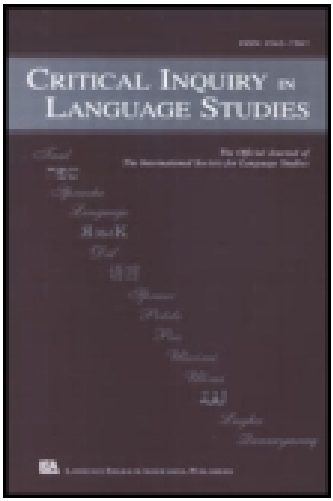

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New Directions in ASL-English Bilingual Ebooks

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NEW DIRECTIONS IN ASL-ENGLISH BILINGUAL EBOOKS

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The widespread adoption of smartphones and tablet computers have enabled the rapid creation and distribution of innovative American Sign Language (ASL) and written English bilingual ebooks, aimed primarily at deaf and hard-of-hearing children. These sign-print bilingual ebooks are unique in how they take advantage of digital platforms to display both video and text, and they take markedly divergent approaches to integrating the two media. How they are designed belies potentially unequal representations of each language, which may be partially a consequence of the composition of ebook production teams and their access to programming skills. In addition, the selection of interactive features in these ebooks suggest that deaf children's acquisition of English literacy skills continues to be a greater priority than that of ASL literacy skills. Given their prioritization of English literacy, these ASL-English ebooks raise intriguing questions about whether and how they support bilingual development in deaf children, the role of ASL as a language of education and literature, and how revolutions in ebook design are challenging traditional approaches to reading.

The spread of tablets as personal computing devices and recent advances in ebook authoring software have enabled the creation and distribution of innovative American Sign Language (ASL) and written English bilingual ebooks designed for these devices. Since 2010, 15 sign-print bilingual ebooks have been published for use on iPads, all with the aim of telling a children's story in both ASL and English. While ASL translations of children's books in English have existed on videotapes, CDs, and DVDs for decades, these ebooks are technologically novel multimodal texts that, for the first time, afford bilingual literary experiences for deaf and hearing children who are learning or using ASL. Such biliteracy experiences are highly prioritized by advocates of the ASL-English bilingual educational paradigm, which considers

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ASL to be the most natural language for deaf children in the United States and Canada. Instruction in ASL along with English in a bilingual education context, they argue, provides a developmentally significant resource that will facilitate cognitive development and the acquisition of literacy skills, including English reading and writing (Chamberlain & Mayberry, 2000; Grosjean, 2001; Hermans, Knoors, Ormel, & Verhoeven, 2008; Hoffmeister, de Villiers, Engen, & Topol, 1997; Humphries & MacDougall, 1999; Johnson, Liddell, & Erting, 1989; Mason & Ewoldt, 1996; Padden & Ramsey, 2000; Strong & Prinz, 1997).

Sign-print ebooks represent unique learning tools that are more than extensions or replacements of existing books (Kucirkova, 2013), reshaping how stories are presented and thus requiring new definitions of "literacy" and the use of multiple methodological approaches to examine these artifacts and how children interact with them (Lankshear, Knobel, & Curran, 2012). Reshaping literature is not a construct new to the deaf community. Kuntze (2008), in arguing that the act of watching and producing ASL videos fell under literacy activities, suggested that definition of literacy be expanded to include modes of language beyond the written form. He suggested that "text" should be redefined to include any type of content that "is recorded and left 'suspended' in time" (Kuntze, 2008, p. 147). Such a definition allowed room for the comprehension of visual language, like ASL, to be included in the overall conceptualization of literacy (Fleischer, 2008; Golos & Moses, 2011; Kuntze, 2008; Snoddon, 2010). This argument about the validity of ASL videos as text and, therefore, requiring literacy skills, dovetails with the New Literacies Framework (Lankshear, Knobel, & Curran, 2012) in embracing new forms of literacy tools with unique affordances for meaning-making. Sign-print bilingual ebooks represent one of these new literacy tools, and is already distinctive in how it integrates two languages, different in modality, using video and text, for viewing on touchscreen-capable mobile platforms.

