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Literacy in Emerging Sign Language Communities

The Impact of Social, Political, and Educational Resources

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Abstract

Literacy in Deaf communities has been redefined to include knowledge and skill in the production and comprehension of sign language as well as in the written form of the larger community's spoken language. However, this reconceptualization has occurred primarily in communities with well-established sign languages. This chapter considers this type of literacy in emerging sign language contexts where the social, political, and financial resources are oftentimes scarce. The chapter presents the community of Nicaraguan Sign Language (NSL) signers, a newly emerged sign language that is now just over 40 years old, as a case study and explores the educational, cultural, and social evolution of NSL. Considering this context, findings are presented that speak to the relationship between language, cognitive development, and academic success particular to sign literacy. These findings are presented in the context of other emerging languages in both urban and rural/village settings.

Keywords: deaf, hard-of-hearing, Nicaragua, education, low-income country, emerging language, sign language, Nicaraguan Sign Language, cohesion, coherence

Introduction

Literacy is most often associated with having skills in the comprehension and production of the printed word (e.g., Venezky, Wagner, & Ciliberti, 1990). The process of learning to read and write usually requires explicit instruction and effort, is often mastered only after years of work, and still may not be achieved universally (e.g., Seidenberg, 2013). Regardless, the longevity and reproducibility of print result in its common use as a primary form of information dissemination in schools across the globe, with a widely shared goal of developing at least basic literacy skills by adulthood (e.g., Abadzi, 2003; Achola & Pillai, 2016; Seidenberg, 2013). The benefit of mastering the written word is not limited to wealthy countries, but also extends to less wealthy, developing countries (e.g., Abadzi, 2003; Achola & Pillai, 2016; Glewwe, 2002).

Children's preliterate verbal abilities predict later reading and writing ability (e.g., Pinto, Tarchi, & Bigozzi, 2016; McKeough, et al., 2008). That is, the development of reading and writing skills is in part founded upon mastery of productive and expressive language. A similar pattern holds for deaf and hard-of-hearing (DHH) children learning to read. DHH children who experience early and full access to a sign language (usually those who are born to deaf, signing parents) display better sign language proficiency than their peers who have parents with typical hearing (TH) (i.e., later and reduced access to sign input) (e.g., Henner, Caldwell-Harris, Novogrodsky, & Hoffmeister, 2016; Mayberry, 2010). Further, children who receive early exposure to sign language also perform best on measures of their second (spoken) language—a language to which they may not have full auditory access (e.g., Davidson, Lillo-Martin, & Chen Pichler, 2014; Dostal & Wolbers, 2014; Hoffmeister & Caldwell-Harris, 2014; Hrastinski & Wilbur, 2016; Mayberry, 2007; Meier, 2016). Thus, linguistic proficiency in sign language promotes success in written literacy for DHH children.

While work in this domain is quite vibrant in countries and languages with long-standing systems of education and strong sign language vitality, much less is known about literacy for DHH children who live in communities using an emerging sign language. Here we describe the characteristics of emerging sign languages and contextualize them within a framework of educational policy, language evolution, and anticipated literacy among their signers. The systematic study of language emergence is a relatively recent phenomenon (becoming a field only in the last few decades, e.g., Kegl & Iwata, 1989; Sandler et al., 2005); thus, most work has focused on characterizing the linguistic structures of emerging languages and the social, demographic, and historical factors that trigger and influence the appearance of new languages. We are not aware of published studies of literacy development among DHH children who are acquiring an emerging language. Consequently, we focus our discussion on the critical precursors of literacy achievement, including robust acquisition of a first language, and the cognitive underpinnings that promote age-appropriate literacy development, such as understanding others' perspectives (i.e., Theory of Mind [ToM]). We hope to increase awareness of the unique circumstances of DHH children in emerging language contexts and to outline future research directions. Note that amplification and hearing technology are virtually unknown in most situations of sign language emergence because the factors that foster the emergence of new deaf communities and sign languages are most common in regions with low incomes and poor infrastructure and health care. We continue to use DHH here because a small number of children in emerging language contexts are hard of hearing.

In this chapter, we will first discuss linguistic and cognitive skills that have been shown to relate to literacy skills. These include fluency with the first language (signed or spoken), cognitive abilities such as ToM and working memory, and signed or spoken narrative abilities,

which reflect preliteracy skills. We will then discuss emerging languages and their linguistic profiles, situating them with regard to other known sign language profiles. In the absence of studies that directly measure literacy in emerging languages, we will present studies of those skills in language and cognition as a window to understanding what literacy skills may look like for signers of emerging languages. Finally, we will discuss the educational experiences of DHH emerging language signers and consider the impact of political, economic, and social influences on their academic and literacy achievement.

Language and Cognition as Precursors to Literacy

Facility with spoken language skills strongly predicts written narrative ability (e.g., Pinto et al., 2016), and linguistic awareness, even in a sign language, strongly predicts later skills in the second language (L2) (e.g., Mayberry, 2007), which for most DHH children is visual/written (Charrow & Wilbur, 1975). These factors apply to any scenario in which a DHH child is charged with navigating the academic domain. However, learning a sign language whose structures are not yet systematized, or regularized, across its signers introduces an additional layer of consideration for DHH children's literacy outcomes. This additional layer is twofold: first, early cohorts, or generations, in emerging language contexts, by definition, often do *not* receive exposure to an established spoken or sign language early in development. This leads to linguistic and cognitive outcomes similar to those of first-language delay found in larger communities with established languages (e.g., Hauser, Lukomski, & Hillman, 2008; Pyers, Shusterman, Senghas, Spelke, & Emmorey, 2010; Schick, de Villiers, de Villiers, & Hoffmeister, 2007; Spaepen, Coppola, Spelke, Carey, & Goldin-Meadow, 2011). Second, if the emerging language itself is not regularized (or systematized) (e.g., Richie, Coppola, & Yang, 2014; Senghas & Coppola,

2001), typical levels of linguistic awareness may not transfer from DHH children's first language (the signed L1) to literacy skills in their second language (their L2; presumably the written form of the surrounding spoken language).

