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Bilingual Storybook Apps: An Interactive Reading Experience for Children

By Melissa Herzig and Melissa Malzkubn

When it comes to reading, technology has changed everything for students who are deaf or hard of hearing. Reading was an experience that was text based; it consisted of negotiating combinations of words expressed in linear form on paper. How was it possible to develop reading materials for bilingual readers, especially if one of the youngsters' languages was visual and spatial?

Enter technology. The touchscreen made a revolutionary difference. In an unprecedented way, touchscreen tablets complemented our conventional and traditional printed books.

Enter the Visual Language and Visual Learning Lab (VL2). At VL2, the Science of Learning Center funded by the National Science Foundation at Gallaudet University, researchers explore themes of literacy and bilingualism for deaf children—and translate their findings into apps that allow deaf children to learn to read.

Enter The Baobab. *The Baobab*, the story of a curious little girl who embarks on a search for a fruit growing from a rare tree and gets into mishaps along the way, was the first downloadable app developed at VL2. Using the latest technology to provide reading for young deaf children, *The Baobab* opened a new field in education. For the first time, deaf children could participate equally with their hearing peers in exploring literature while developing literacy skills in American Sign Language (ASL) and English.

As we watched children enjoy the app, we studied how they read, how they navigated between English and ASL, and how both languages helped them develop strong bilingual literacy skills.

The Benefits of Bilingualism

In recent years, researchers have turned their attention to the cognitive impact of bilingualism, and the benefits of using two languages have become increasingly apparent. Children raised in bilingual families exhibit stronger awareness of the style

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and tone of language, stronger cognitive development, and higher levels of reading skill than children raised in families where only one language is used (Allen, 2015; Kovelman, Berens, & Petitto, 2013; Bialystok, Craig, Green, & Gollan, 2009; Jasińska & Petitto, 2013, 2014; Petitto, 2009).

To maximize the bilingual advantage, children must be exposed to both languages in their early preschool years. Unfortunately many deaf children, with tremendous potential for becoming ASL/English bilinguals, do not get adequate exposure to either language. These children miss out on much-needed linguistic experience—which has a huge impact on their learning and academic success (Petitto, 2009).

British researcher Gary Morgan (2006) found that deaf children rely on and benefit from sign language narratives. Narratives in ASL provide children with “opportunities to develop potential cognitive flexibility and metalinguistic abilities in order to facilitate the development of English literacy skills” (p. 338).

In other words, exposure to ASL narratives and vocabulary allows children to develop skills to grasp concepts related to the understanding of English, and this, in turn, helps them become skilled readers.

Hanson and Padden (1990, 1994) found that when students read a story through a software program called HandsOn, which presents ASL and English side by side, they understood the story better than when they read the story only in printed English. Morgan (2006) concludes that this skill in comprehension is due to how children engage in a “contrastive narrative analysis task” (i.e., how children receive with both languages, processing each separately and deriving meaning through both).

It is this use of two languages—and the resulting contrastive narrative analysis—that stimulates the child’s knowledge of how each language works and maximizes his or her ability to process linguistic information. Past studies have found that deaf children who experience stories in ASL and printed English are more

stimulated mentally than those who experience stories in only one of these languages, and this stimulation facilitates their becoming skilled readers (Morgan, 2006).

With the technological advances of touchscreen computing, we can develop bilingual resources to encourage cognitive development, bilingualism, and literacy growth in deaf children. Adam Stone (2014), who authored an ASL/English e-book, noted that both languages could be provided interactively on a touchscreen with vivid and sophisticated video capabilities. This allows children bilingual access to literature.

Kennedy (2004) found that middle school deaf students demonstrated higher levels of motivation and engagement when texts were accompanied by ASL presentations of the material. When they clicked on printed words, students expressed a preference for representations of the ASL sign equivalents.

Storybook Apps: Exciting in Two Languages

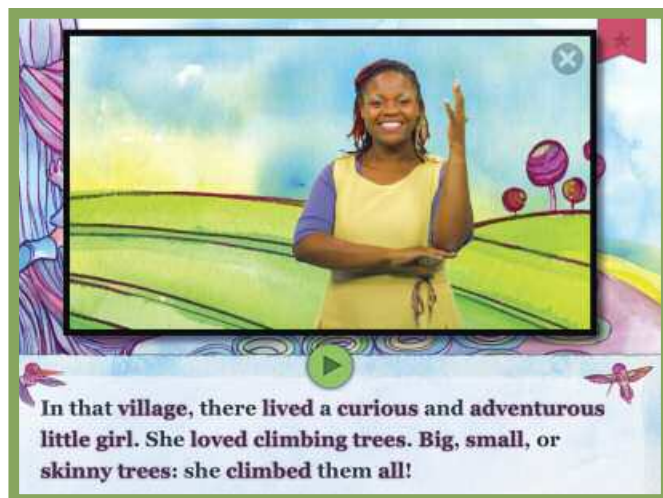
The Baobab, the first story app presented in ASL/English, was soon followed by *The Boy Who Cried Wolf*, *The Blue Lobster*, and *The Solar System*. Developed and designed under Melissa Malzkuhn, in VL2’s Motion Light Lab, each storybook app provides young readers with rich, engaging literature in both ASL and English.