However, ASL and English are not uniformly presented within these ebooks. This article discusses these multiple approaches to sign-print ebook design, which incorporates video and interactive features that expand opportunities to interact with either ASL or English. The diversity we see in the

designs of these ebooks appear to be partially motivated by the composition of an ebook's production team and their access to software programming skills. Taken as a whole, those ebooks exhibit unequal representations of ASL and English, and select interactive features appear to favor the acquisition of comprehension and receptive skills for English over ASL. Thus, these ebooks raise intriguing questions about whether and how they support literacy learning in deaf children and how revolutions in ebook design are challenging traditional approaches to reading.

Bilingual Books: An Introduction

ASL-English bilingual ebooks are a subset of bilingual books, which tell stories, explain concepts, or describe events using two different printed languages. Printed bilingual books appear in many forms with the most common being a full-text translation in which the story is presented twice, one for each language, in a side-by-side arrangement (e.g., a Spanish and English printed children's book). Evidence is bountiful for advantages in language and reading development and cognitive control in bilingual children compared with monolingual children (Berens, Kovelman, & Petitto, 2013; Bialystok, Craik, Green, & Gollan, 2009; Petitto, 2009) and for empowerment and identity development when multilingual children create self-authored "identity texts" in classrooms (Cummins et al., 2005; Cummins & Early, 2011). However, there is little empirical research specifically on mass-produced bilingual books, their design, or their efficacy in promoting literacy development in children.

Sneddon (2008) explored how children from minority French, Albanian, Turkish, and Urdu-speaking families in London used school-provided bilingual books. These children displayed high levels of motivation and pride in their biliteracy achievements and adapted English reading strategies (e.g., figuring out the meaning of unknown words by using context) for reading in their minority languages. In addition, all children chose to work initially with the non-English text, contradicting fears that children will only read in the "easier" language (in this case, English) when presented with bilingual books. Martin and Stuart-Smith (1998) examined the biliteracy attitudes of English

and Panjabi-speaking children living in Great Britain and found that the visual quality with which languages are presented in books was crucial to forming children's attitudes toward their home language. The children's negative attitudes toward Panjabi were found to be related to how Panjabi books were perceived as old, boring, crudely made, and featured scenes from rural India which were wholly unrelated to the children's lives in urban London.

Despite the overall paucity of research in bilingual books, the two studies shed some light on best practices in bilingual book design, which can be applied to sign-print ebooks. First, these books should be visually appealing and treat both languages equally; second, young bilingual readers can and do take advantage of the "doubled" language resources if made available. Based on these studies demonstrating how children respond to bilingual books' availability and design, an exploration of how sign-print bilingual ebooks are designed is a worthy endeavor. First, I will explore the emergence of sign-print bilingual reading software, which preceded the current cohort of ASL-English bilingual ebooks. Via an investigation of specific interactive features in these ebooks, I will then frame an argument for how ASL-English bilingual ebooks continue to favor the acquisition of English reading skills rather than presenting both languages equitably.

The Early Years: Sign-Print Reading Software

When we consider specifically sign-print reading software, we find more scholarly inquiry than with bilingual books in general; this trend began in the late 1980s when computers were becoming popular as educational tools in classrooms. Several sign-print reading software programs were developed and tested. They can be considered precursors to the current cohort of ebooks (2010-present) that have been developed for modern tablet devices. Here, I review examples of these precursors. Some were designed explicitly for displaying both signed and written languages (e.g., *HandsOn*) while others were pre-existing English literacy programs that were later adapted to include sign language videos (e.g., *Thinking Reader*).

The first instance of a sign-print reading software program recorded in the literature, *HandsOn*, was created in the late 1980s and presented several adapted children's fiction and nonfiction stories in both ASL and English (Hanson & Padden, 1990). The creators shared their excitement about emerging video technology that made it "possible to manipulate in traditional and unusual ways combinations of signed and written text" (Hanson & Padden, 1990, pp. 51–52). Contained on a laser videodisc and used with a touchscreen monitor, *HandsOn* permitted children to elect to either read the story in English or watch it in ASL. Usually only one language was shown at a time, and at any point during the story children could tap the screen and switch to the other language without losing their place in the story. *HandsOn* also included user interaction such as answering comprehension questions after reading or watching the story, and captioning the ASL video by typing their own English translations, which was the most popular activity according to student use.

