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The Emergence of Signed Language Education and Reading

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**The Tenth Year Anniversary on the Resolution of the Milan Conference of 1880:
Some Reflections**

Jody H. Cripps
Editor-in-Chief
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      The *Society for American Sign Language Journal* (SASLJ) is pleased to present a special issue: *The Emergence of Signed Language Education and Reading.* I find it fitting that this current issue comes out during the tenth anniversary on the Resolution of the Milan Conference of 1880. The Milan 1880 Conference created a detrimental impact on the education of deaf children worldwide. With the resolution that the International Congress on the Education of the Deaf (ICED) passed in 2010, I welcome the organization's remorse for the damage it imposed on deaf students and their signed language (see http://wfdeaf.org/news/resources/iced-2010-the-new-era/). I find it appropriate to include the artwork by Mary Thornley on the cover of Deaf Life magazine of this notorious event (i.e., soldiers gunning at American Sign Language; see below). I want to add that the magazine's editor referred to the resolution in 2010 as "repairing the damage of Milan 1880".

Full Feature of ICED's Resolution of Milan 1880
(https://www.deaflife.com/backissue/listing/178.html)

I also encourage you to find time to view the video below. Lindsay Darnall Jr. summarized the 1880 event in ASL, and it was moving for me to watch him explain how much deaf people were traumatized with the banishment of signed language in schools for the deaf at the time.

Milan Conference in 1880
(https://www.youtube.com/watch?time_continue=5&v=puq6hQRtxCQ)

The title of this special issue, *The Emergence of Signed Language Education and Reading*, represents a full circle in the education of deaf children. We know that a deaf Frenchman, Laurent Clerc, was recruited by Thomas H. Gallaudet to come to America to help establish the first permanent school for the deaf in Hartford, Connecticut, in 1817. We like to think we had a 'good start' back then when Clerc saw that the school employed ASL as the language of instruction. However, we need to acknowledge that the noble work that Clerc and Gallaudet led back then was only the beginning, as Clerc and Gallaudet did not pursue having ASL written and read. In France during the same period, Clerc's cherished hearing friend, Roch-Ambroise Bébian, was busy creating and testing a writing system for French Sign Language. The climate then quickly soured in France with the rise of oralism, and the whole effort with signed language reading was abandoned (Supalla, 2017). Clerc and Gallaudet were probably wise to stay away from the signed language reading notion that Bébian advocated.

However, deaf children have suffered an enormous cost because signed language reading methods are lacking. Therefore, referring back to ICED's 2010 resolution as it accounts for the past, not the present or the future, I must ask: What is the future for the education of deaf children? Literacy is a crucial matter; thus, this special issue on signed language education and reading is timely and will give us some directions for research and scholarship.

I was fortunate to attend the 2010 ICED conference held in Vancouver, British Columbia, Canada. My role at the conference was to help stimulate a platform discussing essential issues for

our future as deaf people. Most of the contributors for this special issue participated in the symposium I chaired, "A Cross-linguistic Reading Program for Signing Deaf Children." The symposium contributors are alphabetically ordered as follow:

>Laura A. Blackburn, Old Dominion University
>Joanne S. Cripps, Canadian Cultural Society of the Deaf
>Jody H. Cripps, Clemson University
>Heather Gibson, Ontario Ministry of Education
>Shelley Potma, Ontario Ministry of Education
>Anita Small, *small LANGUAGE CONNECTIONS*
>Kristin Snoddon, Ryerson University
>Samuel J. Supalla, University of Arizona

As part of the 10th anniversary on the Resolution of the Milan 1880 Conference, I am pleased that all original participants in the Vancouver conference accepted my invitation to be part of this special issue. I also invited Don Grushkin to be an additional contributor. His publication on written ASL in the American Annals of the Deaf received my attention, and it is my pleasure that Dr. Grushkin agreed to participate. Another contributor, Janelle Rouse joined the team of authors on a paper for this issue. I congratulate Dr. Rouse for completing her doctoral dissertation (https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=9666&context=etd) in 2020.

Finally, I invited Samuel J. Supalla and Laura Blackburn to be the guest editors for this special issue. Both Supalla and Blackburn have made great strides and have extensive years of experience and research in signed language reading. I am honored to have them aboard and participate here. Dr. Supalla and Dr. Blackburn will begin the special issue with a guest editorial I encourage you to read.

I would like to close this Editor's Note by having you look at the diagram below depicting what signed language education looks like (the original source for the diagram can be found in SASLJ's 2019 article written by Supalla et al.). Bilingualism between ASL and English is shown, with ASL serving as the first language or L1 and English as the second language or L2. The diagram illustrates that deaf students need to use ASL Gloss methodology during their elementary school years to learn to read in English through ASL (more discussion on ASL Gloss will follow in this special issue). In this scenario, deaf students can become fluent readers systematically, and could read and appreciate English literature as expected for advanced grades. ASL literature has its place in the education process, as shown in the diagram. Deaf students will need to view videos and study different signed literary pieces in many different genres on their way to becoming masterful signers. Equally important is how young deaf students will have the opportunity to enjoy nursery rhymes in ASL that addresses the lack of access to the same types of works in English.

I encourage you to read Supalla et al.'s article to understand the signed language education model if you have not done so already. We need to understand that spoken language education dominates the American and Canadian landscapes. The power of spoken language education has long been left unquestioned (Cripps & Supalla, 2012). Unfortunately, deaf students are not learning as they should in schools right now. Theory and practice for education need much work. I encourage you to think critically about deaf students as signers and their entitlement to a signed language education. The diagram above has attractive ideas and is worthy of further discussion. I am excited that this special issue has become a reality for readers. I am happy to see that the

Resolution of the 1880 Milan Conference has sparked additional dialogue. It is time to do more and explore ideas to improve the educational outcomes of deaf students.
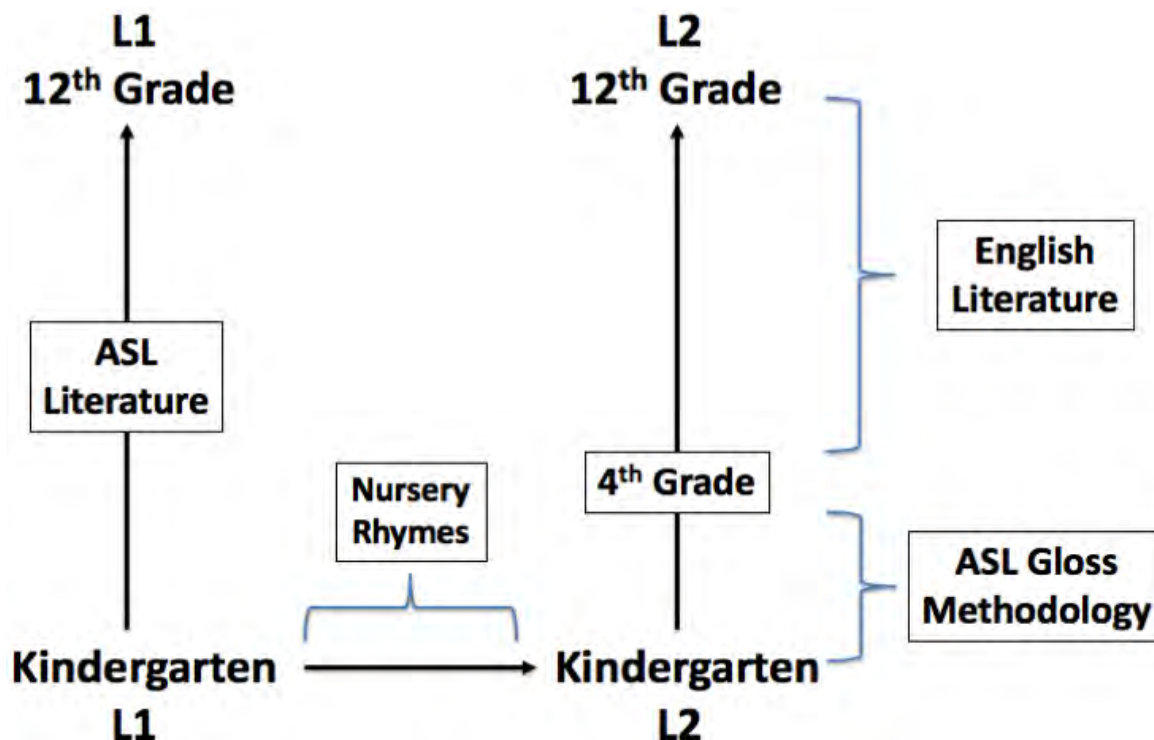
Pedagogical Framework for ASL and English in the Classroom with Deaf Students

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Why Signed Language Reading is Important

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University of Arizona   *Old Dominion University*

With this special issue for the Society for American Sign Language Journal (SASLJ), we begin with the statement that it is not wrong to support the basic concept that deaf children need to read in their language, ASL. If ASL is a full-fledged human language following the linguistic principles, it is possible to have the signed language written, including through the use of an alphabetic system (e.g., Grushkin, 2017; Supalla et al., 2014). At the same time, supporting signed language reading does not mean that we will accept it blindly. We need to be careful and make sure that signed language reading is for real. We need to understand why signed language reading is important. Right now, signed language reading is taboo for the lack of a better word in the education of deaf children. Let's think about during the 1960s and 1970s that many people were not comfortable discussing the linguistic legitimacy of ASL (Supalla et al., 2017). It takes time and patience for the general public and the deaf community to embrace the concept of signed language reading.

We want to thank the Society for ASL organization for the creation of the journal in 2017 to share innovative and groundbreaking ideas. At present, we believe the time is right to move to a new level regarding deaf people's language, ASL. We no longer need to be defensive of the signed language, but rather become proactive and progressive by outlining how deaf students can benefit through a signed language education process, especially for learning to read. Yes, we are talking about signed language education for the reason of distinguishing ourselves from spoken language education that is tailored to the needs and capacities of hearing students (e.g., Supalla et al., 2019).

It is encouraging to know that there are a few scholars who have explored the concept of signed language education for deaf students in the recent past (e.g., Padden, 2003; Padden & Rayman, 2002). However, the scholars who contribute to this special issue will address signed language reading, specifically. What 'signed language reading' means is that ASL should be written and subject to learning to read for young deaf students, for example.

Deaf students also need a way of learning and mastering English literacy, which complicates the picture. The concept of *Bilingualism* (with ASL and English) needs to be clarified. There is some confusion on the question of bilingualism for the education of deaf children, but it will become clear as we move from the beginning to the end in the special issue of SASLJ with our different articles touching on this subject.

Grushkin sets the stage for the topic of signed language reading by sharing his experience of being invited to submit an article for the American Annals of the Deaf (AAD), a well-known and long-established publication source for the field of deaf education. AAD published a special issue exploring the question of whether or not having ASL written and read holds merit. Other scholars were invited to respond to Grushkin's article. We will let you read Grushkin's commentary in this SASLJ issue and learn about how scholars think regarding having ASL written and read.

For SASLJ's special issue, please consider that there are two competing models for having ASL written and read. The concept of signed language reading can be categorized as ASL only or ASL and English. The former focuses on developing reading skills in ASL and only ASL. The

latter focuses on deaf students learning and mastering of English literacy through ASL. Specifically, deaf students would learn to read in ASL and experience a transition to English literacy at the same time. Tools and procedures called ASL Gloss are instrumental for this unique cross-linguistic reading instruction model.

Grushkin disputes ASL Gloss. Again, we let you read and learn what this scholar has to say. What is important to note is that signed language reading must matter at this point. Grushkin and other contributors who are invited to participate in this special issue share this view on signed language reading. That is, deaf students in schools need to learn to read in ASL. It is our hope that this special issue with SASLJ and its collection of writings will help 'clear the air' and reinforce the value of ASL Gloss. This includes resolving Grushkin and other scholars' reservations about ASL Gloss so they understand the *restrictions* of English literacy (for deaf students) and how this must be addressed through pedagogical means.

For the remainder of this issue, the contributors will share their different perspectives on signed language reading with ASL Gloss specifically. We all experience an ongoing evolution in our way of thinking. For example, we like to think that having deaf children becoming proficient in ASL and linguistically prepared for schooling is the only and overriding priority. English literacy will take care of itself when deaf students are proficient in ASL. However, this is *not* what the educational process should look like. As Padden and Ramsey (1998) pointed out, deaf students still need to be taught reading and writing. Literacy is the primary reason for why we have schools in our society. In addition to ASL proficiency, we need to know how deaf children can best learn to read. And we are talking about the inclusion of two languages, ASL and English.

Gibson, Potma, and Rouse give us an idea of what it is like to experience using ASL Gloss in a school setting. These contributors writing the commentary revisit the concept of bilingualism and assert its relevance with the education of deaf children. Readers of this issue need to understand that some deaf education experts have continued to challenge the bilingual education design (e.g., Mayer & Wells, 1996). Gibson, Potma, and Rouse touch on important topics associated with reading including the notion that deaf students can experience full access with ASL Gloss.

The remaining three groups of contributors have their own insights. Snoddon provides some data as well as J. H. Cripps, Supalla, and Blackburn and Small and J. S. Cripps. At this point, we see that research on signed language reading is emerging, and not in one country, but two: the United States and Canada. The current North American endeavor for research and scholarship with signed language reading is much needed when thinking about what is happening around the world. In Europe, for example, much research attention is expended on the signed languages of deaf people (e.g., that a national signed language is recognized through legislation, deaf people having the right to sign, and so on), but little on the literacy issues.

Snoddon's article: "From ASL Phonological Awareness to Print Literacy" is welcoming in that she connects ASL and print, which is a basic, yet very important proposal for the education of deaf children. This is where signed language reading prevails. Moreover, Snoddon focuses on the early years of deaf children's lives when they are exposed to 'Mother Goose rhymes in ASL'. Snoddon recognizes the restrictions of English literacy for deaf students and discusses ASL Gloss for addressing this challenge.

Our article (J. H. Cripps, Supalla, and Blackburn) emphasizes the need for deaf students to learn to read during the elementary school years. The investigation on how two deaf students demonstrate learning of reading skills over time is significant. Thanks to ASL Gloss, readers of

this issue will see how these skills are measured and how preliminary findings on the progress that students made call for additional research. The idea of how deaf students' reading are measurable is novel and much needed for the education establishment.

Finally, Small and J. S. Cripps, look at one component of ASL Gloss: the ASL-phabet. As our article explains, ASL Gloss has different components that integrate and become a process for the benefit of deaf students and their teachers. What Small and J. S. Cripps demonstrate in the creation of a bilingual dictionary for use with deaf students is impressive. Dictionaries are an important resource for any student, including students who are deaf.

As a closing remark, we hope that readers who complete reading this special issue will realize the theoretical importance of signed language reading (with strong and clear implications for practice). There are some issues to keep in mind pertaining to signed language reading. First, there is a technical disagreement among scholars about how ASL should be written, whether it should be done traditionally (i.e., ASL being written and not more) or rather that ASL Gloss needs to be adopted for the reason of deaf children's lacking access to spoken English (and later in reading). Second, ASL Gloss does not involve just the glossing of the text, but rather is an elaborate system with different components. Third, signed language reading should be seen as legitimate and worthy. By all accounts, the general public and the deaf community need to know what options there are for the education of deaf children.

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Institute Press.

On Writing Signed Languages: The American Annals of the Deaf Discussion

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In the Winter 2017 issue of the American Annals of the Deaf, I published an article, "Writing Signed Languages: What For? What Form?" in which I discussed some common objections to and rationales for developing a written system for encoding signed languages on paper or in text. This publication also presented theoretical grounds justifying the form in which I envisioned writing a signed language such as ASL should take. In the paper, I argued that the development and acceptance of a written form for ASL would have benefits to Deaf biliteracy, culture, language and history preservation, as well as the status of signed languages such as ASL. Further, I advocated for the adoption of an alphabetic (based on signed language/ASL principles) approach to writing rather than the "iconographic" approach that is more prevalent and seen in SignWriting, Si5s and ASLWrite (Augustus et al., 2013; Clark, 2012; Sutton, 1999). This paper became an invited paper within a special issue in which several other researchers in the field of sign language studies, Deaf education and literacy offered their responses and perspectives on my original article.

Of the four respondents, Donald Moores appears most receptive to the notion of developing and using a writing system to represent ASL and other signed languages. While he initially suggests that starting the paper off with common objections to the development of a written form of signed language forces me as an author to "prove a negative," he also states that he has found no "indication that Deaf audiences believe that developing a written system for a signed language is an impossibility" (p. 538). This position certainly runs counter to the multiple discussions I have had with Deaf and ASL-speaking audiences in-person and online over the years. Moores takes a primarily scientific approach in his piece, raising areas for research on the topic such as whether a writing system should be arranged horizontally or in some other format, how the variation in signer movement, handshape and location should be represented (if at all), what the signed phoneme-grapheme (writing) relationship should be, and on the importance of linguistic transfer toward biliteracy in signed and oral languages. Encouragingly, he does recognize the possibility of expanding an ASL-based writing system to include handshapes, movements and locations not found in ASL, which would allow for cross-linguistic comparisons of signed languages in writing as well as through visual media; an idea that I, myself had also considered. Finally, he indicates that discussion of this topic through academic channels might not be the most fruitful path for a written system's success; rather, he suggests that a grassroots approach by an individual or group of individuals with "dedication, commitment and determination" (p. 538) may be more effective in the spread of a written sign language system, a point that does hold much validity in its perspective.

Although Supalla, Cripps and Byrne seem generally in agreement that encoding of ASL in a written form is an important route towards biliteracy for Deaf learners, they disagree with my advocacy for a dedicated writing system based on ASL principles; rather, they endorse the use of glosses as the route towards interlinguistic transfer. Through glosses, they argue, Deaf children can "learn to read in their own language while simultaneously transitioning to English literacy" (p. 541). However, there are several problems with their arguments. First, they suggest that through

glosses, Deaf children are reading in their own language. The primary problem with this assertion is that while glosses are attempts at representing a signed language such as ASL, what one sees is still at heart, "English" words and moreover, glosses cannot and do not fully represent signed words at the phonological, syntactical and discourse levels. They also take the opportunity to criticize a sample glossed sentence that I provided in the paper, which they rightly assert was highly simplified and not fully representative of a signed utterance in ASL. Yet, even "expanded" glosses, as exemplified by their revision of my sample sentence, are problematic for the same reasons I outlined above.

