

ATTITUDES OF COMMUNICATION PARTNERS TOWARD AAC USERS

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ABSTRACT

**JULIA LOBUR: Attitudes of Communication Partners Toward AAC Users
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The purpose of the current study was to investigate the relationship between the attitudes of communication partners of augmentative and alternative communication (AAC) users and device voice output (specifically the Tango! and DV4). Also, the study examined the relationship between attitudes and age of the communication partner of the AAC user. Six children, twenty-five pre-service Speech-Language Pathologists, and four in-service Speech-Language Pathologists familiar with AAC watched videos of an interaction between a child using AAC to communicate with an adult. Following the videos, each participant responded to an attitude scale questionnaire. No significant effect was found for the child participant attitudes toward the Tango! and DV4. However, significant results were found between the devices for pre-service adults, in-service adults, and adults as a whole. Recommendations and clinical implications are suggested.

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CHAPTER 1

INTRODUCTION

The purpose of this study was to investigate factors which may potentially influence attitudes of communication partners of AAC users. There are a multitude of factors influencing the formulation of attitudes toward AAC users. These factors range from device technology, familiarity with a person with disabilities, to developmental trends. By researching what factors help create the most positive attitudes toward AAC users; individuals working with AAC can maximize the potential of the items found to be most positive.

The current study specifically focused on the voice output of two systems (Tango! and DV4) and their influence on the attitudes of both child and adult communication partners. These two devices were selected because the Tango! is a brand new device that was designed to support relationship building and social interaction while the DV4 is the device with the highest volume sales for school aged children with complex communication needs. If the developers of the Tango! were successful in achieving their goal, it would follow that the device would generate more positive attitudes toward AAC among communication partners. Previous research focusing on voice output communication devices and the influence on attitudes has shown mixed results (Schlosser, 2003; Durand, 1999; Gorenflo and Gorenflo, 1994). The current investigation attempted to build on the findings

of previous studies to see if there is a clear relationship between the characteristics of these two AAC devices and the attitudes of communication partners.

Research has found that individuals with similar attitudes form social groups. It is difficult to enter and gain acceptance from a group who has negative attitudes toward a person who is seen as different. However, if communication partners have more favorable attitudes toward AAC users they may engage in more successful peer interactions and social acceptance (Beck et. al, 2002). It is necessary for AAC users to communicate with their peers to learn social skills and have natural situations to practice those skills. If negative attitudes prevent children with disabilities from successful interactions, they will not have as many opportunities to develop social skills (Lillienfeld & Alant, 2002; Gorenflo & Gorenflo, 1991; O’Keefe, Brown, & Schuller, 1998). Conversely, if peers have positive attitudes toward AAC, they may view the user as having more communication competence. If there are features of AAC which promote positive attitudes then those characteristics can be highlighted in therapy treatment to create an impression of increased communicative competence (Beck & Dennis, 1996).

With more studies focusing on this area, researchers may be able to determine which features create more positive attitudes, which will help clinicians and AAC users determine what device is best for them, and which create more effective treatment programs. There are significant clinical implications in this area. Children with disabilities are regularly being mainstreamed into general education classes (O’Keefe, Brown, & Schuller; 1998). A potential benefit for children with disabilities in general education classrooms is the opportunity to increase interactions with peers. It is important to increase the probability that these interactions are positive and successful. It is necessary to conduct research on the

attitudes of communication partners toward AAC because children who use AAC are in classrooms with peers and associating with adults in their environment and attitudes (positive or negative) of communication partners determine if interactions will be successful.

The study reported here investigated the issue of attitudes toward AAC by asking child and adult communication partners to view short videos of a child using two devices (Tango! and DV4 with Gateway 40 software) and completing an attitudes survey after each. The results of the study are reported separately for the children and the adults and are discussed with reference to the features of the two devices that may have influenced the attitudes of the two groups.

CHAPTER 2

LITERATURE REVIEW

Introduction

It is estimated that more than 2 million people in the United States today have communication disorders severe enough to necessitate the use of augmentative and alternative communication (AAC) systems (Beck et. al, 2000). As the number of individuals requiring AAC devices grow, there is a need to better understand the potential successes and struggles individuals with communication disorders face when they use or attempt to use AAC. One particular area in need of attention is the arena of social acceptance. If AAC is to be implemented successfully, the techniques and devices must be accepted both by the individual requiring the supports and those who will serve as communication partners. The goal should be to create environments where individuals with communication disorders are able to succeed, especially in social situations.

In society, individuals typically form social groups or circles comprised of members with similar views and/or attitudes. Successful peer interactions are most likely to occur within social groups that accept individuals involved in the communication exchange. People “attempt to interact with others who hold similar attitudes so that behaviors that are consistent with expressed attitudes are encouraged or enforced” (p. 217, Beck et. al, 2002). More specifically, an individual’s attitudes and behaviors are highly influenced by their social interactions and social groups reinforce the attitudes they value as important to their members.

The Multifaceted Nature of Attitudes

An individual's attitude towards other people or things is highly complex and multifaceted construct. Attitudes are formulated by an initial emotional response to a stimulus and the cognitive thought process follows the initial emotions evoked. The behavior of the individual is elicited based on their combined emotional and cognitive thought processes. The emotional response is typically automatic while the cognitive response is deliberate and controlled. These two co-occur, and based on their interaction create an outcome, or behavior (Beck, Fritz, Keller, & Dennis, 2000). Therefore, the evaluation of others, or attitudes held towards others, can either be favorable or unfavorable depending on the emotional response evoked and the counterbalancing cognitive rationale. Research indicates there may be a developmental trend of attitudes in children. As children mature, there seems to be a change in, or leveling of the amount of emotional response and cognitive thought used when determining attitudes (Gorenflo & Gorenflo, 1991).

The concept of developmental trends of attitudes was studied in detail by Ryan (as cited in Beck et. al, 2000) whose results supported the idea of developmental trends and peer perceptions. Attitudes of younger children were less accepting than those of older school age children regarding disabilities in general. The trend indicated an increase in positive attitudes throughout elementary school to high school. However, there was a period of adulthood (late teens) during which attitudes once again became more negative.

There is a growing body of research regarding attitudes children and adults hold toward persons with disabilities, specifically those who use AAC. Understanding this body of literature is important if we are to understand how to meet our goal of creating

environments and devices that maximize success for persons with communication disorders as they attempt to engage successfully in social situations.

The Importance of Social Interactions in Communication

Communication is an integral component of social interactions in life. It is necessary to have some form of communicative means (verbal, gestures, facial expression, etc) to connect with others. The inability to express oneself can lead to isolation from other members of society, making it virtually impossible to become an active member of a social group, without the capability to share or exchange feelings and experiences. Simple behaviors, as small as a sigh or laugh, have the potential to open up communication avenues by indicating to a communication partner “Oh, I’ve been there before” or “I can’t believe that actually happened.” The speaker knows that the partner has received the communication message and there is a bonding moment where they can relate to each other.

In social interactions, communication competence helps individuals reach communication goals. There are four important components of communication competence as defined by Light (1997) : expressing needs and wants, developing social closeness, exchanging information, and fulfilling social etiquette routines. When expressing wants and needs, focusing on the importance of information transfer and not on the people engaged in the interaction is essential. Social closeness is more about the participants in the interaction. Communication does not revolve around what is said; it is more important that the participants are together and successfully relating to one another. Exchanging information is necessary when an individual learns something new or attempts to explain a concept to someone who does not agree or understand. Social etiquette or politeness is necessary to fit in with society (ex. say “hello” when encountering someone).

One way individuals learn communicative competence is through meaningful social interactions with a variety of individuals. They can also listen and watch their peers to learn the skills in the exchange and flow of conversation. Most individuals have the opportunity to practice skills in a natural environment. However, AAC users may have limited opportunities to interact with peers because of device limitations. Currently, most AAC devices are programmed to allow their users to express wants and needs (Light, 1997). However, it is also important to have adequate vocabulary conveniently located on a communication device to allow for smooth communication interactions across other areas of communicative competence. The device must be set up to provide access to the other areas of communicative competence so that AAC users can be effective social communicators. Social interactions may be limited if AAC device usage is viewed negatively by potential communication partners. It is important for communication partners to see each other as communicatively competent, so they will be open to establishing and maintaining social interactions. It is also important to learn communication competence throughout maturation to maintain appropriate levels of interaction with peers over time.

A low rate of interaction between AAC users and their peers has been documented (Lillienfeld & Alant, 2002). Low interaction rates may be detrimental to a child with disabilities because children need practice developing social skills and communicative competence. When the number of potential interactions is limited the child does not have sufficient opportunities to mature in the social/pragmatic domain and develop communication competence. One potential factor limiting interactions may be negative attitudes held by peers towards the AAC user. A combination of a limited number of peer interactions and possible negative attitudes of communication partners will likely result in

unsuccessful communication attempts, thus affecting social acceptance of children with disabilities (Gorenflo & Gorenflo, 1991; O’Keefe, Brown, & Schuller, 1998).

Attitudes Toward AAC

While there is a growing body of literature on a variety of characteristics that potentially affect attitudes toward AAC usage, there is a need to do research in the area of attitudes toward device users. It is increasingly likely that children with disabilities will be mainstreamed into general education classrooms and therefore it is important to understand what features or characteristics of AAC devices promote favorable attitudes of communication partners and facilitate positive peer interactions. Also, device features are becoming increasingly complex with advances in technology and criteria for device eligibility is expanding to include a wider range of disabilities. For instance, high tech AAC devices with infrared head pointers which can select vocabulary are now available. This advancement in technology allows individuals who cannot access a device with their hands or arms to communicate using a device with subtle movements of their head. New technology can read eye movements allowing an individual who had no body movement to communicate via their eyes. Obviously, with these advancements the use of AAC devices is becoming possible for a broader range of people. By identifying features that create more favorable peer attitudes, devices can be selected which are not only physically accessible but help individuals enhance social interactions and acceptance.

The company that developed the Tango! did so with the goal of enhancing social interactions and acceptance by communication partners and peers. As described on the company web site, the Tango! was developed to meet “the dreams so many other had – of better communication, of better support, of better relationships.” While it is reasonable to

expect that other companies have an interest in supporting the social interactions and acceptance of customers using their devices, no other AAC device manufacturer has publicly acknowledged that they developed their devices with this as a primary goal.

The Influence of Quality of Voice Output on Attitudes Toward AAC

One feature of AAC devices that has been increasingly studied is voice output. As technology continues to evolve and become more sophisticated, voice output systems are capable of creating realistic speech sounds. Three options currently available for speech output for AAC devices are analog, digital, or synthesized (Schlosser, 2003). Each type of voice output is associated with pros and cons which potential device users should compare when deciding what system best suits their communication needs. Device user input should be an important factor when selecting a voice output system because output methods lend a different style and feel to the conversation. The primary form of voice output found in the two devices employed in the current study is different. The Tango! uses predominantly digitized speech and even has a feature that allows a message recorded by an adult to be morphed to take on the gender and age of a particular child. In contrast, the DV4 primarily uses synthetic speech.

Schlosser (2003) analyzed existing research on voice output systems looking at the effects of speech output on learners, communication partners, and learner-partner dyads in hopes of creating a concise summary of potential benefits and drawbacks for individuals to use when deciding which AAC device best suits their communication needs. Overall, Schlosser found that the current body of research examining attitudes of individuals towards speech output devices offers mixed results. Previous studies have a variety of extraneous

variables which make it difficult to examine if there is a direct connection between attitudes of the device user based solely on voice output.

Schlosser also found a need to investigate if favorable attitudes, because of increased intelligibility, lead to perceptions of greater communication competence. A connection between attitudes and communication competence would suggest that by establishing interventions which target peer attitudes, the individual who uses AAC would indirectly benefit by appearing more communicatively competent than before attitude intervention.

While the connection between quality of voice output and attitude is unclear, it may be that when AAC user requests are more intelligible, communication partners will respond more quickly to what is said (Durand, 1999), and therefore have more positive attitudes regarding the interaction. Furthermore, the time that is saved during interpretation can then be used on meaningful conversational exchanges. Schlosser (2003) surmised it is too difficult to create broad categories of pros and cons for speech output devices. He highlighted the need for future research to expand on previous studies in order to produce greater generalizations over a variety of communication situations, AAC users, and communication partners. Speech output device choice is highly dependent on the AAC user, communication partners, and the situation in which they interact. The impact of the quality of speech output on attitudes is still unknown.

