

# USE OF ELECTRONIC PAPER TECHNOLOGIES IN FACE-TO-FACE COMMUNICATION

Katrina Rae Fulcher, M.A. & Jeff Higginbotham, Ph.D., SUNY Buffalo  
Michael Williams, M.A., Augmentative Communication, Inc.

## Introduction

Commercial e-paper technologies (e.g., Kindle, SONY Portable Readers) offers new AAC possibilities for designers, SLPs and AAC users:

- Low cost
- Low power consumption
- View in direct sunlight
- Dynamic pages
- Synthesized speech
- Lightweight (kindle 10.2 ounces)
- Integrated with e-book media

*This project explores the potential for integrating AAC applications into commercial e-book technologies*

## E-books Used In This Project



Three devices were reviewed and assessed for this project. They are (from left-to-right):

- Kindle 1
- Kindle Dx
- Sony Portable Reader System – 700.

## e-book Review

### Michael Williams: Inveterate Reader & Expert AAC User

(entire review can be found at: <http://aac-rerc.psu.edu/index.php/projects/show/id/8>):

***As I have gotten older, I have experienced a subtle loss of ability to perform the physical tasks necessary to reading, holding printed material and turning pages... Who knew reading was a contact sport?***

- MW interest in e-books was motivated, in part, by his desire to improve his physical access to reading materials, by his frustration with other electronic reading technologies, and a desire to have newspapers, magazines, books and other reading materials readily available at all times.

***There is no way to easily hold the Kindle without activating one or more of its buttons. ... It raised my frustration level to the point of wanting to hurl the Kindle against a wall.***

***Yes, reading on the Kindle is easy; however, if I want to perform any of the other tasks the Kindle is capable of, like buying a book from the Kindle store, making a note on something, or looking up a word in the built-in dictionary, I must brave the deathly hallows of the Kindle's poorly designed user interface***

- MW found that the Menu structure was hard to learn.
- On the Kindle 1, MW found the selection wheel difficult to manipulate. *Using the select wheel is problematic, as I usually undershoot or overshoot my intended mark while moving the cursor up and down.* MW found the redesigned joystick button on the Kindle II and DX to be somewhat easier to manipulate.
- The selection cursor was hard to see in low light situations.

***Talk about frustration, take the Kindle keyboard...please! It's a total disaster. The tiny keyboard with Chiclets-shaped, oddly angled keys looks like it was dreamed up by a failed design student. Ordinary mortals will find it frustrating to use, let alone persons who lack good hand control.***

***If anyone thinks I'm being overly critical of the Kindle, let me say this in conclusion: The advantages of the Kindle for me as a reader are so great that I will gladly overlook its many flaws to be able to read in comfort, instantly look up definitions of words I don't know in the text I'm reading, and buy books for my Kindle wherever I happen to be. These features make me forget any frustration I have. My Kindle goes almost everywhere with me, tucked in beside me in my wheelchair. Trips to the dental clinic don't seem so daunting anymore now that I'm armed with my Kindle loaded with interesting reading material.***

## e-book Review

### Katrina Fulcher: SLP / Researcher:

(entire review can be found at: <http://aac-merc.psu.edu/index.php/projects/show/id/8>):

**When I first learned about these digital reading systems, I was unsure about their capabilities and functions. I approached these devices, not as a user of augmentative and alternative communication (AAC), but rather as a professional who has experience with different technologies.**

- KF's interest in technology sparked her interest for learning more about the commercially available e-books. While evaluating all three e-books, KF investigated their ease of use as well as their potential as an AAC system.

**At first glance before turning the e-book on, I thought that The Sony Reader had a simple design, was relatively lightweight, and had a large enough display screen to mimic an actual book.**

- KF thought the best part of the Sony Reader was the touch screen display, which made the reader easy to navigate. Also, the Sony Reader offered an easy to navigate menu structure.

**Although my experience with the Sony PRS-700 reader was largely positive I have found negative aspects of their system. While the touch screen has significant advantages for selection, it can be slow to respond. The Sony Reader takes about 2-3 seconds to display a new page, especially when displaying pictures. While the reader can play MP3 audio files, the reader does not have a text-to-speech option for the e-books.**

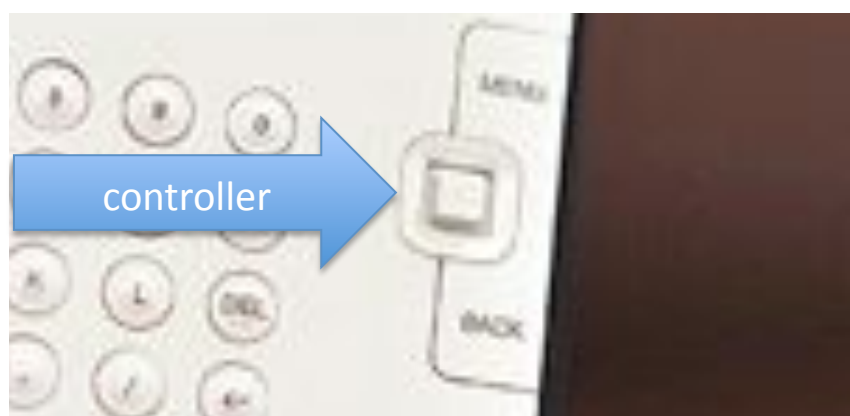
- KF felt that the SONY's screen was too difficult to read in low lighting conditions
- Lacking an external speaker or text-to-speech options further limited it in terms of AAC utility.