Many studies support the notion that language provides a critical foundation for cognition across many domains important for academic success, including executive function (e.g., Hall, Eigsti, Bortfeld, & Lillo-Martin, 2016; Hauser et al., 2008), working memory (e.g., Abadzi, 2003), ToM (e.g., Peterson & Slaughter, 2006; Pyers & Senghas, 2009; Schick et al., 2007), number cognition (e.g., Spaepen et al., 2011), and spatial cognition (e.g., Pyers et al., 2010). Many of these cognitive skills are directly tied to literacy skills in signing DHH populations, for example, the finding that the reading abilities of signing DHH readers are positively correlated with working memory (i.e., the primacy component of free recall span and short-term memory consolidation; Hirshorn, Dye, Hauser, Supalla, & Bavelier, 2015).

Individuals whose language represents the earliest stages of language emergence also struggle with these cognitive skills, even when their language experience begins early in life. Pyers and Senghas (2009) studied two groups of signers in Nicaragua: Cohort 1 (n = 8), the first group of children to attend school in Managua and who created the first version of Nicaraguan Sign Language (NSL[1]), and Cohort 2 (n = 10), younger children who arrived at the school after Cohort 1 and who had Cohort 1 as their language model. They showed that Cohort 2, who used a more systematic and developed form of NSL, outperformed Cohort 1 on a story completion False Belief task testing ToM. Cohort 2 also used more types and instances of mental verbs such as "know, believe, and think," and increased use of mental verbs in both cohorts was associated with better ToM performance (Pyers & Senghas, 2009). These differences held despite Cohort 2

being younger, thus having had less life experience engaging others socially, and having learned NSL from Cohort 1 (see also Gagne & Coppola, 2017; Morgan & Kegl, 2006).

ToM also positively relates to the ability to produce complex narrative structures (Charman & Schmueli-Goetz, 1998; Curenton, 2004). Charman and Schmueli-Goetz (1998) found that ToM, measured by belief-desire reasoning and second-order false belief tasks, correlated strongly with age-appropriate use of referring expressions to introduce new characters in narratives (i.e., narrative cohesion, e.g., Halliday & Hasan, 2014). These ToM measures were also associated with better language skills (Charman & Schueli-Goetz, 1998), which are themselves related to successful written literacy skills (e.g., McKeough et al., 2008; Pinto et al., 2016). Pinto et al. (2016) found that the spoken narrative skills of TH Italian 5-year-olds predicted their written narrative skills 1 year later, above and beyond the predictive power of phonological and orthographic awareness. For more on the role of ToM in literacy in DHH populations, see chapters by Connor & Greenberg; Marschark & Rosica; and Bruce & Borders, this volume. Taken together, these studies highlight a language–cognition–literacy relationship that is made even more complex in emerging language contexts because the language foundation itself has not yet coalesced.

The relatively short histories of emerging languages and incomplete standardization across signers lead to a weaker foundation in language skills, mainly because they have not yet been established or agreed upon, such as consistent grammatical structures for indicating who did what to whom in a sentence (e.g., Senghas, 2003). While a link to literacy outcome has not yet been directly measured in emerging language contexts (i.e., no existing studies directly relate language conventionalization, cognitive-linguistic skills, and reading/writing abilities in DHH signers), many studies have explored the factors that contribute to literacy. What follows is a

characterization of *emerging languages*, an analysis of the impact of educational, social, and political factors, and a discussion of likely educational and literacy outcomes.

The Emerging Language Context

What is an *emerging* language? As the name suggests, emerging languages have appeared relatively recently compared with established languages (often spoken), whose histories extend back centuries or even millennia (e.g., Bauer, 2014; Brentari & Goldin-Meadow, 2017; Meir, Sandler, Padden, & Aronoff, 2010). The designation depends on the language's age and whether they are still rapidly developing linguistic structures (i.e., mature, established languages still evolve and change, though much more slowly). Many emerging sign languages arose de novo; they developed rapidly through the spontaneous communicative interactions of DHH people (often children) with no previous access to an existing spoken or sign language. Emerging languages offer an unprecedented opportunity to understand the human capacity for language, receiving significant attention in the cognitive science and linguistics literature as well as in the popular press (e.g., Meir & Sandler, 2007; Senghas, Kita, & Özyürek, 2004).

The term "emerging language" also does not apply to languages that arise as a dialectal departure from an existing sign language, though some, like spoken creole languages, have emerged from situations in which users of various sign languages have come into contact (e.g., Israeli Sign Language [ISL]) (Lanesman & Meir, 2012; Meir et al., 2010). The process of creolization differs from the development of a dialect in that creolization usually strips away linguistic complexity from the contributing languages, giving rise to a new language that subsequently goes through a process of generating and regularizing new linguistic structures (e.g., Arends, Muysken, & Smith, 1995), similar to languages arising de novo. Consequently,

educators and children in creole language environments face challenges that parallel those described here for DHH children developing literacy in the majority spoken language (e.g., Bryan, 2010).

