Using AAC Device Features to Enhance Teenager's Quality of Life

Linnea R. McAfoose
DynaVox Systems LLC

***Abstract*:** The subject of the attached case study is Sara, a 17-year-old high school honors student who communicates using a DynaVox 3100, which she accesses via single-switch visual scanning. A team of education and engineering specialists at DynaVox Systems LLC collaborated with Sara to identify and maximize her use of device features and accessories that would allow her to use the computer, telephone and other electronic equipment in the home environment without assistance. This team also worked to increase the efficiency of Sara's communication. Essential to achieving this goal were the DynaVox's environmental control and rate enhancement features, the DynaBeam wireless computer access component, and the pages for visual scanners on the Word Power–2 application developed by Inman (2003). Using this combination of technology, Sara can communicate effectively and efficiently, and operate a variety of consumer electronic equipment on her own, enhancing her quality of life.

Keywords: AAC device features, Enhance, Teenager, Quality of life

The environmental control and rate enhancement features of an augmentative and alternative communication (AAC) device can have a powerful impact on the lives of people with significant physical disabilities. Environmental control can make it possible for such individuals to perform ordinary activities such as talking on the telephone, e-mailing friends or turning on a CD player, eliminating the need for assistance from others. Rate enhancement features allow augmented communicators to express themselves quickly, efficiently and effectively. When used together and routinely, these features of the device can be a catalyst for self-sufficiency for augmented communicators, while increasing efficiency in their interpersonal communication.

This action research project, which began in January 2003 and continued for a period of approximately nine months, focused on a young adult's use of the DynaVox 3100 at home to access the computer, use the telephone and control household electronic equipment. The project team also explored ways for her to communicate more efficiently, particularly online and by telephone.

Sara's Situation

Sara is a 17-year-old honors student who has athetoid cerebral palsy with severe spasticity. She attends regular classes at her local public high school. She communicates using a DynaVox 3100 voice-output communication device with a dynamic display screen. The device is developed and manufactured by DynaVox Systems LLC. Sara accesses the DynaVox 3100 via single-switch visual scanning, using a head switch attached to her wheelchair to select vocabulary.

Sara's academic performance and level of participation in social activities is competitive with that of her peers without disabilities according to the Participation Model developed by Beukelman and Mirenda (1998).

She composes, arranges and performs music using the Song Editor on the DynaVox, and has experienced great success in the musical training she's received outside of school.

This AAC device has played a major role in Sara's accomplishments both as a student and a musician, and in her interpersonal relationships. Since Sara got the device approximately four years ago, she has used it as her main system of communication. She and has developed communication skills that have allowed her to stay actively involved, meeting competitive participation with peers criteria (Beukelman & Mirenda, 1998), while realizing her full potential to communicate her unique ideas.

The Problem

Sara reached a point where she needed to expand the application of the environmental control and computer access capabilities of her AAC device in order to become more self-sufficient, particularly at home. Additionally, she wanted to learn new ways to accelerate and fine-tune her communication, particularly via telephone,e-mail, and in social situations. Sara reported that she frequently missed opportunities to communicate ideas or opinions in conversations with peers because she was unable to complete her messages on the AAC device quickly enough to participate in the conversation before her friends had moved on to another topic.

Sara's goals were like those of most teenagers. She valued privacy while communicating via e-mail or the telephone and wanted opportunities to be at home alone. Throughout her early teen years, Sara lacked fulfillment of these age-appropriate desires because she required the assistance of family members to operate the computer, telephone, lights and other household electrical equipment. Out of necessity, Sara's mother often served as an intermediary while Sara was on the phone with friends or writing personal e-mails.

Researchers have noted that gaps often exist between the use of assistive technology in learning environments and at home. Wright (2000) stated:

With the extension of technology enhanced learning opportunities for an increasing number of students in the educational realm, the lack of technology crossover to the home environment is becoming increasingly apparent. As students only have a portion of their day at school, it is vital that this access to technology cross over to the home setting. (p. 1)

The Starting Point

At the outset of working with Sara, the team of education and engineering specialists, including a certified speech-language pathologist, recognized that she needed to increase her home use of the AAC device. Additionally, Sara needed to develop strategies that would allow her to communicate more quickly. She also needed strategies for overcoming some of the functional limitations of using an AAC device. The first step toward achieving these goals was to assess her use of the environmental control and computer access capabilities of her device. The team also assessed the methods used to access the telephone and the application of the rate enhancement features. Assessment was conducted through interviews with parents/caregivers and Sara about aspects of her communication system that satisfied her needs and aspects that could be improved. Observation of Sara communicating and using the computer were videotaped and analyzed to determine the speed of computer access, words per minute, and mean length of utterance (MLU). The use of these strategies allowed those working with Sara to identify the device features and rate enhancement

strategies that were available, but underutilized, on her communication system. Finally, Sara practiced using the new features in a controlled environment, while the team facilitated the integration into her home and daily teenage routines.