While Schlosser's (2003) findings were inconclusive regarding the type of voice output that most influences attitudes towards AAC, one study that explored attitudes of individuals towards low tech, non-computerized, and high tech, computerized AAC device users found more favorable attitudes towards individuals using high tech synthesized voice output AAC devices (Gorenflo & Gorenflo, 1991). A follow-up to this study (Gorenflo &

Gorenflo, 1994) contributed to our knowledge of the impact of synthesized voice output on attitudes. The researchers attempted to explore the impact of variations of synthesized voice output on attitudes of communication partners. Gorenflo and Gorenflo examined four different AAC devices and their affect on the attitudes of communication partners. Previous research indicated that the increased intelligibility of a speaker's utterance may promote more favorable attitudes towards an AAC user (Gorenflo & Gorenflo 1994), but they wanted to know: are listeners' attitudes affected by their preference for a specific synthesized speech device? Important clinical decisions could be made if researchers found a connection between opinions of the speaker and attitudes elicited by their communication partner. Furthermore, if a specific type of voice output promotes favorable attitudes, then there may be a possibility of increasing positive social interactions and social acceptance of the device user if the preferred type of voice output is used.

Results of the Gorenflo and Gorenflo (1994) study indicated a significant effect of more positive attitudes towards AAC users whose synthesized voice is more intelligible making it easier to listen too. There was less effort needed to understand the speech output, placing a greater focus on the content of the message. However, there was not a significant effect for more favorable attitudes when the AAC user had a gender appropriate voice. A potential explanation was that the participants were undergraduate students training to be educators. Since participants were training for a career working with children, they may be less likely to allow gender appropriateness to influence their attitudes. Possibly, gender appropriate synthesized voice output would evoke more favorable attitudes if the individual was communication in a more natural environment.

In a previous study Lillienfeld and Alant (2002) attempted to measure attitudes of children towards unfamiliar peers using AAC devices with and without voice output. The investigators measured attitudes in terms of the emotional component of attitude formulation, the cognitive component of attitude formulation, and perceptions of communicative competence. In this study, researchers chose to use a child who had cerebral palsy and was proficient with the DeltaTalker (Prentke Romich Inc.) AAC device. Involving a child with disabilities who communicated with an AAC device, created a more 'real world' communication experience. The participants in the study were six and seventh graders in a school which did not enroll students with severe disabilities. The majority of the participants had little to no contact with people who had disabilities. Results of the study indicated that voice output had a significant effect on perceptions of communicative competence. The use of a voice output device led to an increase in favorable attitudes towards the child versus no voice output. There was also a significant effect for gender. The girls in the study had more positive attitudes in general for both voice output and no voice output devices. The results were consistent with previous research (Beck & Dennis, 1996).

Some differences in the Lillienfeld and Alant (2002) study may explain why the data collected resulted in significant findings. First, the participants were able to see the majority of the child's body using the AAC device instead of just the child's hands or face. Second, the conversation between the child and his communication partner focused on computers and the internet which is an intellectual conversational topic. Finally, the communication partner did not repeat what the device user said after each utterance. Each of these differences set the current study apart from existing studies and may explain why differences were found.

The Influence of Familiarity with Disability on Attitudes Towards AAC

Another feature, which researchers believe may impact AAC attitudes, is the familiarity communication partners have toward a person with disabilities. Beck & Dennis (1996) focused their investigation on attitudes of children toward a similar-aged child using AAC when the experiences of the children to another child with a disability varied. The researchers varied familiarity with disability by selecting children from different types of schools (inclusive model where children with disabilities participate in general education classroom for at least a portion of the day vs. classrooms where children with disabilities are separated from their age-appropriate peers the entire day). They also varied the type of device used (low tech vs. high tech). Participants in the study included 186 sixth graders from four different schools; two school enrolled children with disabilities and two did not. There was a significant effect for gender and familiarity. The girls had more favorable attitudes than boys, and children in integrated school had more favorable attitudes than children who attended non-integrated schools. These findings support previous research findings.

Interestingly, the results indicated no significant effect for type of AAC technology (low tech vs. high tech) on attitudes toward device users. Possible explanations for the lack of significant findings included the fact that the attitude scale may not have been sensitive enough to pick up on subtle differences in attitudes evoked by the levels of AAC technology. Also, AAC technology may be directly linked to the disability type of the child. It is possible that children with different types of disability may have yielded a significant effect. Furthermore, a conversational script was not used to guide the videotaped interactions between the child with disabilities using the different levels of AAC technology and the

communication partner. Differences in conversational flow and direction may have influenced attitudes along with type of AAC technology. Despite the lack of differences in attitudes based on type of AAC technology, participants familiar to individuals with disabilities had more positive attitudes than those who were unfamiliar.

Important clinical implications can be drawn from this study. When planning intervention special emphasis needs to be on boys because girls in general have more favorable attitudes towards AAC. Also, the greater the familiarity of peers towards individual who communicates with AAC, the more likely the attitudes will be favorable. Therefore, intervention should focus on exposing children to others with disabilities to increase awareness and familiarity with individual who are different than them.

The Influence of Age on Attitudes Toward AAC

Another characteristic that may influence attitudes toward AAC users is age. Developmental trends have been studied to see if there is a relationship between age and attitudes towards AAC. The purpose of Beck et al. (2000) study was to examine peer attitudes toward communication partners focusing on AAC technique, familiarity with someone with a disability, and the relationship between the two with regards to age. Results of the study indicated there were developmental trends of attitudes. A greater number of children in grade one indicated the sad face on the rating scale used to measure attitudes, whereas in the fifth grade there was a greater variation of emotions elicited (not just the happy or sad face). Also, participants in grade one demonstrated more negative attitudes towards the device user while participants in grade three demonstrated an increase in positive attitudes. However, in this particular study, by grade five, participants demonstrated an increase in negative attitudes towards the AAC user. This finding contradicts previous

research by Ryan in 1981 (as cited in Beck et. al, 2000) suggesting that positive attitudes towards AAC exist through the late teen years.

A final age-related significant effect was found between physical status of the AAC user and type of AAC technique. The significant effect of the severity of the disability and the more negative attitude elicited was found for children grade one only. There is a possibility that these younger children are more affected by emotions evoked (Beck et. al, 2000). It is also possible that the images of the children with disabilities evoked feelings of sadness or sorrow for the young children while the image of a person without a visible disability using an AAC device evoked other emotions. For example, it may have evoked feelings of anger or withdrawal from the interaction, because the device was being used when nothing was visibly wrong (Beck et. al, 2000). This study elicited strong emotions (both positive and negative) from communication partners of AAC users.

Summary of Attitudes Toward AAC

It is evident that overall attitudes of communication partners toward AAC users are affected based on a variety of characteristics and device features; specifically voice output, familiarity with a person who has a disability and age of communication partner all play a role in the formulation of positive and negative attitudes. Previous studies have identified characteristics which might potentially interact to form attitudes toward AAC users, however in the current body of literature it is unclear the exact relationship. The purpose of the current study is to build on previous research in the attempt to better define the relationship between voice output and age on attitudes of communication partners toward AAC users.

Developing AAC to Influence Attitudes

The possibilities for AAC device features are extensive, but how can those features which are most important in enhancing the attitudes of potential communication partners be identified? O’Keefe, Brown, and Schuller (1998) expressed the importance of finding an AAC device that fits the need of the user. It is unclear however which features of a device create the most opportunity for social interaction. By tailoring AAC systems to best meet the needs of users, we can enhance interactions, prevent frustration, and limit the likelihood of device abandonment and missed communication opportunities (O’Keefe, Brown, & Schuller, 1998). In order to do this, it is important to identify which characteristics of AAC devices facilitate positive attitudes, social acceptance, and improved perceptions of communicative competence.

O’Keefe, Brown, and Schuller (1998), attempted to investigate the most desirable features of AAC devices for five groups: (a) users of communication aids, (b) familiar conversational partners of communication aid users, (c) International Society of Augmentative and Alternative Communication service providers, (d) manufacturers/distributors of aids, and (e) individuals unfamiliar with communication aids and their users. The investigators found that nearly all of the 186 potentially desirable device items surveyed were rated as having at least some importance to one or more of the five subgroups. Furthermore, 31 of the 186 items were deemed as critically important (the highest rating possible) across the five subgroups (Appendix A). Focusing on the 31 critically important items when choosing a potential AAC device could lead to enhanced attitudes among communication partners.

The results of the O'Keefe et al. (1998) study were highly variable with respect to the five groups of participants. However, a few key elements were found to be critically necessary when features identified by all five subgroups were combined and analyzed. These included situational flexibility, reliability, learning ease, language functions and intelligibility. Focusing on these features could help promote an increase in positive social interactions for AAC users.

Beck, et al. (2002) focused on increasing conversational rates and decreasing pause times to increase the communication competence of the device user. The researchers hypothesized that it would be beneficial to have a device that maximized the speed of output and offered the capability to initiate appropriate conversation quickly. They also hypothesized that it was possible to use specific device characteristics that promoted desirable features to create the impression of a greater amount of communicative competence than the device user may have. For instance, if an individual with low communicative competence used a high tech device that was perceived as desirable to the conversation partner, the partner may overlook the actual competence level of the AAC user. Results of the study found no significant effect for communicative competence, the type of device used, or participants' age. However, a significant effect for gender was shown with girls having a more positive attitude toward the AAC user than boys.

There are a few possible explanations for lack of significant effect within the study. One factor that may have affected the significant effect was that the scripted responses of the AAC user were one to two word utterances. Another potentially influencing factor was the little initiation of speech by the device user. Also, according to Gorenflo and Gorenflo (1991) attitudes are developed through the interaction of emotional and cognitive thought

processes. It may be possible that young children are more emotionally driven and as they age, cognitive processes fine tune and become more pronounced/active in developing attitudes. This shift in attitude components may be why communication competence and device style did not show significant results. The concept of switching or leveling of emotions and cognition may also explain why Blockberger, Armstrong, O'Conner, and Freeman's (1993) found no significant effect for age of third through fifth graders attitudes towards AAC usage. Furthermore, in the study all children who participated indicated they were familiar with someone who had a disability. It is possible that if children are familiar with others who have disabilities, they may overlook pauses in the conversation. Pauses in conversation could be viewed as an individual's unique speaking style, rather than a sign of reduced communicative competence. Children who are exposed to disabilities may develop more positive attitudes (as shown in this study with no significant effects of communicative competence) and may not allow a disability to affect social acceptance and peer interactions.

Summary

The purpose of the current study is to continue the investigation of attitudes of communication partners towards augmentative/alternative communication. The research focuses on device technology, age of communication partner, and experience in the field of Speech-Language Pathology. Specific research questions to be addressed were: 1) Are there differences in attitudes toward the Tango! and DV4 for children? 2) Are there differences in attitudes toward the Tango! and DV4 for adults? 3) Are there differences in attitudes toward the Tango! and DV4 for pre-service and in-service professionals? 4) Does having experience in the field of Speech-Language Pathology lead to different perceptions of a child using AAC?

CHAPTER 3

METHODS

Participants

The current study focused on the attitudes of children without disabilities, pre-service Speech-Language Pathologists (Master's students), and in-service Speech-Language Pathologists (experienced clinicians) toward augmentative and alternative communication (ACC).

Six children were recruited from an elementary school in North Carolina that serves children with significant disabilities and has an after school program. All children involved in the study had permission from the school and their parents. Children who participated in the after school program were given a recruitment letter to bring home. Interested parents contacted a research team member at school on a specified day or via the telephone. Parents then provided written consent for their child to participate in the research during after school care at school. Once written consent was received from parents, written assent from the children was secured.

Adult participants were recruited from the Division of Speech and Hearing Sciences at the University of North Carolina at Chapel Hill to participate in the study. Twenty-five first year Master's students agreed to participate. None of the students have taken the formal Augmentative and Alternative Communication course which is offered as part of their program. Also, adult participants were recruited through the North Carolina Augmentative and Alternative Communication Association (NCACA). The five adult participants recruited

through the NCACA were all experienced AAC clinicians with 20 or more years of experience delivering AAC services to children with complex communication needs.

Settings

The children participated at their school in a location identified by the school administration and after school childcare providers. The Master's students participated in a university classroom at the end of a class in which they were all enrolled and the experienced AAC clinicians participated in the conference room of a local assistive technology resource center at the end of a meeting. Sessions took 20-30 minutes for the children and 30-60 minutes for the adult participants.