Hanson and Padden (1994) compared *HandsOn* and print books in relation to students' reading comprehension and found that students using *HandsOn* had significantly higher scores, suggesting that a language instruction approach incorporating ASL and English could be beneficial for deaf children. With the arrival of streaming Internet video technology, *HandsOn* was retooled as *HandsOn II*, a reading website that now presented the ASL video next to the English text. This, for the first time, allowed for side-by-side reading and comparison (Hanson, 2003), a format that would be adopted by nearly every ASL-English bilingual ebook thereafter. Teachers' analysis of the student-generated captions showed that "students wrote longer, more complex English sentences when captioning (in *HandsOn II*) than they normally wrote for classroom assignments" and noted "better morphological agreement and more inclusion of articles" (Martinez, Hanson, & Crayne, 2003, p. 2); students also avoided doing word-for-word translations of the ASL into English, revealing a greater understanding of the different grammar systems in ASL and English. The captioning features in *HandsOn* and *HandsOn II* exhibit an extraordinary level of interactivity among the reader and the two languages; no subsequent reading software or ebook has offered similar opportunities for the reader

to actively translate between two languages, which may be fruitful as a language learning strategy (Cook, 2010; Károly, 2014).[1]

Researchers also adapted preexisting electronic reading software to incorporate sign language and other visual reading support. Kennedy (2004) explored an adaption of the *Thinking Reader,* an interactive educational reading software with embedded support for reading comprehension and vocabulary; the adaption added ASL translations and illustrations. In a study of deaf middle school students, the ASL elements appeared to motivate them to engage the text more and use word recognition strategies independently. Notably, the students started expressing a preference for words to be defined by their equivalent ASL signs rather than their fingerspelled forms, suggesting an increase in metalinguistic skills.

Mueller and Hurtig (2009) added ASL elements to an existing educational reading program, the *Iowa E-Book*, to create the *Iowa Signing E-Book*. In this adaption, each page included a video which not only showed the narrator signing the English text in ASL but also making comments on the story and directly addressing the reader with questions. Each individual word in the book was clickable and linked to a video clip of the word being reproduced in Signed English.[2] In a comparison of signing ebooks and non-signing ebooks used in hearing mother-deaf child reading sessions, Mueller and Hurtig found that children tended to read signing ebooks longer (but this difference was not great) and that signing ebooks prompted more frequent and high-quality shared reading interactions between mothers and children.

Nikolaraizi, Veikiri, and Easterbrooks (2013) explored Greek deaf children's use of visual multimedia resources while using a specific reading software, *See and See*, which incorporated text, Greek Sign Language (GSL) sentence-level and whole-text videos,

1. Thank you to an anonymous reviewer for pointing out the captioning feature and for suggesting the potential learning opportunities provided by this translation activity.

2. The ebooks creators (Mueller & Hurtig, 2009) made this choice of Signed English in order to achieve an exact one-to-one correspondence for every single word displayed, regardless of its saliency; ASL does not have equivalent signs for many high-frequency English words such as "is" or "the." Other reading software and ebooks (e.g., *The Thinking Reader, The Baobab*) provided equivalences at the word level as well, but only for more salient words like "elephant," which is more readily achievable using ASL.

illustrations, concept maps, and multiple-choice reading comprehension questions. They noted that while deaf students used both the sentence-level and whole-text GSL videos to support reading comprehension, most of the students preferred to read the entire Greek text first prior to watching the whole-text GSL videos in order to fill in comprehension gaps.

These five early bilingual reading software programs took varying approaches to incorporating the two languages: some provided full sign narratives in single videos, others divided the sign narration into page-level or sentence-level videos, and yet others provided sign vocabulary videos to provide direct translations of individual print words. All were primarily university-funded educational resources to be used in schools for supporting deaf children's reading and narrative comprehension skills, as evidenced by the inclusion of specific features to aid print comprehension or to practice writing. These education-oriented bilingual reading software stands in contrast to today's ebooks, many of which were created by independent authors seeking to create authentic pieces of children's literature, and broadly marketed to consumers with tablets and smartphones. However, for different reasons, the current ebooks do not quite escape this tradition of incorporating ASL in order to supplant the acquisition of English reading skills. Next, I discuss these newer ebooks and their features.