On another note, Supalla et al. seize on my mention of the Vista Signing Naturally ASL curriculum's (Smith et al., 1998; Lentz et al., 1992) avoidance of the use of glosses in their instruction, noting that the use of glosses are prevalent throughout the teacher's manuals in this curriculum. However, in doing so, they gloss over (pun entirely intended) the fact that in the Signing Naturally teacher's manual, the authors explicitly state: "...all lessons are designed to be presented in ASL, avoiding the use of voice, written English or <u>glosses</u>..." (Smith et al., 1998: ix), and in the training workshops for the curriculum, the Signing Naturally creators explicitly inform attendees that the glosses in their manuals are there only as a guide to the classroom instructor of the intended sign for instruction during that lesson (E. Lentz, personal communication). Given what I know personally of the Signing Naturally curriculum's creators, I can state with confidence that they only used glosses in their curriculum because they had no other viable alternative; if a writing system for ASL which did not incorporate English to any degree had been available at the time they had been developing the curriculum, they would quite likely have used this instead, for ideological reasons.

Finally, Supalla et al. refer to a system for transcribing ASL words into a written form using non-Roman symbols ("ASL-phabet"; Cripps & Supalla, 2012) for the parametrical components of a sign as "ASL gloss." This is a mistaken understanding of what a gloss actually is, which is the provision of a word parallel to the target language in the written system of another language. While the ASL-phabet words are highly tied to a gloss-based "resource book," they are not glosses of ASL in themselves, but a written representation of ASL signs. Moreover, as I pointed out in my article, the ASL-phabet words were, regrettably in my opinion, not expanded to the syntactic or discourse level, depriving the students at this program from developing biliteracy in both ASL and English.

In contrast, both Rosen, Hartman and Wang and Connie Mayer focus on the English literacy aspect. Rosen et al. appear to be advocating for the use of a "Thinking for Writing" philosophy as a process in developing literacy among Deaf populations, arguing that "For 'Written Sign Language' as an orthographic system to be effective in writing, it needs to facilitate the 'Thinking for Writing' process that involves the imagining, encoding, organizing and imprinting of ideas" (p. 534). Thus, it is apparent that this 'Thinking for Writing" philosophy concerns the writing <u>process</u>, which can occur in any language, regardless of the orthographical system of these languages, and can certainly work with a written ASL system as well. Nevertheless, they conclude that English alphabetic orthography should continue to be used with Deaf readers/writers until studies can show that a written signed language system can effectively reflect writers' "thinking for writing" processes – a conclusion I find ironic, given that other, English-centered approaches to Deaf education, such as Oralism, the Rochester Method, signed English, Cued Speech, Visual

Phonics and more were all implemented without preliminary research studies to prove their effectiveness, yet an ASL-centered approach is urged to proceed with caution.

My greatest ire, however, is reserved for Mayer, who dismisses a signed language-based written system altogether on the basis that this would be of limited use to only a "small" (ASL-speaking) population of Deaf learners, smugly stating:

> this group has never constituted the majority of the deaf school population, and in the current context of universal newborn hearing screening and advances in hearing technologies including cochlear implants, bone-anchored hearing aids, and middle ear implants, its size is continually decreasing. Greater numbers of deaf children are now being educated in mainstream settings and use a spoken language... as their primary means of communication... Therefore, I suggest that it is not (or at least is no longer) accurate to suggest...that most deaf people prefer to sign and are not comfortable with using spoken language, and that English represents their L2 (p. 553).

Mayer overlooks that her argument is one of a self-fulfilling prophecy in that Hearing/English-centered educators and legislators have and continue to control the system in order to make this situation occur and in addition, neglects the effects of language deprivation on the majority of the Deaf school population as well as evidence for the benefit of exposure to ASL for all Deaf children, including those labeled as 'hard of hearing' (Geeslin, 2007; Grushkin, 1996; Grushkin, 2002).

Given that the majority of respondents have offered perspectives on writing signed languages, which are tangential to the issue of developing a written system for signed languages at best, and audist at worst; I remain convinced that developing such a written system holds much potential for our signed languages and communities. It is my hope that more members of our community will come to realize the potential and benefits that writing our signed languages has to offer us, just as it has for other language communities, and instead of dismissing the idea or nitpicking at irrelevant points, we will share in the work of accepting and developing a way to record and communicate in our signed languages in ways other than video or in person.

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An Innovative Pedagogical Approach:
American Sign Language (ASL) Gloss Reading Program

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"Reading is the foundation for success in school, work and life. Learning to read is not a privilege, it is a human right. This inquiry will assess whether school boards use evidence-based approaches to meet their human rights obligations"
(Ontario Human Rights Commission, 2019).

Throughout the history of Deaf education, "hearing loss" has been blamed for the reading difficulties Deaf students experience, including tolerating the 'plateau' of reaching a 3rd or 4th-grade reading level by the time they graduate high school (Conrad, 1979; Gray & Hosie, 1996; Trybus & Karchmer, 1977; Waters & Doehring, 1990).

As American Sign Language (ASL) is the birthright of ASL-bilingual people, we use ASL-bilingual as an asset-based term to refer to Deaf students. This reflects the assets lens within a "gain" frame of mind. This demonstrates the value of and respect for human diversity in education and offers a cultural-linguistic perspective of a minority linguistic group. This serves the purpose of eradicating the use of deficit-based, audist terminology, and promotes focus on ASL-bilingual students' acquisition and development of ASL as a language, particularly in Deaf education.

This premise led the Ontario government to recognize ASL as a fully-fledged human language and its use in educational considerations beginning in the 1990s. About 15 years later, Regulation 298 of the Education Act—regarding the use of ASL and Langue des signes québécois (LSQ) as languages of instruction in school boards, school authorities, and Provincial Schools—was amended (Regulation 258/07) (Ontario Education Act, 2012-20). In this vein, Ontario schools are committed to ensuring that every student in the program has opportunities to thrive on language, literacy, numeracy, and inquiry skills in ASL and English, as well as LSQ and French, in a diverse, multiculturally enriched learning environment.

While many public schools have comprehensive English literacy programs in place in North America that "utilizes synthetic, analytic and socio-psychological orientations in a way that combines the best of all three" (Escamilla, 1999, pp. 127-128), a bilingual pedagogy approach to teach ASL-bilingual students was proposed as a solution to low levels of reading achievement since the 1980s. Johnson et al. (1989/2018) argue that if ASL-bilingual students are language competent in a language other than English, they need to use this critical knowledge for learning English as a second language. The lingering pedagogical question is: How can ASL-bilingual students transfigure their knowledge of ASL to written English? The traditional bilingual education or English as a second language pedagogy is designed for students who have access to English in both oral and print forms. ASL-bilingual students acquire ASL as their first language and learn English as a second language (In regards to the constraints and complications concerning the education of ASL-bilingual students, see Singleton et al., 1998). This gap must be closed through an alternative pedagogy that connects the two different languages for ASL-bilingual students: ASL and English.

In order to address this issue, the Ontario ASL curriculum team has developed a comprehensive ASL literacy program framework. This comprehensive ASL literacy program draws on Escamilla's (1999) three foci: synthetic, analytic, and socio-psychological orientations. That is, the synthetic orientation utilizes ASL for ASL literary works and texts using ASL discourse structures in both live and video text formats. ASL-bilingual students use strategies within the synthetic orientation to convey ideas and information in various forms and styles and apply ASL conventions, ASL grammatical structures, and ASL registers through the ASL constructing process.

The analytical orientation comes in the shape of analyzing ASL graphemes (S. Supalla & Blackburn, 2003), which aid in the decoding of ASL words, both in constructive and printed forms at the phonological and morphological levels. Students use comprehension strategies for the purpose of constructing meaning to understand ASL content, as indicated in Wall's (2014) discussion:

> The ASL Curriculum contains expectations that require students to draw upon cueing systems to comprehend ASL literary works, as well as using comprehension strategies and inferences...Potma (2012) explains that in a [comprehensive] ASL literacy program, students learn about language. Learning about language includes metalinguistic awareness in the language cueing systems. This awareness develops during guided sessions with the teacher while deciphering/deconstructing ASL stories. (pp. 17-18)

The construction and comprehension strategies and processes become more effective through the use of socio-psychological orientation in this program. This orientation is derived from Vygotsky's (1967) zone of proximal development and implemented through natural peer-to-peer and child-to-adult interactions. Discussions of content using metalinguistic and metacognitive skills are conducted between teacher and students and between peers, which will be expanded upon in the next sections.

The comprehensive ASL literacy program is designed for students to study ASL as a language. Therefore, this program does not use English literacy strategies to teach ASL literacy nor use English assessment tools to measure ASL linguistic acquisition and competency. In order to promote a successful comprehensive ASL literacy program, ASL literacy strategies must be developed to teach ASL literacy and language, and ASL assessment tools must be developed to assess ASL language and literacy skills as well. ASL Proficiency Assessment (ASL-PA) and ASL Test Battery (ASL-TB) are used to measure ASL linguistic acquisition (Maller et al., 1999; T. Supalla et al., 1995). The program has resulted in independent and critically literate thinkers with a strong sense of ASL culture.

Historically, schools have perceived ASL-English bilingual programs as involving ASL as the first language and English as a second language (ESL). Educators have attempted to apply English-based assessment tools and instructional strategies in their literacy instruction for their ASL-bilingual students. This pedagogical practice does not provide a 'perfect fit' for teaching English to ASL bilingual students (Gibson & Blanchard, 2010). ESL pedagogy is designed to teach English to students whose first language is also another spoken language (e.g., French).

The traditional ESL pedagogy is incompatible for ASL-bilingual students. Using this pedagogical strategy, teachers employed different teaching methods for students to develop reading skills of English text, using English-based strategies with inconsistent results. Through professional, collegial discussions, educators have found themselves asking whether they are assessing for English reading skills or for bilingual translation skills. This led many to question the validity and reliability of conventional ESL pedagogical and assessment practices used with ASL-bilingual students.

As a result, an alternative pedagogical approach within a comprehensive literacy framework, ASL Gloss reading program, was proposed. This structured reading program is specifically designed for ASL-bilingual students, including those who come from home environments where ASL is not the home language. The reality is that there is a large number of students who come from home environments where ASL or English is not fully acquired and therefore do not have age-appropriate acquisition of either or both of these languages. As a result of the incomplete use of either language, many students arrive at schools with limited or no English reading skills. Many are expected to begin reading English at Kindergarten level like other students who have already acquired age-appropriate command of their aural-oral language sufficiently to think in metalinguistic terms. A researcher, Dr. Samuel Supalla, developed an innovative structured bilingual (ASL and English) pedagogical approach to promoting students' reading development through the use of the ASL PM Benchmark, ASL Resource Book, and the ASL-phabet as well as ASL gloss texts. In that case, when using the ASL Gloss reading program, the students, despite not having full acquisition of English or ASL, will begin to analyze ASL parameters through the use of ASL graphemes, and develop ASL metalinguistic and metacognitive skills in the process.

S. Supalla et al. (2017) propose that there is a cross-linguistic benefit within a reversal effect "of ASL gloss from English-to-ASL as reported for ASL [educators] and students to ASL-to-English with deaf children" (p. 544). They add, "The lexical transfer from ASL gloss to the regular text is automatic[, where] deaf children can learn one sight word after the other with English throughout their elementary school years" (p. 545). Furthermore, Cummins (2000, 2006) implies that bilingual-bicultural programs use ASL not just as a conduit to English and content mastery but as a crucial tool for representing ideas and thinking critically about issues. The rationale for developing strong ASL language is no different than the rationale for developing strong English language among children whose first language is English. Students come to school fluent in English, but they nevertheless spend at least 12 more years deepening this linguistic knowledge and extending it into academic spheres of language. For ASL-bilingual students, the teaching of ASL language within a comprehensive bilingual-bicultural-biliteracy program serves the same function of developing and deepening their language foundation and providing them with a potent tool for thinking and problem-solving in both their first and second languages.

During the school year of 2012-2013, the schools then adopted a bilingual pedagogical approach to implementing the ASL Gloss reading program that was funded by the Teacher Learning and Leadership Program (TLLP). This program, which involves a clear developmental path, ensures that Kindergarten to Grade 2 students are prompted to concurrently develop proficiency in literacy and content knowledge in two separate languages (ASL and English). The block of Kindergarten to Grade 2 involves the "learning to read" process through the use of the

structured ASL Gloss reading program within a comprehensive biliteracy program. In this case, the path looks like this:

- The child is taught to decode ASL words and/or graphemes that are held in three parameters: handshape for the ASL word, location, and movement;
- The ASL grapheme characters are used to represent the ASL words;
- The ASL graphemes are then matched bilingually with printed English words; and then
- The child uses his/her ASL lexicon to recognize the English words.

In the ASL Gloss reading program, ASL is recognized as a viable bona fide language. The highly structured program incorporates the resources of ASL-phabet graphemes and ASL gloss words that are used in comparative analysis and translation activities, where ASL-bilingual students are able to analyze texts. As they deconstruct texts, they gain knowledge and skills with the application of both languages. In short, two distinct comprehensive literacy programs in a biliteracy model that incorporates the three orientations (synthetic, analytic, and socio-psychological, in both languages [ASL and English]) offers the best chance for ASL-bilingual students to develop biliteracy skills in an academic setting.

The ASL Gloss reading program applies Mora's (2007) cross-linguistic metalinguistic awareness (MA) and metalinguistic transfer (MT) using the following process. ASL is written down with the use of English glosses arranged according to ASL' morpho-syntactic structure. As a demonstration from a teacher's perspective: COW FAT serves as the ASL gloss version for "The cow is fat." The gloss sentence represents how ASL operates as a language (with two ASL words as compared to four words in the English sentence equivalent, with the underline representing topicalization through the use of raised eyebrows in ASL). While English text and its different grammatical features are oftentimes overwhelming for many ASL-bilingual students (due to unfamiliarity with English), ASL gloss vocabulary allows them to experience the compatibility of print text and constructed ASL words for the first time. ASL-bilingual students are able to read 'word for word' in ASL, and it facilitates the reading process. As part of transfiguring English literacy, ASL-bilingual students read gloss books translated from English. The students are introduced to English vocabulary naturally (e.g., COW and FAT) all while learning to read in ASL. Should a student come across an unfamiliar word (e.g., FAT), they can use a literacy tool called Resource Book (RB), which is a bilingual dictionary used to read the ASL equivalent to the English word. The ASL words in the book are written down using a system known as the ASL-phabet. The ASL-phabet is comprised of 32 graphemes: 22 for handshape, 5 for location, and 5 for movement. This ASL-phabet system allows educators to teach at the phonological level to ensure that students develop skills for decoding words in ASL (and thus accessing English words through the RB).

According to various scholars in North America, the challenge for ASL-bilingual students with English literacy is immense, but the accumulation of research on ASL as a language over the last several decades provides direction (Goldin-Meadow & Mayberry, 2001; Maller et al., 1999; S. Supalla & Blackburn, 2003; S. Supalla & Cripps, 2008, 2011; S. Supalla et al., 2014). The ASL Gloss reading approach has emerged with some promising research results in a group of ASL-

bilingual students through the practice of natural peer-to-peer and student-teacher interactions (Vygotsky, 1967).

The overview of the ASL Gloss reading program follows the same principles of the English reading program within a comprehensive literacy framework. It consists of Modelled Reading, Guided Reading, Shared Reading, and Independent Reading. Educators teach students various reading strategies such as activating prior knowledge, making predictions, using visual cues, making inferences, and making connections from self to text; text to text; and world to text. The different reading strategies, when explicitly taught, facilitate student development of metacognitive skills in literacy. One component that sets the ASL Gloss reading program apart from other structured reading programs is the Comparative Analysis. ASL-bilingual students are asked to analyze both ASL gloss and English texts and analyze the structural similarities and differences between the two. This comparative analysis process strengthens the bilingual and biliteracy development process. Educators conduct assessments such as pre-test and post-test vocabulary (ASL gloss) recognition tests, spelling quizzes, and matching of pictures/graphemes to gloss words. While the students are reading texts, educators closely monitor their reading attitudes and behaviours and reading strategies through pedagogical documentation protocols. Running record assessments are used to assess student comprehension and decoding of ASL gloss books.

Educators often shared their insights on the efficacy of the program with other colleagues in professional dialogues. For example, they found themselves teaching English grammatical features and ASL grammatical features as informed through the comparative analysis lessons much more effectively. Students and educators work together in discussions to identify and analyze the features of ASL gloss to decode ASL conventions (fs = fingerspell; <rs:____> = role-shift as in character shift). This learning activity enriches student motivation in reading and discussing various books with increased confidence.

In order to engage students' motivation in learning their second language (English), the use of interactive technological literacy tools and strategies are used. Wall (2007) proposes that when students use such media literacy tools independently, their "academic knowledge of ASL [...] improve[s], with effective teaching tools" (n.p). Such examples of the technology activities students find appealing include:

- matching ASL gloss words to pictures;
- ASL gloss sentences to English sentences;
- predicting and rearranging story plots;
- comparing features of ASL and English in print; and
- sharing writing of ASL and English sentences translations.

Through a gradual release of responsibility process starting in Kindergarten, educators encourage students to independently write in either or both languages in different contexts and for different purposes.

Students involved in the ASL Gloss reading program are aware that they are to read each word aloud when reading ASL gloss texts, and that they are to read English texts. When the students finish reading texts, they then retell and demonstrate their comprehension of the content.

Through this reading process, students are able to distinguish between language features in respective ASL and English printed form. For instance, they are able to discuss why ASL gloss text is printed in block letters while the English text uses mixed cases, thus generating a metalinguistic discussion. In metalinguistic discussions, the students and educators are able to question, for example, the existence of "is" as a linking verb in English as opposed to the absence thereof in ASL gloss. This pedagogical approach has led to students' discovery that each language has its own grammar and structure rules.