Apparatus

Videotapes: Two videotapes were created of a child using the Tango! and the Dyanvox DV4 to communicate with an adult communication partner who is speaking. The camera was positioned so that participants could not see the child using the device, only the child's hand selecting messages on the device itself and the adult communication partner. The child in the videotape did not actually have a disability and keeping the child off-camera diminished the likelihood that a child's attitudes would be based on their attitudes about the child's physical appearance. The child and adult participated in a scripted topic-focused conversation that insured equal turns between the two, meaning there were predetermined topics for conversation but the responses and flow of conversation was novel. Each tape was approximately 3 minutes long. The variation across the two tapes was the device used.

Attitude Scales: Child participants completed the Assessment of Attitudes Toward Augmentative/Alternative Communication (AATAAC) by Beck, Fritz, Keller, and Dennis (2000) with a slightly modified response form. As published the AATAAC uses the 5-point

Likert rating scale designed to assess attitudes of school-aged children towards peers who use AAC. In the modification, a cartoon character, Garfield, displaying different levels of emotion, represented four levels of the Likert scale (see Appendix C). The modification was made to accommodate the youngest children in the study who were only 6 years old and found it difficult to respond to the 5 point Likert scale without the images. Per the administration and scoring protocol of the AATAAC, each student's response to positive items was scored from 1 (strongly disagree) to 4 (strongly agree) and scoring was reversed for negative items (those that tap affective, cognitive, and behavioral attitudes). The adults completed an attitudes scale that was developed by the researchers based on the format of the AATAAC, but specifically designed to tap the attitudes of adults. The 12-item scale used a 5-point Likert-type scale (see Appendix B).

Two devices were compared in the investigation. The features of the devices that were salient in the videos and may therefore have influenced the participants' attitudes are described below.

Tango!:

The Tango! is a relatively new device designed by the father of a child who uses AAC. He created the device in an attempt to meet the needs of his child which could not be addressed with AAC options on the market at the time. The voice output for the Tango! uses primarily digitized speech with available synthesized speech. The Tango! can be described as a phrase based system, however there is an option to say single words in each selection. A unique feature of this device is voice morphing capability, meaning an adult can record a message and the device will convert the message into a female or male child's voice. Other voice output features include capability to convert messages into a whining, yelling, or

whispering voice. The screen layout for the Tango! shows up to six vocabulary choices. The picture symbols were specifically created for the device and allow for customization (for example can choose to use the symbol of a child who is the same ethnicity as the device user or in a wheelchair). The Tango! is a relatively small device that has the look and feel of an Apple computer or iPod with white plastic casing and brightly colored navigation buttons.

DV4:

The DV4 with Gateway 40 software is the device currently most often selected for children who require AAC to communicate. Unlike the Tango!, this system is single word based instead of phrase based. The DV4 voice output focuses on synthesized speech with some capability of digitized speech. The layout of the DV4 with Gateway 40 software allows for up to 40 symbol choices at one time. These symbols are arranged in grammatical categories, consistent color coding, and with semantic power strips to quickly access needed vocabulary from the main display screen. The DV4 uses Dynasyms and written words for symbols. Dynasyms are a collection of pictures which represent the word or concept the speaker is intending to communicate. They were created with the intention that the user or communication partner could see the picture and immediately understand the message.

(See Appendix D for more information regarding the Tango! and DV4 with Gateway 40 software)

Procedure

Initially, all participants were read a brief statement regarding AAC and why children use it. Then participants watched two videos of a child using an AAC device to have a conversation with an adult. One video showed a conversation using the Tango! device and the other video used the DV4 device. Videos were presented in counterbalanced order in

same-demographic groups. Each video was viewed two times (4 viewings total). Following the second viewing of each video, the participants completed either the child version of the Assessment of Attitudes Toward Augmentative/Alternative Communication (AATAAC) or the modified version created for the adults.

Analysis Plan

The completed attitudes scales were analyzed separately for the child and adult participants. Furthermore, the adult responses were analyzed as a single group and then separated to distinguish between the pre-service and experienced AAC clinicians. The specific research questions are: 1) Are there differences in attitudes toward the Tango! and DV4 for children? 2) Are there differences in attitudes toward the Tango! and DV4 for adults? 3) Are there differences in attitudes toward the Tango! and DV4 for pre-service and in-service professionals? 4) Does having experience in the field of Speech-Language Pathology lead to different perceptions of the boy in the video and his ability to use AAC? The research questions were answered using descriptive statistics and t-test analysis.

CHAPTER 4

RESULTS

The purpose of this study was to investigate attitudes toward augmentative and alternative communication (AAC) after viewing two videos featuring the same child using two different AAC devices. The results below are reported first for the children and then for adult research participants.

Children

Results indicate that there were differences in attitudes toward the Tango! and DV4 for child participants in the study, however the paired samples t-test of the difference between children's attitudes toward the two devices was not significant ($t(5) = -.594, p > 0.05$). While no significant differences were found when comparing mean scores for the total attitudes questionnaire, examination of the individual questions reveals meaningful differences in responses across the two questionnaires after watching each of the videos.

Descriptive results (Table 1) show that the mean for both the DV4 and Tango! was the same for the statement that read, *Children who use AAC don't take many turns when they try to talk*. For the statement the standard deviation of the Tango! was more variable than for the DV4 device. The mean ($\bar{x} = 2.5$) indicated that the child participants did not feel particularly strongly about whether the boy who used AAC took the same amount of turns during a conversation interaction. When the question was foiled to read as, *Children who use AAC take as many turns as other children do when they are talking*, the mean for the Tango! indicated a more positive response ($\bar{x} = 3.00$) than the DV ($\bar{x} = 2.00$).

Other interesting results found in the descriptive statistics included the overwhelmingly positive attitudes of the child participants in general toward children who use AAC, regardless of device type. All of the children strongly agreed with the following statements for both the DV4 and Tango!: (a) *I like children who use AAC*; (b) *I would introduce a child who uses AAC to my friends*; (c) *I would play with a child who uses AAC*; (d) *I would talk to a child who uses AAC*; (e) *I would invite a child use uses AAC to a party I had*; and (f) *I would walk in the school halls with a child who uses AAC*.

Table 1. Child responses to AATAAC for the Tango! and DV4

Child Data	Tango!	DV4		Tango!	DV4
Question	Mean (Std Deviation)	Mean (Std Deviation)	Question	Mean (Std Deviation)	Mean (Std Deviation)
1	3.17 (0.98)	4.00 (0.00)	14	4.00 (0.00)	3.83 (0.41)
2	4.00 (0.00)	4.00 (0.00)	15	3.83 (0.41)	4.00 (0.00)
3	2.83 (1.47)	4.00 (0.00)	16	4.00 (0.00)	4.00 (0.00)
4	3.00 (0.63)	2.00 (1.10)	17	4.00 (0.00)	3.50 (1.22)
5	2.50 (1.05)	2.50 (1.64)	18	4.00 (0.00)	4.00 (0.00)
6	1.50 (0.84)	1.67 (0.82)	19	4.00 (0.00)	3.83 (0.41)
7	2.17 (1.17)	1.83 (1.17)	20	4.00 (0.00)	4.00 (0.00)
8	4.00 (0.00)	4.00 (0.00)	21	4.00 (0.00)	4.00 (0.00)
9	3.50 (0.55)	4.00 (0.00)	22	4.00 (0.00)	4.00 (0.00)
10	4.00 (0.00)	3.83 (0.41)	23	4.00 (0.00)	3.83 (0.41)
11	3.67 (0.82)	4.00 (0.00)	24	4.00 (0.00)	3.83 (0.41)
12	3.17 (1.33)	3.83 (0.41)	25	4.00 (0.00)	4.00 (0.00)
13	3.67 (0.52)	4.00 (0.00)			

For the majority of the remaining positively worded questions, most of the responses fell within the range of agree to strongly agree for both AAC devices. The response means for these questions differed as a result of the response of only one or two participants making it difficult to determine if one device was seen as more favorable than the other.

Another statement in the study that may indicate positive attitudes of child participants toward other children who use AAC is the following: *Children who use AAC scare me*. The responses to this question were reversed to create a positive Likert scale. The means for the Tango! and DV4, 3.17 and 3.83 respectively, indicate that the majority of children disagreed or strongly disagreed with the statement.

In summary, there were no significant differences between overall mean scores on the two questionnaires for child participants after viewing a video of a child using the Tango! and DV4 to communication with an adult. Despite the lack of significant differences in the overall mean scores, differences in responses to individual questions after viewing the two videos suggest that children did respond differentially in some ways to the two devices. Furthermore, the results suggest that the child participants have positive feelings overall toward children who use AAC and that these feelings do not change as a result of watching the two videos.

Adult Participants

There were significant differences in attitudes toward the Tango! and DV4 for the adults who participated in the study. The paired samples t-test of the difference between attitudes toward the two devices for all of the adults combined was significant ($t(28) = 2.613$, $p < 0.05$). Descriptive results (Table 2) indicated the greatest variation of the mean between the DV4 and Tango! for all adult participants was found for the statement, *Children who use*

AAC can't change their words if they're not understood. It is important to take note that the largest difference in mean scores for any single item across the two questionnaires for all adult participants was 0.44.

Table 2. Adult responses to AATAAC for the Tango! and DV4

Adult Data	Tango!	DV4
Question	Mean (Std Deviation)	Mean (Std Deviation)
1	3.00 (1.44)	2.83 (1.31)
2	4.38 (0.62)	4.14 (0.64)
3	2.66 (1.05)	2.55 (0.91)
4	3.21 (1.05)	2.80 (0.98)
5	4.03 (0.73)	3.59 (0.95)
6	3.66 (0.90)	3.41 (0.91)
7	4.24 (0.51)	4.24 (0.51)
8	4.21 (0.68)	4.00 (0.85)
9	3.83 (0.76)	3.55 (0.95)
10	4.72 (0.46)	4.72 (0.46)
11	4.55 (0.51)	4.66 (0.48)
12	3.83 (0.89)	3.55 (1.02)

The statement, *Children who use AAC don't take many turns when they try to talk*, also produced a greater amount of variability after viewing the two videos than the majority of the statements on the questionnaire. Overall, adult participants disagreed more strongly with the statement after watching the video featuring the interaction with the Tango! (\bar{x} =

3.21) than with the DV4 ($\bar{x} = 2.80$). Other interesting findings include the fact that the mean was the same for both devices for the statements *I like children who use AAC* ($\bar{x} = 4.24$), and *I would feel good about seeing a group of children who use AAC* ($\bar{x} = 4.72$). All adult participants agreed or strongly agreed with each of these statements.

There was only one statement out of twelve on the questionnaire for adults that received scores suggesting that all the adults disagreed or strongly disagreed. The statement was negatively stated (*Children who use AAC scare me*), and after the scales were reversed to standardize the responses for the purposes of analysis, the mean score for the Tango! ($\bar{x} = 4.55$) and the DV4 ($\bar{x} = 4.66$) suggest that the adults participants are not frightened by children who use AAC.

Adult Subgroups: Pre-service and In-service Speech and Language Pathologists

Results indicate that there were differences in attitudes toward the Tango! and DV4 for the whole group of adults (pre-service and in-service speech and language pathologists). The paired samples t-test of the difference between attitudes toward the two devices for pre-service speech and language pathologists only was also significant ($t(24) = 2.337, p < 0.05$). In addition, the paired samples t-test of the difference between attitudes toward the two devices for in-service, experienced Speech-Language Pathologists only was significant ($t(3) = 3.656, p < 0.05$).

Descriptive results for pre-service speech and language pathologists only (Table 3) include some interesting findings. When comparing pre-service speech and language pathologists opinions of the Tango! and the DV4 in conversation, it is interesting that the majority of the means for the twelve questions (8/12) vary across the two devices by no more than .20.

Table 3. Pre-service Speech and Language Pathologists Responses to AATAAC for the Tango! and DV4

Masters Students	Tango!	DV4
Question	Mean (Std Deviation)	Mean (Std Deviation)
1	2.96 (1.46)	2.76 (1.30)
2	4.28 (0.61)	4.08 (0.64)
3	2.84 (0.99)	2.64 (0.81)
4	3.24 (1.05)	2.92 (1.00)
5	4.08 (0.64)	3.60 (0.96)
6	3.76 (0.83)	3.56 (0.82)
7	4.12 (0.44)	4.16 (0.47)
8	4.08 (0.64)	3.84 (0.80)
9	3.64 (0.64)	3.32 (0.80)
10	4.68 (0.48)	4.68 (0.48)
11	4.52 (0.51)	4.60 (0.50)
12	3.72 (0.89)	3.40 (1.00)

For the question, *I would feel good about seeing a group of children playing with a child who used AAC*, the means were identical ($\bar{x} = 4.68$) for both devices suggesting that the responses for the group fall between the agree and strongly agree categories. The largest standard deviation for a single response occurred in response to the statement, *Children who use AAC are trying to understand what others are saying to them* for both the Tango! ($\bar{x} = 2.96$, $sd = 1.46$) and DV4 ($\bar{x} = 2.76$, $sd = 1.30$).