The Present: ASL-English Bilingual Ebooks

As of February 2014, 15 ASL-English bilingual ebooks have been produced for the iPad (titles and authors are listed in the appendix). There appears to be no similar ebooks produced for other tablet computing platforms such as Android. There are two distinct ebook types: "storybook apps" custom-built using Xcode and downloaded from the App Store and "iBooks" developed using iBooks Author, a desktop ebook authoring app, downloaded from the iBookstore and read within the iBooks app. The type of ebook leads to significant differences in how ASL, English, and other modal elements are organized within the ebook. First, I will discuss the storybook apps and their features, and then the iBooks and their features. The critical examination of those

features will illustrate how these ebooks exhibit unequal representations of ASL and English.

The four storybook apps, *Danny the Dragon Meets Jimmy HD*, *Signed Stories*, *The Baobab,* and *The Boy Who Cried Wolf*, are also the only ebooks listed here created by large corporate or university teams. This is likely due to the fact that storybook apps are programmed from scratch using proprietary code, requiring specialized software programmers at a cost that can be better shouldered by larger, better-financed teams. All four apps contained at least a single video that tells the full story in ASL as opposed to dividing the ASL narratives into several individual videos, one for each page—an approach common in the iBooks. But each app take markedly different approaches to presenting the ASL and English elements.

Danny the Dragon Meets Jimmy HD, an adaption of Tina Turbin's book of the same title and produced by zuuka Group (producer of the iStorytime line of storybook apps), allows the reader to read each page at their own pace, listen to audio narration with auto-advancing of pages, or watch a singular video of a signer telling the story in ASL, voiced over in English, and with the background images rotating through individual pages from the original printed book. *Signed Stories,* produced by ITV, a British television network, hosts more than 80 children's stories in both ASL and BSL (British Sign Language) as in-app purchases. Nearly all stories are adapted from existing English children's stories and fables. While *Signed Stories* calls itself a reading app containing books (in fact, its app icon depicts a robot reading a book), it is better described as a collection of video stories where the reader controls the viewing experience by toggling on/off signed language, subtitles, and audio. There are no "pages" in this app, but it does contain memory and vocabulary-building mini-games and ASL/English and BSL/English dictionaries. *The Baobab* and *The Boy Who Cried Wolf* were produced by Visual Language and Visual Learning (VL2), a Science of Learning Center funded by the National Science Foundation and located at Gallaudet University, an ASL and English bilingual university. *The Baobab* is an original story conceived in ASL first and then written in English (M. Malzkuhn, personal communication, August 21, 2012) while *The Boy Who Cried Wolf* is an adaption of Aesop's fable. Both VL2 storybook apps contains three modes with different to

view ASL and English (see Figure 1): *Watch* displays a full-length ASL video without any English text or voiceover; *Read* displays individual pages of the book, with an ASL video on each page mirroring the English text and pop-up ASL videos for individual English vocabulary words, and *Learn* which contains an English dictionary of more than 170 words, each with a corresponding video showing the equivalent ASL sign.

In contrast to the four storybook apps, the 11 iBooks were authored by smaller, independent, primarily deaf teams using iBooks Author, a free ebook-authoring program. All the iBooks listed five or less contributors in their authoring team compared with, for example, 25 contributors listed in *The Baobab*. All the iBooks adopted a similar format of telling a children's story using individual pages, with each page containing English text, an ASL video, and illustration. Approximately half are original stories and the remaining are adaptions of existing children's books and stories. None of them contained an ASL video telling the *whole*

