education sciences

MDPI

Review

Deaf Children as 'English Learners': The Psycholinguistic Turn in Deaf Education

Amanda Howerton-Fox [1,*] and Jodi L. Falk [2]

[1] Education Department, Iona College, New Rochelle, NY 10801 USA; ahowertonfox@iona.edu
[2] St. Joseph's School for the Deaf, Bronx, NY 10465 USA; drjodifalk@gmail.com
* Correspondence: ahowertonfox@iona.edu; Tel.: +1-914-633-2680

Received: 9 May 2019; Accepted: 11 June 2019; Published: 14 June 2019

Abstract: The purpose of this literature review is to present the arguments in support of conceptualizing deaf children as 'English Learners', to explore the educational implications of such conceptualizations, and to suggest directions for future inquiry. Three ways of interpreting the label 'English Learner' in relationship to deaf children are explored: (1) as applied to deaf children whose native language is American Sign Language; (2) as applied to deaf children whose parents speak a language other than English; and (3) as applied to deaf children who have limited access to the spoken English used by their parents. Recent research from the fields of linguistics and neuroscience on the effects of language deprivation is presented and conceptualized within a framework that we refer to as the psycholinguistic turn in deaf education. The implications for developing the literacy skills of signing deaf children are explored, particularly around the theoretical construct of a 'bridge' between sign language proficiency and print-based literacy. Finally, promising directions for future inquiry are presented.

Keywords: deaf education; critical period for language; sign bilingualism; deaf multilingual learner (DML); english learner (EL); age of acquisition; literacy; cognition; ableism

1. Introduction

The purpose of this literature review is to present the arguments in support of conceptualizing deaf children as 'English Learners', to explore the educational implications of such conceptualizations, and to suggest directions for future inquiry. Following Holcomb [1], the term 'deaf' will be used to refer to those whose hearing level qualifies them for specialized services that are typically provided through deaf education; the term 'Deaf' is reserved for references to Deaf culture. Hereafter, the term 'English Learner' (or 'EL') will only be used in direct reference to the federal government's use of this term. We will use, instead, the terms bilingual or multilingual, as they acknowledge children's linguistic assets [2]. Acronyms to refer to groups of children will also be avoided in line with the observation from critical literacy work that acronyms are almost exclusively used in reference to marginalized groups.

The literature reviewed here was drawn from the following databases: ERIC, Wilson Education, ProQuest, PsychInfo, EBSCO, JSTOR, and SAGE. The search terms used were the following: bilingual; deaf education; literacy; English as a Second Language; English Learner; written ASL; age of acquisition; second language acquisition; dual language; critical period for language; deaf multilingual learner; bimodal bilingualism; heritage ASL; and sign bilingualism. Included in the review are empirical research studies, reviews of the literature, dissertations, conference presentations, program descriptions, and position papers. The majority of the literature reviewed was published in the last two decades, but earlier works have been included if they are seminal in their field or if they offer important historical context for the present inquiries.

2. Why Deaf Children Are Compared to 'English Learners'

Deaf children are a heterogeneous group. While some would argue that all deaf children should be conceptualized as bi/multilingual, many of the comparisons made between deaf children and 'English Learners' are based on only subsets of the deaf population. First, research suggests that deaf children whose parents use American Sign Language (ASL) are highly similar to hearing bi/multilingual learners in their language and literacy development. Additionally, a growing number of deaf children in the United States are bi/multilingual in the exact same sense that a growing number of hearing children are bi/multilingual: their parents speak a language (or languages) other than English. Finally, there is a third group of deaf children—those whose parents speak English—who traditionally have not been compared to bi/multilingual learners, but who many argue should be, often citing psycholinguistic research in support of that claim. The arguments surrounding each of these three categories are presented in the following sections. Importantly, we are not suggesting that these three categories are mutually exclusive, or even that they should be conceptualized as representing separate "groups" of deaf children. Instead, our focus is on differentiating the three arguments for purposes of clarity.