Emerging Sign Languages in the Mosaic of Sign Languages

Emerging sign languages fall into two general types, based on the social context of their origins: village sign languages and deaf community sign languages (Meir et al., 2010). Village sign languages arise in the context of an established social group into which a relatively large number of DHH children are born. Thus, the language develops within the context of families, and many TH people also know the sign language to some extent. While some village sign languages are emerging sign languages, others are not; they have relatively long histories (especially for sign languages) and are no longer in a period of rapid structural development (Zeshan, 2010). For example, Adamorobe Sign Language (AdaSL) is an established, well-documented village sign language in Eastern Ghana that is at least 200 years old (Nyst, 2008), a comparable age to American Sign Language (ASL; Baker & Padden, 1978; Tabak, 2006). Conversely, ISL is an *emerging* sign language, about 75 years old, that is situated in a large, urban, deaf community (Meir & Sandler, 2007; Meir et al., 2010). Finally, an emerging sign language that is in fact situated in a village is Al Sayyid Bedouin Sign Language (ABSL), which has existed for at least four familial generations (Aronoff, Meir, Padden, & Sandler, 2008; Meir et al., 2010; Sandler, Meir, Padden, & Aronoff, 2005). In sum, the term *village sign language* describes the sociolinguistic environment of the language, whereas *emerging sign language* describes the development of the language itself (e.g., Bauer, 2014; Meir et al., 2010; Senghas, 2005; Zeshan, 2010; Zeshan & De Vos, 2012). The terms are not mutually exclusive.

Deaf community sign languages, in contrast, form when DHH people come together, usually in an educational or institutional context, and begin communicating with one another (Meir et al., 2010), a common origin for the world's sign languages. Other language "types" making up the sign language "mosaic" include alternate sign languages (Bauer, 2014), and individual (Coppola, 2002) and family homesign systems (Horton, in press). For details, see LeGuen, Coppola, and Safar (in press). In the next sections, we discuss NSL as an example of an emerging Deaf community sign language and review literature indicating that emerging languages have not yet systematized, or conventionalized, all the structures necessary to scaffold a strong language foundation and the requisite cognitive skills for literacy.

Nicaraguan Sign Language: A Case Study of an Emerging Sign Language

NSL emerged in the late 1970s, originating among the newly formed Deaf community in the capital of Managua. In 1979, the new Sandinista government expanded an existing special education school (Polich, 2005; Senghas, Senghas & Pyers, 2005; for a brief sociolinguistic sketch, see Coppola, in press, a). Small-scale programs for DHH children had also existed in Nicaragua prior to the 1970s; these focused on spoken Spanish skills and did not have the critical mass of children likely necessary to give rise to a new community or sign language (Polich, 2005). In 1979, the revolutionary Nicaraguan government pursued "a socialist road to development" (Arnove & Dewees, 1991, p. 92), while simultaneously not wanting to be perceived as aligned with any foreign government. Consequently, they did not import teachers from other signed communities (such as the United States) (Polich, 2005). The teachers at the

school in Managua (at that time, all TH and nonsigning) attempted to learn about sign language on their own and attended workshops on special education in neighboring Costa Rica, where they learned about Total Communication and the idea that sign languages have linguistic value. This acknowledgment of the legitimacy of the manual modality, coupled with the critical mass of approximately 49 children in the first entering class (Polich, 2005), a large repertoire of conventional gestures among Nicaraguan Spanish speakers (Coppola, in press, b), and other factors, likely contributed to NSL's emergence.

Unlike in village sign language contexts, few members of the Nicaraguan Deaf community are genetically related to one another.[2] In other words, only a very small number of DHH children in Nicaragua have a DHH signing relative, a much lower frequency than in countries such as the United States, where approximately 4% of DHH people have at least one DHH parent (Mitchell & Karchmer, 2004). Applying that percentage to the approximately 1,500 current DHH NSL signers (Senghas, 2019), one would expect about 60 NSL signers to have DHH parents, plus those who would have DHH individuals in their extended families. However, observations and interactions with the community suggest that this is not the case. Therefore, the vast majority of DHH individuals in Nicaragua have TH parents who likely do not sign—especially the parents of NSL signers from the earliest cohorts of NSL (who arrived within the first 10–20 years of the school's expansion), because there was no existing language to learn.

The low rate of signing within families has consequences for language emergence and literacy. First, NSL may have emerged earlier had there been deaf family lineages, instead of within a school setting. Second, for DHH children in Nicaragua, the primary and likely sole source for sign language input is their educational context. This is also true in the United States, although in the United States, there is greater opportunity for DHH children from DHH families

to introduce linguistic structures to peers at school. Finally, because NSL is still in the process of emerging (Senghas, 2019), no sign language existed for teachers or parents to learn in order to interact with the children. Signing in the home (by DHH or TH parents) is positively correlated with eventual writing skills for DHH students (Allen, 2015), a scenario that is virtually impossible for TH parents of emerging language signers. The lack of a shared language between parents and children can hinder home literacy efforts, such as routines scaffolding literacy. One example is *shared reminiscing*, in which parents use language to follow the child's conversational lead, expand on utterances, and link past events to the child's current experiences (Reese, Leyva, Sparks, & Grolnick, 2010). The absence of a previously conventionalized language shared among the DHH children, their parents, and teachers compounds the language development and literacy challenges faced by children in emerging language environments.

How Emerged *Is NSL?*

One common characteristic of all languages is the regularity, or consistency, of linguistic structures within and across users. Having consistent structures contributes to mutual intelligibility among those who identify as speakers of the same language (e.g., Hockett, 1960). For example, in a population of speakers (or signers), we expect that most (if not all) would use the same method to show who did what to whom. There are different ways this happens; for example, either by word order or morphology (e.g., spoken language affixes or signed spatial morphology). Importantly, if the method varies greatly across the population (e.g., one person doesn't use affixes and another does), we can't really tell if they actually share the same language. We would have to look for other linguistic similarities between speakers (or signers) before concluding that they share a language. This applies to all parts of language: phonology,

morphology, syntax, and discourse. In essence, a language's *emergence* or establishment can be measured as the degree of shared or consistent use of the same approach across its users; we do not take other languages as the target end state for specific linguistic structures. We propose that regularity within a language scaffolds literacy in emerging languages because using grammatical structures consistently is what it means to know one's language.