Research has shown that exposure to sign language storytelling nurtures the children’s development of vocabulary and increases their skills in language and literacy (Berke, 2013; Mayberry, del Giudice, & Lieberman, 2011). Each app incorporates the latest research in language learning and bilingualism from research done at VL2 and established principles of literacy development; and each offers three ways of interacting with the content, identified as “watch,” “read,” and “learn.”

WATCH—VIEWING THE NARRATIVE

In the “watch” mode, children view the narrative presented by a professional ASL storyteller in conjunction with high-interest visuals and animation. The extended narration, without any editing or interference, requires that young viewers pay attention and enjoy the flow, rhythm, and other elements of ASL storytelling.

Encouraging children to watch stories in ASL helps them learn to follow and understand the sequencing of events within a narrative and become familiar with the structures of narratives. This understanding prepares them for the process of reading, a process in which they will go from the whole story to its smaller parts (e.g., paragraphs, sentences, words, letters).



READ—ENJOYING THE TEXT

In the “read” mode, children view pages of English text on screen in a manner similar to the way most books are viewed in traditional children’s literature. Each page features sentences in English accompanied by illustrations that help children connect words to meaning. There are also plenty of interactive options. Children can check out parts of the story in ASL or view videos showing the signs and fingerspelling for English vocabulary.

At their own choosing, they can alternate between ASL and English, tapping an on-screen “play” button that results in a pop-up window with an ASL translation of the page. This potential page-by-page translation allows children to focus on smaller units of meaning than those in the “watch” mode as well as to see how the two languages handle expression of similar information.

The “read” mode addresses one of the obstacles that many deaf children face as readers—an insufficient knowledge of vocabulary (Torgesen, 1986). Without understanding vocabulary, it is difficult to develop motivation and engagement (Herzig, 2009; 2014). Motivation is what makes a person want to read, and engagement is what makes a person

keep reading (Guthrie & Wigfield, 2000). In the “read” mode, children maintain both their motivation and engagement by proceeding at their own pace, choosing either to watch the ASL version of the page, read the text, or view the vocabulary words in ASL as signs or as fingerspelled words.

LEARN—VOCABULARY FOR ALL

In the “learn” mode, children are presented with a glossary that has vocabulary from the story in an alphabetized list. Children tap on each word to



ASL on iPads: Expanding the Field

Since the launch of Apple’s iPad in 2010, over 20 ASL/English e-books and storybook apps have been created and the demand is high. This is an emerging field, and developers and educators need more empirical research in app design for bilingual readers, how children use the ASL/English readers, and the readers’ effectiveness in literacy development.

At the time of writing, we were conducting assessments on the user experience of our storybook apps. We’re looking at 44 deaf and hard of hearing students from four different schools, tracking how students use the app, how they interact with it, and to what they pay attention. From what we’ve seen, the majority of children, regardless of their language skills and hearing levels, show an interest in both languages.

In the Petitto Brain and Language Laboratory for Neuroimaging (BL2), we, with Dr. Laura-Ann Petitto and her team of students, many of whom are part of the PhD in Educational Neuroscience (PEN) program, are currently conducting a NSF-VL2 Science of Learning Center study with modern fNIRS brain imaging and eye tracking technology to measure precisely how children perceive and process the rich moving visual scenes in storybook apps. In this first educational neuroscience study of how young children process bilingual visual linguistic information—with one language in sign and one language in print—we seek to learn whether segmentation at the heart of fingerspelling in ASL may facilitate the young child’s segmentation of visually presented printed strings of

see its translation into ASL.

Translations both in the glossary and in text are handled through videos that incorporate “chaining”—a natural feature of ASL in which signers present a word in signed ASL, then fingerspell the word, then repeat the word in signed ASL. Research has demonstrated the usefulness of chaining as a tool to enhance literacy development (Humphries & MacDougall, 1999; Padden & Ramsey, 2000). Chaining helps the child build joint internal representations of the word in both languages and provides a means for linking fingerspelling to English print.

The “learn” mode emphasizes vocabulary; children deepen the connection to meaning between signed or printed words when they return to the story in “read” mode.

Lesson Plans— Complementary and Complimentary

Lesson plans are available for free for the storybooks. They can be downloaded in PDF from www.VL2storybookapps.com. The lessons are designed to promote ASL skills, awareness of how ASL works, and literacy in the classroom; they also encourage further immersion in reading.

Creating the Personal Storybook

In an effort to expand the field and the availability of bilingual storybook apps, VL2’s Motion Light Lab is releasing a program called Storybook Creator, which allows an individual to create an app without writing a line of code. Users upload text, images, and videos to create new storybook apps through Storybook Creator in Xcode, Apple’s standard app development software. This is a fantastic opportunity for educators, storytellers, artists, designers, and parents to create stories that benefit the bilingual learner.



English letters, words, and sentences on the page en route to becoming successful readers. We are also examining whether deaf children who learn sign language early in life are advantaged or not in the visual linguistic processing of storybook apps relative to deaf children who learn sign language later.

At the same time, we continue to develop apps for children to enjoy, and we build on what the research has shown:

Bilingualism—the mastery of two languages instead of just one—benefits all children. Deaf and hard of hearing children who are bilingual experience a deeper understanding of language, increased skills in reading, literacy, and enhanced cognitive development. As we look at our students and how they read, and as we develop new apps for them to learn from and enjoy, this knowledge is what infuses the purpose of our work.

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