In addition, Bloom's (1956, 2001) revised taxonomy questioning has been used to elicit students' higher-order thinking skills in both languages. Students who have been involved in the program for at least a year demonstrated much higher-order literacy thinking and analytical skills when reading both ASL and English text. Educators involved in the ASL Gloss reading programs found that students have made much more progress not only in reading, but also in writing. This indicates that the ASL Gloss reading program provided safe opportunities for students to make connections between ASL and English texts, and between both languages. That is, "children's early learning experiences lay the foundations for later development, and for this reason it is particularly important that educators should pay attention to young children's biliterate development in the [...] classroom" (Kenner & Gregory, 2013, p. 376).

Overall, students who are fully immersed in the ASL Gloss reading program for at least a year have been achieving their reading milestones. Students demonstrate appropriate reading behaviours as confident readers who use different reading strategies on a regular basis (e.g., pictorial cues, decoding, visualizing, predicting). Empirical evidence from pedagogical documentation indicates that students' levels of reading ability, behaviour, comprehension and repertoire of ASL, and English vocabulary have been raised. Ultimately, acquisition of both ASL and English languages are necessary in order for ASL-bilingual students to develop reading skills and cross-linguistic, metalinguistic skills through the use of two comprehensive literacy (ASL and English) programs, in a comprehensive biliteracy model.

Using a variety of assessment strategies including pedagogical documentation, educators regularly observe and document field and anecdotal notes to track their students' responses to the ASL Gloss reading activities and their development of ASL and English reading skills. As the ASL Gloss reading program is at the emergent stage, further research is strongly recommended, since learning to read is a human right.

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ASL and Early Literacy:
From ASL Phonological Awareness to Print Literacy

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Abstract

This paper describes how early ASL literacy is fostered in very young children participating with their parents in the ASL Parent-Child Mother Goose Program, and how findings from this study support the argument that literacy is a social practice. Phonological awareness is one of the features of emergent or early ASL literacy that the program leader supports in his teaching of ASL rhymes and stories. Participants gained awareness of ASL phonology through participation in the program, including handshapes and movements as central components of ASL rhymes. Some features of emergent ASL literacy were demonstrated through child participants' visual and joint attention and responses to rhymes, including the production of handshapes through manual babbling. By fostering ASL phonological awareness and vocabulary development, ASL rhymes and stories develop language skills, including metalinguistic awareness. It is argued that the language skills and opportunities for parent-child interaction supported by this program contribute to young children's later reading success. High-quality early childhood ASL programming facilitates young deaf children's acquisition of ASL and supports children and families' socialization into a bilingual deaf community.

Introduction

Literacy is fundamentally a social process integrated into broader social practices involving various forms of communication and types of texts (Gee, 2008). For young deaf children, socialization into language and literacy learning is often shaped by early intervention policies and systems that restrict families' ability to access comprehensive ASL programming. In Ontario, Canada, the provincial Ministry of Children, Community and Social Services provides the Infant Hearing Program (IHP) for universal neonatal hearing screening, audiology assessments and monitoring, and language development services for children who are deaf or hard of hearing (Hyde, 2005). This program requires families with young deaf children to choose between spoken or signed language services because "IHP services are not designed to support development of a child's bilingualism in spoken and signed language" (Ministry of Children and Youth Services, 2018). Thus, parents of deaf children are thrust into a polarized and age-old political debate regarding deaf children's learning of sign language. This debate views sign language as conflicting with learning a spoken language despite empirical research that shows the benefits of sign language learning for spoken and written language development in deaf children (Cummins, 2006; Davidson et al., 2014; Priestly et al., 2017). Empirical research has also demonstrated the cognitive, socioemotional, and educational risks inherent to spoken-language-only interventions for deaf children (Humphries et al., 2016). Underpinning this debate are ableist and eugenic beliefs that view a social identity as a signing deaf person as a failed outcome of medical and technological interventions (Mauldin, 2019).

In the present day, due to the policies mentioned above and ideologies, a high proportion of deaf children are at risk of language deprivation and its effects (Murray et al., 2019). This risk illustrates the need for such interventions as the ASL Parent-Child Mother Goose Program, founded in 2003 by the Ontario Cultural Society of the Deaf (OCSD) (Snoddon, 2011, 2012). The ASL program follows the original Parent-Child Mother Goose Program's principles and objectives to teach oral rhymes, stories, and songs to parents of young children and promote positive bonding, communication, and language development (Snoddon, 2011, 2012). For young deaf children and their parents, the ASL rhymes and stories developed by OCSD's program serve several vital functions. Parent-child communication and literacy activities support young children's developing visual attention, phonological and phonemic awareness, vocabulary development, and metalinguistic awareness. This paper describes how early ASL literacy is fostered in the context of the ASL Parent-Child Mother Goose Program and how this relates to the development of reading abilities. The various components of literacy in ASL and English described in this paper are related to a broad view of literacy as a social practice and highlight young deaf children's need for communication with parents and parents' sharing of ASL and English literature. The following sections introduce the study that provides a background for this paper and outline early ASL and literacy development. Next, the paper discusses their relation to print literacy development in deaf children.

The Study

The data reported in this paper is from an eight-week participatory action research study of the ASL Parent-Child Mother Goose Program carried out in fall 2007 at a deaf service agency in the province of Ontario, Canada (Snoddon, 2012). Parents in the Greater Toronto Agency were often referred to the deaf service agency by a regional coordinating agency for the Ontario IHP. Study participants included the ASL Parent-Child Mother Goose Program leader; two families with deaf parents and deaf children; one deaf parent with a hearing child; and three families with hearing parents and deaf or hard of hearing children. At the beginning of the study, the age range of child participants was between 4 and 11 months. Only two families, both with deaf parents and children, reported receiving ASL or dual-language (ASL and spoken English) services via the IHP (Snoddon, 2012). As of 2018, the dual-language service option is officially no longer available to families with young deaf children (Ministry of Children and Youth Services, 2018). Data was collected via open-ended and structured observations, focus group interviews, and a document review. Field notes and videotaping of program sessions recorded themes of child participants' visual attention and response to ASL rhymes and stories and use of language play (Snoddon, 2012). All qualitative data were transcribed and organized thematically by coding schemes that included child responses to ASL rhymes and stories. In the next section these data are further described.

Early ASL Literacy

Print literacy development is intimately linked to and dependent on oral language abilities in a spoken or signed language. Rather than being separate from or defined in opposition to literacy, orality is part of a broad conception of literacy as a social practice. Orality encompasses storytelling, rhyme, metaphor, and participation in literary events (Egan, 1987). In young children,

oral language skills include metalinguistic and phonological awareness, and are related to the development of a broad first-language vocabulary and having opportunities for verbal interaction, all of which are crucial for print literacy learning (Snow et al., 1998). Considering the language-learning situation of many deaf children who are not exposed to sign language, the social environment becomes paramount. Because of the lack of language access, deaf children deprived of sign language are frequently wanting of basic interpersonal communication and of opportunities to receive, seek, and impart information. Freedom of expression is tied to young deaf children's identity development and the freedom to have social relationships that support a positive deaf identity (Snoddon & Underwood, 2014). As Cummins (1997) writes, "the negotiation of identity … is a mutual process" (p. 418), that begins in early childhood.

Visual attention and joint attention, and response.

As well as supporting young deaf children's engagement with their parents in shared literary activities, the ASL Parent-Child Mother Goose Program provides support for the building blocks of communication and young children's receptive and expressive language development. This mutual interest is seen in the deaf child participants' visual attention and mother and child participants' joint attention to ASL rhymes and language play (Snoddon, 2011, 2012). For instance, the following passage from Snoddon (2012) describes a deaf mother participant, Julia's signing of a rhyme titled "Balloon Numbers" with her four-month-old deaf child, Henry. To protect participant confidentiality, video data from my study is not included in this paper.

> In this rhyme, Julia blew up the fingers of her dominant hand one by one into a 5 handshape. As she continued signing "Balloon Numbers," she alternated blowing up her fingers from her index finger to her pinky, and from her pinky to her index finger. Henry lay still and watched his mother intently as she signed, then began kicking his legs rhythmically and waving his arms as the 5 handshape balloon started to descend toward him. AGAIN? Julia asked. Again she signed the rhyme, blowing up her fingers from pinky to index finger with emphatic movements. The 5 handshape balloon then dropped abruptly on the mat beside Henry, who blinked. Julia blew up her fingers again and the 5 handshape descended in a fluttering motion, like a leaf falling from a tree onto Henry's face. He clutched his mother's hand in his fists as it descended. (p. 86)

As the above episode illustrates, joint attention as a central part of receptive language development is linked to child participants' response to the rhymes and stories used in the program as part of expressive language development. Enhanced visual and joint attention in deaf children, facilitated by early sign language exposure, are linked to early vocabulary and language development (Crume & Singleton, 2008; Lieberman, 2008; cited in National Association of the Deaf, 2019). Henry's kicking in response to ASL rhymes, in addition to other excitatory arm movements, facial expressions, and laughing, was mirrored by other young child participants (Snoddon, 2012).

Children's response to rhymes also demonstrated their familiarity with and anticipation of narrative structure, as seen in the below excerpt from Snoddon (2012):

Child response to certain rhymes increased as the children grew familiar with the rhymes' content and structure. For example, following Jonathan [the program leader]'s introduction of "Bird and Worm" during our fifth session, Julia mentioned her use at home of the conceptually similar rhyme, "Hungry, Eat Your Toes." In "Bird and Worm," the adult signer describes a bird in its nest that looks outward, spots a worm on the ground, then descends with a flapping of its wings. The bird then plucks and pretends to swallow the fingers of a child's hand, one by one, as if they were worms. As Jonathan demonstrated this rhyme, the last finger of the child's hand is difficult to pluck and results in a struggle for the bird. In "Hungry, Eat Your Toes," the adult signs that he or she is hungry and pretends to pluck and swallow a child's fingers or toes, one by one. Julia shared that Henry laughed and pulled his hand back in anticipation when she signed this latter rhyme, as he had grown familiar with its structure. (p. 106)

Similarly, hearing and deaf parent participants reported that their children immediately recognized and responded to rhymes that the parents signed at home. This data from interviews and observations indicates the program's support for verbal interactions between parents and young children.

Phonological awareness.

Young child participants' response to rhymes included their production of some ASL handshapes used in the rhymes as part of manual babbling (Snoddon, 2012). The rhymes and stories featured in the ASL Parent-Child Mother Goose Program involve repetition of handshapes, movement paths of signs, and nonmanual signals that create patterned motions in sign language poetry (Bauman, 2003; Valli, 1990/2018). ASL handshapes, locations of individual signs on the body, and movement paths of individual signs are meaningless, contrastive linguistic units and thus elements of sign language phonology (Sandler & Lillo-Martin, 2006). Language play with young deaf children as described in the excerpts above is linked to metalinguistic awareness (Erting & Pfau, 1997), or awareness of language properties. These actions are also linked to phonological and phonemic awareness, or identifying and manipulating units of oral language. For example, a popular ASL rhyme, "Jolly Bear," involved the repetition of spread C handshapes (which are similar to the clawed 5 handshapes used in the ASL word BEAR), rhythmically moving in different locations from the crown of the head to the cheeks to the shoulders to the lower torso. When describing the bear's physical features, the signer puffs their cheeks. A transcription and a video clip of this poem from Cripps and Small (2004) can be seen as follows:

> BEAR, BIG EARS.
> BEAR, PUFFY CHEEKS
> BEAR, BEAR.
> BEAR, JOLLY TUMMY. (adapted from Snoddon, 2012)

A video clip of "Jolly Bear"
(https://youtu.be/fUQ-COHFk9o)

These rhymes in this poem and others illustrate some poetic features of ASL rhymes for young children, including repetition and manipulation of phonemes. It has been hypothesized that as young children encounter words with similar phonological patterns, words begin to be stored in the brain not as whole units but as segmented, or phonologically detailed representations (Metsala, 1999; cited in McQuarrie & Parrila, 2014). Segmentation allows for more efficient word storage in memory and access to the phonological units of language (McQuarrie & Parrila, 2014). Phonemic and phonological awareness underlies vocabulary and grammatical development in any language, as well as reading development (McQuarrie & Parrila, 2014). This experience applies to deaf as well as hearing children.

ASL Phonology and Print Literacy

The remainder of this paper discusses the relationship between ASL phonology and print literacy development in deaf children and implications for the use of reading methodologies. As McQuarrie and Parrila (2014) write, the establishment of phonological representations is the cognitive precursor that facilitates language acquisition. These authors summarize some of the debate that has taken place regarding deaf children's reading development, with what is known as the qualitative similarity hypothesis dominating the field of deaf education. The qualitative similarity hypothesis holds that deaf children's language and literacy development follows that of typically hearing individuals, albeit at a delayed pace (Paul & Lee, 2010). Meaning, for this hypothesis, deaf children are as reliant as hearing children on spoken-language phonological representations in learning to read (since for most hearing children, spoken-language phonological awareness and mapping a spoken phonological code onto an alphabetic orthography is strongly linked to reading development). A corollary of this argument is that deaf children's acquisition of spoken language via auditory habilitation (and historically, manually coded sign systems) is seen

as necessary in learning how to read. With cochlear implants seen as the standard of care in high-income countries, spoken language becomes the main (or virtually only) purpose of language development service options for deaf children (Murray et al., 2019).

However, bilingual education researchers have challenged the qualitative similarity hypothesis. These researchers have found little relation between spoken-language phonological awareness and reading development in signing, profoundly deaf children, irrespective of age or children's reading abilities (McQuarrie & Parrila, 2009). Although these researchers note that diversity among deaf children means there is differential access to spoken-language phonology (e.g., some children become deaf in later childhood, after the acquisition of spoken language, and/or have more residual hearing), their findings suggest that a significant population of deaf children develop print literacy by other means than those followed by typically hearing children. The authors argue that these alternate means are employed partly because deaf children lack access to spoken-language phonology and partly because full access to the phonology of a sign language provides the segmental representation skills that underlie reading development (McQuarrie & Parrila, 2014).

These authors recount other research that found a strong relation between sign language phonological awareness and English reading skills in deaf children; i.e., there is "cross-language transfer" from ASL to English (McQuarrie & Abbott, 2013). This research complements the larger body of studies showing a strong and positive correlation between ASL proficiency and print literacy in deaf children, and general academic achievement (see Hrastinski & Wilbur, 2016). Newer research also shows that sign language phonological representations activate during reading by deaf bilinguals (e.g., Morford et al., 2011, cited in McQuarrie & Parrila, 2014). These cross-language activation studies show that sign language phonology is activated in both deaf and hearing bilingual signers, while working in a spoken/written language. These insights reinforce the importance of young deaf children having access to high-quality sign language phonological representations via exposure to and acquisition of a natural sign language.

Teaching for Transfer

As McQuarrie and Parrila (2014) note, further research is needed to determine the exact nature of the transfer from a sign language phonology to a segmented orthographic representation of another language; i.e., the "bridge" from ASL to print English literacy. While proponents of the qualitative similarity hypothesis have long maintained that learning a sign language does not support print literacy development in deaf children due to the different modalities of the two languages, this hypothesis does not stand up to the empirical research mentioned above. Furthermore, research with other nondeaf readers shows that not all children rely on phonics to acquire reading skills (Marshall, 2013). Views that ASL does not support the learning of English literacy also fail to pay sufficient heed to the effects of language deprivation on deaf children's overall development or regard it as an unavoidable and apolitical consequence of being deaf (Knoors & Marschark, 2012). Other research that scrutinizes the social practice of literacy notes that issues of power and identity directly impact school learning by minoritized children; as John Ogbu wrote, school "strategies of control and paternalism … divert attention from efforts to educate minority children" (cited in Snoddon, 2012, p. 33). In other words, educators' and other professionals' perceptions of signing deaf children as deficient are intertwined with systems that

restrict children's ability to acquire a sign language and thereby master a written language. These perceptions and systems continue to hinder the broad implementation of sign language-medium education for deaf children. These systemic failures are as apparent now as when Johnson et al.'s (1989/2018) working paper for the Gallaudet Research Institute was published, documenting the failure of English-based sign systems used in deaf education and the superior academic performance of native signing deaf children of deaf parents.

Therefore, initiatives that support deaf children's acquisition of sign language challenge policies and dominant relations of power in deaf education and early intervention. However, as Hrastinski and Wilbur (2016) note, the focus of deaf education should also be on academic success and appropriate language outcomes (which are also linked to collaborative relations of power in deaf education). These outcomes are facilitated by such interventions as the ASL Parent-Child Mother Goose Program for promoting parent-child communication and bonding and children's language development, as described above. Such initiatives support deaf children's access to ASL, providing the neurolinguistic stimulation needed for optional cognitive development (Humphries et al., 2019). As research shows, the most crucial factor in deaf children's achievement of print literacy and later academic success is children's early language exposure (Hrastinski & Wilbur, 2016).

However, other initiatives and research further support and investigate the cross-language transfer from ASL to English (and from other sign languages to other written and spoken languages). For example, Cummins (2006) hypothesized that various types of transfer could take place across languages, depending on the sociolinguistic situation of the two languages:

- Transfer of conceptual knowledge;
- Transfer of metacognitive and metalinguistic strategies;
- Transfer of pragmatic aspects of language use;
- Transfer of specific linguistic elements;
- Transfer of phonological awareness. (p. 3)

Cummins (2005) hypothesized that in the case of dissimilar languages, "transfer will consist primarily of conceptual and cognitive elements" (cited in Snoddon, 2012, p. 17). He also emphasized the importance of "a deeper conceptual and linguistic proficiency that is strongly related to the development of literacy in the majority language" (Cummins, 2006, p. 3). Deaf children's acquisition of ASL evidently provides the cognitive growth, conceptual knowledge, and linguistic proficiency that supports reading and writing in a second language (Hrastinski & Wilbur, 2016). This happening is especially true when young deaf children also have early opportunities to engage with orthography and print through fingerspelling and children's book sharing through ASL (Padden, 2005; Snoddon, 2014). However, research that investigates transfer of phonological awareness across a signed and a written language based on a spoken code is exciting for what it potentially reveals about the cognitive underpinnings of language (McQuarrie & Parrila, 2014).