**Upon first glance, the Amazon Kindle II has more bells and whistles than the Sony PRS-700 Reader. First, the display is larger and it also includes a QWERTY keyboard. The Kindle has similar buttons for accessing menus and turning pages on the e-books. The screen on the Kindle is not a touch screen like the PRS-700, you are able to access the menus and select e-books via a small square movable click cursor.**

- Overall, KF preferred interacting with Kindle than the Sony Reader. The screen was easier to read and more responsive when switching between pages, pictures, and menus.
- The Kindle offers a text-to-speech option for e-book reading. KF felt the clarity and rate of the speech synthesis was easily understandable. However, once initiated, the only way to turn off the text-to-speech option is by toggling a physical button – *in real time*.

**The click cursor made it difficult to navigate easily through the different Kindle menu options. I found myself unintentionally clicking on items, which created difficulties. Also, the menus are not consistent and change depending on whether you are reading an e-book, a personal document, or looking at your homepage.**

## Modifying the 5-Way Controller



Based on MW's review and our own experiences using the Kindle, we felt that the 5-way controller posed a barrier to access. Two usability investigations were performed to improve physical access to the controller.

Eleven different controller tips were developed. These included: glue in the shape of a dimple, glue in the shape of a dome, a beveled grommet, a straight grommet, a screw, a screw with a glue tip, a spring, a welled washer, hook Velcro, a foam pad, and loop Velcro.

### **Preferred controller adaption (Non-AAC Users)**

- Seven individuals with typical physical skills were asked to touch and manipulate each tip option with their finger as well as an eraser attached to the end of a pencil.
- While using their finger, Non-AAC users preferred to use the foam pad or the grommets. When using the eraser of a pencil, they preferred the beveled grommet as a control tip.
- They also stated that they did not like manipulating the plain screw with their finger and that using a pencil eraser to control the movement of the spring was difficult.

### **Preferred controller adaption (AAC-User)**

- A man with ALS (JH) who frequently utilizes different AAC systems evaluated the Kindle 5-Way Controller as well as the modified tip options.
- JH experienced difficulties manipulating the Kindle II's controller for scrolling through text and making menu selections.
- JH preferred using both grommets and the welled washer when using his finger.
- The spring and two screws were most difficult for JH to manipulate.

### **Conclusions**

The 5-way controller could be easily adapted to allow users greater physical control over the Kindle.

More work needs to be done with taking the preferred tip options and placing them on a device to learn more about navigating menus and completing reading tasks with the Kindle.



# Creating Communication Boards

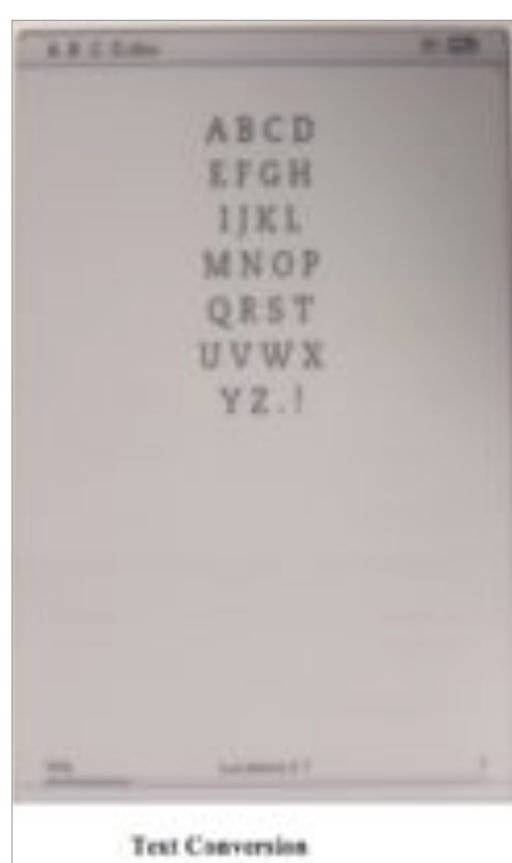
We made some initial attempts to turn the SONY PRS-700 and the Kindle II and Dx into AAC communication aids.

For the Kindle and the Sony PRS-700, different PDF and Word Documents were created in order to see how each system would display simple communication boards. While using the Sony PRS-700, PDFs were created with in the same document. In order to make sure the PDF could go to different pages, links had to be setup with in the document. After they PDFs were made they could be dragged and dropped right to the device.

The conversion process was simple, and the integrity of the document was maintained. The homepage is shown in the pictures below:



The process of creating communication boards on the Kindle was more difficult. Since you have to send your documents to Kindle before they are placed on your device, you have little control over the conversion process. This problem can be fixed however, if you make your word document in to a picture image. When this is done and then sent to Kindle. The conversion process will maintain the visual integrity of the document which is seen below:



## Final Notes

Despite some physical access issues, simple AAC devices may be integrated into current e-book technologies, including multipage picture, word and letter boards.

Even though the Kindle technologies provide good text to speech output, they lack the ability to control speech output for communication device purposes (e.g., control codes are not available to embed into communication pages to stop the speech at the end of a word or utterance).

With the open sourcing of the Kindle software development kit, control of speech output may be possible, providing a new source for low-cost communication aids.

## Acknowledgments



UB's Signature Center for Excellence in Augmented Communication



The Rehabilitation Engineering Research Consortium on Communication Enhancement (AAC-RERC) is funded under grant #H133E080011 from the National Institute on Disability and Rehabilitation Research (NIDRR) in the U.S. Department of Education's Office of Special Education and Rehabilitative Services (OSERS). The contents do not necessarily represent the policy of NIDRR.

Corresponding author: Katrina Fulcher (fulcher2@buffalo.edu)