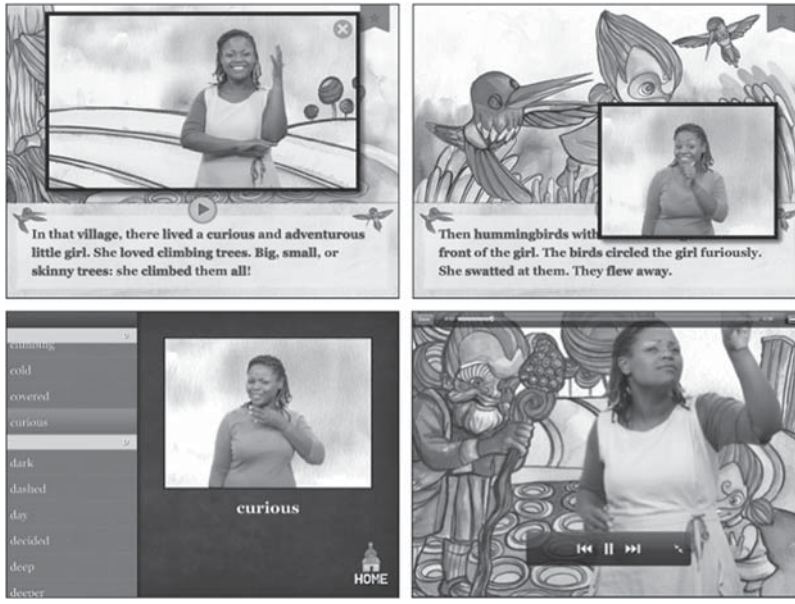

FIGURE 1 The Baobab: Multiple Ways to Represent ASL in a Storybook App. © Gallaudet University/Visual Language & Visual Learning/Melissa Malzkuhn, Project Director. Used with permission.

story, and four ebooks did not contain any English audio; the implications of these unequal representations of ASL and English are discussed further in this article.

There were small variations to the basic iBooks format. *Zoey Goes to the Dog Park* and *Zoey Goes Camping* contained hyperlinked text, which allowed the reader to tap on a highlighted vocabulary word and be taken to view the ASL sign (however, doing so meant the reader exited the iBooks app, switching to Safari, a web browser app; to return to the book, the reader had to switch back to iBooks). *The Manual Alphabet With The Death Hands* had additional explanatory English text that, while hidden by default, could be made to appear with a tap. *Strollin' With Little Baby Owen* had a sliding puzzle game at the end of the book, while *Alistair the Armadillo* would, for each "page," show the illustration by itself on one page, and then English text and ASL video in the next. *Zoey Goes Camping* contained two editions within a single ebook: one edition used English text while the other used an emerging written ASL text called si5s (Augustus, Ritchie, & Stecker, 2013); both contain the same ASL videos.

Even with these variations, the basic design of each of the eleven iBooks are the same (see Figure 2)—compared with the extremely different formats used in each of the four apps. iBooks Author, with which all 11 iBooks were created, appears to provide an easy, accessible way for independent authors and producers to create ASL/English bilingual ebooks without the need for assembling large production teams or accessing advanced programming skills. However, the use of iBooks Author, due to its primary aim as an educational, nonfiction textbook authoring program, also places creative and technological constraints on how a story can be presented. iBook Author users have complained that the software is not "friendly" toward fiction and children's book authors who want to create interactive and innovative reading experiences (R. Blythe, personal communication, May 12, 2014).

The type of ebook—storybook app versus iBook—greatly influences the design and placement of the differing language modalities in the ebook. If a potential ebook author takes the storybook app path, he or she will be afforded a great deal of creative freedom in designing the reading experience, as evidenced by the diversity of interfaces and design in the four

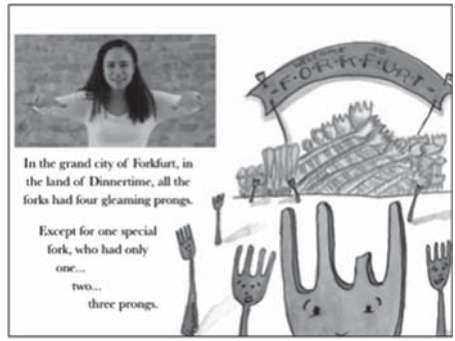

FIGURE 2 Pointy Three: A Single, Common Way ASL is Represented in an iBook. © Adam Stone.

ASL-English bilingual storybook apps, but the technical challenges are also much higher. To create an app of this type, one either needs a high level of programming aptitude or access to people with those skills, which invariably requires funding.

Alternatively, aspiring ebook creators could proceed by themselves, either alone or with selected colleagues, and create an iBook using the free iBooks Author program which requires about the same skill it takes to put together a PowerPoint. Yet, given the homogeneity of the eleven existing ASL-English bilingual iBooks, it is clear that choosing iBook Author as a creation tool ultimately constraints creative freedom and restrains the reading experience within a framework of a traditional book that is merely enhanced by video capability. This represents a situation that Rushkoff (2011) suggests indicates an emerging unequal power structure in which those who code software have dominance over those who merely use these software (even if it is to create their own content). In Rushkoff's world, authors who use iBooks Author and create more limited ASL-English bilingual iBooks lose out to those who are able to use their own programming skills to create innovative bilingual storybook apps. The ability to create more original ASL-English bilingual reading experiences, as evidenced by *Signed Stories* and *The Baobab*, remains out of the reach of many individual content creators who may not have the requisite programming skills.