Reading in Sign Language

Equally, such educational initiatives as Supalla's (2017) description of glossing as an intermediary tool to support children's reading in ASL and English show promise for these

initiatives' enhanced support for facilitating phonological awareness or segmentation across languages in signed and print modes. Although sign language writing systems based on sign language phonology have a long history and prevalence, they have not been taken up broadly, particularly in public education for deaf children (Supalla, 2017). For this reason, a charter school in Arizona became the ideal place to host an ASL glossing initiative (Supalla, 2017). In other states and countries around the world, private schools have also been founded to address pervasive deficiencies in public education systems for deaf children (Happy Hands School for the Deaf, n.d.; Morita et al., 2017; Ni & Jones, 2019; The ASL Academy, 2018). However, these schools are heavily dependent on private and donor funding.

The glossing approach developed by Supalla and colleagues involves the manipulation of English text to follow ASL syntax and the development of a Resource Book with ASL equivalents for English words (Supalla, 2017). The ASL equivalents are written in the ASL-phabet, which employs 32 graphemes representing handshapes, location, and movement. This approach allows for the teaching of phonics in ASL (Supalla, 2017). This approach aims to strengthen children's decoding skills and knowledge of ASL phonology. In addition, the Resource Book supports children's learning of English as well as ASL vocabulary. Reading with glossing supports metalinguistic awareness of ASL and English structures (Supalla, 2017). In this way, ASL glossing can build on ASL phonological awareness fostered in very young children through the ASL Parent-Child Mother Goose Program.

Conclusion

Like the ASL Parent-Child Mother Goose Program, the ASL glossing approach supports what McQuarrie and Parrila (2014) term high-quality sign language phonological representations. In addition, ASL phonological awareness is strongly linked to English literacy skills. These valuable and innovative interventions developed by deaf educators and deaf community organizations need to be further taken up and expanded in bilingual early childhood education for deaf learners. This situation is especially true as research evidence continues to accumulate concerning the lifelong effects of language deprivation in early childhood. High-quality early childhood ASL programming facilitates young children's acquisition of ASL and supports deaf children and their families' socialization into a bilingual deaf community where children are free to develop social relationships that nurture a positive deaf identity (Snoddon & Underwood, 2014).

Acknowledgments

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A Case Study on Accessible Reading with Deaf Children

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Abstract

The concept of accessible reading for deaf students is new and worthy of exploration. In the face of the reading difficulties often experienced by deaf students, the lack of a specialized reading methodology that works for them must be addressed. Central to the paper is a research case study undertaken with two young deaf students, proficient in American Sign Language (ASL) and learning to read. The students participated in a tutorial with a tutor knowledgeable in a specialized reading methodology called ASL Gloss. The participating students demonstrated progress in reading skills over time. Two reading measures were adapted from English to ASL for use with deaf students. Some important features of ASL Gloss are included in the study report. The manipulated English text that closer resembles ASL and the use of the ASL-phabet, are designed to facilitate deaf students' needed transition from ASL to English literacy (Supalla, 2017; Supalla & Cripps, 2011; Supalla et al., 2001). These deaf students engage in oral reading (in ASL) and are also given a different task. That is, to identify ASL-phabet letters that represent the phonological structure of signed words. The reading measures under development appear to promote the process of learning to read as informed by the quantitative and qualitative data. These findings support the need and promise of pursuing an alternative theory and applied research for deaf students' reading that accounts for their ability to become fluent readers.

Introduction

For years, achieving English literacy has been problematic for deaf students in schools, and recently traditional curriculum, instruction, and assessment models have been targeted for improvement. This trend indicates that scholars and researchers are thinking about the underlying systemic restrictions for deaf students regarding reading instruction. The view of reading education is broadening to tailor best practice instruction to all students in all their diversity. Reading is a crucial skill for academic success. Effective reading instruction is no longer limited to students who can hear. What this shift suggests is that deafness should not be used as a rationale for reading difficulties. The historical view of teaching deaf students using a methodology similar to hearing students cannot continue. Deaf students must have their effective methodologies for learning to read. The crux of the matter is that effective reading strategies and measures must be accessible for deaf students to facilitate their learning. Only then can deaf students experience progress while learning to read and become fluent readers.

This changing mindset and outlook for American education is part of the underpinnings of the Universal Design for Learning (UDL) framework. UDL means that "all four components - goals, media and materials, teaching methods, and assessment – need to apply to all students" Hitchcock et al., 2002, p. 10). Flexibility with the curriculum is a key concept as it can help facilitate deaf students' learning to read (see Supalla & Byrne, 2018 for the connection of the UDL framework to the education of deaf children). Thus, the UDL framework is evidence-based and

supported by multiple scholars (e.g., Hitchcock et al., 2002; Ralabate, 2011; Rose 2000; see also Elliott et al., 2001 and Roach et al., 2008 for the importance of curriculum, instruction, and assessment alignment). The UDL framework offers the opportunity for a fresh look at the education of deaf children.

At the same time, the UDL discussions are limited to general education settings (such as a local public school) where students with disabilities are enrolled. For this paper, the UDL scope is broadened to include schools for the deaf where American Sign Language (ASL) is frequently employed as the language of instruction (see Cripps & Supalla, 2012 for the identification of schools for the deaf as signed language schools that achieve the least restrictive environment status). It is encouraging to consider those modern educators who work with deaf students and understand that their students may know and use ASL. However, it is more critical now than at any time in the 200 plus years of deaf education's history to recognize the promise of using ASL in the classroom on reading instruction and measurement. While most educators understand the importance of measuring and monitoring deaf students' progress with reading, it is difficult to achieve. The field of deaf education is riddled with flaws that impact language and literacy instruction (see Supalla & Byrne, 2018 for further discussion on the traditional practices being poor); these must be remedied one way or another.

Some scholars and researchers (e.g., Grushkin, 2017; Hopkins, 2008; Miller, 2001; Reagan, 2006; Turner, 2009; van der Hulst & Channon, 2010) have proposed that deaf students are entitled to learn to read in ASL. They posit that written ASL will need to be embraced and promoted in schools for the deaf. Any discussion that includes signed language reading is new for the field of deaf education (see Supalla, 2017 for a formal distinction between signed language reading and spoken language reading). However, this paper does not focus on deaf students learning to read in ASL exclusively but instead learning an intermediary way to maneuver from ASL to English literacy. Deaf students can benefit from such a cross-linguistic construct in order to thrive as readers. The students in this alternative model learn to read in the signed language with the intention of transitioning to English literacy (Supalla, 2017; Supalla et al., 2017).[1]

The research case study outlined in this paper aims to demonstrate how deaf students' progress with reading skills is made possible through a specialized reading methodology that accounts for ASL and English as two languages. With a significant amount of alignment to the curriculum, instruction, and assessment, deaf students will have an accessible reading program. Special tools and procedures are part of this program. In any case, the data will shed light on how deaf students develop authentic reading skills over time. For the full appreciation of the research study undertaken, it is essential to address reading measurement for deaf students. This includes an understanding of how reading measures developed initially for English can be adapted for ASL with the specialized reading methodology in mind.

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[1] The alternative model for signed language reading with ASL Gloss is comparable to 'hitting two birds with one stone' (i.e., deaf students are learning to read with ASL and then move towards English literacy at the same time). The authors of this paper are not against the idea of deaf students learning to read in ASL exclusively, but it will not address the pressing pedagogical problems associated with how these students can learn to read in English effectively.

Background to the Study

First, it is necessary to examine how deaf education addresses the task of measuring deaf students' reading skills. While hearing students' reading can be effectively measured by the Dynamic Indicators of Basic Early Literacy Skills (DIBELS, Good & Kaminski, 2002; the University of Oregon Center on Teaching and Learning, 2009), this measure poses a challenge for deaf students. The deaf education expert, Dr. John Luckner of the University of Northern Colorado (2013), acknowledged that DIBELS is "the most widely used screening and progress monitoring assessments for reading in [American] preschools and elementary schools" (p. 9). Therefore, it is necessary to look more closely at Luckner's discussion regarding the measurement in question:

> The DIBELS subtests were developed to prevent reading failure by targeting early literacy skills that are predictive of later reading success (Torgesen, 2002). This targeting is accomplished by focusing on three essential areas: (a) phonological awareness, (b) phonetic skills related to the alphabetic principle, and (c) automaticity (National Reading Panel, 2000; National Research Council, 1998). These areas have been derived from the contention that reading in alphabetic orthographies such as English is mediated by phonology (i.e., access to the meaning of written words is mediated by the readers' knowledge of spoken words). (p. 15)

According to Luckner's description above, it is easy to understand that the DIBELS is well-regarded among educators. The idea that the DIBELS subtests are designed to help prevent students from becoming reading failures is attractive. Luckner himself devoted a section in his article to how deaf students experience reading difficulties. The deaf education expert explained that "research done over the past 90 years has documented the fact that most individuals who are deaf or hard of hearing complete their educational programs without being able to read well…" (p. 7). Therefore, something must be done about deaf students' reading situation. These students also have the right to become fluent readers.

As intriguing as the title of Luckner's article, *Using the Dynamic Indicators of Basic Literacy Skills with Students Who are Deaf or Hard of Hearing: Perspectives of a Panel of Experts* may be, the findings are perplexing and not helpful. Luckner relied on a panel of deaf education experts to help determine the DIBELS's appropriateness for use with the children in question. Please understand that the prevailing perspective holds that the DIBELS will help *all* students at risk with reading skills. Luckner's concluding remarks on the reading measurement for deaf students are as follow:

> While there is disagreement about whether this perspective is applicable to students who are deaf or hard of hearing (e.g., Allen, et al., 2009; Wang [et al.], 2008), to date, alternative theory or research demonstrating that deaf students who are deaf or hard of hearing develop reading skills differently from typical hearing students has not been produced (Paul & Lee, 2010). (p. 15)

Luckner's writing indicates that 'a ball is being dropped' in the investigation of DIBELS and the question of reading measurement for deaf students. There are two important considerations

here. First, Luckner only accepted DIBELS at face value, meaning that English is the target language and students are hearing. It is no wonder that the deaf education experts could not agree on whether to use the DIBELS with deaf students. What deaf education experts, including Luckner, should have done is explore avenues that will ultimately make DIBELS applicable for deaf students. Deaf students' reading can be monitored when a measurement system such as the DIBELS considers their language, ASL, for example. Ironically, Luckner mentioned that a Spanish version of the DIBELS is available. Nevertheless, Luckner did not mention ASL by name in his article. He only vaguely referred to signed communication (using terms such as *sign* and *signing*) used by deaf students. Unfortunately, when discussing the use of DIBELS with deaf students, Luckner appears to evade the vital language issue for reading measurement altogether.

Interestingly, experts in deaf education have thought about the differential needs that deaf students may have with reading (with their reference to the alternative theory and research for deaf students' reading), yet they are in limbo with no provision of support. Should there be an explanation for the situation described here, it would be about the long-held view that deafness is a severe form of deficiency. Deafness or hearing loss viewed in this manner has caused many experts to pursue and maintain a negative outlook. Thus, over the years, deaf education experts find themselves explaining to society why deaf students do not perform like hearing students, especially with learning to read.

Consequently, any deaf education experts are bound to the "deafness as deficient" mindset preventing them from pursuing alternatives that could help change the view of disability for the better. Andrews et al. (2016) explained that the ideology of deficiency had shaped the education of deaf children in a profound way, which is unfortunate and requires systematic reform. Such a deficiency outlook is opposed to viewing deaf students as fully capable with different needs with a positive outlook for their education. If more educators adopt this new and progressive mindset, the challenges for deaf students' education would be better addressed.

Second, a correction must be made regarding Luckner's statement on the lack of an alternative theory and research on deaf students' reading differences from hearing students. In 1998, fifteen years before Luckner's publication (in 2013), the first paper on a new paradigm for understanding and promoting deaf students' reading was released. The second author of this paper collaborated with Jenny Singleton, Sharon Litchfield, and Sara Schley in writing *From Sign to Word: Considering Modality Constraints in ASL/English Bilingual Education* published in the Topics in Language Disorders Journal.[2] For comparison, Luckner had his paper published in the American Annals of the Deaf, the journal that represents the field of deaf education. At the same time, there have been scholars and researchers who may not have a direct affiliation with deaf education, but they developed a strong interest in the education of deaf children. This circumstance led to the publication of the 1998 paper in a journal outside the field of deaf education.

In any case, Singleton et al. clarified that English is a spoken language. The scholars took advantage of the fact that English literacy is a challenge for deaf students to learn and master (and many fail to become fluent readers). This understanding is well documented in the deaf education

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[2] For the record, other publications support the alternative theory and research for deaf students' reading during the years before Luckner's 2013 publication. They are Cripps & Supalla, 2012; Supalla & Blackburn, 2003; Supalla & Cripps, 2011; Supalla et al., 2001. The other publications after 2013 are Rosen, 2017; Supalla, 2017; Supalla & Byrne, 2018; Supalla et al., 2014, 2017, 2019.

literature. All educators who work with deaf students must recognize that their students do not benefit from access to spoken English. These students do not develop or internalize spoken language knowledge for reading development purposes (see McQuarrie & Parrila, 2009; 2014 for further discussion of this topic). Please understand that the conventional reading instruction practices assume that students have access to spoken English either as a first or second language (Supalla et al., 2017). It is easy to understand that deaf students have trouble with English literacy when the barriers are formidable. Teachers who work with deaf students are seemingly powerless to correct this situation.

The formal distinction that Singleton, Supalla, Litchfield, and Schley made in their paper with English as a spoken language and ASL as a signed language is helpful. The term used in the paper includes the modality-constrained bilingualism that emphasizes the modality differences and language differences. The equation for the two languages in question for deaf students is complex and must be addressed accordingly. The learning of ASL and English cannot continue to be viewed as simply bilingualism. The unique experiences that deaf students have with language is something to embrace and should serve as a basis for reading programming.

Another relevant publication made before Luckner's 2013 publication is Supalla and Cripps (2008), in which the scholars introduced readers to the concept of linguistic accessibility and the special status of ASL as a signed language. What this suggests is that deaf students must learn to read in ASL. These students are known for thinking and processing in the signed language (e.g., Lane et al., 1996). This realization is where reading becomes authentic with deaf students who can make connections between ASL and print. English literacy is not accessible to deaf students for the simple reason that they do not have access to the spoken language. Having heard (and acquired) spoken English is a requirement for reading development purposes (see Supalla, 2017 and Supalla et al., 2017 for the rationale and importance of signed language reading).

The authors of this paper wish to emphasize that the status of English as a spoken language can be addressed for deaf students learning English literacy (see Caldwell-Harris, in press for difficulties faced when English literacy is introduced to deaf students with the expectation that they become fluent readers). The path to learning is just a matter of how a specialized reading methodology must be created, including an awareness that teachers will need to be appropriately trained to teach reading strategies and skills effectively to deaf students (Supalla, 2017). The crucial concept for best practices lies in tapping into deaf students' linguistic strengths in ASL to become literate in an otherwise inaccessible language, English. It is Singleton et al. who stated that "specific ASL-based methods must serve as a bridge to print English" (p. 21). This publication is where the scholars made the first reference to 'glossing' that formally known as American Sign Language Gloss. All deaf students are entitled to undergo the reading instruction developed from this perspective, including their foundation of proficiency in ASL.

The ASL Gloss methodology mentioned above and seen in this study is a direct product of a charter school in Arizona. This school's name was the Laurent Clerc Elementary School, established in 1996. The school's mission was to implement and test ASL Gloss. The charter school was affiliated with the University of Arizona (where the second author of this paper, Dr. Supalla, is employed as a professor). The fact that Singleton, Supalla, Litchfield, and Schley had their paper published two years later in 1998 is not a coincidence. This paper and ASL Gloss result from university-led research and development work with the participation of teachers and students in a school setting. Teachers at the charter school appreciated the tools and teaching procedures

related to ASL Gloss, as they have substantial implications for the curriculum, instruction, and assessment.

ASL Gloss promotes the integration of reading skills from ASL and deaf students' learning of English vocabulary and grammar. The cross-linguistic set-up of ASL Gloss results in deaf students crossing the bridge from ASL to English literacy. ASL Gloss would be phased out as a reading instruction program around the 4th grade as typical academic standards transition students from 'learning to read' to 'using reading to learn' (see Supalla & Blackburn, 2003 for a comprehensive description of the ASL Gloss programming from kindergarten through the 3rd grade). The highly desirable outcome includes how these students develop reading comprehension and fluency while learning an adequate amount of English language knowledge.

Furthermore, curriculum-based assessment alignment using ASL Gloss allows for test adaptation. An adapted form of the Dynamic Indicators of Basic Early Literacy Skills or DIBELS (Deno, 2003) serves as an answer to deaf education's struggle with reading measures. According to Haug and Mann (2007), test adaptation is common with different languages worldwide. It is noteworthy that these scholars had some experience with test adaptation concerning signed languages. Haug and Mann discussed how the signed language proficiency measures for ASL and British Sign Language are subject to adaptation for use with various European signed languages (see Enns & Herman, 2011 for a more recent example of how a test developed initially in British Sign Language was subject to test adaptation to ASL). While Haug and Mann did not address ASL Gloss specifically or discuss that ASL and English are two languages (with the associated modality-constrained bilingualism), but their understanding of test adaptation is insightful.

Haug and Mann explained that the test adaptation "incorporates the notion of developing a test for the target language which remains as close as possible to the source language while, at the same time, continues to meet the specific needs of the target language" (p. 139; see Oakland & Lane, 2004 for more information concerning the test adaptation efforts with hearing populations and spoken languages). Haug and Mann went on to discuss the test adaptation in more detail as follows:

> ...[the] parallel test (i.e., target test) ... acknowledges the linguistic, cultural, and social conditions of those who will be taking the adapted test while retaining the measurement of the constructs found in the original (i.e., source) test. The ultimate goal is to have two tests that measure the same trait in fair, equitable, and somewhat equivalent fashion. (p. 139)

The implications for the DIBELS become evident, including how ASL could be the target language and English as the source language. A parallel test could be developed, that could be called the DIBELS-ASL Gloss, for example. Haug and Mann emphasized that "such a process [referring to the creation of a parallel test] needs to be approached with great caution" (p. 139). This process includes addressing "how well psychometric measures transfer from one instrument to another" (p. 138). The parallel test for the DIBELS will also need to be re-standardized. Haug and Mann noted in their own words that "lack[ing] a thorough documentation of psychometric properties" in their own words (p. 145) is the situation described for most of the signed language proficiency test development work worldwide. It is important to understand that signed languages have been accepted as part of the world's human language family in the last few decades. This

finding suggests test adaptation work needs to be done with various signed languages. ASL Gloss is new and not yet widely accepted as a reading methodology for deaf students.