The greatest variation of the mean (\bar{x} difference = 0.48) between the DV4 and Tango! for pre-service speech and language pathologists participants was found for the statement, *Children who use AAC can't change their words if they're not understood*. Other statements with larger differences in means between the two devices include, *I think children who use AAC would be fun for other children to be with* and *I would talk with a child who used AAC that I saw in public*. Responses to each of these questions favored the Tango! device (\bar{x} = 3.64 and \bar{x} = 3.72 respectively) as opposed to the DV4. Also, two negatively stated statements, *Children who use AAC don't take many turns when they try to talk*, and *Children who use AAC can't change their words if they're not understood*, had larger variations of the mean indicating that pre-service adults disagreed more with the statements when the child was using the Tango! device (\bar{x} = 3.24 and \bar{x} = 4.08 respectively) as opposed to the DV4 (\bar{x} = 2.92 and \bar{x} = 3.60 respectively).

After examining the data collected from the in-service, experienced Speech-Language Pathologists, there were interesting descriptive results (Table 4). Means were the same for both the Tango! and DV4 devices for a large portion of the questions asked. The four statements that received the highest rating of *strongly agree* from all four of the in-service, experienced Speech-Language Pathologists were: (a) *I would feel comfortable around a child who uses AAC*; (b) *I think children who use AAC would be fun for other children to be with*; (c) *I would feel good about seeing a group of children playing with a child who used AAC*; and (d) *Children who use AAC scare me*. It is important to keep in mind that the last responses were reversed to allow for 5 to indicate the most positive response possible. Also, the means were the same for both the Tango! and DV4 (\bar{x} = 3.25 and \bar{x} = 4.25 respectively)

for the questions *Children who use AAC are trying to understand what others are saying to them*, and *I would talk with a child who used AAC that I saw in public*.

Table 4. Experienced SLPs responses to AATAAC for the Tango! and DV4

Experienced SLPs	Tango!	DV4
Question	Mean (Std Deviation)	Mean (Std Deviation)
1	3.25 (1.50)	3.25 (1.50)
2	5.00 (0.00)	4.50 (0.58)
3	1.50 (0.58)	2.00 (1.41)
4	3.00 (1.15)	2.00 (0.00)
5	3.75 (1.26)	3.50 (1.00)
6	3.00 (1.15)	2.50 (1.00)
7	5.00 (0.00)	4.75 (0.50)
8	5.00 (0.00)	5.00 (0.00)
9	5.00 (0.00)	5.00 (0.00)
10	5.00 (0.00)	5.00 (0.00)
11	4.75 (0.50)	5.00 (0.00)
12	4.50 (0.58)	4.50 (0.58)

Experience in the field of Speech-Language Pathology led to different perceptions of the boy in the video and his ability to use AAC. Experienced clinicians had more to say on their questionnaires. They tended to elaborate and qualify their responses by writing on the margins of the form. Also, they asked for clarification on questions so their responses were not misinterpreted, and they chose multiple answers on certain questions and then explained situations where each answer was warranted. Like the pre-service Speech-Language

Pathologists, these differences led to significant differences in overall mean scores on the two questionnaires after viewing the two videos.

In summary, there were significant findings overall for all adult participants and both subgroups (pre-service and in-service Speech Language Pathologists) on the two questionnaires after viewing the videos of communicating with the Tango! and DV4. Also, differences in responses to individual questions after viewing the two videos suggest that adults did respond differentially in some ways to the two devices. Furthermore, like the child participants, results suggest that both pre-service and in-service Speech Language Pathologists have positive feelings overall toward children who use AAC. However, the adults in the study may be more open and objective to the questionnaire since they are either training or currently working in a field where the goal is social acceptance and communication success for all individuals.

CHAPTER 5

DISCUSSION

It is important to examine the attitudes of the communication partners of AAC device users to determine if they hold generally positive or negative opinions toward devices and the children who use them. Also it is important to consider whether or not specific devices appear to influence attitudes. Attitudes shape the direction of social interactions. Positive attitudes toward an AAC user are more likely to lead to successful interactions. In contrast, negative attitudes toward a device user may potentially inhibit successful interactions and decrease the likelihood of social acceptance. Previous research has examined a broad range of factors that may contribute to the development of positive or negative attitudes of communication partners toward individuals who use AAC devices. Studies have focused on factors such as gender, familiarity with people with disabilities, length of AAC messages, proficiency of the device user or communicative competence, and the type of device. The current study investigated the influence of type of device, age, and experience in the field of Speech-Language Pathology on attitudes toward AAC.

Children

The results for the children and the adults differed in the current study. For the small group of children who participated, there were no significant differences in overall attitudes as a result of viewing the two videos; however, the descriptive results for individual items provided interesting findings. Child participants' responses were more variable with the DV4 when asked to identify how they felt about turn-taking abilities for each device.

Responses were slightly more positive with the Tango! suggesting that the children believed there was a greater potential for the user to participate in conversation when using the Tango!. However, the mean for the item after both videos was low. It is important to take note that this low mean reflects responses rated below *can't decide*. The indecision is independent of the device type in this study; therefore, it may be possible that there are other factors influencing the children as they develop attitudes regarding the communicative competence of their peers who use AAC, or create favorable/unfavorable attitudes toward their ability to maintain a balanced conversational interaction.

When children were asked if AAC users were scary there was some variability between device type and rating. The children responded more positively to this question after viewing the video of the child using the DV4, but we cannot be certain what factor or factors led the participants to view AAC users as more scary after viewing the child using the Tango!.

In the current study, the sample size for the children was very small (6 participants) which may explain why there was not a significant result when t-tests were run. Despite the fact that no significant differences were noted at the group level, the item-level differences provide important information regarding attitudes of children toward AAC users. Until more data is available from a larger group of child participants, all conclusions about attitudes toward AAC based on this research should be tentative at best.

Adults

Most of the adult participants in the study generally had positive attitudes toward AAC users. The majority of the questionnaire, which focused on the likeability of AAC users, was rated positively for both devices. It is promising, but not at all surprising

considering who they were, that the majority of adults in this study have formed positive attitudes in general of children who use AAC devices and according to the results device type does not dramatically affect the overall opinion (positive or negative) of the device user.

Watching the two videos resulted in a slight difference in attitudes for vocabulary flexibility and turn-taking abilities. Overall, adults had more positive attitudes toward turn-taking after viewing the video featuring the Tango!. It appears that with the Tango! conversation turn-taking is perceived as a more balanced interaction than with the DV4. Also, for the statement, *Children who use AAC can't change their words if they're not understood*, adults responded with more positive attitudes toward the Tango! It appears that the adults viewed the DV4 vocabulary available as more concrete, with less flexibility to adapt or adjust the conversation flow than for the Tango!. This is an important finding because a goal is to create AAC devices that will allow users to maximize their potential for successful interactions. If communication partners feel that certain device characteristics create rigid, inflexible parameters for conversation, they may be less likely to engage in novel communication since device vocabulary may not allow for repairs if a breakdown occurs.

When considered separately, findings for all adult participants were consistent with the results for the pre-service Speech - Language Pathologists. Overall attitudes were positive for AAC use, however the Tango! device was viewed as more flexible for turn-taking and vocabulary flexibility. This balance in turn taking is important because successful conversations that allow each individual to contribute equally promotes social interaction and acceptance. As with the whole group of adults, the slightly smaller group of pre-service Speech - Language Pathologists viewed the DV4 vocabulary in the video as more concrete

with less flexibility to adapt or adjust the conversation flow than for the Tango!. This finding is not surprising, because the results for all adult participants suggest that they found the Tango! device more adaptable and equipped with the capability of choosing alternate vocabulary if a communication breakdown occurs.

While there are significant differences between the overall responses to the twelve-item questionnaire for pre-service Speech - Language Pathologists, it is important to note that the individual responses to most statements regarding both the Tango! and DV4 were within a small range. This is important because it may indicate that adults studying to become Speech - Language Pathologists are not affected greatly by AAC technology when in contact with children who have disabilities and will therefore work with any device to encourage positive social interactions and acceptance with typically developing peers. Also, regardless of device type, therapists will hold high expectations for all children with disabilities.

Interestingly, experienced clinicians were the least likely to have their attitudes toward AAC swayed by device technology. Most of the questions asked regarding acceptance and likeability of AAC users were rated with similar means of agree or strongly agree for both the Tango! and DV4. The similarity of the means is important because these individuals who are highly experienced in the field felt that regardless of device type children should be viewed positively and immersed in activities with typically developing peers. The fact that these questions had similar means for the two devices may imply that people who are actively involved in working with children who use AAC do not see differences in device technology (Tango! vs. DV4) which significantly impact the potential for successful communication interactions.

Implications

The current study results both support previous research and create new avenues for future research. In 1994 Gorenflo and Gorenflo found that “Listeners prefer a synthetic voice that sounds more natural, is highly intelligible, and in most cases is gender appropriate (p.65).”. The findings of the current study support these findings. The Tango! device, which was perceived as more interactive and compatible with the flow of conversation, offered more natural sounding speech that was highly intelligible.

There are important clinical implications of the current study. Teachers are most often faced with the challenge of facilitating interactions in the classroom between children who have disabilities and their age-appropriate peers. Ideally, general education teachers could collaborate with a special education team to offer each other support and brainstorm strategies to promote positive peer interactions of children with disabilities, which would increase social acceptance (Light & Kent-Walsh, 2003). According to Light and Kent-Walsh (2003) “it is essential that all teachers are able to communicate effectively and efficiently with students with complex communication needs (p. 104).” Teachers are integral components to a successful inclusion experience. By researching what characteristics influence the attitudes and perceptions of peers and adults it may be possible to build programs or models to aid teachers and other professionals in the facilitation of peer interactions.

Light and Kent-Walsh (2003) completed qualitative interviews with eleven general education teachers across the United States who had students in their classrooms who used AAC. Interviews focused on positives and negatives of including AAC users, barriers to successful inclusion outcomes, supports necessary for successful inclusion, and

recommendations for team members who work with students who use AAC devices. The teachers interviewed all felt there were benefits for everyone involved in the inclusionary process. At the same time, they acknowledged negative impacts of inclusion including the fact that children who used AAC could face social exclusion or unequal status relationships with classmates. The teachers indicated that peers of AAC users were occasionally distracted by the actual device (for instance, it would say something at an inappropriate time or had a computer malfunction which required stopping the class activity). Furthermore, they felt that a lack of appropriate message selection to facilitate social interactions posed a significant barrier. Teachers commented that device vocabulary made it difficult for social interactions. Children often did not have the words available to participate in social conversations even if they wanted to. The teachers also stated that a mismatch of interests and the presence of an assistant to whom the other children talked presented further barriers.

If researchers can identify specific characteristics that promote positive peer attitudes towards AAC device users, a model or program could be established for teachers to facilitate increased positive interactions and greater social acceptance. Collaboration between team members could focus on targeting specific areas in classroom activities for facilitation to maximize the potential positive peer interactions. Results from the current study can be applied to Light and Kent-Walsh's (2003) study. Important device features that were seen as positive on the Tango! were vocabulary flexibility and turn-taking ability: two issues raised as barriers to inclusion for AAC users by the teachers in Light and Kent-Walsh's study. Possibly using the Tango! device in schools and focusing on these two characteristics, may lead to an increase in positive attitudes toward AAC users and improved social interactions.

Also, in 1984 Weiner and Graham (cited in Light & Kent-Walsh, 2003) found that attitudes, such as the sorrow and fear they found in their study, offer clinical implications. Positive and negative attitudes of participants in the current study can be used to jump start therapy activities to promote positive attitudes toward AAC users. It gives therapists a good starting place for educating peers regarding individuals who use AAC in order to create positive interactions. Positive interactions between peers are imperative for success of the child in inclusion settings.

Limitations of the Study

There were a few limitations of the current study which should be noted. The sample sizes for the child participants and in-service Speech-Language Pathologists were small (6 and 4 participants respectively). It is possible because the group of child participants was small that there was no significant overall mean when the t-test analysis was compiled. However, when the in-service Speech-Language Pathologists' ratings were analyzed there were significant findings despite the small sample size.

