page was created to allow Joel to talk about his favorite movie.

To assist in initial vocabulary selection the researcher used portions of the Preschool AAC Checklist (Henderson, 1992). This resource provides guidelines for initiating an AAC system with students who are preschool age through grade one. It also offers a tracking system to document modifications made to the system over time.

Twenty-five individual tutorial sessions were conducted during after school hours in Joel’s home. These sessions lasted from 45 to 60 minutes each and included the pre- and post-testing reported in the results section of this chapter, in addition to AAC teaching. During each of these sessions the researcher also consulted with Joel’s mother regarding his progress using the device, the status of his communication abilities, and the design of additional communication pages. A conversation was also held with Joel’s father regarding communication progress.

Within the school setting ongoing consultation was held with Joel’s classroom teacher, educational assistant, speech and language therapist, and other school personnel. In addition, the researcher, classroom teacher, and speech and language therapist were able to participate in two training sessions sponsored by Dynamyte’s manufacturer, Dynavox Systems, Inc. The educational assistant attended one of these sessions. The purpose of the training was to discuss and practice programming the device.

Over the course of the study the researcher and the subject’s mother consulted the Dynamyte technical support staff by telephone on several occasions to assist in
programming and maintenance issues. Additional support was provided to the researcher by means of the internet List-Serve “DynaMicDuos.” This List-Serve offers programming tips and implementation strategies for individuals who use Dynavox Systems products, their families, and others involved in their lives.

Physical programming of the device was initially conducted by the researcher. As the study proceeded, however, the classroom assistant assumed increasing responsibility for programming. Input regarding vocabulary and symbol arrangement was given by the researcher, classroom teacher, speech and language therapist, and parent. Because the classroom assistant had a strong knowledge base in computers, he was able to design pages with scanned photographs and internet pictures. These pages were highly motivating for the subject. The assistant also proved to be a valuable resource to the researcher in terms of technical consultation.

A variety of direct instructional strategies were implemented to help Joel learn to use the Dynamyte. These strategies were designed by the researcher in collaboration with the speech therapist. Joel’s initial goals for using the Dynamyte included becoming familiar with its layout and using it to answer questions and engage in simple conversation. As his competence in using the device became evident, goals were expanded to include literacy skills and asking of questions. Another goal was for Joel to use the device to create simple phrases and sentences of two or more words. The instructional strategies are described below.

1. **Guess What Game**

   The instructor described a target vocabulary word, stating its category and function or description. For example,
I am thinking of a food. It is a fruit. It is red. What is it? Answer- apple.

I am thinking of a body part. You see with it. What is it? Answer- eye.

2. Describing Picture Cards

The instructor showed the subject a picture of a person performing an action. The instructor described the picture in one sentence and asked the subject to answer factual questions. For example,

Sentence- The girl is riding a bike.

What is the girl doing? Answer- ride.

What is she riding? Answer- bike.

Who is riding the bike? Answer- girl.

3. Conversation with Modeling

The instructor engaged in conversation with the subject regarding personal events in school or at home. There was also discussion of the calendar and upcoming holiday events. The instructor modeled how to ask and answer questions using the Dynamyte.

4. Literacy Activities

The researcher used Hands-On Reading (Kelly & Friend, 1993) as a guide to plan literacy activities based on common children’s literature. This book provides reading activities such as the creation of student books, simple action games, and comprehension worksheets. All of the activities utilize the Picture Communication Symbols identical to the symbols on Joel’s Dynamyte. The lessons enabled Joel to participate in reading stories and answering comprehension questions.
5. Choosing Vocabulary

To encourage Joel to take ownership in his AAC device the researcher allowed him to participate in some of the programming. On several occasions, he was given the opportunity to choose the picture symbols that accompanied the words on the device.

In addition to the Dynamyte AAC device, the other components of Joel’s AAC system included oral speech, gestures, body language, and sign language. A “hard copy” print out of the Dynamyte pages served as a back up manual source.

Results and Analysis of Data

Research Question 1: Will use of an electronic augmentative communication device by an eight-year old male with Developmental Apraxia of Speech result in his improved academic performance?

