



Deafness & Education International

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/ydei20

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To cite this article: Jessica A. Scott & Jonathan Henner (2021) Second verse, same as the first: On the use of signing systems in modern interventions for deaf and hard of hearing children in the USA, Deafness & Education International, 23:2, 123-141, DOI: <u>10.1080/14643154.2020.1792071</u>

To link to this article: https://doi.org/10.1080/14643154.2020.1792071

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Published online: 07 Jul 2020.



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Second verse, same as the first: On the use of signing systems in modern interventions for deaf and hard of hearing children in the USA

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ABSTRACT

Signing systems that attempted to represent spoken language via manual signs - some invented, and some borrowed from natural sign languages – have historically been used in classrooms with deaf children. However, despite decades of research and use of these systems in the classroom, there is little evidence supporting their educational effectiveness. In this paper, the authors argue against the use of signing systems as instructional tools. This argument is based upon research demonstrating that (1) signing systems are less comprehensible to learners who rely upon signs rather than speech, (2) signing systems are used inconsistently by teachers, and (3) signing systems often unintentionally exhibit features of natural signed grammar, leading to input that does not accurately convey spoken languages, which is the original intention of these systems. Instead, the authors advocate for a return to the use of natural signed languages in classrooms educating deaf children, with creative uses of interpretation to provide those students who may prefer or benefit from spoken English with its presence in the classroom. In addition, we note ways in which future research may explore how natural sign languages and deaf adults may benefit the educational experiences of deaf children.

ARTICLE HISTORY

Received 17 October 2019 Revised 26 June 2020 Accepted 28 June 2020

KEYWORDS

Deaf; American sign language; natural signed language; signing systems; signed English; theory

Signing systems have been used in classrooms with deaf children for upwards of 50 years. However, in this article the authors argue that there is not satisfactory evidence that signing systems are effective, and they should no longer be used. The use of sign in classrooms educating deaf children, ranging from the use of natural sign languages to signing systems, has a complex history. Signing systems are commonly used in deaf education settings in the United States (for example, SEE-2; Luetke-Stahlman & Milburn, 1996). Stedt and Moores (1990) remind us that the argument over which approach (communication

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system or natural language) is superior for educating deaf children is already hundreds of years old. As deaf education tends towards cycles, educators and researchers appear to be again supporting a possible resurgence of the use of signed systems in the classroom (as if their use ever truly faded away, even in the post Unlocking the Curriculum era).¹

In classrooms and educational research, the presence of signing systems that attempt to represent English (an auditory and sequential language) using signs (by their very nature, visual and spatial) is problematic. These problems range from the presence of conflicting linguistic messages (Hoffmeister, 1992, 1995), to issues of comprehensibility and accurate use of systems by teachers (Stewart et al., 1995; Tevenal & Villanueva, 2009). Yet signing systems continue to be provided as an option to parents who are advised by professionals that the best way to teach the spoken language and its printed forms is to map it to the hands. As recently as 2018, Rendell et al. argued for the validity of Signing Exact English as a pedagogical tool for deaf and hard of hearing children.

In this article, we propose a theoretically-driven argument against the use of signing systems in the education of deaf children. We advise a return to natural sign languages (henceforth *sign languages*²) in the classroom and tighter standards on the way they are analysed in research. We begin by exploring the origin and history of signing systems in the States, as the authors are from the States and use States based frameworks and lenses. We follow by reviewing the literature on the linguistics and classroom usage of signing systems. We conclude with a hopeful vision for classrooms meeting the needs of deaf children without resorting to artificial systems, and suggestions for effective pedagogy using natural sign languages (alongside spoken languages, where necessary and appropriate).

What are signing systems?

The phrase *signing systems* is a term used here as a catch-all for a group of manual communication tools that were artificially created to represent spoken languages through a visual modality, also often called manually coded language (e.g. manually coded English, MCE) (see Stedt & Moores, 1990 or Bornstein, 1990 for details). The emergence of modern sign systems in the mid-twentieth century was strongly related to the lack of effectiveness found in a strictly auditory/oral approach for supporting the language and literacy development of deaf students (Gustason, 1990). The theoretical reasoning behind the development of then new signed systems was that by exposing deaf children to spoken language

¹Unlocking the curriculum was a Johnson et al. (1989) manifesto that argued that oral and signed systems did not work and that educators should use bilingual-bicultural approaches to educating deaf children.