Educators in the United States must acknowledge that a review of research studies on ASL Gloss shows its promise (see Supalla, 2017). Deaf students can learn to read when it comes to signed language reading, for example. These students know ASL and mediate with the signed language in ways that authenticate the reading process. It is essential to understand that the various studies cover deaf students' reading with ASL Gloss at one point in time or another, not over time. Yet, the research findings continue to be significant as signed language reading is actual and comparable to what is known for spoken language reading with hearing students. The adaptation of DIBELS for ASL Gloss is thus a top priority and an appropriate undertaking. DIBELS has seven measures for English that are listed as Letter Naming Fluency, Initial Sound Fluency, Phoneme Segmentation Fluency, Nonsense Word Fluency, Oral Reading Fluency, Retell Fluency, and Word Use Fluency. As part of including ASL Gloss as a reading methodology, all seven measures will need to be adapted for deaf students.

The Study

For this paper, an exploratory research study on test adaptation to measure deaf students' reading through ASL Gloss was undertaken. The authors of this paper recognize the importance of a parallel test development with all seven subtests of the Dynamic Indicators of Basic Early Literacy Skills or DIBELS for the education of deaf children. Included here is the creation of a normatively rare database that accounts for deaf students' accessible reading development. It will be part of a long-term study with many deaf students. For now, it is imperative to shed light on the feasibility of the test adaptation idea for the education of deaf children. Two reading measures underwent the adaptation process to document and evaluate deaf students' progress with signed language reading skills.

The fundamental research question for the current study is: How do deaf students perform with reading skills over time when taught through ASL Gloss, and what indications are there to support the measures' face validity? The setting for this research was a tutorial where ASL Gloss was used for teaching reading skills to deaf students. The research study for this paper has its roots in the doctoral dissertation that the first author of this paper completed in 2008. It is the second and third authors who initiated the test adaptation project for ASL Gloss.

Participants

The students who participated in the tutorial were two females, aged 7 and 9. Both were profoundly deaf since birth. Pseudonyms have been developed for these students for reasons of confidentiality. Renee is the younger student, and Pat is the older student. The ASL Gloss background was different between the two students. The younger student, Renee, enrolled in the Laurent Clerc Elementary School (where ASL Gloss was first developed and implemented as a reading methodology) at pre-Kindergarten and remained there until the end of 1st grade. At the time of the tutorial, Renee was scheduled to enter 2nd grade in the fall. The older student, Pat, had attended a school for the deaf but transferred to the charter school in 3rd grade. Her exposure to

ASL Gloss was for one year. Thus, Renee had a more extended experience using ASL Gloss for learning to read.

Both Renee and Pat were ranked highly proficient in ASL via the American Sign Language - Proficiency Assessment (Maller et al., 1999). However, Pat's parents were concerned about their child's reading skills. The parents understood Pat disliked reading and struggled with reading comprehension tasks. This difference explains, in part, why Pat was transferred from a school for the deaf to the charter school. Therefore, the tutorial with ASL Gloss was determined to be an appropriate action plan for Pat.

The situation with Renee was different. There was no urgent need for this student to undergo the tutorial, but she was eager to participate to avoid the boredom of staying home during the summer. Renee's parents saw that the tutorial would be a good opportunity for their child to review ASL Gloss. In any case, the setting for the participating students' learning to read via ASL Gloss is a tutorial during a summer break from school. The tutor was a native signer, well-versed in ASL Gloss, and saw a benefit in having two students for the tutorial. The learning dynamics for the tutorial were thought to improve with two students rather than just one.

Since Renee and Pat were subject to learning to read via ASL Gloss, it is important to discuss what was involved with the tutorial. A children's book entitled "The Lady and the Spider" (McNulty, 1987) was selected to teach reading skills and strategies to Renee and Pat. The text's readability is gauged for children aged 6 through 9. This story's protagonist is a spider who lived in a woman's garden. The story is told from the spider's perspective as it lived inside a lettuce head in its world. The woman takes a lettuce head from her garden and starts cleaning it with running water in the sink. At this point, the reader sees conflict when the spider's life is disrupted with chaos and its world verges on being destroyed. However, the lady soon rescues the spider and returns it to the garden on a different lettuce head, and life for the spider was restored.

Moreover, "The Lady and the Spider" originally written in English, was glossed for use with Renee and Pat. The English text underwent manipulation and became ASL-like. The English words or roots that had equivalence with ASL signs were fully capitalized and arranged according to ASL's morpho-syntactic structure. For example, special writing conventions were used to mark the glossed sentences for ASL's inflectional morphology, facial markers for topicalization and other syntactic operations, and classifier constructions. The resulting glossed sentences are a product of interlinear translation from English to ASL (see Supalla et al., 2017 for a detailed discussion on how a glossed text is written; also see Ralabate, 2011 and Rose, 2000 for the value of text manipulation for all students as part of the Universal Design for Learning framework).

The glossed book "The Lady and the Spider," was then divided into seven parts, and these parts delineated the instructional design for reading instruction over time. The Resource Book or RB (a bilingual dictionary) had also been developed for each section to use it to help identify English words in the glossed text as needed (Supalla et al., 2001). The RB has English words from each part of the glossed book paired with the ASL equivalents written in the ASL-phabet. The ASL-phabet uses 32 symbols for writing signed words. The signs are written based on the phonological structure of ASL, comprised of the handshape, location, and movement parameters (Supalla et al., 2001; see Supalla et al., 2014 for a detailed description of the ASL-phabet and how it is an alphabetic type of writing for ASL). It is essential to keep in mind that the ASL-phabet is designed for writing and reading at the word level only. Deaf students read sentences or text through the glossed text.

During the tutorial, Renee and Pat participated in a wide range of activities using the glossed book "The Lady and the Spider" for eight days from 9:00 AM to 1:30 PM Monday through Thursday over two weeks. The tutor considered the guided reading sessions as the primary activity for the students. However, substantial time was provided to explore ASL songs, conduct homework reviews, story structure analysis, and English language lessons. English language lessons are one major component of ASL Gloss alongside the RB and glossed text components. This reading methodology integrates all three components that define ASL Gloss (Supalla, 2017; Supalla & Cripps, 2011; Supalla et al., 2001, 2019; see Supalla et al., 2017 for the emphasis on ASL Gloss as a process).

With the English language lessons, Renee and Pat had the opportunity to conduct comparative analysis of the glossed text with the original English for "The Lady and the Spider" with their tutor. This is where the students learned about English's grammar to help ensure their transition to English literacy. Please keep in mind that the same students also learned English vocabulary via reading the glossed text and using the RB when needed. However, for the reason of limited space in this paper, the English language lessons are not part of the current research study. Only use of the RB and the reading fluency with glossed text were subject to examination.

Method

The research with the two participating deaf students, Renee and Pat, is best described as a case study. Test adaptation (with reading measures) plays an important role in this study. Both types of data, quantitative and qualitative, were collected and subject to analysis. The quantitative data was collected through the administration of the adapted reading measures with both students. The examination of the students' reading skills is based on the three-time intervals of the tutorial: Initial, Middle, and Final. The initial period refers to the first day of the tutorial, the middle period was a day halfway through the two-week tutorial, and the final period was during the last day of the tutorial.

The adapted measures are called the ASL-phabet Letter Naming Probe and Glossed Running Records. The first measure is modeled on the DIBELS's English subtest called Letter Naming Fluency. The ASL-phabet probe is designed to assess the participating students' letter naming fluency for the signed language. The probe relies on the 32 ASL-phabet letters scrambled on a chart with 130 letters (with some letters showing up once and others multiple times).

The tutor instructed Renee and Pat to go through the chart and identify the letters as quickly as they could for the assessment procedure. Then each ASL-phabet letter read would be signed from one to another. The time limit for the task was two minutes. Please note that the procedure as described is identical to the DIBELS's Letter Naming Fluency. The computation for the ASL-phabet letter naming scores is also like those developed for the English version. The formula for scoring the ASL-phabet letter naming probe computes the numbers of correct letters/number of letters reached multiplied by 100.

The transcribed ASL-phabet letter naming data over the three assessment periods for Renee and Pat are included in Appendixes 1a, 1b, 1c, and 2a, 2b, 2c, respectively. √ refers to the correct responses that the students made with the individual letters (e.g., signing ⌒ for the symbol of ⌒). When the students self-corrected, their responses were marked as SC. In this case, the students misread one letter for another letter but quickly realized the error and came up with the correct

response (please note that SC responses were counted as a correct response according to this study).

Concerning errors, three types were considered for deeper investigation. First, when Renee or Pat misnamed a letter with an alternative letter, the error was transcribed as an X. This transcription symbol also represented a few occasions where the students mimicked the shape of an ASL-phabet letter by tracing the letter with their index finger in the air. Although the students were aware of the need to sign the letters, they did air tracings with the hope of providing a partially correct answer, rather than making a complete error. Finally, X also represented any time that that the students skipped a letter in the probe.

Test adaptation with the glossed running records is a bit more complicated. The DIBELS has a subtest named Oral Reading Fluency, including text that hearing students read English aloud. One option considered for this test adaptation was to gloss the DIBELS story and ask Renee and Pat to read it using signed language. However, for this study, the DIBELS text option was not pursued because the tutor wanted to use the ASL Gloss text from "The Lady and the Spider" (used for instruction) as a formative measure and more authentic curriculum-based assessment. The tutor had instructed Renee and Pat to read aloud parts of the glossed book, "The Lady and the Spider," in ASL during the tutorial time. The students' performances were all videotaped in their entirety for transcription and analysis. This valuable data was submitted for analysis in this paper.

Clay's (1993) running records and calculations were adopted to examine how Renee and Pat performed using oral reading in ASL of "The Lady and the Spider." The adoption of Clay's calculation chart for this study is supported by the fact that Clay's measure provides more detailed information related to measuring the participating students' oral reading performances (in ASL) than what is provided through the separate DIBELS oral reading assessment. Clay's formula charts define three areas of reading behavior: error rate, accuracy, and self-correction rate. Figure 1 below show the formula for each area.

CALCULATIONS
(RW = Running words; E = Errors; SC = Self-corrections)

ERROR RATE	ACCURACY	SELF-CORRECTION RATE
$\dfrac{\text{Running words}}{\text{Errors}}$	$100 - \dfrac{E}{RW} \times \dfrac{100}{1}$	$\dfrac{E + SC}{SC}$
e.g. $\dfrac{150}{15}$ = Ratio 1:10	$100 - \dfrac{15}{150} \times \dfrac{100}{1}$ = 90%	$\dfrac{15 + 5}{5}$ = Ratio 1:4

Figure 1: Clay's Calculations Chart

At the same time, the glossed running records include a one-minute cut-off, which is borrowed from the Oral Reading Fluency subtest of the DIBELS. Thus, Clay's calculations were computed according to the one-minute read-aloud performance of Renee and Pat in ASL. Nersesian's formula (2002) was used for tallying the word count. An accurate word count is critical for the success of a valid glossed running record. The word count does not just address 'regular

signs' but is applied for other ASL features such as classifier constructions (that require their own counting in sub-morphemes, for example). Readers of this paper are encouraged to read Nersesian's groundbreaking research on how to best count 'words' in ASL.

There are symbols to consider when it comes to scoring the participating students' performances with the glossed running records. Some are borrowed from Clay's running records for English, and others are unique to ASL Gloss. √ refers to the correct responses that the students made with the individual words read. When the students made self-corrections, they were transcribed as SC. An SC is recognized when the students misread one word for another word but quickly recognize their production as an error and then read the correct word (and SC is counted as a correct response according to this study, in the same way as for the ASL-phabet probe count).

When Renee or Pat read a word with an erroneous sign, it is marked with a slash or –. This symbol (–) is also used any time the participating students skipped a word in the running records. Any time the students used the RB to help identify unknown English words in the glossed text, the transcription symbol used for coding is RB in parentheses or (RB). (RB) is written next to either correct or erroneous responses to indicate that not only do the students use the RB but that they make a correct or erroneous response when doing so. The transcribed running records over the three assessment periods for Renee and Pat are included in Appendixes 3a, 3b, 3c, and 4a, 4b, 4c, respectively.

Moving to the qualitative component of the research study, the fact that all the tutor's guided reading activities with Renee and Pat were videotaped proved valuable for research purposes. This data was once again turned over to the research study team for this paper. The analysis focused on finding all tutorial episodes that demonstrate the students' learning behaviors corresponding to what was measured through the ASL-phabet probe and the glossed running records. The criteria as developed helps with locating the appropriate learning behaviors with Renee and Pat. The identified tutorial episodes were subject to detailed descriptions.

Results

The research findings with Renee and Pat and the test adaptations for ASL Gloss are substantial and insightful. Results are presented here with the first part covering what the measures reveal and the second part on the students' tutorial experiences.

Part 1: Reading Skills Subject to Measurement

For this part, the participating students' reading performances are laid out over the three assessment periods, first with the ASL-phabet letter naming probe and then with the glossed running records. Thus, in addition to measuring what Renee and Pat learned internal to ASL Gloss, research reveals the effects of the students' backgrounds on their reading performances. Information is also provided for the tutor's decision to change the assessment procedure for the third and last period. These considerations are important for confirming any reading measure's sensitivity to the external variables.

Letter Naming Skills with the ASL-phabet. Table 1 shows the results of Renee and Pat's performances with the ASL-phabet probe. The students correctly name a great proportion of letters with their corresponding signs by a significant proportion during the three periods of the tutorial

Table 1 – Letter Naming Performances Over Three Assessment Periods

Students	Initial	Middle	Final
Renee	51/66 = 77.3%	66/75 = 88%	73/74 = 98.6%
Pat	91/101 = 90%	107/117 = 91.5%	121/130 = 93%

(i.e., initial, middle, and final). The data suggests that the students had already known the letters before their participation in the tutorial. Renee and Pat attended Laurent Clerc Elementary School before the tutorial.

At the same time, Renee and Pat do have some letter naming skills for ASL-phabet letters that need to be developed. In this sense, the tutorial was helpful. The students steadily improve with their letter naming skills over time, according to the data above. Initially, Pat had a better standing with the letter naming skill than Renee. However, Renee made the most improvement and scored better than Pat by the final assessment. The fact that Renee had more schooling with ASL Gloss (as compared to Pat) suggests that she recovered and became fluent with the letters at 95% or higher. Pat stopped short of achieving the fluency level at 93%.

The effects of maturation concerning the two participating students can be seen with the ASL-phabet probe as well. Pat had more letters named within the two-minute limit for all three periods (ranging between 101 and 130 letters) in comparison to Renee (ranging between 66 and 75 letters). Thus, Pat had an age-related cognitive advantage enabling her to go through the ASL-phabet probe faster than Renee. However, it is important to keep in mind that this outcome does not have a direct relationship to improved letter naming skills.

Measurement of the Oral Reading Fluency. Table 2 shows how Renee and Pat perform over time when they read aloud the glossed rendition of "The Lady and the Spider." With the initial assessment, the running words/errors calculation results indicate that Renee produced four errors out of 41 running words. With the error ratio being 1:10.3, she produced one error out of every ten words. Renee's self-correction ratio is 1:2, which means that she self-corrected once per two errors on average. With the instructional level at 90% or better, Renee achieves this level with a 90.2% accuracy.

Pat produced seven errors, thus creating an error ratio of 1:9.4. The average of one error out of every 9.4 words is higher than what was reported for Renee. Pat's self-correction ratio is 1:8, which means that she self-corrected once per 8 errors. Thus, Pat engaged in self-corrections less frequently than Renee. With a 89.4% accuracy rate, "The Lady and the Spider" is ranked at the difficult level for Pat (please note this child had never demonstrated a 90% or better accuracy rate even for the later assessment periods).

Table 2 - Oral Reading Performances Over Three Assessment Periods

Students	Initial	Middle	Final
Renee			
Running Words/Errors	41/3	77/7	54/6
Error Ratio	1:10.3	1:11	1:9
Accuracy Rate	90.2%	90.9%	88.9%
Self-correction Ratio	1:2	1:3.33	1:3
Pat			
Running Words/Errors	66/7	108/14	61/7
Error Ratio	1:9.4	1:7.7	1:8.7
Accuracy Rate	89.4%	87%	88.5%
Self-correction Ratio	1:8	1:15	1:8

By the middle assessment, a total of four parts of "The Lady and the Spider" had been read. Both Renee and Pat experienced a boost in their reading confidence, evident by the increased number of running words (i.e., from 41 to 77 for Renee and from 66 to 108 for Pat). The tutor's engagement in guided reading appears to have helped the students becoming more comfortable with reading.

In addition to reading more words, Renee's error ratio was stable, if not slightly improved (from 1:10 to 1:11). With the self-correction ratio of 1:3.33, Renee engaged in self-correction once every three errors rather than two. Thus, this student continued to be at the instructional level at 90.9%. The fact that Renee not only sped up her reading, but also became less prone to making errors and self-corrections, is interpreted as a positive outcome for the tutorial.

The situation with Pat is different. This student seemed overly confident with reading, and she rushed to read. This hurried reading behavior caused a higher proportion of errors (i.e., 1:7.7 as compared to 1:9.4 during the initial assessment). Self-corrections became far less frequent (i.e., 1:15 as compared to 1:8 during the initial assessment). In comparison, Renee performed as if she knew more about what the task of reading involved. She was able to increase her reading speed

without increased error. Once again, recall that Renee had more schooling with ASL Gloss compared to Pat must have played a role in oral reading skills using ASL Gloss.