Taking the extent of grammatical consistency in NSL as a measure of its degree of emergence, NSL is still emerging, although by some accounts it is developing grammatical structure more rapidly than emerging sign languages with different sociolinguistic profiles. The rate of emergence matters because literacy requires a reliable (i.e., consistent) language foundation; then one must be concerned with the speed at which the language can emerge. Senghas (2005) and Meir et al. (2010) considered factors that influence this rate; in this section we highlight two. First, a greater proportion of TH (vs. DHH) signers seems to slow the rate of increase in grammatical complexity; and second, the degree to which individuals share a cultural or environmental context influences how much information the language needs to express overtly, also affecting the rate of innovation of new structures.

In village contexts, more TH people sign. Greater communication with hearing individuals has advantages and disadvantages: While it affords greater social maneuverability (Meir et al., 2010), it also reduces the proportion of signed DHH-to-DHH interactions, because signed interactions are spread across the village due in part to DHH signers' greater social maneuverability. Richie, Coppola, and Yang (2014) showed that the interconnectedness of a communicative network predicts the rate of conventionalization of lexical items, that is, agreement on what to call something. They elicited labels for common entities like *cow*, *sun*, and *girl* from two types of signers whose communication networks differed. The first type were deaf

Nicaraguan homesigners (n = 4) who were not part of the NSL signing Deaf community, and who used homesign with TH family and friends, who in turn used Spanish (and not homesign) with one another. The second group were first-cohort NSL signers (n = 8). One can imagine the homesign communication network as a hub with the single deaf homesigner in the center and spokes radiating outward, depicting links with each of the individual TH family members who use the homesign. The endpoints are not connected to each other, though, because hearing family members do not use the homesign with each other. In contrast, in the NSL signers' network, all nodes are fully connected because all signers communicate with each other via NSL.

At the time of the study, both the homesign systems and NSL were approximately 25 years old, meaning each had the same amount of time to conventionalize their signs (Richie et al., 2014). The authors measured how similar the expressions for certain meanings were, for example, asking whether signers within a group always used "horns" to refer to a cow, or "long hair" to mean a girl. They found that the fully connected NSL network of signers all used the same sign for *cow* (and for the other meanings investigated), whereas the "hub"-type network of homesigners and their families varied in their signs for concepts (e.g., "milking," "horns+chewing-cud," and "horns" alone all appeared within the same homesign network).

Structural regularities may emerge on different time spans in a new language. Unlike the very early emergence of consistency in lexical items, consistency in the use of space in NSL developed later. Senghas (2003) asked NSL signers from Cohort 1 (n = 6) and Cohort 2 (n = 6) to describe simple video events featuring three people seated at a round table, facing the camera (e.g., passing a cup, bouncing a ball, or rolling the ball to another). Cohort 1 and Cohort 2 differ in more than their year of entry into the community; importantly, Cohort 2 signers benefited from interacting with Cohort 1, who were adolescents when Cohort 2 signers were young

children. The adolescents, as mentioned earlier, had already begun the process of conventionalizing elements of NSL (e.g., the lexicon), providing a linguistic substrate for the younger children to build upon, and to contribute further linguistic structure and complexity.

Signers' ability to regularize in the early stages of a language is therefore not limited to "simpler" linguistic elements such as referring expressions/nouns. Senghas (2003) showed that very early in the emergence of NSL (within 15 years of first contact), Cohort 2 signers had taken the inconsistent signing they learned from Cohort 1 and transformed it into the beginnings of a spatial verb agreement system (like those used by established sign languages around the world). Specifically, Senghas (2003) demonstrated that Cohort 1 and Cohort 2 signers differed in how they moved verbs through space to include information about who did what to whom. When the female actor gave the ball to the actor on her right, Cohort 2 signers, but not Cohort 1 signers, consistently modified the verb GIVE to include information about the recipient. While Cohort 1 signers spatially modulated their verbs as often as did Cohort 2 signers, the relationship between their spatial productions and the actual events was inconsistent (Senghas, 2003). The findings reported in Senghas (2003) serve as an excellent example of how certain linguistic structures may not emerge in the first wave of signers of a new language but are nevertheless developed by very young children of the next wave. Cohort 2 signers were approximately 5 years old when they arrived at the school, and these structures were developed before teachers had begun to sign themselves (Polich, 2005; Senghas & Coppola, 2001); thus, the teachers could not have been the source of the innovation (nor could it have come from Spanish because Spanish grammar does not use space). Senghas and Coppola (2001) and Senghas (2003) credit children's ability not only to acquire language, but also to create it, as the mechanism underlying this innovation.

As mentioned, no studies have related knowledge of an emerging language and literacy in a spoken language; however, two studies have assessed aspects of literacy in emerging signers. Delkamiller (2013) conducted an exploratory field study to evaluate Dolch sight words in English, ASL, Spanish, and NSL, focusing on the formational parameters of signs to compare the frequency of phonemes across languages. This study was intended to serve as a foundation for implementing NSL as a means of achieving literacy for Nicaraguan DHH students. Gangel-Vasquez (1997) worked with 15 DHH NSL signers in Bluefields, on Nicaragua's Atlantic coast, who varied in the ages they began learning NSL as well as how long they had been using it. The program used SignWriting (Sutton, 1977), a writing system for sign languages, to scaffold literacy among these signers whose experience with language and formal education was sparse and began late in development. Finding that even beginning signers could recognize the written signs, which capture the formational parameters of signs referred to earlier, she concluded that "achievement of 'sign language literacy' may open the door to literacy in an oral language."