Also, previous research has emphasized that attitudes of communication partners toward AAC users may be affected by familiarity with individuals who have disabilities (Dennis & Beck, 1996). In the current study, it was not required for child participants to be familiar with someone who has a disability. This extraneous variable could have influenced the study results.

Furthermore, it would have been beneficial to compare child and adult responses to the questionnaire to see if age affected attitudes toward AAC users. However, we were unable to compare the two groups because the questionnaire for children differed from the adult version. The two forms were similar because the adult version was based on the child

form, but the child form was rated on a 4 point scale with 25 questions and the adult form contained 12 questions and was rated on a 5 point scale. It would be interesting to see there were developmental trends such as those reported in previous research (Beck et al., 2000).

Directions for Future Research

Future research should focus on expanding the adult participant population to include a broader range of professional backgrounds. All of the adults in this study were either training to be Speech-Language Pathologists or were working in the field of Speech-Language Pathology, specifically AAC, at the time of their participation. Our experienced adult participants work closely with individuals who have disabilities and are trained to provide alternative means of communication if the avenue of speech is severely impaired. It would be interesting to see if adults across different educational backgrounds view AAC devices overall as socially acceptable ways of communication. Also, future research should expand the number of child participants to include a more diverse group in regards to familiarity with individuals with disabilities. Perhaps, a larger group of children who were more familiar with a child who had significant disabilities would be less concerned with trying to be polite than the current group was when responding to the questionnaire and talking about the process afterward. Children who use AAC will not always be in therapy sessions or in classrooms with teachers facilitating peer interactions; therefore understanding how device features can engender more positive attitudes and thereby enhance social interactions is imperative.

Summary

In summary, this study of the attitudes of children and adult communication partners toward AAC provides important preliminary evidence regarding the features of a relatively

new AAC device, the Tango!. Results of the current study indicate there is definitely a difference in the attitudes for all participant groups when rating the Tango! and DV4. Future research should focus on expanding the study to include a larger sample size and variations of the communication interaction between the adult and AAC user to promote greater generalization of the results.

Appendix A

Ranked List of Features from the Communication Aid Protocol (CAP) Considered Critically Important by the Group (O'Keefe, Brown, & Schuller)

Aid infrequently breaks down	User can employ aid in the community	Aid has full guarantee
Aid not damaged by partner or user mistake	Aid can be used in many settings	Device is safe
Aid works well after long use	Aid can be used in work settings	Manual explains all aspects and functions of aid
Voice is clear	Aid is portable	Aid has battery power capability
Acceptability of aid to user	Aid can be used in social setting	Aid does not restrict number of situations
Aid message is easy to understand	Batteries allow for a full day of use	Aid allows for many communicative functions
User can operate aid with little assistance	Electronic aid has enough programming space	Aid provides battery discharge indicator
Aid comes with good manuals	Aid can be used in an educational setting	User can learn aid easily
Aid does not embarrass user	Aid allows user to quickly seek help	Aid has no hidden costs
User comfortable with aid in public and private	Manual explains how aid can be set up in various ways	Aid can be used with doctor and dentist
		Aid allows user to produce new words and phrases

Appendix B

Adult Attitude Scale

Name: _____

Device: _____

Attitudes Towards Augmentative/Alternative Communication: Adult Scale

The single feeling that best describes the way I feel when I think about a child who uses AAC is (circle only ONE):

Sad	Scared
Happy	Concerned
Surprised	Disgusted

1. Children who use AAC are trying to understand what others are saying to them.

Strongly Disagree	Disagree	Can't Decide	Agree	Strongly Agree
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2. Children who use AAC try to talk about what other children want to talk about.

Strongly Disagree	Disagree	Can't Decide	Agree	Strongly Agree
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3. Children who use AAC take as many turns as other children do when they are talking.

Strongly Disagree	Disagree	Can't Decide	Agree	Strongly Agree
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4. Children who use AAC don't take many turns when they try to talk.

Strongly Disagree	Disagree	Can't Decide	Agree	Strongly Agree
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5. Children who use AAC can't change their words if they're not understood.

Strongly Disagree	Disagree	Can't Decide	Agree	Strongly Agree
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6. People have trouble knowing what children who use AAC are trying to say to them.

Strongly Disagree	Disagree	Can't Decide	Agree	Strongly Agree
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7. I like children who use AAC.

Strongly Disagree	Disagree	Can't Decide	Agree	Strongly Agree
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8. I would feel comfortable around a child who uses AAC.

Strongly Disagree Disagree Can't Decide Agree Strongly Agree

9. I think children who use AAC would be fun for other children to be with.

Strongly Disagree Disagree Can't Decide Agree Strongly Agree

10. I would feel good about seeing a group of children playing with a child who used AAC.

Strongly Disagree Disagree Can't Decide Agree Strongly Agree

11. Children who use AAC scare me.

Strongly Disagree Disagree Can't Decide Agree Strongly Agree

12. I would talk with a child who used AAC that I saw in public.

Strongly Disagree Disagree Can't Decide Agree Strongly Agree

Appendix C

Child Attitude Scale

NAME: _____

Device: _____

Attitudes Towards Augmentative/Alternative Communication: Student Scale

1. The feeling that describes the way I feel when I think about a child who uses AAC is



2. Children who use AAC are trying to understand what others are saying to them.



3. Children who use AAC try to talk about what other children want to talk about.



4. Children who use AAC take as many turns as other children do when they are talking.



5. Children who use AAC don't take many turns when they try to talk.



NAME: _____

Device: _____

6. Children who use AAC can't change their words if they're not understood.



7. People have trouble knowing what children who use AAC are trying to say to them.



8. I like children who use AAC.



9. I would feel comfortable around a child who uses AAC.



10. I think children who use AAC are fun to be with.



NAME: _____

Device: _____

11. I would feel good about myself if I was with a child who used AAC.



12. Children who use AAC scare me.



13. I would work at school with a child who used AAC.



14. I would eat lunch at school with a child who used AAC.



15. I would go to the park with a child who uses AAC.



NAME: _____

Device: _____

16. I would introduce a child who uses AAC to my friends.



17. I would invite a child who uses AAC to my house.



18. I would play with a child who uses AAC.



19. I would sit next to a child who uses AAC in class.



20. I would talk to a child who uses AAC.



NAME: _____

Device: _____

21. I would invite a child who uses AAC to a party I had.



22. I would walk in the school halls with a child who uses AAC.



23. I would choose a child who uses AAC to be on my team in PE.



24. I would go to the library with a child who uses AAC.



25. I would ask a child who uses AAC to sleep over at my house.



Appendix D

Tango! and DV4 Information



tango!
THE POWER of **6**

THE NEXT GENERATION OF
SPEECH-GENERATING DEVICES ▶▶▶



The Power of Six.

Six Buttons. A Revolution in Communication.

6 Amazing Buttons

► What can you do with six buttons? Actually, the question is, "What can't you do?"

With the tango!'s six buttons, you'll discover an amazing world of more than **2,000 digitally enhanced phrases**, plus more than **3,000 synthesized words** and **90 Core Words**. You can speak thousands of engaging, prerecorded phrases or synthesize any sentence you want — word by word, or letter by letter.

With six buttons, you can access a built-in camera to take hundreds of photos and put them into one of **30 Photo Albums**. Or take photos and quickly create thousands of new images.

You'll even find a Story Wizard that allows you to create and store up to **60 sequential stories**. And an innovative **Pop-Up keyboard** for spelling with word prediction.

How is that possible? Look at the best of today's consumer electronics. You'll find remarkable ways of organizing information. Better ways of accessing information. And innovations in navigation and interface. That sensibility is at the heart of the tango!, the first AAC device to incorporate the power of consumer electronics and mass media.

Experience the tango! today. And discover the broadest range of communication options imaginable.



5 Modes of Communication

► Multimodal communication from six buttons? Well, yes! Hard to believe, but amazing power can also be amazingly simple. And because people use different forms of communication at different times, we've made that possible on the tango!

Introducing Phrase-First Language. It's the first language organization to embrace the notion that, while precision is often necessary, pure efficiency can often be extremely powerful. Heck, we're not the first to realize that it's not always *what* you say, but *how* you say it.

So the tango! offers you five communication modes to meet many different needs.

Phrase Banks: More than 2,000 prestored, digitally enhanced, and smartly organized phrases for much of your day-to-day communication.

Word Banks: More than 3,000 words, integrated into topics and arranged into lists. They can be used individually, or for building sentences.

Core Words: Start with 90 powerful Core Words. Then create crisp, powerful sentences. Or combine Core and Topic Words to make more complex sentences. Core Words allow not only powerful communication, but great opportunities to develop language and literacy.

Spelling: A powerful Pop-Up keyboard is always available — featuring advanced word prediction. Use the keyboard alone or combine spelling with words.

Photo Albums: Use our built-in camera. Then combine photos with either Voice Morphing™ or speech synthesis to capture experiences and relate them to others. It's an incredibly powerful and engaging way to communicate.

4 Innovations in Technology

► Is the tango!'s technology cool? Sure. But more so, it's pragmatic. The tango! is an extraordinary expression of how technology can deeply enhance human experience.

Built-in Camera and Flash: Quickly capture experience. Or create icons to customize your AAC device. Importantly, our patent-pending interface does more than just take pictures: It provides many breakthroughs for integrating photos quickly into our many communication modes. You need to try it to believe it.



Voice Morphing™: Record an adult's voice, then choose any of four transformations to make it sound like a child's. Or take a voice and make it whisper, whine, or shout. It's part of how the tango! builds not only sentences, but relationships.

Fixed-Location Pop-Ups: You've seen pop-ups, but never like this. Experience a new way of thinking. Buttons always where you expect to find them. With consistent functionality. And seamless integration into a device.

State-of-the-Art Ergonomics: We built the tango! from the ground up to answer the needs of individuals with disabilities. Contoured exteriors help guide movement. And our truly sleek design profile promotes personal interaction. It's the first AAC device to honor the importance of not only function, but also of form.



3 Types of Customer Support

► Customer support doesn't just mean fixing a device when it's broken. It means creating a device that isn't all that hard to use. Or customize. Or program.

It means creating an AAC device that comes with a Quick Start Guide that actually gives you a quick start. And a Reference Guide that reads, well, not much worse than a bad novel.



It means tackling the issue of durability. And so the tango! is manufactured by the people who build many of the world's cell phones and gaming consoles. It's been drop-tested and water-tested until we knew it was worthy of the people who would rely on it.

In fact, with all the thought that went into the tango!, we worry our folks in customer support might wind up like that washing

machine repairman: the loneliest people in the world.

But if you want help, don't worry: We're right there.

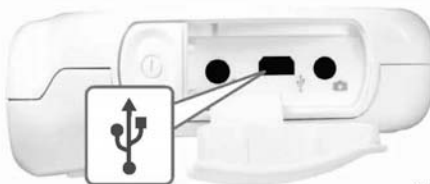
E-mail us at help@blink-twice.com and we'll get you an answer right away, always within 48 hours.

Call the 877-BLINK-11 hotline and someone will answer your questions on the spot, or return your call first thing in the morning.

Log on to blink-twice.com and sign up for one of our Webinars. You'll be amazed at how much you can learn from our online emulation. But, then again, that was our plan — to make life easier for you.

2 Ways to Link a Computer

► Is there one device for everyone? Of course not. Do people want computing power? Of course. But we felt a big screen would result in a device that's less friendly and portable.



So we focused on what seemed smart. Making it easier to connect a device to a PC (for users) or to a keyboard (for professionals or faster typists). That way, you expand your capabilities when you need them — but always maximize the power of your device.

Tango! Type!™

The tango! plugs right into a computer with a USB port, so you can use it as a keyboard. Actually, you can do more. Any phrase or word on the tango! can be outputted directly to the screen.

Turbo tango!™

The tango!'s two-touch keyboard provides terrific access for individuals with motor difficulties. But you can also plug in a standard USB keyboard and type right onto the tango! It's a great way for individuals with more dexterity to speed up programming or type directly into the tango!

1 Revolutionary AAC Device

► In its first few months, the tango! has been featured in a vast array of media, from the cover of **Exceptional Parent** magazine to a Person of the Year segment on **ABC World News with Charles Gibson**.

This hasn't happened simply because our company had a dream. It happened because we embraced the dreams so many others had — of better communication, of better support, of better relationships.

We reached out to some of the most amazing companies in the world — from **Nickelodeon** to **Flextronics** (they built the Xbox 360) to **frog design**.