It is important to note that Pat became a more careful and focused reader by the end of the tutorial. Pat's error ratio was better than the score she achieved during the middle period (i.e., 1:8.7 vs. 1:7.7). Pat demonstrated the same self-correction ratio as reported for the initial period, suggesting that she picked up with her performance after the middle period. After reading more parts in "The Lady and the Spider" with the tutor's guidance. Pat must have realized that speed is not the most crucial factor when reading. This student started to pay closer attention to what was read and no longer viewed reading as a timed race.

During the final assessment, the tutor faced an unexpected circumstance. Time had run out for Renee and Pat to read through the seventh and last part of "The Lady and the Spider" with the tutor's guidance. Instead of following the previous tutorial schedule, the tutor asked the students to read the part for assessment purposes only. This task was more challenging than reading a section with the tutor's guidance, and then rereading the part again for assessment purposes. Thus, the impact on the reading process is understandable, including how Renee and Pat slowed down and the running words fell from 77 to 54 and 108 to 61, respectively. It is noteworthy, however, that Renee's error and self-correction ratios remained stable, suggesting that her reading skills are well-established.

Similar to what was discussed for the letter naming skills with the ASL-phabet, the maturational effect prevailed for oral reading with ASL across all three assessment periods. Pat being the older student, consistently produced more running words than the younger student, Renee. That is, 66 words as opposed to 41 for the initial period, 108 vs. 77 for the middle period, and 61 vs. 54 for the final period.

Finally, there is no indication in the data over the initial, middle, and final periods that Renee or Pat used the RB while reading the glossed text of "The Lady and the Spider." The RB was left untouched when these students participated in the running records. The tutor made it clear to the students that they could use the RB when needed, but they chose not to. Essentially, some of the errors that the students made with the individual words may not have occurred had they used the RB. Let us consider Renee as the most accomplished reader of the two. When this student uses the RB for unknown English words, her performance with the running records is likely to go beyond the highest accuracy rate of 90.9%, for example.

Part 2: Tutorial Experiences for the Participating Students

For the qualitative data of the research study, three tutorial episodes were identified that confirmed a relationship between what the participating students learned and what skills were measured. In addition, the tutor's engagement in guiding Renee and Pat in using the RB is noteworthy (given that the students did not use the RB as they should, according to the first part of the research study). The fact that both Renee and Pat learned new English words through ASL (with the tutor's guidance, of course) should be appreciated. Finally, please consider that the ASL Gloss skills taught during the tutorial with Renee and Pat are comparable to what occurs with hearing students in letter identification, word decoding, and oral reading.

The Learning of Reading Skills #1. On the first day of the tutorial, the tutor led a flashcard activity to help prepare Renee and Pat for reading the glossed rendition of "The Lady and the

Spider." The flashcards used for the tutorial had an English word written on one side and the ASL equivalent on the other. The tutor drew on the first part of "The Lady and the Spider" to provide English words for inclusion in the flashcards. The teaching procedure required the tutor to show Renee and Pat English words on the flashcards, one after the other. When the students failed to correctly read an English word, the tutor flipped the flashcard and had them read the ASL equivalent. Consequently, the tutor had the opportunity to closely monitor the students' reading of the written signs and provide assistance whenever necessary.

According to the videotaped discourse data, Pat responded the most to the English words during the flashcard activity (by providing ASL translations). Renee sat next to Pat, observing and throwing in signs occasionally. While Pat was able to sign and identify a sizable number of English words on the flashcards, there are some words that she did not know. For example, Pat could not identify the word INSIDE. The tutor flipped the card and showed the ASL equivalent to her: ⋇₁⋇₁ ↲ ≈И . The first two letters (i.e., ⋇₁⋇₁) represent two identical handshapes produced in the sign, whereas the third letter (i.e., ↲) designates the location. The last two letters (i.e., ≈И) represent the movements internal to the sign.

Although Pat could have tried to read and identify ⋇₁⋇₁↲ ≈И as a whole word in ASL (so that she could know the meaning of INSIDE through her knowledge in the signed language), the tutor did something more fundamental. The tutor asked Pat to identify the individual letters in the written sign, and the student did. There is a reason for this, as the tutor wanted to know how well Pat knew the ASL-phabet's 32 letters. Having fluency in letter naming is critical for success in reading written signs as whole words.

In any case, Pat's letter naming performance with ⋇₁⋇₁↲ ≈И is informative, including how she successfully named the handshape and location letters of the word. However, the movement letters were a different story for Pat.[3] When Pat produced an error by signing Ϟ for the ≈ letter, the tutor stepped in and discussed the difference between Ϟ and ≈. Similar assistance by the tutor occurred for the other movement letter И .

Of interest to this case study, Renee happened to not be paying attention to the interaction between Pat and the tutor regarding the distinction between the letters Ϟ for ≈. The impact of missing this instructional information was significant for Renee. The reading measurement under development reflects this. Upon taking the ASL-phabet probe later the same day after the tutorial, Renee had trouble identifying the movement letter ≈ (she did not reach the И letter in the probe yet; see Appendix 1a for a review). On the other hand, Pat named ≈ and И correctly (see Appendix 2a for a review), representing successful learning during the tutorial.

The Learning of Reading Skills #2. The tutorial's attention moved on to oral reading. The setting included Renee and Pat taking turns reading the sixth part of "The Lady and the Spider" with the tutor's guidance. In this part of the story, one event has the spider scrambling inside the lettuce head as the lady washed the vegetable in her sink. The spider's perception of 'rain' falling on him is a direct result of the lady's washing. The water drops are described as huge in the eyes of the spider.

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[3] Readers need to acknowledge a report that Supalla (2017) made regarding "the handshape-location/ symbol relationships [are] easier to learn as compared to the movement/symbol relationships, thus the former [is] seen as involving consonants and the latter vowels" (p. 46). The ASL linguistics community has a similar view in regard to how consonants and vowels prevail in the signed word structure.

When Renee read aloud the glossed text in ASL, she stalled at the word: HUGE. Renee did not voluntarily use the RB. For this reason, the tutor gently reminded Renee to use the RB. The student, however, rejected the tutor's guidance and tried to decipher HUGE by rereading the sentence again, this time, silently. The child tried to figure out the word's meaning through the context of the story. This reading strategy was a good choice but was insufficient for what was needed. Consequently, Renee could not think of a sign that matched the target word. The tutor once again encouraged her to use the RB. Renee then used the RB and was quick to identify HUGE upon reading the ASL equivalent: ⌶⁄ ⌶⁄ Ɔ ϟ ≈. According to the video discourse data, Renee was visibly elated that she now enjoyed full comprehension with what she was read. Renee then proceeded to read subsequent events in "The Lady and the Spider" with success.

Please recall that Renee scored as fluent with letter naming skills according to the ASL-phabet probe. Renee being able to read and identify ⌶⁄ ⌶⁄ Ɔ ϟ ≈ without any struggle during the tutorial falls in line with this measurement outcome. Equally important is how the tutor was teaching Renee about the use of multiple reading strategies. If relying on the glossed text's context to help identify a word's meaning does not work, Renee needs to use the RB.

The Learning of Reading Skills #3. The third and final tutorial episode covers oral reading during the final tutorial period with the sixth part of "The Lady and the Spider." The student is Pat this time. The event that Pat read is about the spider becoming afraid of the fact that her home, the lettuce head, had been shredded. The spider was now floating on a leaf in the sink. The lady watched the spider trying to escape from this situation. The glossed text looks like this:

LADY   LOOK>DOWN,   MOTION>TINY   (2h)Ⅵ-EYE>FOCUS.   SEE

SMALL   SPIDER   [⋂ -SURFACE   Ⅴ -ADRIFT],   TRY+   ESCAPE.

Pat read the first glossed sentence correctly. Please understand that the English translation of the glossed sentence in question is: The lady looked down and a tiny motion caught her eye. This sentence is complex and embedded with many ideas. The same holds true for the glossed version. Pat's successful reading performance at the sentence level is significant (see Figure 2 below for the ASL recitation of the child's oral reading).

However, Pat still needed more development in reading skills as she experienced some difficulty with the second glossed sentence.[4] She did not recognize the last word in the sentence: ESCAPE and paused. Pat chose to rely only on context to help identify the meaning of the unfamiliar word. She did not choose to look up the word in the RB. This strategy is comparable to what Renee chose, as discussed earlier. Instead, Pat reread the sentence again, this time silently, then looked at the tutor and articulated the sign: CONTACT. Based on Pat's word choice, the spider was trying to contact the lady or get her attention to ask for help.

However logical, the sign CONTACT does not fit well with what took place in the story. The tutor explained to Pat that in the first sentence, the lady was already looking down at the spider. Therefore, it was inaccurate to say that the spider was trying to make contact with the lady. The tutor then asked Pat to look up the word (i.e., ESCAPE) in the RB. This student went through the RB to locate ESCAPE and read the ASL equivalent: ⋂⁄ ⌶ ᶁ ⅃ ≈.

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[4] The original English sentence is: She saw a small spider, adrift on a raft of lettuce, trying to escape.

Figure 2: Recitation of Pat's successful oral reading performance in ASL
(https://youtu.be/ucXtoNc33qQ)

Pat's word decoding effort with the ASL equivalent for ESCAPE was not successful because she did not recognize the movement letter: ꩜. The fact that Pat did not master this letter according to the ASL-phabet probe (see Appendix 2c) serves as an excellent example for the correspondence between what took place during the tutorial and the measurement. Before presenting a detailed discussion about the student's multiple efforts to identify the correct sign when reading �си | ꝺ ꩜ ≈, it is important to understand that the ASL equivalent to ESCAPE has a fourth letter in the movement position of the word. The first two letters of ꝏ | ꝺ ꩜ ≈ refer to the two distinctive handshapes used in the sign, and the third letter refers to where the signed word is formed (i.e., location). The fifth and last letter refers to the additional movement information about the sign for ESCAPE.

A total of six decoding attempts were made before Pat signed ESCAPE as the correct response. This child had a problem reading ꩜. Pat can be seen to put effort into reading the word as best she could; however, she got caught up with several signs that are written similar to the ASL-phabet version of ESCAPE. Also, Pat added the repeated movement information or ∨, which is not part of the print form. The combination of adding information to what is read and failing to recognize a letter led to the child's signing of the wrong words. With the first attempt, Pat quickly learned that she was incorrect based on the tutor's correction. Her subsequent production of a gibberish sign (her second attempt; see Figures 3 and 4 below for the signing of ESCAPE and how closely it resembles the recitation of Pat's gibberish sign). The second attempt prompted the tutor to point to the individual letters of the written sign for ESCAPE in the RB. The purpose of this guidance was to help Pat pay attention to word decoding information available. Pat reread the word and responded with signs that are close to ESCAPE phonologically yet erroneous (fourth, fifth, and sixth attempts).[5] By the time of Pat's sixth attempt, the tutor resorted to using the context of

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[5] Readers of this paper are encouraged to see Supalla et al. (2014) for a similar outcome with a different written sign with a more detailed description for the multiple word decoding attempts.

Figure 3: Signed word for ESCAPE (https://youtu.be/-IpyCq6qQ4U)   **Figure 4:** Gibberish sign resembling ESCAPE (https://youtu.be/fpTh8HgiRBE)

the glossed text to help her with decoding the ASL equivalent to ESCAPE. The tutor took over and read aloud the sentence that ends with ESCAPE. The equivalent to what the tutor signed, "She (the lady) saw a small spider, adrift on a raft of lettuce trying to..." The tutor stopped short of signing ESCAPE, asking Pat to 'fill in the blank' or use a Cloze reading strategy. Given this prompt, the student quickly signed ESCAPE. Right before this, Pat was trying to decipher the phonological information pertaining to the ASL equivalent of ESCAPE and how it could help fill in the word in the sentence. Although Pat did not have accurate phonological information (for the ASL word) at that time, she had enough information to narrow down choices and produce the correct sign. As described for Renee earlier, Pat's face was visibly elated over her successful reading of the sentence.

DISCUSSION AND CONCLUSION

To answer the original research question, the two participating students involved in this tutorial did make progress, most notably with the ASL-phabet letter naming skills and to some degree with oral reading in ASL. Understanding that the reading measures are under development, they are sensitive to what took place during the tutorial. The different variables associated with the fact that the students were learning to read with ASL Gloss, the students having their distinctive backgrounds, and the change that the tutor made for the assessment procedure at the end of the tutorial are significant. More support for this comes from how the students' learning during the tutorial corresponds with what the measures have to say on three different occasions. The two measures, the ASL-phabet letter naming probe and the glossed running records, demonstrate their face validity for the performance and progress of the two students, Renee and Pat.

Regarding the Universal Design for Learning framework, it is important to note that the tutor was flexible regarding the introduction and use of instructional strategies (concerning the goals, media and materials, teaching methods, and assessment). The primary goal was for Renee and Pat to learn to read based on the accessible language of ASL (and for transitioning to English literacy when it comes to the larger picture of ASL Gloss). To help achieve this flexible instruction, materials such as glossed books and The Resource Book or RB were created. The tutor then guided the students by reading with them at the word and sentence levels. The teaching method includes having students develop fluency with the letters representing the phonological structure of ASL

words. The same holds true for reading the glossed text that is consistent with ASL's morpho-syntactic structure. Finally, the tutor used the ASL-phabet letter naming probe and the glossed running records (based on those developed for English) to measure the students' progress with reading skills.

According to the data, Renee and Pat deciphered the English words INSIDE, HUGE, and ESCAPE through The Resource Book or RB. This finding suggests the fulfillment of the cross-linguistic reading instruction intention of ASL Gloss. Please understand that those English words are the same in orthography and spelling as the glossed words (i.e., inside/INSIDE, huge/HUGE, and escape/ESCAPE). Therefore, the transfer from ASL to English should occur here, at least theoretically (see Supalla & Cripps, 2011 for further discussion of this topic). Please also understand that Renee and Pat had the opportunity to learn about English' morpho-syntactic structure through comparative analysis with the glossed text and the original English text of "The Lady and the Spider." The impact on reading comprehension at the word and sentence levels with English needs to be confirmed through future research.

Considering the research study detailed here, it can be said that an instructional baseline was established for Renee and Pat regarding their signed language reading skills. When thinking about these students going back to the Laurent Clerc Elementary School in the fall, the assessment information as provided through the research study would be beneficial. Renee is ready to integrate the RB into her daily reading with glossed books (given that she is fluent with the ASL-phabet letters and performs at the instructional level when reading a glossed text). This student can be described as on the verge of becoming a spontaneous user of the RB (see Cripps & Supalla, 2004 for a report on a deaf child who succeeded in using the RB spontaneously, helping with the child's reading process). Renee must understand both that the RB is connected to her improved reading comprehension capacity and about the importance of multiple reading strategies. More guided reading activities in the classroom at the Arizona charter school are expected to accomplish this. The teacher will need to closely monitor Renee for her reading development feature with the RB to maximize her reading skills.

With Pat, the situation was pressing due to her age. Pat was not as fortunate as Renee, owing to her limited schooling experience with ASL Gloss. However, this situation does not spell doom for Pat. Remedial reading instruction could be implemented to emphasize additional one-on-one instructional strategies using guided reading and ASL Gloss. Pat's teacher would need to see that she achieves fluency with the ASL-phabet letters, allowing her to read written signs in the RB with fluency. The glossed books will also need to be 'easier to read' for some time before Pat gets better with reading (and can then start reading more advanced books). Pat needs to integrate the RB into her regular reading of glossed books, but it will take time.

The fact that the tutorial was set up initially for Pat (because her parents were concerned about her reading skills) is something to consider. This case study confirms that Pat had more to learn as a reader when compared to Renee. According to the data, Renee is decidedly the better reader of the two students. The other important consideration lies in the value of the distinctive data. All the scores presented in this paper are part of that data, not through conventional reading measures. It is clear that deaf students, in general, deserve the kind of detailed assessment information as provided for Renee and Pat. Teachers can be empowered to teach reading to deaf students when having the means to assess through ASL Gloss. Thus, the relevance of the

alternative theory and research for deaf students' reading and the UDL framework has become paramount.

The scenario for reading measurement for the education of deaf children can be described as changing from bleak to bright with possibilities unfolding in the evidence presented in this paper. The adaptation of reading measures initially developed for English becomes an important direction to pursue, including the needed standardization with a large population of deaf students. For now, the tutorial's results stand as a platform for a dialogue on how deaf students can demonstrate a variety of reading skills (such as word identification, word decoding, and oral reading), some learned over time and some still needing to be learned. Accessible reading as provided through ASL Gloss is an exciting avenue to pursue for the research and development work with deaf students. This methodology includes consideration for a signed language education model that accounts for ASL Gloss, among others (Cripps & Supalla, 2012; Supalla et al., 2019). The case study covering the two participating deaf students with ASL Gloss achieved its purpose, demonstrating how developmental patterns can occur with signed language reading.