NSL is still emerging. All languages change over time, reflected in variation in the use of words or phrases among speakers or signers of a language, and exemplified by the perplexed reactions of parents of teenagers who *thought* they knew a word that has now taken on new meaning. However, the amount of variability across speakers of an established language is generally small; indeed, changes beyond the level of individual words may be difficult to detect within one or two generations. Moreover, differences across speakers in established languages are usually restricted to the lexicon and do not manifest in syntactic variation. While parents may be perplexed by their child's use of *"mood"* to refer to feeling empathy (www.urbandictionary.com), it is an expected variation (at least in the United States in 2019). Parents would not expect their children to begin to use a completely different word order, for

example, or to begin marking plural differently from their parents. In this, we can say that emerging languages are indeed emerging. The amount of variability across signers is greater, though this does not preclude mutual intelligibility. For example, Cohort 2 signers can *understand* Cohort 1 signers, but Cohort 2 signers comment that conversations with Cohort 1 signers require more back and forth to be clear. This evidences the implications of Cohort 1's irregularity as compared to the regularities that Cohort 2 signers expect when speaking with other Cohort 2 signers. Both are NSL in their lexicon, but each represents different stages of the language's emergence. For future literacy work in this context, the empirical question would be whether NSL signers from different cohorts would perform differently on tests of reading/writing Spanish. The hypothesis would be, given the early cohorts' performance on language measures and on cognitive measures known to relate to literacy (i.e., ToM), that literacy would positively correlate with cohort order (i.e., later cohorts would perform better). Even though Cohort 1 signers are the oldest signers and have had the most experience navigating the world using written Spanish, we predict that because their language is the least regularized, they would have weaker literacy skills than the younger Cohort 3 or 4 signers, who would have a more consistent language foundation in NSL, yet would have used written Spanish for less total time than Cohort 1. Age of first sign exposure could be controlled for, since it is possible to find DHH NSL signers who began learning the language at approximately the same age (4 to 6 years).

We have presented NSL as a case study of the language-cognition-literacy link in an emerging language and next aim to describe the linguistic and educational contexts of other emerging languages around the world and corresponding literacy efforts. As stated earlier, no studies directly measure the literacy skills of DHH signers of emerging sign languages, though linguists, anthropologists, and psychologists working with these languages have characterized

their literacy in general ways. We will also discuss the greater social, political, and educational conditions that influence academic gains made by signers of these languages.

The Effect of Education on an Emerging Language

There is no doubt that educational experiences provide multidimensional benefits for children (e.g., Behrman & Stacey, 1997; Lochner, 2011). This is a global benefit; in low-income countries schooling has been acknowledged as providing basic functional literacy such as the ability to read the newspaper to stay current with the news, to decipher prescriptions for accurate medicine dosing, or for parents to guide their children in basic academic pursuits (Abadzi, 2003). Literacy and social/interpersonal skills enjoy bidirectional benefits. Better literacy improves prediction and comprehension during social interactions (Huettig & Pickering, 2019), and better language skills (spoken/signed) improve ToM abilities (e.g., Peterson & Slaughter, 2006; Pyers & Senghas, 2009; Schick et al., 2007). ToM itself is, in turn, argued to be an important substrate for social and educational success (e.g., Kleinknecht & Beike, 2004). These benefits of literacy further extend to increased cognitive processing abilities such as greater working memory (Abadzi, 2003). Finally, societal benefits of literacy have also been identified, including national economic growth (Glewwe, 2002). In sum, education and literacy benefit society in general, regardless of language, socioeconomic status, or country of origin.

When the Emerging Language Is the Language of Instruction

Clearly, education for DHH children is necessary and beneficial. However, the educational experiences for children whose first language is an emerging sign language may either be a

challenge or a benefit, depending on the relative sociolinguistic status of the emerging language in comparison to the language used in the local deaf schools. Emerging languages such as NSL and ISL that have developed in the context of a school setting provide a rich environment for the child to interact with others using the emerging language and serve as a locus for further regularization and development of the emerging language (e.g., Lanesman & Meir, 2012; Meir et al., 2010; Senghas, 2003). The opportunity to use the emerging language in the school setting arguably speeds the rate of language regularization (e.g., Senghas, 2005) because of the benefit of using the language with others who do not always have the same shared experiences (e.g., with nonrelatives and in an environment that is removed from the home, where contextual information could be supplied by pointing). Children learning an emerging language that is systematizing faster, in principle, could develop a stronger language and cognition foundation earlier, which would, as we have discussed, scaffold literacy skills earlier in these contexts than for signers who do not use the emerging language in a school setting. Developing a solid foundation in a signed first language goes hand in hand with developing strong inferencing skills and reading comprehension (Marschark et al., 2009). For example, college-age DHH students show similar weaknesses in comprehending written passages as they do in comprehending signed passages (Marschark et al., 2009), suggesting that developing strong language skills in one realm may commensurately scaffold the other.

However, settings in which the emerging language is the language of academic instruction should not be idealized; such classrooms can experience similar challenges to those that use established sign languages such as ASL. Ramsey (1997) notes that “language is more than a system for constructing well-formed utterances. In order to learn, children need repeated and intelligible interaction with other people who are users of shared language with a history” (p. 4).