When the team began working with Sara, she used her home computer to compose school assignments, surf the Internet, and communicate via e-mail. She accessed the computer using row/column scanning and word prediction on the WiViK keyboard, a software program manufactured by Prentke-Romich Corporation, that provides an on-screen keyboard and mouse. When Sara used the WiViK program, one of her family members had to unplug the switch that was connected to Sara's AAC device and plug it into a switch box on the computer. Sara used her switch to scan the on-screen keyboard and perform mouse moves. Sara found WiVik to be adequate, but slow, and she did not have access to her communication device while using the program. To save time, she often dictated her assignments or e-mails while her mother typed them into the computer.

The team noted that it took Sara three minutes and 50 seconds to log onto the Internet and go to instant messaging using the onscreen keyboard and mouse moves. This included the time it took to enter her screen name and password, a task that required Sara to make 15 to 20 head strokes on her switch.

Sara's telephone use at this point was a few times per month at best and she had no way to access the phone directly. When Sara did participate in telephone conversations, another person held the phone to her ear and relayed messages to the person on the other end, while Sara communicated using her AAC system and limited vocalizations.

Similarly, Sara made little use of the infrared environmental control capabilities of her AAC system other than to operate the stereo or television. Consequently, it was difficult for her to be at home alone for a significant length of time because she could not operate electronic household appliances, such as lights, the air conditioner, or phone without assistance. This dependency also affected the rest of the family, Sara's mother for example, could not attend her younger son's ballgames because Sara needed her help at home.

When the team first met with Sara, she communicated reliably using her AAC system at an average rate of 5.6 words per minute. Her MLU was 13.2 words. These averages were determined through the analysis of a language sample taken during the first meeting with Sara.

Sara used Word Power-2, an application developed by Inman (2003). The page set included a fixed core vocabulary, a QWERTY keyboard and word prediction.

Sara scanned blocks of items on the display screen of her AAC system, row by row, then activated her switch when she reached her desired selection. Sara learned this access method at the age of 5, when she used an older and less sophisticated communication device. When Sara reported that scanning came naturally to her with a bit of practice, she made the analogy that it was like tying shoes, a skill that comes easily to most people after a period of teaching and learning. Sara also noted that a strategy commonly used in baseball helped her to develop good scanning skills as a child. Like a batter keeping an eye on the ball, Sara kept her eye on the button containing her desired selection on a communication page, then activated her switch as soon as the scanner highlighted the block containing that selection.

As a visual scanner, however, Sara's use of Word Power was limited because she did not use the pages that were designed for optimal

visual scanning. Instead, she used pages in the application designed for direct selectors. The direct selection pages featured a QWERTY keyboard located in the middle of a page, making it cumbersome for her to spell out messages. When Sara attempted to scan the QWERTY keyboard, for instance would get part of the keyboard and a word predictor in one block instead of the whole keyboard. The arrangement of parts of speech of the direct selection pages was not conducive to building sentences by scanning. In some cases, Sara would have to scan multiple rows on the page to get from a subject to a verb when building a sentence. To reach her desired selection, she often had to scan significant amounts of vocabulary that she didn't need, slowing the pace of her communication.

Sara accessed vocabulary more quickly when she began to use the scanning pages in Word Power-2 (the same scanning pages found in the original Word Power application) during her work with the team. The frequency-of-use keyboard on the scanning pages made it possible for Sara to spell out messages quickly because of its compact positioning. Sara could scan the whole keyboard in one block and the letters that she needed most often could be reached most easily because they were presented in some of the first available selections within that keyboard layout. The core vocabulary arrangement has allowed Sara to build sentences with greater speed and ease because she can scan groups of any part of speech as one block.

Figure 1 shows the direct selection page set on the original Word Power and Figure 2 Word Power-2's visual scanning pages. The numbers on these figures show the pattern which Sara scanned through on each page set. They indicate the sequence in which the blocks were highlighted. The blocks show the vocabulary that was grouped together when that section was scanned.