And we reached out to some of the most remarkable people in the field — **Pati King-DeBaun**, **Karen Erickson**, **Caroline Musselwhite**, and **Linda Burkhart**.

We told them what we thought was possible. And then we asked them to improve on it.

We talked with parents who wanted more for their children, and with teachers who wanted better tools for teaching. With people who rely on AAC. And with a variety of their friends.

The result? A device that's not simply changing the way we think. But the way we communicate. And doing so in countless ways. Join the revolution.



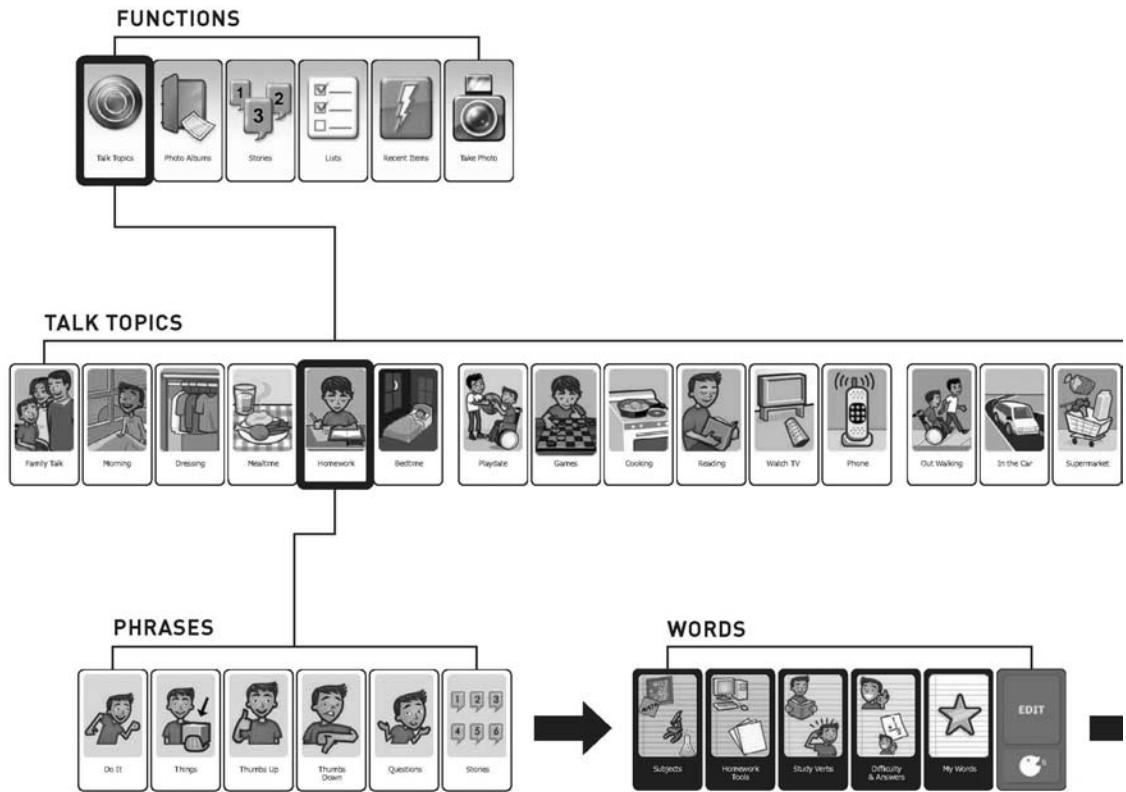
tango!
Retail price
\$6,899



The tango! is an E2510 device.

If you need information on the tango! or on funding options, just give us a call at 877-BLINK-11.

Six Buttons. A World of Expression.



Here's what you'll find:

6 FUNCTIONS

Talk Topics
Photo Albums
Stories
Lists
Recent Items
Take Photo

30 TALK TOPICS

(Five Screens of six Talk Topics each)
Family Talk, Morning, Dressing, Mealtime, Homework, Bedtime
Playdate, Games, Cooking, Reading, Watch TV, Phone
Out Walking, In the Car, Supermarket, Shopping, Arts and Crafts,
Arriving, Morning Meeting, School Talk, Recess, Snack, After Sch
New People, Group Talk, About Someone, About Something, Thin

WELCOME TO
tango! town!

▶▶ Now you can choose any of these cool new characters for your tango!



Zack



Zoe



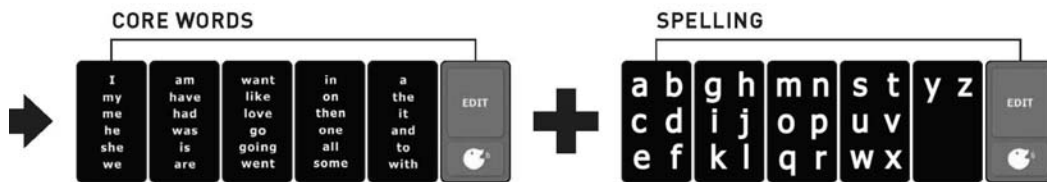
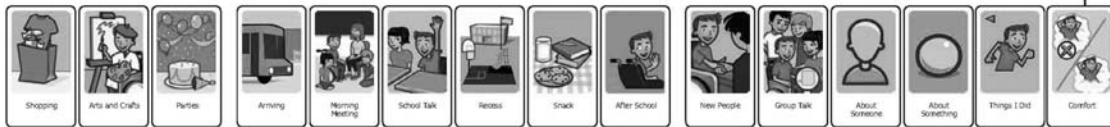
Danny



Danielle

tango!™

language hierarchy



72 PHRASES PER TALK TOPIC

- 12 Action Phrases
- 12 Thing Phrases
- 12 Positive Phrases
- 12 Negative Phrases
- 12 Questions
- 12 Story Phrases

UP TO 90 WORDS PER TALK TOPIC

- 72 Topic-Related Words
- 18 User-Selected Words

90 CORE WORDS

Static Across Talk Topics

Parties
ool
gs I Did, Comfort



What is Gateway Series 4?

Gateway Series 4 is a developmentally-based series of page sets for the DynaVox Series 4 product line (DV4 and MT4). It is a compilation of Gateway, Jr., Gateway 54 and the Gateway to Language and Learning application page sets. It also contains a new word-based page set, Gateway Pro, designed for the literate user of an AAC system. Many new features have been added to simplify and enhance the functionality of all Gateway page sets. Gateway Series 4 accommodates the fundamental communication needs of the young user as well as the complex communication needs of the competent adult communicator. There is consistency within the design of all the page sets so a user can seamlessly move from one page set to the next level of complexity while maintaining his or her communicative competence.

Each Gateway page set includes a core single-word vocabulary to enable the user generate novel messages as well as a set of activity and/or message-based pages, to promote efficient communication within focused or recurring activities.

The Origin of Gateway

The original Gateway to Language and Learning program presented a new approach for storing vocabulary on a dynamic display device (Bruno, 1997). Traditionally, dynamic display page sets contained a main page that linked to a set of topic-based pages. These pages contained preprogrammed sentences, a set of phrases or a restricted single-word vocabulary that was related to the specified topic. This approach limited what users were able to say. They could not generate novel messages. They lacked a generative single-word vocabulary.

In 1994, Bruno used Speaking Dynamically software to design a single-word vocabulary page set for two severely apraxic children. This page set contained a core vocabulary on the main page that was arranged in modified Fitzgerald Key Format. It included grammatically-based links to less frequently-used words, as well as a link to a spelling page. This page set enabled these children to communicate effectively in the classroom and within targeted interactive activities.

With the advanced features of the DynaVox 2 software, the design of the early single-word page set was enhanced in 1997. A page set that was initially created for a young AAC user evolved to become Gateway to Language and Learning. This page set contained a core vocabulary of approximately 800 root words, selected word morphology function keys and strategically designed autoclose popups. The main page linked to pages that contained words from grammatical categories such as people, verbs, descriptive words, objects and places. It also contained a link to a spelling page with word prediction. The core vocabulary included many words identified as frequently used by young children (Beukleman, Jones & Rowan, 1989; Bruno, 1989; Carlson, 1981; Fried-Oken & Moore, 1992; Raban, 1988). The outcome was a page set that allowed efficient message generation and enabled unrestricted communication. On average, a user could create a sentence using an average of 1.3 key selections per word.

In 1998, Gateway 54 was created. It contained all of the features of Gateway, but had 54 buttons on the main page and popups. Gateway 54 was designed to accommodate individuals who could benefit from fewer keys on a page for reasons related to their physical, visual perceptual and/or language needs.

Gateway, Jr. was designed in 1999. It contained four separate page sets, all targeting users with limited expressive language performance. Three of the four programs were for young children with language skills ranging from 18 – 48 months. The fourth set targeted adolescents and adults with expressive language delays. While the vocabulary within each of the page sets reflected user needs and abilities, their design mirrored the organization of the other Gateway programs.

In 2001, the Gateway page sets were included as a separate user environment within the DynaVox 3100 products (DynaVox and DynaMyte). Each page set was now identified by the number of buttons on its main page. Included in this series were Gateway 12, Gateway 20, Gateway 30, Gateway 36, Gateway 40, Gateway 54 and Gateway 75.

With the development of the DynaVox Series 4 product line, the Gateway to Language and Learning page sets were redesigned to include many of the advanced features of these new devices and renamed Gateway Series 4. In addition to operational changes resulting from new device features, new DynaSims were added and the core vocabulary of each page set was enhanced. Gateway Series 4 now includes Gateway 12, Gateway 20, Gateway30, Gateway 40, Gateway 60 and Gateway Pro. Separate scanning versions exist for each of these page sets.

Gateway Series 4: What Does it Include?

Gateway includes six page sets for individuals who use direct selection (i.e., pointing, joystick, head mouse, etc.) to access the device:

- Gateway 12
- Gateway 20
- Gateway 30
- Gateway 40
- Gateway 60
- Gateway Pro

Each of these page sets have been modified to accommodate the needs of individuals who access their devices through scanning. Gateway 20 has also been configured for use by an auditory scanner. Direct selection and scanning versions have the same vocabulary contents, but the location of function keys and some words may differ to maximize efficiency.

Gateway 12

Gateway 12 is designed for children who are chronologically between 2 and 6 years of age, and whose receptive language performance is at the 18 - 24 month level. The targeted user can successfully access a 12-location array and is developmentally ready to begin combining words to create multi-word messages. Gateway 12 includes different topical page sets. Each set is intended to be a part of a focused activity or routine mediated by an adult communication partner.



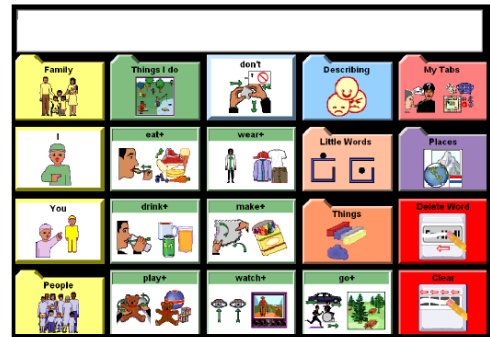
Gateway 12

Gateway 20

Gateway 20 targets two distinct user populations. The first includes children, chronologically between 2 - 15 years of age, whose receptive skills are at the 24 - 30 month level. These children may demonstrate severe physical impairments, mild to moderate cognitive limitations and/or an oral apraxia. The second clinical population includes children whose diagnosis falls within the PDD - Autistic Spectrum. These children are chronologically between 3 - 10 years of age and typically use PECS with an *I want* sentence strip. They can recognize symbols for nouns, verbs and some adjectives/adverbs. Both of these user populations would be communicating in messages of 1 to 2 words.

Gateway 20 includes a main page that features a modified Fitzgerald Key format with links to *People, Family, Things I Do, Describing Words, Things* and *Places*. This page set contains a variety of new features to enhance language development opportunities and expand the size of the core vocabulary. Sentence development links provide a simplified approach for a child to create a sentence. Selecting a verb automatically opens a page of related words that the child can use to complete a message. For example, accessing *Go* will lead the user to places such as *Grandmom's* or *Outside*. *Concept* and *Color* links are available on each of the associated pages,

providing additional opportunities for a child to expand his or her sentence complexity. The present progressive verb form, *-ing*, is modeled on the verb page to promote spontaneous usage when communicating in later page sets. Semantic Power Strips (sets of paradigmatically-associated words) provide a focused array of words to offer greater diversity of expression. Selecting *Opposite* on the *Descriptive Words* page systematically expands available vocabulary. A set of six tabs is available, including *About Me*, *Time to Chat*, *Time to Learn*, *Time to Play* and *Time to Relax*. These increase a child's opportunities for participating in dialogues, as well as in educational and recreational activities.