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Appendix 1(a): Initial ASL-phabet Probe – Renee

General ASL-phabet Probe

Student Name: _Student #1_   Date: _7/21/03_

CBA #1- Researcher #1   end here

[01:53:19:27 - 01:55:20:00]

2 minutes

Total: _51/66_

Appendix 1(b): Middle ASL-phabet Probe – Renee

General ASL-phabet Probe

Student Name: ___Student # 1___   Date: ___7/24/03___

CBA #2 – Researcher #1

[00:11:37:24 – 00:13:38:10]
2 minutes

Total: ___66/75___

Appendix 1(c): Final ASL-phabet Probe – Renee

General ASL-phabet Probe

Student Name: _____Student # 1_____   Date: ___7/29/03___

CBA #3 – Researcher #1

[00:13:42:14 – 00:15:46:12]

2 minutes

Total: ____73/74____

Appendix 2(a): Initial ASL-phabet Probe – Pat

General ASL-phabet Probe

Student Name: _Student #2_   Date: _7/21/03_

CBA #_1_ – Researcher #_1_

start
here

[01:50:22:22 – 01:52:22:24]

2 minutes

Total: _91/101_

Appendix 2(b): Middle ASL-phabet Probe – Pat

Appendix 2(c): Final ASL-phabet Probe – Pat

Appendix 3(a): Initial Running Records – Renee

Appendix 3(b): Middle Running Records – Renee

CBA #2 - Researcher #1   RUNNING RECORD SHEET [00:14:41:15 – 00:15:41:15]
1 minute

Name: Subject #1   Date: 7/24/03   D. of B.: _____   Age: _____ yrs _____ mths

School: Tutorial Program   Recorder: Researcher #1

Text Titles		Errors Running Words	Error Ratio	Accuracy Rate	Self-correction Ratio
Easy	_____	_____	1: _____	_____ %	1: _____
Instructional	The Lady and the Spider	77/7	1: 11	90.9 %	1: 3:33
Hard	_____	_____	1: _____	_____ %	1: _____

Directional movement _____

Analysis of Errors and Self-corrections
Information used or neglected [Meaning (M), Structure or Syntax (S), Visual (V)]

Easy _____

Instructional _____

Hard _____

Cross-checking on information (Note that this behaviour changes over time)

Nersesian's Formula

Page	Title	E	SC	E MSV	SC MSV
	HAPPEN ONE SUMMER DAY LADY POS=3	0	1		
	GARDEN HAVE LETTUCE (2h)✳-SPHERE, INSIDE	0	0		
	SPIDER [⫫-SURFACE v-STAND>ON]. (2h)LOOK>ABOUT	0	0		
	SEE GREEN (2h)HILL# GREEN VALLEY#.	0	0		
	BETWEEN TWO LETTUCE CREVICE SEE>IX=2	0	0		
	GREEN fs-CAVE. EIGHT (2h)h-LEG#	2	0		
	(2h)✳-WALK>DAINTY [⊂-HALF-CYLINDER ✳-GO>INSIDE].	0	1		
	WITH TIP FRONT∧ (2h)h-LEG>LONG FEEL [WALL	2	0		
	(2h)h-LEG>FEEL#] [CEILING (2h)h-LEG>FEEL#]	0	0		
	[FLOOR (2h)h-LEG>FEEL#]. fs-CAVE IX=3 SUIT.	1	0		
	[⊂-HALF>CYLINDER IX=3] RIGHT fs-SIZE FOR	1	0		
	POS=3 HOME.	0	0		

CBA #2 - Researcher #1   **RUNNING RECORD SHEET**   [00:14:41:15 - 00:15:41:15]
1 minute

Name: Subject # 1   Date: 7/24/03 D. of B.: _____ Age: ____ yrs ____ mths

School: Tutorial Program   Recorder: Researcher # 1

Text Titles	Errors / Running Words	Error Ratio	Accuracy Rate	Self-correction Ratio
Easy		1: _____	_____ %	1: _____
Instructional The Lady and the Spider	77/7	1: 11	90.9 %	1: 3:33
Hard		1: _____	_____ %	1: _____

Directional movement _____

Analysis of Errors and Self-corrections
Information used or neglected [Meaning (M), Structure or Syntax (S), Visual (V)]

Easy _____

Instructional _____

Hard _____

Cross-checking on information (Note that this behaviour changes over time)

Nersesian's formula

		Count		Analysis of Errors and Self-corrections	
				Information used	
Page	Title	E	SC	E MSV	SC MSV
	— ✓ ✓ ✓R **NIGHT** LETTUCE WET (2h)⚹₁-SPHERE>FORM. HAVE	1	0		
	✓ SC ✓ end here **INSIDE** (2h)HOLLOW ǀ BESIDE SPIDER HOME.	0	1		
	WATER (2h)ǀ-DROP+ (2h)⋂ᵣ-FILL>UP (2h)Cₒ-CIRCLE> TINY. **MOON** [⋂-SURFACE Cₒ-MOON>RISE]. **GARDEN** fs-MOTH WAKE (2h)⋂ᵣ-FLY (2h)⋂ᵣ-FLY>ABOUT SEARCH FOR OTHER fs-MOTHS. **ONE** SEE>IX=2 WATER (2h)Cₒ-CIRCLE HAVE MOON [⋂-SURFACE Cₒ-MOON> ON]. (2h)⋂ᵣ-FLY>DOWN INTO WATER. **WING** BECOME WET. UNABLE FLY, DROWN. **MORNING SUN** [⋂-SURFACE ⊂-SUN>RISE] SPIDER LOOK>IX=2 WATER (2h)Cₒ-CIRCLE SEE>IX=2 [⋂-SURFACE ᵥ-FLOAT]. (2h)⚹₁-WALK TO WATER (2h)Cₒ-CIRCLE [⋂-EDGE ⚹₁-STOP] EAT EAT+MORNING.	7	3		

Appendix 3(c): Final Running Records – Renee

Appendix 4(a): Initial Running Records – Pat

Appendix 4(b): Middle Running Records – Pat

CBA #2 - Researcher #1   RUNNING RECORD SHEET   [00:19:02:00 – 00:20:01:03]
                                                                    1 minute

Name: Student #2 _____   Date: 7/24/03   D. of B.: _____   Age: _____ yrs _____ mths

School: Tutorial Program _____   Recorder: Researcher #1 _____

Text Titles		Errors Running Words	Error Ratio	Accuracy Rate	Self-correction Ratio
Easy	_____	_____	1: _____	____ %	1: _____
Instructional	_____	_____	1: _____	____ %	1: _____
Hard	The Lady and the Spider	108/14	1: 7.7	87 %	1: 15

Directional movement _____

Analysis of Errors and Self-corrections
Information used or neglected [Meaning (M), Structure or Syntax (S), Visual (V)]

Easy _____

Instructional _____

Hard _____

Cross-checking on information (Note that this behaviour changes over time)

Nersesian's Formula

Page	Title	E	SC	E MSV	SC MSV
	HAPPEN ONE SUMMER DAY LADY POS=3	0	0		
	GARDEN HAVE LETTUCE (2h)⋇-SPHERE, INSIDE	0	0		
	SPIDER [⊓-SURFACE v-STAND>ON]. (2h)LOOK>ABOUT	0	0		
	SEE GREEN (2h)HILL# GREEN VALLEY#.	0	0		
	BETWEEN TWO LETTUCE CREVICE SEE>IX=2	0	0		
	GREEN fs-CAVE. EIGHT (2h)⊓-LEG#	2	0		
	(2h)⋇-WALK>DAINTY [c-HALF-CYLINDER ⋇-GO>INSIDE].	1	0		
	WITH TIP FRONT (2h)⊓-LEG>LONG FEEL [WALL	2	0		
	(2h)⊓-LEG>FEEL#] [CEILING (2h)⊓-LEG>FEEL#]	0	0		
	[FLOOR (2h)⊓-LEG>FEEL#]. fs-CAVE IX=3 SUIT.	1	0		
	[c-HALF>CYLINDER IX=3] RIGHT fs-SIZE FOR	2	0		
	POS=3 HOME.	0	0		

CBA #2 - Researcher #1   **RUNNING RECORD SHEET**   [00:19:02:00 - 00:20:01:03]
1 minute

Name: _Student #2_   Date: _7/24/03_   D. of B.: _____   Age: _____ yrs _____ mths

School: _Tutorial Program_   Recorder: _Researcher #1_

Text Titles

	Errors / Running Words	Error Ratio	Accuracy Rate	Self-correction Ratio
Easy		1: ____	____ %	1: ____
Instructional		1: ____	____ %	1: ____
Hard _The Lady and the spider_	108/14	1: 7.7	87 %	1: 15

Directional movement _____

Analysis of Errors and Self-corrections
Information used or neglected [Meaning (M), Structure or Syntax (S), Visual (V)]

Easy _____

Instructional _____

Hard _____

Cross-checking on information (Note that this behaviour changes over time)

Nevsesian's formula

Analysis of Errors and Self-corrections — Information used

Page	Title	E	SC	E MSV	SC MSV
	NIGHT LETTUCE WET (2h)✳₁-SPHERE>FORM. HAVE	0	0		
	INSIDE (2h)HOLLOW BESIDE SPIDER HOME.	0	0		
	WATER (2h) ǀ -DROP+ (2h)∩-FILL>UP (2h)C₀-CIRCLE>	1	0		
	TINY. MOON [∩-SURFACE C₀-MOON>RISE]. GARDEN	2	0		
	fs-MOTH WAKE (2h)∩₁-FLY (2h)∩₁-FLY>ABOUT SEARCH	1	0		
	FOR OTHER fs-MOTHS. ONE SEE>IX=2 WATER	2	1		
	(2h)C₀-CIRCLE HAVE MOON [∩-SURFACE C₀-MOON>	14	1		
	ON]. (2h)∩₁-FLY>DOWN INTO WATER. WING BECOME				
	WET. UNABLE FLY, DROWN. MORNING SUN				
	[∩-SURFACE C-SUN>RISE] SPIDER LOOK>IX=2				
	WATER (2h)C₀-CIRCLE SEE>IX=2 [∩-SURFACE				
	V -FLOAT]. (2h)✳₁-WALK TO WATER (2h)C₀-CIRCLE				
	[∩-EDGE ✳₁-STOP] EAT EAT+MORNING.				

Appendix 4(c): Final Running Records – Pat

Language Planning: Development of ASL-phabet.com, the First Animated American Sign Language Dictionary for Children

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Abstract

The authors describe the rationale for and development of the first animated American Sign Language (ASL) dictionary for Deaf children, ASL-phabet.com. In the context of language planning rationale (corpus planning, acquisition planning, status planning and attitude planning) as well as pragmatic considerations, the dictionary is developed as a critical resource for children to search words in ASL, their primary language. Using metalinguistic phonological awareness of handshape, location and movement to select graphemes and search words, ASL bilingual children can find vocabulary they have been exposed to and discover their meanings in ASL as well as explore their English counterparts. Prototype and comprehensive dictionary development and beta testing using ethnographic research (classroom observations using the online dictionary, interviews, focus groups and questionnaires) are described. These demonstrate dictionary development process, usability, initial learner outcomes, revisions, dictionary content and structure, recommendations for future dictionary research and expansion.

Theoretical Rationale: Animated ASL Dictionary's Unique Role in Language Planning[1]

Dictionaries hold a unique, vital role influencing each area of language planning. Language planning in turn impacts all aspects of society – social life, education, health, business and politics. To establish national, societal and linguistic cohesion, governments and groups engage in language planning explicitly or implicitly with the intent to control language use. This can have devastating effects on minority languages including death of a language as Skutnabb-Kangas (2000) pointed out. Language planning may also intentionally preserve minority languages and facilitate their growth and spread. It can encourage knowledge of multiple languages within a society, adding a richness of multiple cultures as language and culture are inextricably tied. In this way, minority languages can advance as they are viewed as resources to be nurtured within society (Ruiz, 1984).

Language planning touches on four arenas - corpus planning, acquisition planning, status planning (Nover, 1992; Mason, 1994; Lane et al., 1996) and attitude planning (Small & Mason, 2008). The authors examine each of these language planning dimensions as they pertain to the role of dictionaries in general and with specific reference to the role of the ASL-phabet, first animated ASL on-line dictionary for children[2]. This provides the

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[1] Language planning description draws upon an encyclopedia article co-authored by the first author (Small & Mason, 2008) and a monograph co-authored by both authors (Small & J. S. Cripps, 2009).
[2] www.asl-phabet.com

conceptual rationale for the approach to developing the first animated ASL dictionary for ASL bilingual children. The authors then describe the process of creating the dictionary from developing the vision and finding financial resources for dictionary development to vocabulary selection, grapheme presentation, definitions development, research findings and recommendations for the future.

Corpus Planning

Corpus planning creates new words and forms, modifies old words and forms and selects words and forms from various options in a spoken [signed] or written language (Cooper, 1989). The development of a dictionary clearly falls in the arena of corpus planning. Dictionaries are used to establish standardization in a language and provide a resource for social, academic and literary attainment in vocabulary and form in a language.

As part of this language planning process, the Ontario Provincial Schools ASL Curriculum Team was established in 1999 to develop ASL bilingual student learning benchmarks in academic ASL and ASL literacy from nursery to grade 12 (Gibson & Potma, 2010). Canada had a dearth of its own ASL published resources from which to draw prior to 1998. That year, the Canadian Cultural Society of the Deaf (CCSD), the only national organization representing the cultural interests of ASL and Langue des signes québécois (LSQ) Canadians, established the Deaf Heritage Project and began to publish award winning ASL resources including deafplanet.com, an ASL non-fiction multi-subject (science, math, sports, Deaf history, geography) children's TV series, DVD and ASL/LSQ/English/French interactive website. It was nominated for several Gemini Awards (2004 and 2005), grand finalist for the prestigious International Japan Prize (2005), winner of the UN World Summit Award (2005) and selected Best of the Best by the United Nations World Summit on the Information Society (WSIS) at UNESCO among 200 past International World Summit Award (WSA) winners (2013).

CCSD also created numerous ASL literature DVD productions. Some of these resources meet academic requirements defined by the ASL curriculum. They serve as important community-based language examples providing a critical link for students to their rich heritage and community. The Ontario Cultural Society of the Deaf produced several ASL Parent Child Mother Goose Program DVDs featuring ASL rhythms and rhymes (2004, 2008). These are significant resources not only for early ASL poetry but also for ASL phonological awareness (Snoddon, 2009, 2010).

Even with these literary resources, school age children had no comprehensive resource in which they could look up vocabulary meanings in their own, primary language - ASL, if they came across words they did not know. There was no standardized resource where students could search meanings of an ASL word they saw, find its meaning in ASL and/or look up English counterparts to an ASL word they knew. ASL dictionaries have typically provided word search from English to ASL. Deaf children have been dependent on adults for definitions if they recognized an ASL word but did not know the English vocabulary. Parents of Deaf children have historically had no way to search a sign they saw for which they did not know the meaning. Furthermore, published ASL dictionaries in print are frozen with drawings or photograph and with written English descriptions of

vocabulary meanings. However, ASL is a spatial language that cannot be represented fully in print format. Therefore, picture dictionaries are inherently limited in the meta-linguistic awareness of ASL features that they can provide. A comprehensive ASL-based dictionary designed specifically to search words in animated ASL that captures children's attention, provides a unique contribution to ASL language planning. Its role in corpus planning is clear, establishing models and standards for searching and producing signed language vocabulary with recognized phonological features of ASL signs across Canada and their meanings. The animated ASL dictionary for children also holds a particular role in acquisition planning.

Acquisition Planning

Acquisition planning is the deliberate attempt to influence the number of language users, to increase language distribution and literacy. It is designed to increase opportunities for language learning. Acquisition planning facilitates language maintenance and spread. Language arts curricula cannot extend language and literacy without sufficient language resources to support it. The Ontario ASL Curriculum developed to teach ASL Bilingual-Bicultural students, uses strands in keeping with the Ontario Language Arts Curriculum.

The ASL Curriculum's four strands are American Sign Language (language-focused), ASL Literature, ASL Texts and ASL Media Arts and Technologies. ASL-using students attain knowledge of the ASL semantics, lexicon, and syntax as well as exposure to, analysis and production of ASL literary works through the curriculum. These students require access to an ASL-based ASL dictionary to increase their receptive, expressive, creative, and playful use of ASL for social and academic use and to fully appreciate ASL literary works.

Status Planning

The third area of language planning is status planning. A clear example of this in Canada is the recognition of English and French as two official languages. In 1993, Bill 4 was passed by the Ontario Parliament recognizing ASL and LSQ as languages of instruction (Carbin, 1996). This was achieved through the efforts of Gary Malkowski, the first-ever ASL-Deaf member of Parliament, together with the Deaf Ontario Community. Bill 4 resulted in revisions to Ontario's Education Act to include "ASL" and "LSQ" in numerous clauses; however, regulations that dictate how the law applies remains weak more than fifteen years later with no requirement for future teachers to be ASL proficient. Without going into detail on the current state of status planning in Ontario (Gibson & Potma, 2010), the role of an animated ASL dictionary is vital in establishing recognition of ASL with national standards in terms of vocabulary, phonology and meanings.

Attitude Planning

This fourth area of language planning is the least understood yet it has great impact on the other three areas of language planning. Language planning in Deaf education has

been operational for over two centuries. Nover (1992) demonstrated evidence of language planning, beginning with de L'Epee's implementation of manually-coded French in the 1760s and introduction of artificial signing systems called Manually Coded English (MCE) such as SEE 1, LOVE, and SEE 2 in North America during the 1970s. These artificial systems would more accurately be described as "methods of communication" planning, and are counter to true ASL language planning (see Schick, 2011 for the limitation of language acquisition in MCE when compared to ASL). The value underlying these artificial systems was and still is focus on English acquisition rather than acquisition of a signed language with its own linguistic integrity. Research has repeatedly demonstrated that children who develop strong ASL proficiency develop increased English literacy skills compared with students with weaker ASL skills (Hoffmeister, 2000; Padden & Ramsey, 1998, 2000; Prinz & Strong, 1998; Strong & Prinz, 1997, 2000).

The underlying values of educators are reflected in attitude planning either consciously or unconsciously, and impacts the other arenas of language planning. Thus, attitude planning is both insidious and powerful as it influences corpus planning, acquisition planning and status planning. To finally have an ASL animated dictionary that is driven by ASL phonological awareness, ASL vocabulary and ASL definitions reflects attitudes with focus on ASL and simultaneously influences attitudes regarding ASL as it legitimizes it and becomes a resource that can impact both ASL development and English development as a second language for ASL proficient Deaf children.

Pragmatic Rationale

The authors, Co-Founders and original Co-Directors of the DEAF CULTURE CENTRE, Canadian Cultural Society of the Deaf (CCSD), planned the first children's animated American Sign Language (ASL) dictionary to be freely accessible on-line as they perceived the potential positive impact of such a resource on all areas of language planning for ASL bilingual children. They also recognized the limitations of dictionaries that existed for ASL bilingual children.

Problem with Dictionaries to Date

- ASL/English dictionaries tended to have word search from English to ASL only
- Deaf children could not look up vocabulary according to their own, primary language - ASL
- Deaf children had to rely on adults for definitions if they recognize the ASL word but not the English vocabulary
- Parents had no way to search a sign they saw but did not know the meaning
- All dictionaries were frozen, book format with static pictures
- These picture dictionaries provided limited meta-linguistic awareness of ASL features

- Children's dictionary access depended on the philosophy and finances of gatekeepers (teachers, parents, medical professionals, principals)
- There was no ASL based dictionary designed specifically to capture children's fascination and make it fun

Potential Solutions

To address the problems with dictionaries to date, the authors designed a bi-directional dictionary – with capability to search from ASL to English using ASL graphemes as well as to search from English to ASL, that would be accessible on-line and animated for children.