²It is beyond the scope of this manuscript to explore the differences in grammatical structures of signed and spoken languages. For further information on this topic, see Liddell, 2003.

via visual means, they would have visual and accessible opportunities to produce and comprehend English (Gustason, 1990).

Gustason (1990) explained that educators were worried about what she identified as seven challenges of deaf students. She described these failings as excessively simple written sentences (e.g. I went to the store. I bought milk. I came home. I drank milk.), simpler use of clausal structures compared to hearing children, small spoken language vocabularies³ which were also shallow (they assigned a single meaning to words that may have multiple meanings), lack of understanding of spoken language syntax and morphology, use of fewer adverbs, auxiliaries, and conjunctions, and typically omitted important features in written spoken languages. It was these concerns that led to the invention of signing systems, and their intention was to correct these perceived difficulties. For instance, Mayer has argued that because ASL did not have a written form, the language was insufficient for supporting English literacy and a signing system would fill this linguistic gap (Mayer & Akamatsu, 2000; Mayer & Wells, 1996), although there is evidence that interventions using natural signed languages seem to have positive effects on literacy (Dammeyer, 2014).

Examples of signing systems used in the States include Signed English (Bornstein, 1974), Linguistics of Visual English (LOVE) (Wampler, 1971), Signing Exact English (Gustason, 1990) (SEE I), Contact Sign (Pidgin Signed English), and Seeing Essential English (Anthony, 1971) (SEE II). Internationally, some in Australia also use signed English (Power et al., 2008) and countries such as Sweden have their own systems invented to represent their national spoken language (Bergman, 1979). It does not include cueing systems, which are a way to represent the abstracted phonemes of spoken languages visually.

Linguistic research on signing systems

Use of signing systems

There have been several papers documenting how signing systems are used. These studies look at both children (Geers & Schick, 1988; Suty, 1986) and adults (Wilbur & Petersen, 1998). In studies of how children used signing systems, there was evidence that despite exposure in the classroom, the children did not use as many English function words as expected (Geers & Schick, 1988; Suty, 1986). In fact, Geers and Schick (1988) found that children used only signed 70% of the expected English signs. It is telling that Geers and Schick (1988) found that despite repeated exposure to English structures, the structures were frequently missing from the children's expressive communication. This phenomenon could be explained by the notion that artificial signs are not natural or

³The size of their ASL vocabulary was not mentioned; the lack of discussion on this is a trend still worth talking about today.

inherently useful (Kluwin, 1981), and thus are not used spontaneously by children.

In a study of hearing adults, including Children of Deaf Adults (CODAs) and non-CODAs, Wilbur and Petersen (1998) examined speech and sign production during simultaneous communication, compared to speech or signed English alone. Participants who knew *only* signed English omitted more signs during simultaneous production than those who knew ASL in addition to signed English. All participants frequently omitted function words regardless of language background, although CODAs made fewer omissions than non-CODAs. This finding suggests an inconsistent use of signed English (Wilbur & Petersen, 1998), which would be highly problematic if the purpose of signed English was to consistently and clearly expose children to grammatical structures in English.

Grammatical limitations of signing systems

Early on, researchers distinguished between signing that was used in schools with deaf children, and signing that was used by deaf adults and community members. One of the earliest distinctions, made by Stokoe (1970) (possibly alongside Casterline and Croneberg), identified classroom signing (signing systems) as a mode that was only learned in highly controlled classroom environments through repetition and explicit instruction, while the signing used by the deaf community (in the United States, ASL) was learned naturally. He noted that academic concepts were almost never presented to deaf children in natural sign languages, also stating that there was no legitimate linguistic reason for this (Stokoe, 1970).

Signing systems borrow heavily from signed languages for content words, often modifying these signs through initialisation in an attempt to distinguish between words with related meanings (for instance, theory and hypothesis; the signs executed with a T and H, respectively) (Humphries & MacDougall, 2000). These systems also add invented signs to express spoken language grammatical functions. For instance, in ASL, the sign GO has the concept of TO embedded within it (using *path* to connect *source* and *goal*). A user of a signing system that is striving to represent each individual English word would add the invented sign for "to" in a sequentially structured syntax similar to English (e.g. I GO TO THE STORE). In some signing systems, this is even completed using invented signs for bound morphemes, which are expressed in some signing systems unbound from their accompanying verb (e.g. GO + ING).