This situation can be contrasted with the relative ease and low cost of creating and distributing ASL-only narratives for children. Such literature can be easily recorded on widely available handheld cameras or mobile phones, edited using free/low-cost video editing software, and hosted on video streaming websites such as YouTube and Vimeo or aggregates such as ASLized.org, where children can view them using any Internet-capable device (Matthews, Young, Parker, & Napier, 2010). ASL-English ebooks have yet to approach this level of ease in creation and distribution.

Language Representation—or Bias?

Programming skills aside, there remains the question of whether these ebooks—iBooks and storybook apps alike—provide equal representation of ASL-English. Such equal representation appears to be valuable to bilingual children, enhancing their reading experiences (Martin & Stuart-Smith, 1998; Sneddon, 2008). Comparing two languages in, say, a Spanish-English bilingual book is simple: one would check whether the narrative was fully conveyed in both languages, and that both had similar and equivalent font sizes and colors. It is not as easy to compare representation of ASL and English in ebooks: one language is shown in print and the other is shown via video. Does one compare English text with the number of ASL signs in the video, the size of the video, or the video length in minutes? My early attempts to compare ASL and English looked at the tablet's screen area that contained ASL video and the screen area containing English text. While all four storybook apps had much larger ASL videos, ranging between 28% and 32% of total screen space, compared with ASL videos in iBooks, which ranged between 8% and 13%, this approach proved unworkable because all iBooks videos have the capability to play in full-screen mode. As an alternative, we can look at the interactive features afforded by each ebook and treat them as proxies for language representation. In doing so, three major instances of potentially unequal language representation emerged: the manual playing of ASL videos, the presence of English vocabulary support, and the lack of a singular, full-story ASL video.

First, there is the act of engaging ASL within an ebook. In all ebooks that contain pages (which excludes *Danny the Dragon Meets Jimmy* and *Signed Stories,* which do not use individual pages in their stories), ASL must be played. That is, when the reader turns to a new page, they must then tap a "play" button in order to see the ASL signing. No such action is needed to see the English text. Superficially, this may simply reflect the modal capacities of video versus text—after all, nobody has to press "play" to see text in a printed book, while viewers are accustomed to actively playing videos on computers and televisions. However, the possibility of auto-playing video exists; for example, YouTube videos often begin playing without intervention from the user. It is not hard to imagine an ebook design in which the ASL video auto-plays as soon as the reader turns to a new page, and a button tap is needed in order to display English text. Yet, this scenario does not exist in any of the current ebooks. The current design in which ASL must be explicitly played in order to be seen makes possible a reading experience where the child could read through an entire ASL-English bilingual ebook without ever seeing the ASL. The converse scenario—reading an entire ASL-English bilingual ebook without ever seeing the English story text—is much less probable.

Next, there is the English vocabulary support available in some ebooks. *The Baobab, The Boy Who Cried Wolf, Zoey Goes To The Dog Park, Zoey Goes Camping,* and *Signed Stories* all have functionality in which the reader can tap an active English word to play a pop-up video showing the ASL sign for the word. *The Baobab* and *The Boy Who Cried Wolf* go further by also displaying fingerspelling while both *Zoey* ebooks include fingerspelling, definitions, and usage. While these features are laudable for promoting vocabulary learning across two languages, none of the ebooks have an equivalent feature for ASL signs. That is, there is no functionality in which the reader can tap an unknown ASL sign in mid-video in order to learn its definition or English equivalent. This emphasis on showing ASL equivalencies of specific English words is reminiscent of earlier ASL-English reading software which were educationally oriented and incorporated similar signing features, often to aid English reading acquisition (Andrews, 2012; Hanson & Padden, 1990). The inclusion of overt educational goals such as English vocabulary learning in

ASL-English bilingual ebooks contrasts with many English-only storybook apps, which do not have such features.