Challenges common to the emerging and established language classroom include finding teachers who can understand and accommodate the needs of the DHH classroom (e.g., Easterbrooks, Lederberg, & Connoret, 2010) and teachers who are fluent in the local sign language (e.g., Hermans, Knoors, Ormel, & Verhoeven, 2008). In emerging language situations, however, these dynamics play out on a different timeline and may be magnified given the language's emerging status and the conditions which first led to the emergence of the language (namely, the lack of a previously existing signing community). The emerging status of NSL directly influences formal educational attainment via (1) the language–cognition relationship (discussed earlier) and (2) the availability of achieving higher education due to limitations on direct instruction in sign language and interpreter availability.

Teachers in the Emerging Language Classroom

Until relatively recently, all the lead teachers at the main school for the deaf in Managua, Nicaragua, have been TH. At first, they did not know any sign language; this was a main contributor to the development of a new language by the children who did not get any sign input. Later, these TH teachers did learn NSL as a second language from the very children who had begun to create the language. DHH students who receive instruction from teachers who are fluent in the local sign language demonstrate higher reading levels because such children develop stronger print word-to-sign mappings (e.g., Hermans et al., 2008; Hoffmeister & Caldwell-Harris, 2014). Hermans et al. (2008) found a positive relationship between vocabulary size in Dutch Sign Language (SLN) and written Dutch and interpret their findings as support for the effectiveness of the "chaining" approach used by teachers of the deaf to link previously known concepts in sign with their written form. The implication is that having reading instructors fluent in the sign language may be crucial to support better reading in DHH students.

In Nicaragua today, most, if not all, of the classrooms for DHH children at the Melania Morales Center for Special Education in Managua have a teacher or a teacher's assistant who is DHH, and most if not all the TH teachers know some NSL (Kocab, in progress). Most are drawn from Cohort 2 NSL signers, who are now in their thirties. Very few cohort 1 signers became teacher's assistants. At the time that Cohort 1 was completing their primary school education, no secondary education opportunities existed, only becoming available to a small number of Cohort 2 signers, who could then prepare to continue on to the university level (Kocab, in progress). For Cohort 1, social attitudes, including the limited acceptance of DHH people as teachers at that time, as well as their own ability to direct another's learning given their struggles with some basic cognitive processes, likely dampened their motivation and prospects. In the early 2010s, the number of DHH educators at the school in Managua reached a high of 12. Currently, approximately 10–15 DHH teachers have positions in DHH classrooms in Managua, Masaya, Estelí, Jinotega, and Condega. Several DHH individuals in Managua, Estelí, and other cities are pursuing degrees in pedagogy and hope to work as teachers in deaf schools.

The emergent literacy environment in DHH classrooms plays a special role in promoting literacy in DHH children (e.g., Easterbrooks et al., 2010). Therefore, establishing a system for training and certifying both DHH and TH teachers who are fluent in the emerging language and who can offer instruction incorporating features found to be unique to the DHH classroom is a crucial step to ensure reading gains for DHH children in this environment.

Access to Higher Education and Interpreting Services

An additional barrier to hiring DHH teachers who sign the emerging language is the scarcity of qualified interpreters who can provide access for teachers in training at the university level, directly impacting the literacy success of the classroom. As one example, DHH signers in

Nicaragua who want to become teachers report serious barriers to accessing the required education for becoming certified to lead a classroom. Two main factors contribute to this challenge. First, training programs for interpreters are small in number and have extremely limited capacity. Additionally, there is a lack of materials available for would-be interpreters to practice their skills. Reading material could be imported or translated into the local spoken language (i.e., some materials regarding spoken to signed interpretation for use in Nicaragua are available in Spanish). However, interpreter training programs also rely on hands-on activities using video recorded texts (spoken or signed) to practice translating. In this regard, sign texts for practice cannot be borrowed from elsewhere; they are not in the right language for the local sign community. Such texts have to be made locally, covering the diversity of topics (i.e., education, medical, legal) needed; or, more likely, practice is conducted "on the job." In either case, critique of translations into the emerging language can be difficult, given that the language itself is emerging. Beyond the lexical level (which may itself show regional and age-related variation), who is to say which translation is accurate when the grammatical structures in the language have not yet crystallized, or have crystallized for some signers but not (and likely never) for others?

In sum, the availability of interpreters for would-be DHH teachers' higher education directly impacts the literacy success of future DHH students. DHH teachers are likely the most fluent in the language, and sign language facility facilitates literacy (e.g., Hermans et al., 2008). Supporting the advanced education of DHH teachers also theoretically contributes to the overall knowledge of the staff at the school in the particular needs of DHH students.

Special Education Availability and Training

In 1995, Nicaragua passed a general law (Law 202) affirming the right of all children to an education; in 2009, NSL became the official language of the DHH community in Nicaragua (Law 675), and in 2011 NSL was deemed the appropriate language of instruction for DHH children (Law 763, which updates/replaces Law 202; JICA, 2014). Despite this, DHH children in Nicaragua, along with their peers in most low-income and developing nations, face significant barriers to receiving accessible education. While 25 municipalities have a center for special education (Nicaraguan Ministry of Education, 2019), many areas of the country remain un- or underserved; in particular, areas in the north and along the Atlantic coast. The recent global trend toward "inclusive education" is well-meaning in that it encourages children with disabilities to be educated alongside their peers. However, in countries that have extremely limited resources, such as Nicaragua (Donovan, 2015) and Peru (Goico, 2019), the poor implementation of inclusive education practices does not serve disabled children (Eleweke & Rodda, 2002). For DHH children, this poor implementation manifests, for instance, as a lack of fluent signing communication partners and no instruction in or interpreted into sign language.