The Jerry Johns Basic Reading Inventory Early Literacy Assessment is a criterion-referenced test which assesses early reading skills. The Pre-primer Reading subtest requires the student to orally read a brief passage at the pre-primer level and then answer comprehension questions. Joel was unable to participate in this assessment at the time of the 3/21/00 Learning Evaluation because he did not have the ability to pronounce words. He was able to participate in this subtest following implementation of the Dynamyte.

During the post-test he vocalized sounds for each word in the given 50 word passage. Many of his word approximations included initial or final sounds. He also vocalized several medial sounds. The researcher felt he was able to decode each of the words in the passage. Joel answered comprehension questions using a specially designed page on the Dynamyte. He correctly answered one out of five questions.
Examiner observation data from the 3/21/00 Learning Evaluation indicated Joel was able to produce the beginning sounds of most words. The researcher observed Joel using combinations of initial, medial, and final sounds during testing and tutorial sessions. Although Joel’s intelligibility remained problematic, there had been an increase in the number of words he articulated clearly.

The *Clinical Evaluation of Language Fundamentals*—Third Edition (CELF) is an individually administered assessment used to evaluate students with suspected language deficits, ages 6 years, 0 months through 21 years, 11 months. The CELF yields standard scores (mean of 10 and standard deviation of 3) and percentiles. The CELF is part of the standard test battery administered by the speech and language therapist involved in this study. She was unable to administer this test for the 2/2000 Speech and Language Evaluation due to Joel’s severe language deficits. He was able to participate in selected subtests of this assessment following AAC implementation. The portions of the test which required an oral response were modified by the creation of special pages on the Dynamyte.

The *Word Classes* subtest requires the student to make associations by choosing words that go together in a given set. Joel earned a standard score of 6 and a percentile rank of 9 on this subtest, placing him in the below average category. He was able to associate words such as *windy-rainy, hour-minute*, and *garage-car*.

The *Word Structure* subtest requires the student to apply morphological rules by completing orally presented sentences. For example, "*The girl has a notebook. The notebook is hers."* Nine items were administered on this subtest before it was
discontinued because Joel appeared to have difficulty understanding the test requirements.

The *Sentence Structure* subtest requires the student to point to one of four pictures which best represents an orally presented sentence. The student must apply rules of morphology and syntax. Joel earned a standard score of 3 and a percentile rank of 1 on this subtest, placing him in the lower extreme category. Although he attended to specific words in sentences, he was unable to comprehend the entire meaning of the sentences.

The *Listening to Paragraphs* subtest requires the student to listen to orally presented passages and then answer comprehension questions. Joel was able to correctly answer three out of five comprehension questions on each of two paragraphs at the 6-0 to 7-1 age level. He answered main idea and inference questions. He could not answer questions involving predictions.

The *Durrell Analysis of Reading Difficulty- Third Edition,* *Listening Subtest* requires the student to respond to comprehension questions following orally presented passages. On the 2/2000 Speech and Language Evaluation Joel correctly answered one out of seven questions on a story at the first grade level. Although it is possible he knew the answers to more questions, he did not have the means to adequately communicate them.

Following AAC implementation Joel was able to correctly answer three out of seven questions at the first grade level. He also correctly answered four out of seven questions at the second grade level. This places Joel at a below first grade listening level. However, his score significantly improved with AAC use.

Examiner observation from the 2/2000 Speech and Language Evaluation indicated that Joel's expressive language was limited to sound approximations, single words, and
signs. He could not adequately express himself at home or in school. Language assessments usually administered to children at his cognitive level could not be given due to his lack of expressive language abilities. With the use of the Dynamyte AAC device Joel was able to participate in these assessments. In addition, his speech output had advanced to the stage where some verbal responses were possible.

The Kaufman Survey of Early Academic Learning Skills (K-SEALS) is an individually administered norm-referenced measure of children’s receptive and expressive language skills, articulation, and academic skills. It is normed on children ages 3 years, 0 months through 6 years, 10 months. Although this test yields standard scores, it was administered to the subject as a criterion-referenced measure because his chronological age exceeds the norms. The researcher administered this test pre- and post-intervention to determine the skill difference. Following is a report of the results.

The Receptive Vocabulary items require the student to point to pictures that best represent orally presented vocabulary words. Joel’s raw scores were similar on both the pre- and post-test, indicating his receptive vocabulary remained steady during the course of the study.