Finally, many ebooks lack a singular video that tells the full story in ASL. Only the storybook apps *Signed Stories* and *Danny the Dragon Meets Jimmy* have their ASL storytelling contained in a single video. The 11 iBooks show ASL only in multiple video segments, with one video segment per page. *The Baobab* and *The Boy Who Cried Wolf*, also storybook apps, accomplish both through the use of "Watch" and "Read" modes. Mirroring other languages steeped in oral traditions, ASL narratives are almost always told through continuous streams of storytelling (Bauman, Nelson, & Rose, 2006; Christie & Wilkins, 1997). Only four out of 15 ebooks—all storybook apps—have this continuous ASL storytelling; otherwise, the ASL narrative, in being divided into multiple parts, has been shoehorned into an alien form in order to fit a construct of printed languages—the page.

Taken together, we have ebooks that ostensibly provide ASL-English bilingual reading experiences, but (1) permit reading of the English text without ever interacting with the ASL text, (2) often provide support for English vocabulary acquisition through the insertion of videos showing ASL equivalencies but not vice-versa, and (3) often lack full-length ASL storytelling videos. It is difficult to conclude that current ASL-English bilingual ebooks afford equitable representations of ASL and English, especially when existing technology has solutions to remedy the three examples detailed above. Despite being wrapped in new computing platforms, they continue a tradition, initiated by older ASL-English reading software, of utilizing ASL narratives in order to support English reading acquisition. For example, *HandsOn*, the earliest example of an ASL-English bilingual reading software, was created "to improve [deaf children's] written English skills, using their ASL competence and interactive video technology" (Hanson & Padden, 1990, p. 49). Like the older bilingual reading software of the 1980s to 2000s, the ebooks of now appear to suggest that English continues to be the default language of literacy and that the learning of English demands greater attention from parents and educators than the learning of ASL. The English bias inherent in these ebooks raises the need for awareness and training on how to develop new ebooks that provide a more equitable representation of both languages and cherish traditional forms of ASL

storytelling, countering a prevailing attitude in which "the use of ASL is acceptable in deaf education insofar as it moves the student towards some level of competence in English but not really for its own sake" (Reagan, 2011, p. 621).

Future Directions: Research and Evaluation

More research is needed to examine sign-print bilingual ebook design and how the unequal representation of sign language and printed language can be remedied. Kucirkova (2013) recommends three avenues of inquiry in ebooks: (1) investigating the role of background factors (e.g., income, gender, exposure to technology) in children's engagement with ebooks; (2) looking at the links between computer/tablet use, home literacy practices, and classroom practices; and (3) examining more closely the variety of ebook designs and content available for ebook readers and tablet devices. In addition, there is little empirical research on the design of bilingual books or their efficacy in promoting biliteracy in children who use more than one language. It is in these avenues that looking at ASL-English bilingual ebooks may provide some illumination.

However, I also recommend looking at *how* these ebooks are designed and published and who has which abilities to create these products. As shown earlier, we see great differences in ebook design and the implementation of ASL and English depending on who or what the authoring teams are, and their level of access to valuable resources such as software programming skills. If the creation of original, innovative ASL/English bilingual ebooks on the scale of *Signed Stories* or *The Baobab* remains possible only in the hands of large and better-funded teams, this situation may spell problems for independent Deaf authors who are relegated to creating only ebooks based on the traditional model of books, as is the case with using iBooks Author (which is not designed explicitly for producing ASL-English bilingual ebooks, or even for children's books in general). To remedy this situation, new ebook authoring software or programming frameworks can be developed explicitly for creating more sign-print bilingual ebooks.

In addition, not explored here is who benefits from these ebooks and from the computer/tablet technology used to view

those ebooks. For example, in the United States, people have advocated for the use of signed language with hearing babies of hearing parents to promote early communicative abilities (Acredolo & Goodwyn, 1996) but discourage the same strategies for deaf babies of hearing parents (Brueggemann, 2008; Reagan, 2011). How does the wider availability of ASL-English bilingual materials influence this long-standing debate on deaf children's right to early visual language? Another avenue would be examining who has access to these materials. To engage with storybook apps, one must own an iPad device, and, in order to read an iBook, one must own either an iPad or an Apple computer running the most recent version of OS X. In addition, to download those ebooks, one needs access to a wireless broadband internet connection and an Apple ID. These technical requirements for ebooks, which are anomalous considering the comparatively low barriers towards reading a printed book, may limit deaf children and their families' access to these ASL-English bilingual resources.