Special education training in developing countries such as Nicaragua is sparse (see, e.g., Delkamiller, Swain, Ritzman, & Leader-Janssen, 2016), with practically no specialization in the education of DHH students. This lack of general and specialized training, combined with low teacher salaries, results in a teacher workforce that barely meets minimal educational requirements and that may have difficulty identifying students with learning or other disabilities. Thus, approaches to literacy that incorporate the specific needs of DHH children are rare. For example, the bilingual-bicultural approach that is gaining in popularity in the United States and other developed nations is virtually unknown in Nicaragua and other developing nations. This approach holds that DHH children need a language foundation in their local sign language to

serve as a base for acquiring written literacy in the surrounding spoken language (Evans, 2004; Koulidobrova, Dostal, & Kuntze, 2018). Despite Nicaraguan DHH children's right to accessible education, these limitations on the necessary parental, pedagogical, and educational resources leave many DHH children without access to a first language, a shared home language, education, and literacy in either a sign or spoken language.

Language Endangerment

When the Emerging Language Is a Minority Sign Language

The experiences of DHH signers of emerging languages that arose in an educational setting versus those that developed in proximity to a larger, established sign language can differ. While signers of NSL or ISL (for example) benefit from using the emerging language in both community and school contexts, signers of other emerging languages may have no access to school or be faced with learning a second sign language at school. The scenario in which a second sign language is needed to access academic content can endanger the vitality of the emerging language. In such cases, a stronger language foundation achieved via the established sign language may better ensure literacy, even though it is not the local sign language and may, in fact, have negative consequences for the language's sustainability.

Language endangerment is not unique to minority sign languages. Roughly half of the languages of the world have orthographies (Eberhard, 2019); consequently, to achieve literacy, speakers of the other half of the world's languages (i.e., those that do not have orthographies) must learn a second language. In doing so, the vitality of the home language may become endangered as it competes with the prevalence of the academic language in terms of the number

of speakers, diversity of topics, and attitudes (UNESCO, 2003). Here again, the challenges facing DHH children whose first language is an emerging language may be magnified relative to children who use minority spoken languages. DHH children whose home language is an emerging language must learn two other languages to become literate: the sign language used at the school for the deaf and the structures of the spoken language that the written form represents. Furthermore, while children who speak a minority spoken language can return home and are ensured that the vitality of the home language has been maintained by those who remained behind, that may not be the case for DHH children.

Education in the majority sign language, while likely benefiting DHH children from emerging language communities, has two consequences that bear consideration. When the primary maintainers of the sign language (i.e., members of the signing deaf community) leave the village to attend a school using another, majority sign language, fewer DHH people remain to maintain the use of the village sign language among the TH signers. This weakens the language's sustainability (e.g., the eventual disappearance of the Martha's Vineyard signing community when children moved to the mainland to attend school; Groce, 1985). Also, children who use an emerging sign language at home but not at school may introduce another element of language endangerment when they return home to the village context. In a village context, topics of conversation typically focus on daily life; these may differ drastically from the topics discussed at school. DHH children attending a school may be exposed to topics that they then wish to discuss at home, but their home language may lack the lexical or syntactic structures to do so (e.g., Nonaka, 2014; Senghas, 2005). Thus, they are likely to introduce terminology or structures from the majority school sign language into the village sign language. The more frequently this occurs, the more endangered the village sign language becomes. This dynamic may place village

sign languages that are themselves emerging (i.e., that may not have had the time or concentration of DHH persons to crystallize structures) even more at risk.

Literacy Skills of TH and DHH People in Village Contexts

Literacy skills in the dominant spoken language may vary greatly among TH people in villages with and without emerging sign languages (e.g., Abadzi, 2003 Hou, 2017; Kusters, 2015). Hearing status can also affect access to education, influencing villagers' attitudes about literacy and education for the DHH members of their community (e.g., De Vos, 2012; Kusters, 2015). In Adamorobe, for example, DHH villagers have more access to free schooling and literacy skills than do TH villagers (Kusters, 2010; Nyst, 2007). The opposite is often true: TH children usually have greater access to schooling and literacy skills than DHH children due to the scarcity of DHH programs. In the case of Ban Khor Sign Language (BKSL), a village sign language of northern Thailand, hearing villagers have greater access to texting, while DHH villagers' use of texting is limited due to their limited literacy skills in Thai (Nonaka, 2014). DHH children there have access to a school, though it is not in the village and uses the majority Thai Sign Language, introducing the majority-minority sign language issues discussed earlier. In Al Sayyid, older ABSL signers experience little exposure to written Arabic (Kisch, 2012), and while younger ABSL signers are beginning to communicate by texting, their skills do not necessarily reach "functional literacy" (Kisch, 2012, p. 105). In Al Sayyid, the main locus of literacy among present-day DHH children is at school (Kisch, 2012). However, the primary language of instruction at the local village school is ISL, not ABSL. ISL provides the entré to literacy and the academic topics that schooling affords (Kisch, 2012), but exposure to ISL can also present a challenge as ISL may be used to fill lexical gaps in ABSL and/or provide access to relationships,

interactions, and experiences outside the village with other DHH individuals whose only common language is ISL.

The experience of language endangerment is not unique to emerging languages; minority languages across the globe are threatened by contact with majority languages (e.g., Tsunoda, 2013). However, sign languages themselves are already a minority class and when the sign language is emerging or in a village with little to no academic support, the language may be at risk of extinction as its signers learn and use other established languages.