Gateway 20

Gateway 30

Gateway 30 is designed for adolescents and adults who demonstrate limitations in cognitive-language performance. Candidates for Gateway 30 communicate in single- or multiple-word utterances and typically do not use function words (e.g., the, this, with) or word endings such as *-ing* or *-ed* as a part of their spontaneous message generation. The vocabulary within this page set is functionally-based, reflecting many activities of daily living.

The main page of Gateway 30 was redesigned for Gateway for Series 4. It includes simple object categories such as *Foods*, *Household*, *Clothing* and the like. *About Me* offers general information about the user. *Talk to Friends* enables the user to express a range of pragmatic functions. *Talk About Holidays* enables the user to talk about what occurs during the different months of the year as well as about his or her birthday. *Talking in Town* provides general messages for communicating within the community, and *Time to Relax* offers a set of functions that the user can operate to help control his or her environment.



Gateway 30

Gateway 40

Gateway 40 addresses the needs of children, chronologically between 3 - 12 years, whose receptive skills are at the 30 - 60 month level. The expressive performance of these users would range from use of telegraphic sentences of 2 - 3 words to syntactically correct sentences. The user of this page set has the potential to learn to use word endings, articles and prepositions. Spelling and reading are among educational goals and/or abilities.

The main page is arranged in a modified Fitzgerald Key format with links to words from a variety of grammatically organized categories. The strong developmental language features of Gateway 40 have been maintained while a variety of new features have been added. These new features enhance language development opportunities, simplify vocabulary retrieval and expand the size of the core vocabulary. Semantic Power Strips (sets of paradigmatically-associated words) provide a focused array of words for a greater diversity of expression. All forms of the verb *to be* are easily accessible from the main page.

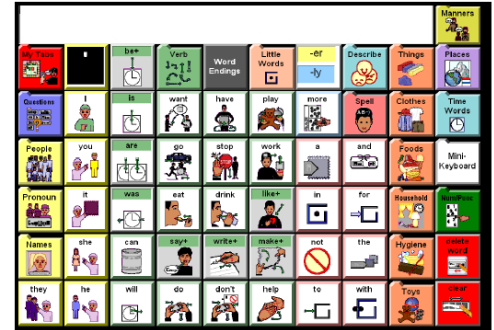


Gateway 40

The *Pronoun* page has been reorganized to facilitate easier access to targeted words, and frequently-used *Object* categories (e.g., *Household*, *Toys*) have been moved to the main page. Selecting *Opposite* on the *Descriptive Words* page systematically expands available vocabulary. The expanded *Questions* and *Nature* popups also offer expanded vocabulary. A set of six tabs is available, including *About Me*, *Time to Chat*, *Time to Learn*, *Time to Play* and *Time to Relax*. These increase a child's opportunities for participating in dialogues, as well as in educational and recreational activities.

Gateway 60

The 60-location page set combines the best features of the former Gateway 54 and Gateway 75 programs. The format and organization is consistent with other Gateway page sets. Gateway 60 targets children and adults with language skills at least at a 4-year level. Potential users should be constructing sentences of 5 - 6 words, including articles, prepositions, and pronouns. They should also be using (or learning to use) the full range of word morphology features. Users would also require access to the spelling and word prediction features.



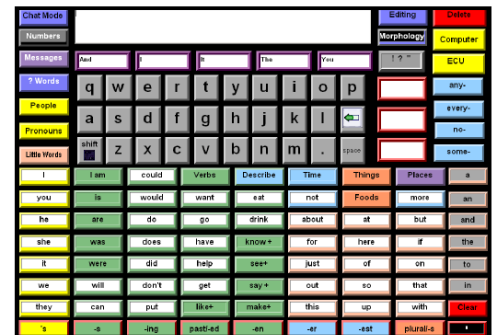
Gateway 60

Gateway 60 has a variety of new features to enhance the efficiency of message output and increase the available vocabulary. Semantic Power Strips (sets of paradigmatically-associated words) are available for verbs and some nouns. They provide a focused array of words that offer greater diversity of expression. Use of the auxiliary form of the verb *to be* automatically transitions verbs to the required *-ing* form. Frequently-used *Object* categories (e.g., *Foods*, *Household*, *Hygiene*) have been relocated to the main page.

The vocabulary content of the page set has been significantly increased by the addition of word categories like *Time Words*, *States*, *Capitals*, *Planets*, *World Places* and others. New vocabulary can also be reached by opening the *Questions* popup and selecting *Opposite* on the *Descriptive Words* popup. A set of six tabs is available, including *About Me*, *Time to Chat*, *Time to Learn*, *Time to Play* and *Time to Relax*. These increase the user's opportunities for participating in dialogues, as well as in educational and recreational activities.

Gateway Pro

Gateway Pro is designed for literate users of AAC devices who can access over 100 buttons on a page via direct selection or scanning. A typical user would demonstrate fully-developed syntactical performance using word endings, articles and prepositions, etc. He or she would also rely heavily on spelling as a part of routine message generation. The main page of Gateway Pro is a dynamic page that contains a QWERTY keyboard and provides consistent access the most frequently-used words of our language. In addition, it provides access to an approximately 2000 words through semantically-organized category links. These include popups for the following word categories: *People*, *Questions*, *Pronouns*, *Verbs*, *Descriptive Words*, *Time Words*, *Places*, and *Things*. Gateway Pro also provides access to comprehensive computer access and environmental control pages.



Gateway Pro

Why Gateway Series 4?

Choose Gateway for the following:

- Efficient Communication: CN < 2
- Effective Communication
- Ease of Learning
- Developmental Model for Language Acquisition

Efficient Communication: CN < 2

Gateway has been organized to provide maximum efficiency for the user. An efficiently-designed communication system enables the user to converse with a minimum amount of effort. In 1986, Baker suggested that there appeared to be a critical number (CN) of key selections that determines whether an AAC user will use his or her communication device. The critical number varies from user to user and may vary across situations. The CN can be calculated as follows:

$$\text{CN} = \frac{\text{Motivation}}{\text{Time (Cognitive /Physical Effort)}}$$

According to Baker, the numerator (Motivation) represents how important the message is to the user. The denominator is determined by two factors, the time it takes the user to generate the message and the combined effects of the physical and cognitive efforts to produce the message. The higher the critical number, the less likely it will be for the user to access the vocabulary and use the device.

Gateway was designed to achieve an average CN of less than 2 selections per word for core vocabulary words (e.g., words contained in key frequently-used word lists by Beukelman and University of Nebraska Word Lists). Words that are considered fringe (or less frequently-used) vocabulary may require more than two key selections. The number of words presented on a page affects efficiency. Therefore, when a user is creating a sentence with Gateway 20 or Gateway 30, the average number of selections per word may be more than two.

The following table presents sample sentences that were created using the single-word vocabulary of the Gateway 40, Gateway 60 and Gateway Pro vocabulary sets. These sentences were generated by some of the individuals who use Gateway. The sentences demonstrate the power of the Gateway. Since many of the Gateway 20 users typically generate telegraphic sentences, it is not included in the following comparison. The sentences contain 58 words. Using the single-word vocabulary of Gateway Pro for example, a user would need to make total of 78 key selections to generate these sentences. The average number of keystrokes (ANK) that were necessary to create these sentences was 1.3. This is significantly lower than the targeted goal of a CN less than 2 key selections per word. The ANK of key selections will vary with the messages generated. The ANK for Gateway 60 is 1.3 and the ANK for Gateway 40 is 1.5.

Sentence	# of Words	Number of Key Selections		
		Gateway 40	Gateway 60	Gateway Pro
I want to go outside.	5	6	6	6
I don't want to go to school.	7	8	8	7
Can you help me?	4	7	5	5
Will you read to me?	5	8	7	7
I am going to play baseball.	6	8	8	7
I forgot to do my homework.	6	11	9	11
You are my best friend.	5	10	7	8
What are we going to eat?	6	9	7	7
Do you have it when you go to school?	9	8	10	11
Yesterday I went swimming.	4	8	10	9
Total Number of Words	58	88	78	78
Average Number of Keystrokes		1.5	1.3	1.3

Effective Communication

Once an individual has developed the ability to generate syntactically-corrected sentences, he or she needs access to a page set that enables efficient and effective communication. Effective communication has been defined as the ability to say what you want to say, when you want to say it, with a minimum amount of effort (Blackstone, 1993). For an augmented communicator, being an effective communicator requires access to age- and developmentally-appropriate vocabulary that is efficiently organized. Gateway Series 4 was designed to promote effective communication. Each Gateway page set contains a flexible single-word vocabulary with both core and fringe vocabulary. The vocabulary in each page set matches the needs and interests typically associated with its target user population.

Ease of Learning

Gateway is easy to learn. The cognitive demands of learning are minimized by the use of DynaSyms (symbols) and written words to represent vocabulary. For nouns and many other word classes, DynaSyms provide a transparent or intuitive means of representing vocabulary. Individuals can look at a picture and immediately infer the intended meaning. Written words are used to represent many function words. This helps to reduce the need for learning arbitrary symbols to represent the function words of our language. Symbols for verbs, adjectives and adverbs are less transparent and may require instruction to be understood by an individual who either is young or demonstrates perceptual and/or cognitive limitations. Young children tend to separate pictures according to categories. That is, children can easily sort pictures into categories of people, colors, foods, places and so on. The organization of Gateway reflects this developmental ability.

A Developmental Model for Language Acquisition

Gateway Series 4 meets the needs of individuals who demonstrate a wide range of expressive language abilities. Many of these individuals require intervention directed towards improving their expressive communication performance. It is important that individuals who provide this intervention understand how they can use the language features designed as a part of the Gateway page sets to enable children who use AAC to expand their expressive language performance.

In the course of normal language development, children first speak single-word utterances and then gradually move to utterances of 2 words. Before long, children create novel sentences using word endings. Gradually, syntactical competence mirrors that of an adult. Children generate complex novel sentences expressing a range of pragmatic functions.

In teaching a severely speech-impaired child to communicate with Gateway Series 4, the course of the child's expressive language acquisition can mirror normal language development. The child can begin communicating using single words. By combining symbols across pages, he or she can begin to form telegraphic messages. Once the child understands verb tenses, use of plurals and other morphologic endings, the child can learn to use them to create syntactically correct sentences. Using the vocabulary and word morphology keys embedded systematically within the Gateway page sets, the child can learn to recode our language to achieve the same level of language competence as his or her speaking peers.

Gateway 12 can be introduced to non-speaking children who are functioning at Stage 6 (Representational Thought, 18 - 24 months level). For these children, intervention should include the use of pictures or other symbols to enhance their language comprehension. At this developmental level, the use of pictures/objects can evoke absent objects. A child can point to a symbol of mom to indicate that he or she may want mom when she is not present. During this stage in a young AAC user's language development, we want to begin introducing a symbolic means of referencing objects - symbol, sign, pointing, looking. Using the pictures within the Gateway vocabulary set, a speech-language pathologist can begin to stimulate the use of action words, requests, responses to questions and the use of single words in succession. An effective intervention strategy is to model and stimulate pivot-word utterances using the Gateway vocabulary.

In Gateway 12, a child can learn to combine words within a topically-based vocabulary set. These page sets are designed around play routines because it is known that children develop language through play. In Gateway 20, the set of topic pages have been consolidated to form an integrated core vocabulary. The question words (who, what and where) have been added to this page set to enable a child to generate requests for objects and information. A child can begin to communicate across a variety of topics and is no longer context-bound. The therapist or teacher can use Gateway to model two-word messages, thus taking an AAC user to the beginning of pivot grammar.

Somewhere between the ages of 2.0 and 2.6, a child enters the early Preoperational Stage or Brown's Stage II of language development. At this stage of language development, normally-developing children begin to use grammatical morphemes. They begin to use *-ing* without *is*, the prepositions *in* and *on* and plurals *s* and *z*. They begin to speak using 3 - 4 word declarative sentences. They are using negatives, interrogatives with rising intonation and some *Wh* questions. Imperatives can also be observed in their speech. In Gateway 40, these words and word morphology features are included so a child can be taught to use them in therapy and later integrate them into his or her spontaneous conversation.

A normally-developing three-year-old (Brown's Stage III) is using irregular past tense, possessive and the future verb tense. Sentences are becoming longer and more complex. To facilitate a child's ability to perform at this level, the page sets of Gateway 40 and Gateway 60 contain all of these elements.