Perhaps most importantly, because these ebooks are primarily aimed at deaf and hard-of-hearing children and their families, future research needs to look at the efficacy of such ebooks for supporting ASL and English literacy skills, metalinguistic awareness, and parent-child shared reading. For example, the quality of sign language narration can be uneven across ebooks. This is an issue that would not appear with bilingual books with two written languages; in such a case, neither language would require audio or video narration. ASL video inherently functions as narration, and there currently exists no quality-control apparatus to evaluate sign language videos in ebooks and other educational media. Next, lesson plans can be developed to enhance the efficacy of these ebooks. For teachers, units can be designed in order to support the acquisition of ASL signing skills, English reading acquisition, or the development of general comprehension strategies (e.g., visualizing, inferencing, asking questions, summarizing). At-home learning plans geared toward parents may focus on literacy-building activities like parent-child shared reading or simple arts and crafts projects to expand on themes from the ebooks. Finally, ASL-English bilingual ebooks are ripe for an expansion into other genre types. It is remarkable that the 15 ebooks created thus far all tell fictional children's stories, and several of them are translations of existing print children's books. Future authors ought to

consider nonfiction content such as science or biography and explore how to design ASL-English bilingual ebooks for older children and teenagers. Even more telling is the near-absence of deaf characters in this collection of ebooks. Only the two *Zoey* ebooks contain such characters—there are signing deaf adults and Zoey is a deaf dog (see Bailes, 2002, for a discussion of the representation of deaf characters in literature).

I do not mean to malign current sign-print ebooks nor their authors for not doing enough or for inadvertently promoting English over ASL. As the author of *Pointy Three*, also an ASL-English bilingual ebook, I see far more promise than peril in these new literacy innovations and am very excited about the potential of these ebooks to engage young deaf, hard-of-hearing, and hearing children that are learning ASL. These products, much like other inventions studied within the New Literacies Framework, push the limits of what we consider to be "literature;" it is exciting to recognize that that the desire to include signed language in children's literary experiences is a driving force in the overall redefinition of literacy. By crossing genre and audience boundaries, keeping abreast of changing technologies in ebook creation, and carefully considering equal language representation via interactive ebook features, we can possibly discover even more effective approaches to integrating ASL and English within the reading experience, with the goal of equitable and mutual appreciation of both languages in all children.

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APPENDIX

Ebooks: Storybook Apps	*Ebooks: iBooks*
Danny the Dragon Meets Jimmy HD *zuuka incorporated* Signed Stories *ITV Broadcasting Limited* The Baobab *Melissa Malzkuhn, Project Director* *Visual Language & Visual Learning* *Gallaudet University* The Boy Who Cried Wolf *Melissa Malzkuhn, Project Director* *Visual Language & Visual Learning* *Gallaudet University*	Pointy Three *Adam Stone & Joyce Hom* Strollin' With Little Baby Owen *Owen Tales* Zoey Goes To The Dog Park *Rachel Berman Blythe & Jena Floyd* Alistair the Armadillo *Mike Brumby & Cipta Croft-Cussworth* Zoey Goes Camping *Christopher Blythe & Jena Floyd* The Manual Alphabet With The Death Hands *Benjamin Vess* The Night Before Christmas *Clement Clarke Moore, F.O.C. Darley, Joshua Beckman, Imran Hakamali, Abigail Henderson, & Maria Vieytez* Humpty Dumpty *W.W. Denslow, Katy Walker, Sarah Bristow, Carla Morris, & Miranda Stewart* Jemima Puddle Duck *Beatrix Potter, Ellen Bachmannhuff, Megan Hodges-Cook, Jerri Aubrey, & Angela Tutt* The Little Engine That Could *Lois Lenski, Janis Cole, Camille Jeter-Lorello, Stephanie Kesterke, Rehana Omardeen, & Melanie Sweeney* Rocky The Cat Who Barks *Donna Jo Napoli, Marie Kane, Tamara Petrosino, Casey Ferrara, Krishneer Sen, Justin Reynolds, & Margaret Perkoff*

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