The Expressive Vocabulary items require the student to name pictures. These items were difficult for the researcher to score. Although Joel’s pronunciation was inexact, the researcher was certain he knew the answers to certain items due to familiarity with his speech. The researcher resolved this dilemma by scoring this section twice. One time credit was given only for answers which were exact. A second scoring gave credit for approximations which the researcher felt were correct answers. Using the first criteria, Joel answered 3 out of 20 items correct on the pre-test and 2 out of 20 correct on the post-
test. Using the second criteria, Joel answered 15 out of 20 items correct on the pre-test and 12 out of 20 correct on the post-test. An analysis of pronunciation reveals closer word approximation post-treatment. Joel also used the Dynamyte to make word associations (see Table 4.1).

**TABLE 4.1 K-SEALS EXPRESSIVE VOCABULARY ITEM RESPONSE SAMPLES**

<table>
<thead>
<tr>
<th>Target Word(s)</th>
<th>Pre-Test Response</th>
<th>Post-Test RepONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>spoon</td>
<td>said pa</td>
<td>said poo</td>
</tr>
<tr>
<td>watching t.v.</td>
<td>said ee</td>
<td>said a-ee</td>
</tr>
<tr>
<td>book</td>
<td>said ba and signed book</td>
<td>Used Dynamyte to say read</td>
</tr>
<tr>
<td>umbrella</td>
<td>said be</td>
<td>Said be and used Dynamyte to say umbrella</td>
</tr>
<tr>
<td>star</td>
<td>no response</td>
<td>Used Dynamyte to say night</td>
</tr>
<tr>
<td>escalator</td>
<td>pointed up in the air</td>
<td>Said e-cuh and pointed up in the air</td>
</tr>
</tbody>
</table>

The *Articulation Scale* requires the student to pronounce words with varying initial, medial, and final sounds. Joel’s pre- and post-test performance indicate he was able to more closely approximate words following AAC intervention. He was also able to articulate two-syllable words (see Table 4.2).
The *Number Skills* items measure early math skills such as counting, one-to-one correspondence, quantitative concepts, and simple addition and subtraction. Joel received similar raw scores pre- and post-treatment. He demonstrated understanding of one-to-one correspondence, counting to nine, number identification to 34, and concepts of big/little. He could not complete simple addition or subtraction problems.

The *Letter and Word Skills* items measure the early literacy skills of alphabet recognition and sight vocabulary. Joel received similar raw scores pre- and post-treatment. He demonstrated more verbal responses following AAC intervention, and he used closer word approximations.

Joel’s special education classroom teacher communicated with the researcher throughout the AAC implementation. She reported Joel using the device during a limited number of academic lessons in the classroom. In addition, Joel used his device only when directed by school personnel. He used the device for calendar activities and in daily conversation with the classroom assistant during indoor recess time. He also used it in weekly, integrated small group language lessons with the speech and language therapist.
The teacher found it difficult to incorporate the Dynamyte into large group instruction due the extent of time and expertise involved in programming. She also viewed the Dynamyte as a tool to help Joel speak more clearly; she placed a much greater priority on oral speech than on use of the electronic device. However, the teacher reported that Joel’s oral speech had improved over the course of the study as a result of using the Dynamyte. She noted that using the device had increased his self-esteem, which was positively reflected in his academic work. At the end of the study the classroom assistant programmed a *Cooking Page* to enable Joel to talk about his experiences in his life skills cooking class. This page was made at the request of the classroom teacher.

Joel’s speech and language therapist incorporated Dynamyte activities into her weekly language lessons in collaboration with the researcher. The therapist had Joel use the Dynamyte to engage in conversation, play simple games, and participate in reading and talking about stories. She felt these activities could be incorporated into daily classroom activities with planning. Throughout the study the therapist noted improvements in speech and language skills as a result of using the device. She indicated Joel’s oral speech showed an increase in the number and variety of sounds produced, improved fluency, and increased volume of voice. She also felt Joel demonstrated a more thorough understanding of the concept of categories.