By the time a child reaches 4 years of age (Brown's Stage IV), a normal, speaking child is using words such as *when*, *before*, *after*, *but* and *because* to coordinate sentences. They enhance their language performance by adding contractions and modal verbs. If we hope for a child dependent upon AAC to achieve normal syntactical performance, we must include these words within their single-word vocabulary. Gateway 60 and Gateway Pro provide all these tools. Gateway Series 4 empowers the user to develop communicative competence.

How was the Vocabulary Selected?

The vocabulary for Gateway was selected according to the following:

- Frequency of Use
- Syntactical Development
- Promote Language During Leisure Activities
- Academic Needs

Frequency of Use

The vocabulary within each of the Gateway Series 4 page sets is based on research and an analysis of the vocabulary contents of the communication boards of individuals who can effectively communicate across a variety of topics appropriate to their age and interests (Beukelman, Jones, & Rowan, 1989; Bruno, 1989; Carlson, 1981; Raban, 1988; <http://aac.unl.edu/VLN3.html>). All programs contain a core vocabulary of words like *eat, drink, go, want, have* and *big*. No matter what phase an individual has attained in their language development, these words are a part of the necessary core vocabulary. Other words may be important at one phase of an individual's life and not at another. For example, bubbles are important to young children. A razor may be important to an adolescent or adult. Gateway 12 and Gateway 20 of Gateway address the needs of preschool and primary-aged children. Vocabulary targets these needs and interests. Gateway 30, intended for use by adolescents and adults, includes words that address many activities of daily living. Gateway 40, Gateway 60 and Gateway Pro address the needs and interests of older children and adults.

Syntactical Development

Grammatical morphemes (e.g., tense markers, plurals, possessives) and the comparative and superlative adjective forms are included within Gateway Series 4 to promote age-appropriate syntactical development. Auxiliaries and word morphology function keys have been incrementally added to the page sets in an order and complexity that parallels normal syntactical development. Vocabulary has been included across all grammatical categories to support sentence formation.

Promote Language During Leisure Activities

Young children learn to communicate through play. Older children and adults frequently initiate communication surrounding social interaction. Social vocabulary and topic pages have been designed to facilitate device use during recreational activities. For children, pages of jokes, riddles and popular board games are included. This vocabulary is consolidated within the tab sets located in each of the Gateway programs.

Academic Needs

Many of the individuals who will use Gateway Series 4 will be school-aged. To accommodate this population, Gateway 12, Gateway 20, Gateway 40 and Gateway 60 include academic pages that enable individuals to demonstrate their competency when learning about the states, capitals, countries, nature, time concepts, money words and measurement terms. The academic pages have also been designed to promote independence in completing written assignments. The *Test* page can enable a user to complete a test or worksheet without significant adult assistance. With these functions, even a child who has not attained literacy skills can use the single-word vocabulary to create a story and save it in a written format. There are pages with many open locations to allow for easy customization. Commands for sending text to a printer and computer have been included.

Punctuation, printing and computer commands have been included to ensure that the advanced communicator can generate age-appropriate messages or documents. These commands also help children learn how to use these functions within the course of their educational training. Number and punctuation pages include numbers, punctuation and, in some cases, the following functions: Backspace, Close, Go Back, Clear, Return, Document Up and Print. The *Print* key is an essential tool that enables a user to independently generate written output and complete school or office work. A full set of mouse commands is available in the Gateway 60 and Gateway Pro page sets. Limited controls are available in the other Gateway page sets.

How is Gateway Organized?

The Gateway page sets include the following organizational tools:

- Consistent Color-Coding
- Fitzgerald Key Format
- Conversational Main Page (with links to grammatically-organized word categories)
- Semantic Power Strips
- Opposite Strategy
- Tab Set for Social and Academic Vocabulary

Consistent Color-Coding

A consistent color-coding strategy is used throughout the Gateway Series 4 page sets. All pages designed for use by direct selectors have a black background to enhance the contrast between the buttons and the background. Word categories are colored to correspond with the Fitzgerald Key (Fitzgerald, 1954) format: People = yellow; Verbs = green; Little Words = pink; Words That Tell About = blue; Things and Foods = orange; and Places = purple. Word morphology buttons are colored to match the part of speech with which they are typically associated. For example, the possessive noun command button is colored yellow, as it is used with people. The noun plural command button is orange, as it is typically used with things.

Fitzgerald Key Format

The Fitzgerald Key was designed as a tool to teach language to the deaf. The presentation of words in categories (i.e., people, verbs, little words, descriptive words, objects, places) reflects the format of a simple declarative sentence. Little words include articles, conjunctions and prepositions. Descriptive words include adjectives, adverbs and time words.

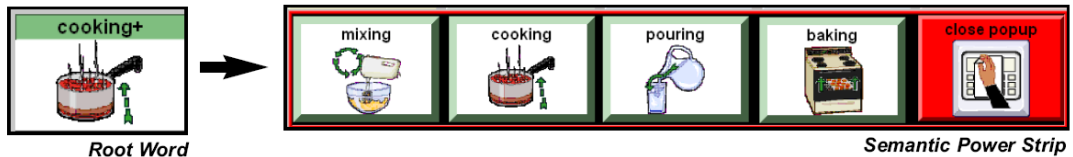
By selecting a word from each category and moving from left to right, a person can create a simple declarative sentence. Users can learn to form sentences by telling, *who - is doing - little words - descriptive words - what - where* (e.g., *Mary is eating the big cookie.*).

Conversational Main Page

Within each vocabulary set, the main page contains a core of high-frequency words and, depending upon the specific version, links to the following categories: People, Verbs, Little Words (e.g., articles, prepositions, conjunctions), Words That Tell About (e.g., adjectives and adverbs), Things, Foods and Places. On the Gateway 40 and Gateway 60 page sets, the user can access spelling from the main page. Gateway Pro provides simultaneous access to the keyboard and the navigational single-word vocabulary.

Semantic Power Strips

Semantic Power Strips are a unique feature of the Gateway Series 4 page sets. These sets of paradigmatically-associated words are launched by accessing a root word. Root words are marked by a “+” sign and a solid colored label. The Semantic Power Strips provide the user with a focused array of synonyms that offer greater diversity of expression. Words in a Semantic Power Strip are of the same grammatical class as the root word that launches the strip. The strips may include a range of 3 - 9 associated words. Semantic Power Strips can help a young user learn new words, ultimately building the child’s vocabulary. They offer advanced users easy access to a richer vocabulary.



Opposite Strategy

An opposite strategy is employed to expand the vocabulary within each Gateway Series 4 page set without increasing navigational demands. Activating a button will speak its label. Activating the *Opposite* button followed by a button, will speak the button’s opposite. In each Gateway page set, the *Opposite* button is colored gray.

Since children who use Gateway 20 may need to learn the opposite for each word, two labels and their corresponding two symbols are pictured within each button. The opposite word and its corresponding symbol are both pictured in gray, visually depicting their relationship to the gray-colored opposite function button. In Gateway 40 and Gateway 60, the opposite word label is gray.



Tab Set for Social and Academic Vocabulary

The main page of each Gateway page set (Gateway 12 excluded) provides a link to social, academic and leisure vocabulary through the *Tab* button. The *Tab* button links to a subset of five or six tabs, each containing a set of related words or messages. Tab sets may include a subset of tabs such as *About Me*, *Time to Chat*, *Time to Play*, *Time to Learn* and *Time to Relax*.



The *About Me* tab provides a core of messages that enables the user to share personal information about likes and dislikes. The *Time to Chat* tab provides the user with messages that express a range of pragmatic functions. It offers many opportunities for an individual to comment and request information and assistance. The *Time to Learn* tab contains topic pages related to each month. Each month's page contains a greeting appropriate to that month and some basic information relevant to the given month. For example, on the *February* page the child will find a Valentine's Day greeting, statements about the season and the number of days that are in the month. There are also a variety of messages related to topics such as leap year, Groundhog Day, and Presidents' Day. Depending on the available number of locations, the *Time to Learn* tab may also include pages and functions to maximize classroom participation and independence. The *Time to Play* tab contains pages for recreational activities. These typically include a *Jokes* page, a *Riddles* page, a *Scrabble* page and a *Games* page. The *Games* page contains vocabulary relevant to several board games (i.e., Guess Who, Monopoly, Jr. and Clue, Jr.). There is adequate room for adding vocabulary and/or activities to the recreational tab set. The *Time to Relax* tab includes functions for ECU operation. Buttons can be configured to operate household appliances like the VCR and the TV.

Gateway 30 contains a slightly different tab set, focusing on interaction within the home and the community. Tab headings include *About Me*, *Talk to Friends*, *Talk About Holidays*, *Talking in Town* and *Time to Relax*. An embedded tab set provides an additional set of tabs, each expressing a different pragmatic function. Open locations are available within each tab set to provide opportunities for customization.

Customizing Gateway

To customize the Gateway program, a facilitator needs to examine three domains:

- Personal Information
- Needs and Interests
- Educational, Social or Vocational Information

When these areas have been considered in relation to the intended user, the facilitator should then make changes that are appropriate for the user. The process of customizing Gateway requires knowledge of the augmented communicator's communication abilities, needs and goals, the vocabulary within the Gateway page set, the color-coding system used within Gateway and the fundamental categorization of the Gateway vocabulary. In addition, the facilitator must know basic operation of the DynaVox software. Individuals who need assistance with the technical operation of the DynaVox should refer to the DynaVox tutorial resources. Using the User Setup Wizard feature can simplify some customization efforts, but there are many locations that require individual modification.

Personal Information

The User Setup Wizard feature can simplify the process of adding personal information. However, it should not be assumed that using the wizard will work within all pages sets. Many locations require personalization. Some examples include classmates and specific messages on the *About Me* page.

Needs and Interests

Unless the Gateway Series 4 vocabulary matches the needs, wants, interests and personality of the user, it is unlikely that the user will maximize use of the program. The second step in customizing Gateway is to add and/or change key vocabulary items and expressions.

The *Food* page contains an assortment of foods and beverages that are representative of the typical foods people eat. This may or may not match the preferences of the individual using the device. This page should be changed as needed to allow the user to effectively communicate. Family and user input should be considered when determining what changes, if any, are needed. Other pages, such as *Things* and *Places*, will require the same type of consideration.

Educational, Social or Vocational Information

In order to meet educational goals, a child must be able to express the targeted vocabulary for the range of spoken and written educational tasks associated with each course competency. While it is recognized that Gateway Series 4 does not contain all of the educational vocabulary that is needed by each user of this program, it is believed that Gateway does create a framework that enables children to meet many educational competencies. Individuals working with children who use Gateway (i.e., teachers, therapists, aides) must take an active role in adding appropriate vocabulary to this program. This requires these individuals to become familiar with the contents of Gateway. It also requires that they know what vocabulary is needed to complete daily lessons. Any necessary vocabulary that is not currently stored within the Gateway vocabulary should be added.

Within a school curriculum, there are several areas targeted for potential device use. These include math, calendar or the morning routine and monthly thematic activities. Pages have been created for each of these areas and they must be customized to maximize the child's classroom participation as needed. There are several forms of math vocabulary within Gateway Series 4. These include numbers, number words, math functions, time words and a calculator. The user's math competencies should be reviewed. When appropriate, changes should be made to these pages.

Implementation

Facilitators should take the following steps when introducing a device with Gateway:

- Where do We Begin?
- Transitioning to Gateway
- Teaching Language Through the Use of the Single-Word Vocabulary
- Therapist's Role and Responsibilities
- Evaluating the AAC User's Abilities
- Learning to Communicate with Gateway
- Modeling as an Intervention Strategy
- Expansion as an Intervention Strategy
- Teaching Vocabulary Contents and Location
- Highlight the Organizational Structure
- Using Gateway to Converse.
- Create Opportunities to Learn New Words
- Writing a Letter
- Learning Gateway Through Traditional Language Intervention.
- Communicating Through the Academic Pages
- Using the Recreational Pages

Where Do We Begin?

The specific approach that is used to implement Gateway Series 4 will vary with the needs and language abilities of the user. It is the philosophy of the author that Gateway should be introduced to the user in a variety of functional contexts. Successful implementation requires a commitment on the part of the individuals working with the user (i.e., facilitators, teachers, SLPs) to become familiar with Gateway's vocabulary contents and the location of these words. It also requires a commitment to customizing the program to match the needs, interests and abilities of the user.

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