The details of what constitutes an internal structural norm for signlanguages is still a theoretical discussion. Back in the 1980s and 1990s, scholars such as Hoffmeister (1995) argued that signing systems were ineffective because deaf children exposed to them would latch onto the natural signs embedded within the systems and the children's bioprogramming (Bickerton, 1984) would recognise them as elements of a natural language and nativise accordingly. Per Hoffmeister:

The fact that MCE (manually coded English) in its borrowing of forms from ASL also

presents a plethora of common structures that are antithetical to how these structures are

established in spoken English suggests that the young deaf child will have to resolve

conflicts in rule generalizations in the acquisition of a language from a model of MCE.

According to what has just been explained, English may be our goal, but the rules one

can abstract do not conform to English rules (p. 302).

The rules that Hoffmeister refers to are aptly described in Wilbur (2012). Wilbur contrasted the linearity of English and therefore sign systems based on visually representing it, and what she called the *layering* evident in the grammars of many natural sign languages. Layering is a unique feature of sign languages and can be done because of the visual/spatial/gestural nature of the modality. An example of layering can be found in spatial agreement marking whereupon a classifier handshape can move from one indicated referent at a location (that is, a subject has been marked in space through indexing either by the hand or by the eye) to another to show marked agreement between a *source* and *goal*. Sign languages, according to Wilbur, can also be layered non-manually, where expressions may provide suprasegmental information (e.g. stress and intonation) or indicate syntactic structures (e.g. yes/no). English (and most spoken languages), on the other hand, is sequential; signing systems are designed as sequential because *they must visually duplicate the spoken language manually*.

To understand this phenomenon, we employ cognitive linguistic approaches, specifically the concept of "Construction Grammars" (Lepic & Occhino, 2018). Construction grammars focus on three assumptions according to Lepic and Occhino: a) phrases and lexical items can be looked at as constructions rather than as compositional, b) constructions are not divided into categories like syntax or morphology, and c) languages are learned through generalising previously experienced events. The last point is vital, as exposure to elements of natural sign languages will likely influence reduced fidelity to the strict requirements of signed systems (Corrine Occhino, personal communication, 2019). Consider the signed construction of I GIVE TO YOU.

Following the rules of signed systems, each word in the sentence is represented visually, in the order that English speakers produce. However, GIVE, in ASL, has compositional elements that allow for spatial agreement⁴ for first and third person even in the sign system construction; GIVE can show agreement

⁴Linguists debate how agreement operates in sign languages, with some preferring the concept of indicating verbs (Liddell, 2000). Here we use agreement as defined by Lillo-Martin and Meier (2011) for simplicity.



Ι

GIVE

TO

YOU

Figure 1. I GIVE TO YOU.

in the verb production by physically moving to the space where the referents have been indicated (either in signing plane front of the signer, or towards the signer themselves). GIVE is also a phrasal structure in that the meaning of the verb is iconic in its production. Literally, one can see that something has been given.

Children who have seen the form of GIVE in Figure 1 are likely to generalise this form to other verbs. They may not generalise correctly, but incorrect generalisation is a feature of verb acquisition in many languages (e.g. runned in spoken English) (Ambridge et al., 2013). We assume that children will generalise relatively consistently; that communities of signers will exist as self-correcting entities through communicative pressures (i.e. I cannot understand you, can you repeat what you said?). While some signers who have learned signing systems may keep the preposition TO even in the context of using GIVE with spatial agreement embedded in the verb construction, others may rationalise that TO has been marked spatially and drop it, therefore moving away from fidelity to the signing system towards what we have described as either ASL-like or contact signs (Figure 2).

Iconicity

The use of initialisation in signed systems may be problematic given recent developments in understanding the role of iconicity in natural sign languages. Iconic signs are structures which look like the things they are supposed to represent and there is novel evidence that iconicity helps signing deaf children learn vocabulary concepts (Caselli & Pyers, 2017). Not only did iconicity support vocabulary development, but its use was also supported by neighbourhood density (how many other signs had similar phonological structures to the sign in use), and lexical frequency (how often a sign appears in various discourses). Initialisation of the sign can reduce all three elements that Caselli and Pyers say support word learning in signing deaf children. The sign may no longer be iconic, and changing the phonological parameters of the sign means that both



GIVE (1st person)

GIVE (3rd Person)

Figure 2. GIVE.

neighbourhood density and lexical frequency no longer apply for scaffolding recognition of the sign if no concept has been attached to the sign (e.g. the child does not know what the sign means and now has no way of stitching form and meaning).