The researcher conducted several structured classroom observations of Joel using the Dynamyte to communicate. Speech and language lessons were observed on three occasions. Each lesson lasted 15-20 minutes and was conducted in a small group with a total of three students. Over the course of the lessons Joel was observed linking to the correct page and clearing the message bar to the point of mastery. His ability to choose
the correct symbol/word to respond to questions fluctuated. During the 2/28/00 lesson there were a number of new symbols and words on Joel’s device. This could account for his decline in accuracy. The number of times Joel verbalized his answers steadily increased. The rate at which he used vocalizations in conjunction with the AAC device remained constant. See Table 4.3 for data summary.

**TABLE 4.3 OBSERVATION DATA FROM SPEECH AND LANGUAGE LESSONS**

<table>
<thead>
<tr>
<th>SKILL</th>
<th>11/8/00 Observation</th>
<th>1/17/01 Observation</th>
<th>2/28/00 Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chose correct symbol in response to question</td>
<td>89%</td>
<td>100%</td>
<td>77%</td>
</tr>
<tr>
<td>Number of times answer verbalized alone</td>
<td>9</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Number of times answer verbalized in conjunction with Dynamyte</td>
<td>8</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>

Anecdotal records of tutorial sessions revealed usage of the Dynamyte in a number of academic activities. Joel used the keyboard function on the device to spell and speak as well as read words. He discussed the calendar and weather during each session, which provided reinforcement of these concepts. The Hands-On Reading activities provided Joel with practice in reading and discussing literature, thereby facilitating story comprehension. The categorical arrangement of the vocabulary on the device gave Joel continual practice in learning about categories and word associations.

Throughout all academic work the instructor modeled using the device to provide social praise (i.e. *Good job! Terrific! Awesome!*). Joel followed this model when prompted, but he did not use the phrases spontaneously during the tutorial sessions.

The researcher felt that AAC implementation assisted Joel in becoming more active in his academic work. It provided an additional means to reinforce concepts in a highly
motivating manner. The researcher also concluded that AAC improved Joel's oral speech capabilities. This had a positive effect on all of his academic work.

**Research Question 2: Will use of the augmentative device result in the subject's improved social interaction with peers?**

The Vineland Adaptive Behavior Scales (VABS) is an individually administered scale that measures communication, daily living skills, socialization, motor skills, and maladaptive behavior. It yields standard scores, percentile ranks, age equivalents, and adaptive levels. The VABS is administered to people familiar with the subject of the assessment. There are two forms of the VABS, the classroom teacher scale and the parent scale. Selected subtests of this scale were administered to Joel's mother and his classroom teacher to determine his levels of social interaction with peers pre- and post-intervention. Identical subtests were also administered to the classroom assistant in the post-treatment condition.

A qualitative item analysis of the Socialization Domain of the Vineland Scales indicated an overall improvement in social interaction with peers. Joel's mother reported improvements in making friends, spending time with friends, and attending school events with peers under adult supervision. Improvements were also shown in Joel's ability to converse with peers on topics of mutual interest and in his ability to play games involving turn-taking and keeping score. Skills that remained constant over the course of the study included responding verbally to others and asking permission of peers to use their toys. Joel's ability to engage in simple interaction games with others also remained steady.

Through the Vineland Scales Joel's classroom teacher also indicated that he developed a preferred group of friends during the course of the study. She reported that he began to
attend school events with friends under supervision. The teacher felt Joel’s interest in the activities of others remained constant, as did his ability to initiate conversation and play simple games with others.

At the end of the study the classroom assistant agreed with Joel’s mother and teacher in reporting the development of a preferred peer group. In reflecting on Joel’s display of emotions, he suggested an *Emotions* page be added to the Dynamyte to allow Joel to express a variety of emotions in social situations.

*Research Question 3: Will use of the augmentative device result in the subject’s improved social interaction with family members and persons in the community?*

Interviews with Joel’s mother indicated a positive change in his social interaction within the family. Joel used the device after school each day to talk about what he did and who was present. He frequently used the device when playing board games with his older brother. He also liked to tell “knock knock” jokes to the family.

Joel’s mother reported it was easier for him to communicate with all family members as a result of using the Dynamyte. She noted that distant family members who had not seen Joel for several months were pleasantly surprised with the improvements in his oral speech.