When the team first met with Sara, she used no social scripts or abbreviation expansions, and few pre-programmed messages. Her strategic skills, discussed by Light and Binger (1998) as "compensatory strategies that may be utilized by individuals who use AAC to overcome functional limitations that restrict their effectiveness as communicators" (Light & Binger, 1998, p. 2), needed to be further refined to enable her to develop strategies to overcome some of the difficulties she identified during day-to-day communication.

The Essential Elements

After assessing Sara's use of her communication system, the team identified the DynaBeam and Word Power-2 application as essential elements to increase her home use of the AAC system and improve her rate of communication.

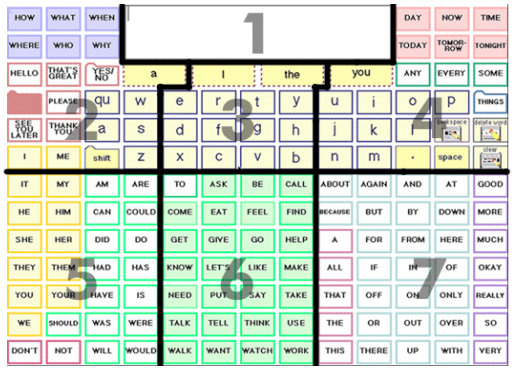

Figure 1. Word Power direct selection page

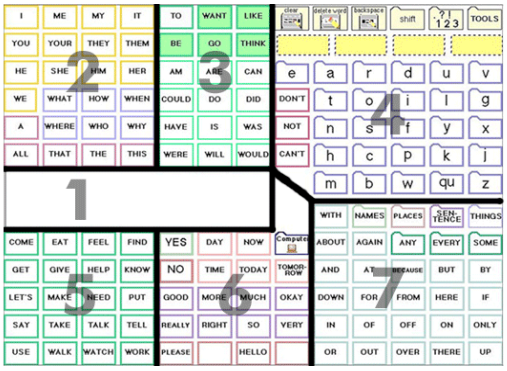

Figure 2. Word Power 2 scanning page

The DynaBeam is a separate component that provides wireless computer access to those who cannot access a computer through traditional means. While Sara had a DynaBeam of her own, she was not familiar with its use or the system features that would allow her to access it through her device.

Word Power–2 is an updated version of the original Inman application (Inman, 2003) that Sara used previously. Word Power 2 features communication pages for visual scanners and provides access to computers directly from those pages. It also features common keyboard shortcuts for computer access, such as macros to complete a task that would otherwise require the execution of a series of commands, and numerous preprogrammed keyboard shortcuts defined by Microsoft for a wide variety of applications.

Used in combination with her AAC system's environmental control and rate enhancement features, these elements have allowed Sara to expand her use of the communication device in the home environment for purposes beyond communication. They also allow her to communicate more efficiently on the telephone, via e-mail and in person.

Results

The DynaBeam gives Sara a way to use the computer without having to rely on others to unplug her communication device, set her up at the computer and plug in the computer emulation software. Now, Sara can set herself up to use the computer by positioning herself in front of it so that her DynaVox can send infrared signals to the DynaBeam to operate the computer.

Sara finds the keyboard and mouse emulation capabilities of her AAC system to be more efficient than the software program she used previously provided. To access the Internet, for instance, Sara no longer has to enter her screen name and password letter by letter. By using the DynaBeam in conjunction with the capabilities of her AAC system and Word Power-2 to construct macros, she can log onto the Internet and go to instant messaging in two head strokes. It takes her 44 seconds to complete the task, nearly one-sixth the time it took her to do so before.

The same combination of technology also allows Sara to create macros that make it easier for her to access websites directly from her AAC system. Before she had access to macros, Sara had to type the names of the websites she wanted to visit in the address bar with the exception of sites whose names appeared in the bar automatically because she had visited them recently. In such cases, she could get to a site with a single press of her head switch. Now, she can access any site in the same manner, selecting the desired site from a pop-up menu. As a result of Sara's ability to access new web sites more quickly than before by using spelling, word prediction and macros that emulate keyboard shortcuts, she can quickly and independently navigate to any destination she chooses. In doing so, she makes use of many of the preprogrammed keyboard shortcuts within the Word Power 2 page set. These include shortcuts for common extensions such as 'www.,' '.com' and shortcuts to select the address bar, cut and paste text, and perform a wide range of other functions. Additionally, Sara can add macros for new sites to her system because of the DynaVox's capacity to allow the user to program and customize her own communication device.