Success of Schooling in a Village

Establishing a school in a village can be successful with the appropriate investment and support. De Vos (2012 describes the process of establishing a school in the signing village of Bengkala (known by the locals as *Desa Kolok*, or "Deaf Village"), where the local village sign language is known as *Kata Kolok*. De Vos (2012 describes the initial attempts, obstacles, and eventual success of the school, which she attributes to the support of individuals at many levels, including the head of the local village school who contributed classroom space, leadership at other deaf schools, the village head, and the researcher herself. Clearly, an undertaking like this was not easy, and the school's future is tenuous, as it depends on the frequency of DHH children born in the village. Nonetheless, the program was deemed a success, and it exemplifies a successful endeavor to maintain language vitality while simultaneously providing valuable academic and literacy gains. De Vos (2012 citing Kortschak, 2010) describes the positive impact of the school on DHH students' self-esteem, particularly in a village with an overall low literacy rate. While Kata Kolok is not viewed as an emerging language, its sociolinguistic context parallels that of many emerging languages in the risks posed by potential language contact and serves as a model for the benefits gained by receiving instruction in the local language.

In sum, the attainment of literacy in an emerging language setting depends on the development, as soon as possible, of a strong infrastructure of interpreters, teachers, and parents who are familiar with the emerging language, though this largely depends on how quickly the emerging language itself crystallizes. Further, while language contact is natural and ubiquitous, in cases where language endangerment threatens a signing community, efforts should be made to establish a school where the language of instruction is the emerging language itself. This provides a locus for DHH children to gather and use the emerging language across a diverse set of topics and student experiences, which also increases the rate of emergence. However, such an endeavor should be a community decision that respects local ideologies. As researchers of language acquisition, development, and emergence, we have a duty to share resources with collaborating communities, policymakers, and each other, to increase awareness of the factors influencing emerging language communities while simultaneously holding ourselves accountable to the ethical practices that support the autonomy of the emerging language community.

Conclusions

Literacy skills are useful in today's world, whether one lives in a large urban environment or a rural area of a developing country. Yet literacy skills take time to develop and are founded upon a well-developed first language that is spoken or signed. The benefits of literacy extend to DHH individuals, perhaps even more so, as a go-to medium for obtaining news or medical information, for interacting with TH people who may not know sign, or for using communication technologies such as texting and social media. For example, the author's own observations find a relationship between the prevalence of mobile phones among DHH Nicaraguans and their increased Spanish proficiency. The foundation provided by the first language may not be as

strong, however, if that first language itself is still in the process of emerging. Such is the case for many sign languages today.

Emerging languages vary in their sociolinguistic contexts, including the concentration of DHH persons using the language, the availability of the emerging language in school, and the sociopolitical supports for providing qualified teachers, interpreters, and other necessary resources. These varied environmental factors have a direct impact on the rate of development of the emerging language, which further impacts the individual literacy experiences of its signers. This chapter provided an overview of emerging language contexts, the factors that influence language emergence, and the factors that influence the schools for the deaf in these contexts. In doing so, we highlight the factors that future researchers and practitioners should consider when engaging with signers of emerging languages from the perspective of academic success and literacy. We describe the vulnerability of emerging languages in the face of competition with a majority sign language, particularly in the school setting, and simultaneously highlight the success of some minority sign languages in maintaining their vitality in such situations.

The three main takeaways relative to literacy are as follows: First, emerging languages may emerge faster when DHH signers have frequent and sustained opportunities to engage with each other. Hearing signers in these contexts may sign, but they do not depend on the language for all their daily interactions, as do DHH signers. This is an important distinction and may influence the rate of language emergence: the faster a language becomes systematic, the earlier it can serve as a foundation for literacy in the second, written language. Second, the rate of emergence also influences the relationship between language and cognition, the main thrust behind academic pursuits and literacy in schools. Without a solid, shared language foundation, signers may struggle with basic cognitive processes, affecting their academic and literacy achievement and

their capacity to become teachers themselves, directly impacting future generations. Finally, the educational system in the emerging language context has both familiar (e.g., the need for qualified teachers who understand the unique needs of a DHH classroom) and unique (e.g., the youth of the language translates to even fewer than usual signing individuals [DHH or TH] who can assume leading roles) characteristics. These demands directly influence the literacy attainment of students in emerging language classrooms by posing challenges to DHH children's ability to acquire the preliteracy abilities that are necessary to acquire reading and writing skills. However, these demands may be satisfied, and thus barriers lowered, by improving support at the political, educational, and community levels.

Emerging languages provide valuable insights into the capacity for humans to generate a new language born of the unique cultural contexts of its signers in combination with children's natural abilities to learn and create language. Studying the creation of new languages in real time highlights the power of children to create language and counters the conventional wisdom that language is always transmitted intergenerationally. Despite these amazing linguistic capacities, DHH children in these contexts face many challenges to literacy that are inextricable from the fact that their language itself is so new. Challenges in access to skilled language models and sufficient peer interaction, skilled instructors and sufficient learning materials, and access to interpreters for advanced education can be overcome with support and investment at all levels, including the signing community itself, educators, researchers, and policymakers. Directly measuring the literacy skills of children in emerging language environments is key to capturing the contribution of preliterate cognitive abilities, sign language fluency (i.e., language consistency or regularity), and language contact to literacy outcomes. In emerging language contexts, socioeconomic factors, including access to skilled and knowledgeable instructors,

interpreters, and peers, take on even greater import than they do in established sign language communities. We have attempted to highlight here the multidirectional relationships among literacy, language, and cognition for deaf children acquiring emerging languages that of course form part of the experiences of deaf children in all communities globally. Supporting the literacy and education of signers in emerging language contexts can only foster community growth by nourishing the language–literacy–cognition relationship.

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Notes

[1] Here we use "Nicaraguan Sign Language" as the English descriptor of the country of the language's origin. The Nicaraguan deaf community generally uses "Lengua de Señas Nicaragüense" when referring to the language in Spanish.

[2] The low rate of intrafamilial deafness in Nicaragua may result from a low incidence of recessive genes; consequently, hearing loss is likely predominantly acquired due to poor overall nutrition, prenatal care, and medical care (e.g., Saunders et al., 2007).