In the home, the mother felt the Dynamyte was especially helpful when breakdowns in oral communication occurred. For example, one afternoon Joel had a conversation with his mother after school. He used oral speech to tell her that one of the activities of the day was cooking, and that the class had made spaghetti. Joel’s mother asked what ingredients they had used. Joel repeatedly said “Ssss.” Joel’s mother could not understand what he was trying to say. On his own, Joel retrieved the Dynamyte and said
“cheese.” He had added parmesan cheese to his spaghetti. Joel’s mother reported that he frequently used this communication repair strategy.

Joel’s parents stated they felt the augmentative device helped Joel to communicate his wants, needs, thoughts, and feelings in a more effective way. They also saw marked progress in his oral speech. When Joel decorated the Christmas tree with his family this past year, he said the word happy for the first time. Additional words and phrases that emerged over the course of the study included *I don’t know, Go away, Let’s go home, Cape May,* and use of the form *ing* (eating, playing). These improvements positively impacted Joel’s social relationship with his family.

Joel’s mother reported that he did not take the device into the community. Even though she valued the AAC approach, she remained hesitant to have Joel use the device in public because it made him appear “different.” She also reported fearing the device would be damaged or lost. This was especially disconcerting in light of the Dynamyte’s high cost. However, Joel did use the device prior to excursions into the community, and he used it upon return to talk about his experiences. For example, he talked about what he would order to eat at McDonald’s prior to the family going out to eat, and then he would discuss the experience when he returned home. The researcher suggested a way to introduce AAC usage into the community might be to begin someplace the mother felt comfortable, such as church.

Research Question 4: *How do parental and teacher views of the subject’s communicative competence change with the introduction and use of the augmentative device?*
As discussed above, the subject’s parents indicated improvements in Joel’s communication abilities with the implementation of the AAC device. Joel’s expressive language deficits had previously limited his ability to adequately relate to others in his environment. With the Dynamyte, he was able to communicate his wants, needs, thoughts, and feelings. He also used the device to relate his experiences. His mother reported he often explored the Dynamyte pages on his own for up to an hour at a time. He liked “stringing” together long lists of words, and he laughed at his ability to “be funny.”

Joel’s parents reported better oral speech, which they attributed to the device. His words contained more sounds and were more intelligible than at the beginning of the study. He also used brief phrases and sentences, whereas before he had vocalized only single words. Joel rarely used the Dynamyte to ask questions, although he did participate in “back and forth” conversation with adults.

Joel’s classroom teacher also documented improved speech, and she attributed this to usage of the augmentative device. Although she indicated she did not want Joel to become dependent on the device for all of his communication, she felt the Dynamyte had a valuable place in his educational program. She felt it was especially useful in individual and small group conversation and in providing clarification in oral communication.

Joel’s speech and language therapist reported similar improvements in oral speech and overall ability to communicate. She felt the device could be used successfully throughout the school day to enhance Joel’s classroom participation.
Summary

The following findings were discussed in this chapter. In relation to academic development, the subject was able to participate in several standardized and criterion-referenced assessments following AAC implementation. These assessments were unable to be administered to the subject prior to AAC usage due to his severe expressive language deficits. Overall test results indicated an improved rate of academic performance. Improvements were also noted in oral language abilities and participation in early reading activities. The subject’s parents and school personnel reported progress in social interaction with peers following AAC implementation. Parental reports also indicated improved social interaction with family members. There was no opportunity to use the AAC device in the community because the subject’s mother was concerned about his appearance of being different and with possible damage to the device. Parental, teacher, and speech therapist views of the subject’s communicative competence changed over the course of the study. Before AAC the subject was viewed as limited in his ability to adequately communicate with others in his environment. With use of the augmentative device he was able to answer questions, relate experiences, and tell jokes. He exhibited improved oral speech in terms of variety and number of sounds and words produced, increased volume, and improved fluency.
CHAPTER 5

SUMMARY, FINDINGS, AND CONCLUSIONS

Summary and Findings

The purpose of this study was to examine the academic and social effects of using an electronic augmentative communication device with an eight-year old male who has been diagnosed with Developmental Apraxia of Speech.

The subject was enrolled in a self-contained special education classroom for children with multiple disabilities. The class was located in a public elementary school in Southern New Jersey. The subject's educational classification was multiply disabled (neurologically impaired and communication impaired), pursuant to the New Jersey Special Education Code. He had a history of special education placements and had received intensive physical therapy, occupational therapy, and speech and language therapy.