Linking form and meaning is especially important in sign recognition because it assists in using analogical reasoning to determine how an unfamiliar sign is being used in the discourse environment (Occhino, 2017). Occhino argues that signers create schemas around specific and recognisable handshapes that can be employed to assign the appropriate meaning to a classifier handshape. While *rain* and *salad* use the same handshape, other phonological elements are employed to implement specific form-meaning mappings (e.g. palm down means rain goes down while palm upon means salad tongs moving lettuce leaves). However, these mappings are entirely dependent on experience. A deaf child who has never seen salad tongs in use may not recognise the classifier handshape for salad unless given specific and targeted instruction. Iconicity, therefore, is not enough (Occhino et al., 2020).

Comprehensibility of signing systems

Few researchers have examined how well children are able to comprehend messages conveyed in signing systems. Those studies that do exist primarily attempt to identify whether students can parse messages both in signing systems and ASL (Borman et al., 1988; Luetke-Stahlman, 1991) rather than evaluate how well students can understand a signing system for learning content. For instance, Borman and colleagues (1988) found no differences in how well students could understand phrases conveyed in ASL, signed English, and contact signs. However, students scored just above chance in each condition, suggesting generally low understanding. Additionally, the authors reported no information about students' prior exposure to or knowledge of ASL. As all students in this

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study were educated in a simultaneous communication setting (Borman et al., 1988), it is likely that they had little exposure to fluent ASL and perhaps low scores in general were the result of language deprivation (see Hall et al., 2017).

Another study examined the ability of students educated in settings that used signing systems to understand ASL messages (Luetke-Stahlman, 1991). Luetke-Stahlman found that ASL was comprehensible for students who were educated in SEE-2 settings. This result could again be the result of versions of signed English unknowingly incorporating structures (e.g. spatial referents or directionality) of ASL because it was created by individuals who were not well-acquainted with ASL and how it functions linguistically (Hoffmeister, 1992, 1995). As a result, the incorporation of ASL into signing systems made some of the grammatical expressions of ASL more familiar to students who use a sign system than some linguistically-naive researchers or teachers might expect.

Some researchers have found that deaf students were not as able to answer comprehension questions on content presented in simultaneous signed and spoken English when compared to hearing students presented with the same content and in the same format (Tevenal & Villanueva, 2009). Similarly, preschool children engaging in storytime activities demonstrated greater levels of engagement in storytelling approaches that included ASL rather than those that were strictly SEE-2 (Schick & Gale, 1995). Among middle school deaf children, researchers have also found better recall of stories told unimodally through ASL as compared to stories told through simultaneous use of signed and spoken English (Wang et al., 2017).

Nativisation of signing systems

One of the biggest challenges in conducting research on the effective use of signing systems is managing *nativisation* processes. Nativisation is the process by which children regularise language based on inconsistent exposure (e.g. the poverty of the stimulus). The idea of nativisation arose from studies of *inbetween* languages such as contact languages, pidgins, and creoles (Hudson-Kam & Newport, 2005).

Hudson-Kam and Newport (2005) variably exposed children and adults to an unknown language and then gave them a series of vocabulary and grammatical assessments. While both children and adults were able to pick up on the language, generally only children were able to regularise beyond the input they had received (Hudson-Kam & Newport, 2005). These results are similar to studies performed on deaf children. For example, in Singleton and Newport (2004)'s case study of a deaf child, Simon, he was able to nativise the inconsistent ASL input given from his deaf parents, who themselves had learned ASL late and did not use it fluently.

Signing systems, however, are artificial constructions and not natural languages, nor are they pidgins or creoles. Accordingly, how nativisation

processes apply to such systems may not be immediately clear. Yet, nativisation works not just with language input, but what arises from nativising inconsistent input, even inconsistent input from a system of visually representing spoken language on the hand (Hoffmeister, 1995). Studies which intended to promote the use of signing systems did not control for nativisation in participants (Gee & Goodhart, 1985). If deaf people have automatically and unconsciously translated signing systems into sign language structures (e.g. contact), then studies demonstrating comprehension of signing systems may actually be evidence of nativisation in action. Nativisation could account for Mayer and Akamatsu's (2000) observation that deaf students who use ASL were able to understand signed English stories (albeit it at a somewhat lower rate than ASL stories). If the signed English stories inherently contained features of ASL, then it is impossible to disregard the possibility that these were present during storytelling and supported participants' comprehension of the story.