Why Create an ASL to English and English to ASL dictionary?

This dictionary is intended for ASL/English bilingual children. It finally provides in their own language, ASL definitions and looks up words by their own phonology and graphemes but also provides the first real opportunity to broaden their knowledge starting with their own language and then extending it to English. In European countries children learn multiple languages. It is important for children and adults to see that ASL is truly its own language with its own counterparts to other languages such as English.

Why use ASL Graphemes?

ASL graphemes provide a visual representation of the phonological features of ASL (handshapes, locations and movements). Just as hearing children connect the auditory sounds of phonemes to decode written words, so too ASL bilingual children use the visual representation of phonemes to decode ASL words. This becomes more automatic as children become increasingly more literate.

Why Produce the Dictionary On-line?

An on-line dictionary is widely open and accessible for all children and adults, parents, siblings, extended family, teachers, interpreters, other professionals and hearing children in school as well. Furthermore, an on-line dictionary could be animated.

Why Make the Dictionary Animated?

The ASL signed vocabulary online is clearer with animation. This is not possible in a print version. For example, movement is tracked with animated features (stars highlighting the movement path) for emphasis for children. It is also faster to search graphemes online rather than searching through a print version. The animation makes the dictionary more fun and likely to be used by children.

Dictionary Development Process[3]

Vision and Establishing Partnerships

In 2002, the authors participated in a workshop provided by Dr. Samuel Supalla, University of Arizona along with his colleagues, Laura Blackburn, Tina Wix, and Jody H. Cripps. The workshop on ASL graphemes impacted the authors' vision of how a dynamic ASL word search could be achieved. Dr. Supalla and his team had described an ASL-phabet[4] or grapheme system that represented the features that make up ASL words – handshapes, location and movement. The authors envisioned an animated ASL dictionary for ASL/English bilingual children that had the ability to search ASL words based on these features. Children could scroll through the ASL features, displayed like slot machine pictures, to select the ASL features for the word they wished (see Figure 1). It would eliminate leafing through text pages to find the feature needed. Not only would it alleviate an inherently cumbersome process in a print version. It would also be three dimensional. This is a critical feature for an ASL dictionary.

Figure 1: ASL word search by handshape, location and movement[5]

The authors wished an animator with knowledge of ASL and the ability to capture animated nuances of the ASL features (handshape, location and movement) as well as facial expressions with accuracy. By serendipity, the authors attended the World Federation of the Deaf (WFD) Conference in Madrid, Spain in 2007 at the time that they were seeking an animator for the ASL dictionary. They were impressed with the child-friendly and

[3] Description of the dictionary prototype development process draws upon an article and presentations by Small and J. S. Cripps (2010a, 2010b, 2010c). Description of the comprehensive dictionary development process draws upon a presentation by Small and J. S. Cripps (2012).
[4] Permission from Dr. Supalla for citation of ASL-phabet.
[5] Vision by Small and J. S. Cripps, CCSD (2002). Draft sketch by Marblemedia Inc. and CCSD (2008).

precise animation they observed in the WFD welcome video created by Deaf award-winning animator, Braam Jordaan from South Africa. Braam became the animator for the ASL dictionary.

The authors had previously collaborated with the new media production company, Marblemedia Inc., on their award winning deafplanet.com educational TV series and website.[6] They were confident with Marblemedia's skills in educational web development and had experience working with them on Deaf/hearing cross-cultural and ASL/English linguistic issues that would arise in this project. The authors therefore forged a tri-country alliance with the U.S. (linguistics consultation by Dr. Supalla), South Africa (animation by Braam Jordaan) and Canada (dictionary content and website structure by the DEAF CULTURE CENTRE in collaboration with marblemedia and with other Canadian consults). (Refer to acknowledgments at the end of this article for a full listing of and insight on the many consultants required to produce the dictionary.) The dictionary underwent numerous iterations of layout and functionality from the original slot machine version to an iteration that allowed for the three-feature selection (handshape, location and movement) to be displayed via pop-ups (see Figure 2).

Figure 2: ASL-phabet[7,8]

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[6] Deafplanet.com was a Gemini Award nominee, Most Popular Website and Best Interactive TV/website production (2004 and 2005), has won Grand Finalist, NHK Japan Prize (2004), was recipient of the World Summit Award (WSA), for best e-content and creativity, e-inclusion (2005) and selected United Nations' WSIS +10 Champion, Best of the Best by the World Summit on the Information Society (WSIS) at UNESCO among 200 past International World Summit Award (WSA) winners for e-inclusion (2013).
[7] Permission from Dr. Supalla for citation of ASL-phabet.
[8] Handshape (yellow), location (green) and movement (blue) grapheme selection pop-ups display model for the final dictionary prototype (2009).

Financial Resources and Permissions

In addition to the importance of worthy academic rationale, research and effective strategic plan, adequate funding was an essential component to develop an excellent dictionary. In 2008 the Inukshuk Wireless Learning Plan Fund granted $147,700.00 initial funding to the DEAF CULTURE CENTRE, Canadian Cultural Society of the Deaf to develop a dictionary prototype of 100 words, multiple definitions, use in sentences and English translation. This prototype served as the template for dictionary testing and expansion for young children in junior kindergarten (JK) to grade two. A $5,000 grant from TD Bank Group (2009) enabled the launch of the animated dictionary prototype, important for acknowledging the progress to date and for launching the next phase to complete a comprehensive (1500 word) on-line animated ASL dictionary for children.

A $500,000 grant from Canadian Heritage, Canada Interactive Fund, 2011 provided the support to develop the comprehensive *Interactive Animated Dictionary for Children.* This funding was complemented by private donor support through "adopted" dictionary words ($500/word x 284 words for $142,0000) required to complete the project. All supporters are acknowledged on the site under credits and "words brought to you by . . ." individual donors and organizations who supported the project.

The authors received permission from Dr. Supalla to use his ASL-phabet grapheme system and use of *The Resource Book* which became the template for how to search words by graphemes. Dr Supalla was the ASL Linguistics Grapheme Consultant on the project (2009). Houghton Mifflin Harcourt Publishing Co. gave permission for CCSD to use their word definitions and adapt their use in context from *The American Heritage First Dictionary* (2003). CCSD already had copyright for the *Canadian Dictionary of ASL* (2002) for reference to adult definitions of signs in a printed text.

Development of Animated Vocabulary Model

The authors together with Marblemedia envisioned that the signing word "model" would be an animated character and that the word definitions and word use in sentences would be a human character. A natural animated character and human pair was needed. The animated character required large hands for clear signing. An animated rabbit with a magician for the human character were viewed by the authors and creative team as a good solution. It was determined that this was a pair that naturally fit with each other, that would appear fun, endearing and that young children in JK to grade two could relate to.

Several versions of the animated character were created by Braam Jordaan. The first version was fondly called "Scary Rabbit". Drafts were revised until the character rendering became a sweet rabbit with floppy ears suitable for young children (see Figures 3 to 5). The animator created stars to emphasize and trace the movement features of the rabbit's signs. (The stars do not appear in Figures 3 to 5).

Methodology for Determining Vocabulary

For the prototype, random selection (every third word) from *The Resource Book*

Figure 3: First draft version of the animated character ("Scary Rabbit")
by Braam Jordaan

Figure 4: Refined "Sweet Rabbit" rendering by Braam Jordaan inserted into the
animated dictionary structure by Marblemedia Inc. and CCSD

(Supalla, 2009)[9] was used to obtain 300 words to define. All 300 words were signed by
Master ASL instructor, Mario Pizzacalla on film. Video clips of 100 words were sent to
South Africa to be transformed into animations by Deaf animator, Braam Jordaan (see
Figure 6). All words selected were cross-referenced from *The American Heritage First
Dictionary* (2003) to ensure age appropriateness of vocabulary.

Four teachers knowledgeable in grapheme development from the Ontario
Provincial Schools for Deaf students who also served on their ASL Curriculum Committee
were the grapheme writers for the vocabulary selected and Dr. Supalla and the dictionary

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[9] The Resource Book (Supalla, 2009) was originally created by Dr. Supalla (see Supalla & J. H.
Cripps (2011), Supalla et al. (2014), and Supalla (2017) for more information on this topic).

Figure 5: Final animated dictionary with "Sweet Rabbit", structure by CCSD and
Marblemedia Inc. Graphic design by Marc Keelan-Bishop

developers reviewed all grapheme word representations for triangulation of results. Any
discrepancies were reviewed and agreed upon.
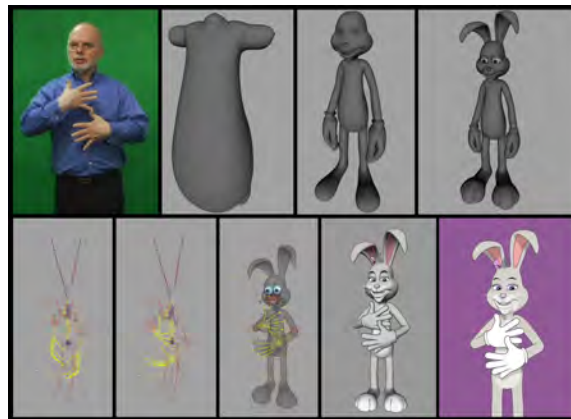
Figure 6: Master ASL instructor, Mario Pizzacalla, signing "breathe", transformed into
signing rabbit by animator Braam Jordaan

Methodology for Producing Definitions

It was essential to add to and adapt the dictionary definitions from *The American
Heritage First Dictionary* and *Canadian Dictionary of ASL* (2002). This is because ASL
and English semantics do not have a one to one correspondence. For example, the English
word *run* has numerous definitions and numerous ASL signs. Also, one ASL sign may
have two or more definitions and two or more English words such as in *miss/guess*.

ASL also has homographs[10] *(such as act* and *address* that have the same grapheme representation). Another example is *freeze* and *want*. In this example, the handshapes, location and movement are the same and so the graphemes are identical. While, the palm orientation is different (down for freeze and up for want), palm orientation is not included in the ASL-phabet. Homographs are also found in other languages such as in English for example, *blow wind* and *wind the clock* are written the same even though one is articulated with a short vowel while the other has a long vowel in "wind" (Supalla et al., 2014).

Multiple definitions, lack of one to one correspondence of vocabulary in ASL and English as well as homographs must all be considered in the dictionary structural design. ASL/English interpreting students developed the initial adaptations of the English word definitions. The authors, a hearing socio-linguist and Deaf community leader respectively, reviewed the ASL definitions along with a Deaf adult child of Deaf parents (DCDP) and a Deaf ASL linguist. This provided triangulation for definitions.

Prototype Results

Efficacy of the animated dictionary website prototype, was pre-tested for usability and outcomes at three bilingual schools for Deaf students. The site was tested with 52 students and 14 teachers in nine classes from JK to grade four. Ethnographic methodology was used including observation, field notes and teacher reports throughout one week of beta testing in November 2009.

Usability

It was found that students JK to grade four liked the signing title created by a Deaf female signing actor dressed as a magician (Figure 7) and loved the rabbit and magician (Deaf male actor who signs the definitions). Many users asked for a full-screen version. The grapheme word list was not in order for the prototype testing but was improved so that users could select words in grapheme order. All English words began with a capital letter. This was confusing to students. Some feedback showed confusion on the "1, 2, 3" boxes. Some students clicked on the numbers rather than the boxes beside them. This was improved by highlighting the box they were to select from. Students did not intuitively know how to "get out" of an action, or how to reset the tool for a new word. This was improved by creating an "x" box to exit from an action. "Play" buttons for the rabbit and the magician were placed closer to the characters following student feedback.

In all cases, the tool was used more effectively when the teacher was familiar with the dictionary, had experimented with it and could problem solve usability questions with the students. Students needed instructions on graphemes for easy use which was added to the comprehensive dictionary. They liked the introduction, but many students and teachers wanted to see an additional introduction that explained the graphemes and why they are important as well. These explanations were added to the comprehensive dictionary. A "grown-up guide" was also added to the comprehensive dictionary in response to requests

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[10] E-mail correspondence with Dr. Supalla, 2009.

Figure 7: Signing title modeled by Deaf female signing actor, Amanda Richer
dressed as a magician

for a teacher-training module with more in-depth ASL grapheme explanation. Some younger students found there to be too many buttons, and were distracted by them. This was improved upon in the help section by removing the multiple arrow buttons and replacing them with highlighted sections.

Feedback was that the site was useful up to grade eight. Some users wished they could have a keyboard to type graphemes to select ASL words. The comprehensive dictionary allows for word selection with the graphemes on the magician's cards or by selecting words in the word search list either by ASL graphemes or by English graphemes on the magician's hat. Initial comments included, *hard* and after 15 minutes included comments such as *cool* (JK), *he's cool!* (grade one), *I love it!* (students of all ages JK to grade four, teachers, teacher aid) *love it!* (teacher) and *This is fantastic!* (teacher).

Learner Outcomes

Many students imitated signing ASL words from the dictionary such as *accept, strange, same, wrong, again, never, agree* and *scratch* while they were using it. Students repeated definitions unsolicited to their teachers and to the researcher that they had learned from the dictionary. Students demonstrated meta-linguistic skills and independent research skills, learning the search strategies within 15 minutes. Students maintained their focus on the animated dictionary from between 15-50 minutes.

Comprehensive Dictionary Revisions

The comprehensive dictionary expanded the original prototype to 1,500 words which is the norm for children's dictionaries for the age group K - grade one. (Beta testing included children JK to grade four to test the range of responses at a broader age range). The expanded version includes cross-references. This is important so that one ASL sign with different meanings could have multiple definitions and different English words when needed. Similarly, one English word could have multiple definitions and many ASL signs when applicable. This cross-referencing required thousands of research hours. ASL and English remained separate in the comprehensive dictionary website structure. Voice over to hear the English interpretation of the ASL for hearing users was added to the website. A parent & teacher guide explaining graphemes was added as well as curriculum ideas. Grapheme instruction and a dictionary introduction in ASL about ASL structure was added for children in ASL (see Figure 8). A calendar feature was also added for fingerspelled months with easy access to ASL numbers one to 31 and days of the week.

The Comprehensive Animated Dictionary for Children, *ASL-phabet.com: The Signing Dictionary for Kids* (known as ASLphabet.com upon launch) was available to the public on March 22, 2012 (see Figure 9). Training for parents, counselors and teachers of the provincial schools for Deaf children in Ontario took place that year.

Figure 8: Comprehensive Dictionary including ASL-phabet grapheme explanation for children, dictionary introduction, parent teacher guide and calendar

Figure 9: Final Comprehensive Dictionary showing graphemes for the signed word "accept" and the magician's definition card popping out of the magician's hat

Comprehensive Dictionary Results

Efficacy of the comprehensive dictionary was pre-tested for usability and outcomes at three bilingual schools from JK to Grade four. Nine classes were tested in one school. Mixed age groups were tested together in two schools. Ethnographic research methodology was used including observation by an educational researcher and educational co-ordinator, field notes were recorded, focus groups were conducted and 11 teacher reports were analyzed from one week of beta testing in February 2012.

Usability

Results from beta testing guided the revisions to the final comprehensive dictionary structure. All recommended changes to structure were incorporated into the final version. For example, fonts were enlarged for easier viewing and the calendar button design was changed so children would know intuitively to click on it. The arrow was clear for all students with the exception of JK children who initially needed a prompt. Highlighting each step was determined to be effective as children knew how to proceed from step to step without assistance, children and teachers loved the signing bunny and magician as is. The dictionary button was made more distinct following beta testing so that children would know how to navigate easily back into the dictionary after using the calendar.

Learner Outcomes

Students imitated words and definitions. They searched words by all four methods: 1) by selecting graphemes, 2) by ASL-phabet word list, 3) by alphabet word list, and 4) by typing in letters. Students' feedback on the dictionary was as follows:

- It's great!
- It's fun.
- I love it – I would watch it again and again.
- It's all great!
- It's new – it's wonderful!
- I like the expressions!
- It's for older and younger kids - and me.
- High school and parents can use it too.
- I liked it all!
- Thumbs up!
- The calendar is cool!

Teachers comments were:

- The website provides a wonderful tool for anyone to learn vocabulary (both ASL and English) from the age of 4 and up!
- We loved the site - great site for all ages!
- LOVE the rabbit!
- It is good for older kids as well, because they can challenge themselves to find any specific signs for English words or any English words for ASL words.
- The site is definitely good for younger kids because it's very colourful and exciting, which would motivate and educate kids and their parents about ASL words.
- I like everything on the site. It excites me to use it as a daily reference!

Recommendations

Ten years post dictionary development, several recommendations are provided moving forward.

1. Since initial development of the animated dictionary, technology has moved from Flash animation. The authors suggest that the format be changed from Flash to an updated format that can easily be adapted to an app for use on hand held devices for greater flexibility.
2. Further testing is recommended of the expanded comprehensive on-line animated interactive dictionary ten years post production for effectiveness as a resource in both first and second language acquisition of both ASL and English.

3. It is suggested that 300 additional animated words that have been created for this age range, be added to the site before follow-up testing.
4. Follow up testing is required on long term retention of learned words from the site.
5. The authors acknowledge the value of an LSQ animated dictionary and that this best be developed if desired by scholars and community members from within the LSQ community.
6. An animated dictionary following this template and learnings from the ASL-phabet.com could be created for other sign languages that provide cross-referencing from ASL to any of those other signed languages and back, encouraging sign language pluralism.
7. Children require increased exposure to a variety of storybooks with graphemes for them to develop great ease decoding ASL using the three features. This would provide natural incentive for them to use the ASL animated dictionary with graphemes. It is suggested that an increased number of grapheme-based storybooks be produced for ASL/English bilingual children.

Acknowledgements and Permissons

See end of article for the list of acknowledgments and permissions.

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Permissions

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