Traditional speech therapy methods to treat the subject’s apraxia were not effective. Communication means were limited to sounds, word approximations, several single words, gestures, and sign language. Since this communication system did not adequately meet his communication needs, he was referred to the Technology for Life and Learning
Center in Trenton, NJ for a professional augmentative and alternative communication evaluation.

Results of the AAC evaluation recommended purchase of a **Dynamyte 3100** electronic augmentative communication system with a **Gateway 54** application program and a **Picture Communication Symbols** application. The subject’s school district subsequently purchased the AAC device and the appropriate applications. The researcher then began instructing the subject in how to use the AAC device.

A variety of instructional strategies were utilized to teach the subject effective AAC use. Modeling, demonstration, prompting, games, and literacy activities were several of the techniques implemented.

Ongoing consultation with the subject’s classroom teacher, speech and language therapist, classroom assistant, and parents addressed programming issues. The consultation also tracked the subject’s progress in communication, academics, and social skills.

Standardized tests, criterion-referenced assessments, and adaptive behavior rating scales provided further information regarding the subject’s progress.

Study results indicated an increased rate of academic performance, improvements in listening comprehension, greater participation in literacy activities, and improved understanding of categories. Familiar adults reported that AAC improved the subject’s communication skills. Oral speech improved in fluency, volume, and number and variety of words and phrases spoken. Progress was noted in the subject’s interaction with peers in terms of the development of a preferred peer group and time spent with peers at school events. Social interaction within the family improved as well. There was no direct effect
on interactions within the community because the subject used the device only at home and in school.

**Discussion**

The use of the Dynamyte AAC device by the subject of this study will no doubt continue for many years to come. At the conclusion of this research the individuals involved set new objectives for the subject:

1. Use the Dynamyte to ask *who, what, where,* and *why* questions.
2. Combine three to four words into syntactically correct sentences.
3. Use the Dynamyte throughout the school day, especially during academic activities.
4. Expose others in the school environment to the Dynamyte AAC device, allowing the subject to demonstrate its use.
5. Begin to use the device in community settings, as the family feels comfortable.

In addition to setting new objectives, the subject’s parents made several requests regarding the Dynamyte at his recent IEP meeting:

1. The school district will purchase a warranty and comprehensive insurance on the Dynamyte to protect against malfunction, damage, loss, and theft.
2. The school will arrange for the classroom teacher and speech and language therapist to attend ongoing training sessions regarding programming and device updates.
3. Weekly programming time will be scheduled to allow programming of the device by a trained individual.
4. The subject will engage in daily classwork using the device with assistance provided by trained personnel. These requests will be investigated and responded to by the Child Study Team.

Clearly the new objectives and the parental requests regarding the Dynamyte suggest a vested interest in using AAC to enhance the subject’s communication, academic, and social skills.

**Conclusions and Future Directions**

It is clear from the results of this study that the subject’s communicative competence was enhanced as a result of AAC implementation. This finding parallels the results of other research on AAC discussed in Chapter 2 of this study.

From this study and the review of the professional literature on augmentative and alternative communication, the researcher has come to several conclusions regarding this important and growing field:

1. The use of AAC is a complex process that requires extensive training and support. To be successful in the school setting there must be appropriate evaluation, device selection, and ongoing training of personnel. In addition, sufficient time must be allotted for programming.

2. It is vital to have a team approach when considering or implementing AAC. Families and school personnel must work collaboratively if systems are to be successful.

3. The use of AAC improves the development of oral speech in some individuals. AAC does not inhibit speech or result in a regression of speech abilities.
4. There continues to be stigma attached to people with disabilities. Specialized equipment, while helpful in meeting individual needs, may signal differences to outsiders. These differences are often perceived as negative.

5. It is important to encourage people with communication impairments to use all available means to communicate. Electronic devices are only one facet of a multi-modal communication system.

In light of these conclusions the researcher offers several suggestions to further expand and improve use of augmentative and alternative communication. First, funding needs for AAC are great and are often unrealized. Considerations include equipment needs, adequate personnel, and ongoing training. School districts should be made aware of the benefits of AAC so that funding can be secured (Blackstone, 1989; Chambers, 1997; Parette & Angelo, 1996).