Overall, the linguistic research that exists suggests at best inconsistency with how signing systems are used, and at worst a complete failure to use signs to express spoken language grammar. There is evidence that grammatical elements of sign languages appear in the expressive and receptive signing abilities of children who are educated in environments that use a signing system. The presence of these elements implies an inherent shortcoming of signing systems to convey a comprehensible message without relying upon features of signlanguages to make the message complete. There is also a lack of evidence that messages received by deaf children using a signing system are parsable, though there is a possibility that children take this inconsistent input and nativise it into something more like contact sign. Despite this, signing systems have been used in classrooms with deaf children for over half a century.

As recently as 2012, Knoors and Marschark argued that simultaneous communication (SimCom) (which often necessitates spoken language structure of sign languages) was a viable bi-modal input system for deaf children, particularly ones that were implanted. They wrote that there was limited evidence against its use, and that there was "no pedagogical, audiological, or linguistic reason to advise parents against it" (p. 299). Yet, to make this point, they had to disregard nearly 30 years of pedagogical and linguistic reasons to not use SimCom or signed systems, and also input from various members of the signing deaf communities on a preference for natural sign languages in pedagogy (Mounty et al., 2014). Blom and Marschark (2015) attempted to show that SimCom was more effective than speech alone for students operating in inclusive environments (here, college students at the National Technical Institute for the Deaf; NTID). Participants who used Cls were given a self-report to determine their English, sign system, and ASL skills. The participants were then given two passages from a text orally, with one passage randomly accompanied with simultaneous sign. Comprehension scores were higher for texts accompanied with sign. From this they concluded that SimCom had the potential to support learning in deaf students with Cls. Blom and Marschark did not specifically engage with the problems inherent in SimCom, nor in the use of signed systems. Adults and even children can extrapolate language data from missing information (see Singleton & Newport, 2004), but we still do not recommend it as a daily pedagogical experience.

Educational research on signing systems

Teachers' use of signing systems

Researchers in deaf education have noted concern about how consistently and accurately teachers of the deaf use signing systems in the classroom (Stewart et al., 1995). Others, like Luetke-Stahlman (1991) and Nielsen et al. (2011) have argued that as long as the meaning is encoded, users of a specific signing system (SEE-2) can be accurate on average 86% of the time. This number appears to be an arbitrary bar, and one would hope that our expectations for teachers of any children would be that they can correctly use the classroom language 100% of the time. Luetke-Stahlman (1991) shows that the 25 participants in her study frequently did not follow the rules of the signing systems they purported to use even when they were able to express the general meaning of the sentence: there were wrong, omitted, and invented signs and markers from the participants.

Two teachers who were involved in a four-year intervention to improve their representation of English morphemes in sign began the study only representing up to 66% of the spoken English morphemes they were using on their hands. This was despite being experienced teachers (one of the two having 14 years of experience) who were working explicitly in settings that espoused a simultaneous or total communication philosophy that included MCE (Stewart et al., 1995). These teachers were able to increase their percentage of English morphemes represented using signing systems to 90% or above after intervention. However, in both studies, the teachers received ongoing regular supervision and feedback on their signing systems use. Few teachers who are currently working in these settings would have access to the training that was provided by these researchers, suggesting that the average teacher may accurately represent even less than 86% of the English language on their hands.

There has been some limited evidence (Bennett et al., 2014; Wood et al., 1991) suggesting that by using highly controlled curricula in one-on-one settings that students can memorise and replicate sentences expressed using a signing system, though rarely with 100% accuracy. Others have found that while representations of English by teachers may be passable, combining signs and spoken English in an MCE system resulted in classroom teachers using fewer complex grammatical structures than those who used only spoken English (Wood et al., 1991). Additionally, teachers who used an MCE system appeared

by their own reports to be using the system inconsistently or even incorrectly (Woodward & Allen, 1988), and linguistic analyses of teacher utterances using signing systems revealed that the majority of utterances were ungrammatical both in English and in ASL (Marmor & Pettito, 1979). The takeaway is that children in classrooms using MCE may be exposed to less complex English grammar than hearing students or even deaf students in oral settings. These findings are frustrating for any professional who works with deaf children.