Sara can now access the telephone and make calls on her own using a telephone access page that the team helped her create. She selects the number of the person she wants to call from a list of frequently called friends and relatives programmed into her AAC system. Using macros while on her telephone page, Sara can dial the number with a single stroke

of her head switch, similar to pressing one button to make a call using a telephone's speed-dial feature. The environmental control features on her AAC system activate the phone.

Dovetailing with Sara's use of rate enhancement strategies for computer and telephone access is her expanded use of the AAC system's environmental control capabilities. Practice sessions with the team gave her a foundation to use these capabilities to operate lights, the air conditioner and other home electronics on a daily basis, bringing her to a higher level of self-sufficiency.

Communication Efficiency: A Quality of Life Issue

The use of macros to work online or use the telephone is one of several rate enhancement features that Sara has started using on a daily basis. Among the features that have allowed her to create and deliver communication messages more quickly are the Word Power-2 visual scanning pages. Their design lets Sara scan blocks of core vocabulary and pop-ups in a frequency-based sequence that allows her to build messages more quickly and easily than she could with the direct selection-based pages. The compact frequency-of-use keyboard on the layout makes it convenient for Sara to add fringe vocabulary to messages by spelling words letter-by-letter and using word prediction. Another advantage of the application is that there is little to no repetition of core vocabulary in its word prediction buttons. This allows word predictor buttons to be reserved for those less frequently used words that need to be accessed by spelling.

Social scripts as defined by Burkhart and Musselwhite (2002) provided another way for Sara's e-mail and telephone communication to be more rapid and effective than before. With help from the team, Sara created and programmed a series of social scripts, with simple yet meaningful messages to use in conversations with friends and family. She used the social scripts to initiate and maintain early portions of a conversation. Once the communication partner had been engaged, Sara was then able to develop novel messages to share during the conversation.

Abbreviation expansion allows Sara to deliver messages by selecting a series of just two or three letters referred to as a salient letter code. Light, Lindsay, Siegel, and Parnes (1990) found that the use of salient letter codes was an effective means by which literate individuals with physical disabilities could retrieve pre-programmed messages. Additionally, they speculated that this strategy may have been even more effective had the individuals in the study been able to personalize the codes rather than adhere to the predefined codes which were required during their research (Light et al., 1990). Since Sara can assign her own codes to the abbreviation expansions she uses, she has a personalized tool for establishing the salient letter codes for these expansions. Sara finds such codes helpful in the halls at school and when she is on the phone or computer. For example, she can select 'hh' to say "Hey, how's it going?" It allows her to express needs and ask for help more quickly than spelling the full message or selecting a series of buttons on her AAC system to create the message. For example, to let someone know that she needs to go to the bathroom, Sara selects 'sgb.'

Additionally, Sara's rate of communication had more than doubled to 11.5 words per minute. Her mean length of utterance increased to 18.7 words, an increase of more than five words.

The communication strategies that Sara has learned in recent months have raised her comfort level when she is out in the

community or at home alone for a few hours at a time. Now she has a way to call her mother, a neighbor or a close friend for help with personal care, which she did not have before.

With time, practice, and professional guidance, Sara has made her newfound shortcuts for using the technology routine. Her ability to accomplish daily tasks and to use the rate enhancement strategies has increased significantly. She has the satisfaction of addressing daily needs on her own and is enjoying a better quality of life that extends to her entire family.

While the strategies for rate enhancement and computer access used with Sara were effective for her, one must exercise care in applying these results across all augmented communicators. The study was limited to a single subject. Although the results may be of interest to related augmented communicators, generalizations may not be accurate. The action research project offers preliminary information on the use of environmental control, rate enhancement features, and Word Power 2 on the DynaVox 3100. While the use of macros for computer access, social scripting, and infrared environmental control may have widespread application for individuals of varying cognitive abilities, use of strategies such as the salient letter coding associated with abbreviation expansion and the scanning of a core word vocabulary system will require more complex cognitive skills and physical abilities and therefore may vary in their effectiveness to enhance the rate of communication for any individual.

It is the use of a combination of these strategies that resulted in the increased rate of speech and MLU, and greater self-sufficiency and speed for computer and telephone access for Sara. Future research should consider further evaluation of these strategies as a whole. Additionally, there is limited research that considers computer access through the use of an AAC system from within the communication software and the communication pages that are used by that individual. Comparative studies that focus on both the benefits and limitations of this approach to computer access would assist clinicians in determining the importance of considering this feature on an augmentative communication system while drawing attention to the importance of computer access for individuals with disabling conditions.