Second, training in AAC should begin at the college undergraduate level. Many colleges do not offer adequate courses in AAC for special education and speech and language pathology majors, yet these are the individuals who will someday be expected to implement AAC with their communication impaired students and clients (Parette, Hourcade, & VanBiervliet, 1993; Reichle, 1997).

Finally, disability awareness needs to be addressed in schools to reduce the stigma attached to individuals with special needs. Young children should be exposed to peers with disabilities and have the opportunity to learn about differences in a positive manner. The researcher feels that with sensitivity training there is a greater likelihood that people will be more accepting of individuals with special needs.
If these suggestions are acted upon, society will hopefully witness more people with communication impairments participating in and enjoying everyday activities. As one AAC user stated, ‘Speech isn’t everything but communication is’ (Huer & Lloyd, 1990, p. 246).
Reference List


New Jersey Administrative Code, Title 6A; Chapter 14 Special Education, November 1, 1998.


Commercially Available AAC Systems

Ablenet
1081 Tenth Ave. S.E.
Minneapolis, MN 55414-1312
www.ablenet.com
1-800-322-0956

Enabling Devices- Toys for Special Children
385 Warburton Ave.
Hastings-on-Hudson, NY 10706
www.enablingdevices.com
1-800-832-8697

Mayer-Johnson Company
P.O. Box 1579
Solana Beach, CA 92075-7579
www.mayer-johnson.com
1-800-588-4548

Prentke Romich Company
1022 Heyl road
Wooster, OH 44691
www.premtrcom
1-800-262-1984

Dynavox Systems, Inc.- a division of
Sunrise Medical, Inc.
2100 Wharton Street
Pittsburgh, PA 15203
Internet: sales@synavoxsys.com
1-888-697-7332

Appendix
Internet Online User Group

ACOLUG
Augmentative Communication On-Line User Group
www.temple.edu/inst_disabilities/acolug

Appendix

B
Dynamyte Pages at Conclusion of Study

Appendix

C
Social Page
Knock Knock!

Who's there?

bee

Who?

Amsterdam

Who?

Cape

Who?

Adam

Who?
Knock Knock!

Who's there?

What's your hurry?
Calendar and Weather Page

It is sunny windy
rainy snowy
hot cloudy
cold foggy

The month is January February March
number
April May June
July August September
October November December

yesterday today tomorrow

and

Sunday Monday Tuesday Wednesday Thursday Friday Saturday
Games Page

<table>
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<th>Legos</th>
<th>card game</th>
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<td>go fish</td>
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<td>break ice</td>
<td>chip o</td>
<td>air hockey</td>
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<td>yellow</td>
<td>orange</td>
<td>purple</td>
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<td>I did it</td>
<td>good job</td>
<td>you won</td>
<td>you're cheating</td>
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<td>clear</td>
<td>master screen</td>
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Star Wars Page

JEDI KNIGHTS

STAR WARS
EPISODE I

ARE SPRITE IS
GOOD BAD
FIGHT BRAVE
FUNNY WINS
## Legos Page

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*Note: The images are not readable.*
January Page

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March Page

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April Page
Things to Say Page
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<td></td>
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Classmates Page

Tom B.  Jen  Paige
Annie  Andrew  Mike Z.
Adam  Sean
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Sports Page

I like baseball, hockey, basketball, football, and
play

watch, boxing, tennis, golf, soccer, clear
master screen
Colors Page

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My Class Page
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Class Jobs Page
Clothing Page
Rhyming Words Page
Cooking Page

We made cake cookies with butter eggs flour.
Brownies bread bake mixer sugar water baking soda.
Pizza pie measure oven salt vanilla cake mix.
Cupcakes muffins and used chocolate chips milk brown sugar.
Easy hard healthy not healthy.
Good OK yucky.
Clear master.
Foods Page
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## Animals Page

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Dogs Page

Gretel

Sophie

Coming soon... Baji

Dogs
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Dear Zoo Book Page

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[Diagram of a typewriter keyboard with keys labeled a to z]
Internet List-Serve

DynaMicDuos
List Owner: DynaMicDuos-owner@egroups.com
http://www.egroups.com/group/DynaMicDuos

Appendix