Outcomes of children educated using signing systems

Unfortunately, research conducted in settings that use signing systems have not included ASL comparison groups, making it impossible to determine what outcomes are related to the use of *signs* (and other educational factors such as teacher effectiveness, language exposure in the home, parental education level, whether or not the child has been read to by the parents, all of which have been shown to be important mediators of language and literacy), as compared to outcomes related specifically to the presence of a system of signed *English*. For instance, Gaustad (1986) compared deaf children who had been exposed to MCE for at least three years to a hearing control group. She examined their ability to imitate, understand, and produce inflectional morphology in English. While time enrolled in an MCE programme predicted production of inflectional morphology, it was not related to comprehension or imitation. The lack of an ASL comparison group makes it impossible to determine whether similar effects could have been found using a natural signed language rather than a signing system.

Several of these older studies actually suggested that signed systems were ineffective in increasing deaf students' comprehension of English. One study that did include both ASL and signed English examined predictors of comprehension of relative clauses in English (Lillo-Martin et al., 1992). The researchers found that participants better understood relative clauses in ASL and signed English compared to written English. However, stronger understanding of relative clauses in signed English did not seem to equate to understanding of relative clauses in printed English, which suggests that signed English comprehension did not support written English comprehension.

Similarly, in a comparison study of children in total communication programmes and spoken English only programmes, Geers et al. (1984) noted that children in total communication programmes had better sign production than spoken language production, and tended to use sign only in responses. Schick and Moeller (1992) also explored the elements of MCE systems and their learnability, and found that deaf students educated in this way did not sign following English grammatical structures, and made errors in their production of bound morphemes and articles. Although the primary purpose of signing systems was to support the comprehension and production of spoken and written English, these findings do not support this goal.

Solutions in research and in the classroom

Despite almost 40 years of research, there is unsatisfactory evidence of specific benefits of signing systems in the education of deaf children. Specifically, there is no evidence to imply that the addition of signing systems, over and above the addition of visually accessible signs, had any impact on the spoken language knowledge of deaf children – and in fact, there is growing evidence that proficiency in natural sign languages may support spoken language (and its associated print system) knowledge (see Lange et al., 2013; Novogrodsky et al., 2014; Tang et al., 2014, among others). Rendell et al. (2018) attempt to make the argument that signing system users have better speech intelligibility, and have good English skills. Aside from the fact that speech intelligibility should never be used as an assessment tool because of racist and ableist metrics, the body of research they presented was the same one analysed in this article and subject to the same challenges we presented. This may beg the question what should we do moving forward? There is a need to reconsider both research and educational practice that moves away from signing systems and embraces approaches that capitalise on the unique linguistic strengths of deaf children.

Research

In research, we advocate for the development of a robust examination of innovative approaches to supporting the natural language development of deaf children. First, research should engage more with language deprivation and its effects. Ideally, deaf children would be exposed to a full and accessible language from birth in their homes. Yet, most deaf children are not raised in environments where they have access to ASL-fluent language models (Mitchell & Karchmer, 2004) – meaning that for those children who do not have complete access to spoken English, their homes are not ideal settings for language development. This is likely to lead to language deprivation (Hall et al., 2017; Humphries et al., 2016), which has cascading impacts on development in areas such as language development, literacy, abstract reasoning, psychosocial development, interpersonal skills (Payne-Tsoupros, 2019), and neurological development (Rhys-Jones & Ellis, 2000). As Payne-Tsoupros (2019) notes, the National Association of State Directors of Special Education specifically recommends against the use of any signing system for infants and toddlers because they are "not complete languages" (p. 122).

Further research is necessary regarding multi-modal and multi-lingual classrooms. One of the better representatives of multi-lingual and multi-modal classroom environments can be found in Tang et al. (2014)'s description of the Jockey Club Sign Bilingualism and Co-enrolment in Deaf Education programme (SLCO), which enrolled both deaf and hearing students with the expectation that both groups would become proficient in Hong Kong Sign Language. In another example of multi-modality in education, deaf children with Cls benefited from a bimodal classroom that intentionally developed early signing skills (Swanwick, 2016). Such a benefit to early exposure to sign language among Cl users has been found by others (Andrews & Dionne, 2011; Rinaldi & Caselli, 2014). Lange and colleagues (2013) found benefits in print language and mathematics skills in a longitudinal study of deaf children in an ASL/English bilingual programme further suggesting that the model may be applied generally elsewhere. There is research to demonstrate that deaf parents of deaf children have positive orientations towards bimodal bilingualism (Mitchiner, 2015), though currently there is insufficient evidence describing or evaluating the benefits and trade-offs of specific approaches to multi-modal and multi-lingual deaf education settings.