Outcomes and Benefits

Sara, 17, was a proficient augmented communicator when she began working with the team of education and engineering specialists to increase her use of the environmental control and rate enhancement features of her DynaVox 3100 communication device, which she accesses via single-switch scanning. While the device played a key role in her academic and social successes, she had not yet developed strategies for using its environmental control capabilities and rate enhancement features.

The effort to maximize Sara's use of the environmental control and rate enhancement features on her AAC device focused on devising strategies for Sara to access the computer and telephone without assistance from family members. Sara now realizes many benefits by using the computer and telephone on a regular basis, including greater self-sufficiency, enhanced interpersonal communication and more time for herself. The strategies allow her to use assistive technology for daily activities in her home environment without assistance. Sara has privacy when she communicates with friends on the telephone or via e-mail because she no longer needs an intermediary to help with the preparation or mechanics involved. She can be at home alone for significantly longer

periods of time because she can use the computer and telephone readily. She has made a habit of using the infrared environmental control capabilities of her AAC device to use the telephone, control the lights and use other electronics in her surroundings.

A key step toward achieving these results was to incorporate the DynaBeam computer access component and the Word Power-2 application into Sara's routine use of her communication system. Using the DynaBeam with the computer access pages on Word Power-2, Sara can use the computer without assistance. The DynaBeam allows her to maintain access to her AAC device while she is at the computer because she does all environmental control and computer access directly from her communication pages. Word Power-2 also provides macros that allow Sara to access the Internet or visits a website with one press of her switch. The program that Sara used previously required her to spell out her screen name, password and the names of websites letter by letter. This process was not only time-consuming (it took Sara 3 minutes and 50 seconds to access the internet compared to 44 seconds with the DynaBeam and Word Power-2), but also involved considerable physical effort. Sara had to activate her switch 15 to 20 times just to get online.

The telephone access pages that Sara and the team created on her AAC device provided macros that allowed Sara to make a phone call with one stroke of her switch, eliminating her need for assistance and increasing her privacy while communicating on the phone.

The rate enhancement strategies that Sara uses daily as the result of her work with the team facilitate her communication in a variety of settings. Central to this improvement is Sara's use of Word Power-2's visual scanning pages because their design matches her physical abilities more closely than that of the direct selection pages she used before. Other rate enhancement strategies featured in the application, such as macros and the frequency-of-use keyboard, allow Sara to access vocabulary quickly and easily, allowing her conversations to flow more smoothly. The same holds true when she exchanges e-mails with others. Abbreviation expansion is a rate enhancement feature that has made a noticeable difference for Sara, whether she's communicating by telephone or in person.

A significant quantifiable outcome of Sara's combined use of these strategies is the increase in the rate and content of her communication. From the beginning of this project to its completion, the number of words per minute that Sara communicates increased from 5.6 to 11.5, and her mean length of utterance from 13.2 to 18.7 words.

Sara's increased use of the rate enhancement and environmental control capabilities has reduced her need for assistance with daily tasks. Because she requires less help, her family can devote more time to other activities. Sara, meanwhile, has significantly reduced the amount of time and effort it takes to express herself, ultimately increasing her opportunities for fluent and meaningful communication.

References

Beukelman, D. R., & Mirenda, P. (1998). *Augmentative and alternative communication management of severe communication disorders in children and adults* (2nd ed.). Baltimore, MD: Brookes.

Burkhart, L., & Musselwhite, C. (2002, March). *Social scripts: Co-planned sequenced scripts for AAC users*. Paper presented at the 2002 International Conference on Technology and Persons with Disabilities. Retrieved May 25, 2004, from

http://www.csun.edu/cod/conf/2002/proceedings/209.htm

Inman, N. (2003) *Word Power – 2™ – A word-based vocabulary for DynaVox 3100 and DynaMyte 3100*. Pittsburgh, PA: DynaVox Systems LLC.

Light, J., & Binger, C. (1998). *Building communicative competence with individuals who use augmentative and alternative communication*. Baltimore, MD: Brookes.

Light, J., Lindsay, P., Siegel, L., & Parnes, P. (1990). The effects of message encoding techniques on recall by literate adults using AAC systems. *Augmentative and Alternative Communication*, *6*, 184-201.

Wright, P. (2002, March). *Experience the power of assistive technology at home*. Paper presented at the 2000 International Conference on Technology and Persons with Disabilities, California State University at Northridge. Retrieved November 11, 2003, from http://www.csun.edu/cod/conf/2000/proceedings/0026Wright.htm