Researchers are often vague in their descriptions of how their participants use language, describing deaf children as using "signs," which may include ASL, signing systems, or contact signs. Inaccurately describing how deaf children use their language and making assumptions about the relationship between their language and a specific skill (e.g. decoding print) may show results that are not situated in how the child actually engages with the skill. We argue that researchers who publish based on this kind of inaccurate methodology perpetuate harmful stereotypes about signing deaf children (e.g. Geers et al., 2017).

Practice

In the classroom, we advocate for a return to sign languages as the primary language of instruction for children in classrooms that might otherwise use signing systems. This linguistic shift provides children with a complete and comprehensible language which may serve as a solid foundation upon which second (or third) language knowledge may be built (Cummins, 2006). The use of a visual language (e.g. ASL or BSL) that follows the grammatical structures natural for a visual modality may avoid some of the potential conflicting linguistic messages noted by Hoffmeister (1992, 1995). From this point of linguistic understanding, parallels can be drawn between how a concept is expressed in sign languages and how it might be constructed in spoken languages.

If the goal of signing systems is to expose students to spoken language structure, signing proficient teachers will likely be effective at presenting print spoken languages and using signed languages to explain the content and structure. Such an approach will require rigorous training among teacher candidates who have learned or are learning sign languages as an additional language, and higher entry standards will be needed in terms of language proficiency for employment. Such a programme may include partnerships with local deaf communities, mentorship with deaf teachers, and immersive language experiences (including in the college classroom) (see an example of such an innovative and vital programme described by Humphries, 2013). Programmes need to purposefully recruit teachers of the deaf from the pool of deaf adults. This type of recruiting may require teacher preparation programmes to remove (unnecessary) barriers to entry of the profession that may stymy attempts at becoming teachers – including programme requirements involving speechand audiology, as well as making these programmes more accessible generally.

Increasingly, in the U.S. more and more states are passing Language Equality and Acquisition for Deaf Kids (LEAD-K) bills. The goal of LEAD-K is to ensure that deaf children meet language milestones regardless of the modality chosen by the family (LEAD-K, 2020). Under LEAD-K, educators would be required to assess children's language development milestones from an early age, which can be used to engage in purposeful language planning and instruction (Payne-Tsoupros, 2019). Experts in early education of deaf children have noted the importance of early assessment and progress monitoring (Moeller et al., 2013), and the emergence of LEAD-K and similar legislation is promising for providing the infrastructure and guidance to ensure that consistent and effective early assessment and education is possible.

Another option for providing a multi-lingual education environment is for teachers to use *consecutive interpreting* techniques to alternate between languages. In consecutive interpreting, interpreters first input the source language, process it, and then produce the target language *after the speaker has completed an agreed upon number of sentences* (Seleskovitch, 1978). While consecutive interpreting may not be common in many deaf-related communicative environments, many interpreters prefer its use and once deaf people learn about it, some deaf people prefer it too (Russell, 2005). An adaptation of this practice into the classroom, called consecutive teaching, has found favour among teachers in some bilingual deaf classrooms (Bailey, Personal Communication, 2019). Teachers who use the technique find it easy to use signed languages, and then switch to spoken languages, then back to signed languages. Team teaching with both a deaf and hearing teacher, or inclusion of a deaf interpreter, has the potential to facilitate this type of instructional approach (Swanwick & Tsverik, 2007).

Conclusion

Despite a lack of evidence for the effectiveness of signing systems for instruction, they continue to be used in classrooms educating deaf children. Research shows signing systems lack comprehensibility and their use tends to be uneven across teachers. It is our hope that we can avoid creating a second "verse" of deaf education research that merely replicates previous mistakes. Deaf children deserve access to a full language and opportunities to converse with adults and peers who are fluent users of that language. Signing systems provide children with neither. Instead, rigorous training for teachers to allow them to become

proficient, fluent users of sign languages⁵, recruiting deaf adults to become teachers, effective use of qualified educational interpreters, and where appropriate, consecutive interpreting use amongst teachers hold promise for classroom environments that are more appropriate for deaf students. Itbenefits us to instead consider the promise of sign languages- complete languages that are completely accessible to all deaf children.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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⁵Though Jacobs, 1996, notes the significant barriers to achieving sign language fluency even after taking four semesters of sign language, which is often the maximum number of courses in a typical teacher training programme.

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