2.1. Deaf Children Whose Home Language Is American Sign Language

Approximately 15% of deaf children in the United States have a parent, or parents, who use American Sign Language (ASL) [3]. These parents have made the choice to use ASL in the home either because they are deaf ASL-users themselves, because they want their child to have access to ASL and/or Deaf culture, or because the child's amplification has been unsuccessful and ASL will allow them to communicate with their child [4]. A large body of research indicates that deaf children who are raised with ASL as their first language, and who are exposed to English (via print and/or auditorily) as a second or simultaneous second language, share much in common with hearing children who are raised bilingually.

First, research has shown that speech and sound are not necessary for normal language acquisition and that signed language and spoken language nurture brain development in qualitatively similar ways [5]. Recent functional magnetic resonance imaging (fMRI) and magnetoencephalography (MEG) research into the ways in which the brain organizes itself in the absence of auditory linguistic input has shown that the auditory cortex—the area of the brain activated by voice recognition—becomes selective for faces when the brain lacks access to spoken language [6]. Children with early exposure to sign language achieve all the same milestones, and according to the same time table, as hearing children who are exposed to spoken language (see [7]). Also, when children are exposed to a signed and a spoken language (via print and/or auditorily), they exhibit similar language acquisition and literacy development patterns to those who are exposed to two spoken languages (see [7]). Furthermore, sign bilinguals engage in the same kinds of code-switching, or translanguaging [8], behaviors that are observed with hearing bilinguals [9,10]. Finally, bilingualism—particularly simultaneous bilingualism—has been associated with cognitive and linguistic benefits for bilingual children who use two spoken languages [11–13], as well for those who use one signed and one spoken language (see [7]). Specifically, sign bilinguals are better at moderating their attention than their monolingual peers [14] and show more syntactic complexity in both languages [15].

The research cited above strongly suggests that it is appropriate to conceptualize deaf children who learn ASL as native language as bilingual learners of English. However, Knoors and Marschark [4] caution that the conditions necessary for transfer from L1 to L2 are not uniformly present for deaf children who use ASL at home. Proficiency in L1 and quality input in L2 are both important for effective transfer to occur, and Knoors and Marchark argue that these conditions are "rarely met" in regard to deaf children [4] (p. 292). While the level of ASL proficiency of hearing parents who choose to sign with their deaf children is an important consideration and warrants further investigation, research has shown that deaf native signers are proficient models of the language and serve as skilled communication partners for their deaf children. Research on the behaviors of deaf mothers—to which we will return later—demonstrates that they call their deaf children's attention to English print in a

rich, communicative context, arguably providing deaf children with the kinds of quality input in L2 required for language transfer.

2.2. Deaf Children Whose Home Language Is Neither English Nor ASL

Deaf children whose native language is ASL have long been considered learners of English as a second language by many researchers and practitioners in the field. There is another subset of the deaf population, though, who are receiving more research attention as our country becomes increasingly diverse: the group of deaf children whose parents use a language other than ASL or English at home. The term deaf multilingual learners, or DMLs, has been adopted by the research community to refer to members of this population.

On the whole, the number of children whose parents speak a language other than English has grown at least 150% over the past three decades [16]. The Gallaudet Research Institute's (GRI) [3] most recent report indicates that nearly 25% of deaf children have a home language other than English or ASL (17.9% Spanish, 5.7% Other). This represents an increase of at least 20 percentage points since 2000, when the number of deaf children with a home language other than English or ASL was reported at 2.7% by the GRI [17]. It is important to note, however, that the GRI's Annual Survey of Deaf and Hard of Hearing Children and Youth, while the most comprehensive database of its kind, only represents about 65% of deaf children nationwide [4]. Therefore, it is probable that the percentage of deaf multilingual learners is even higher. Compton [18], for instance, estimates that 47% of deaf children use ASL and a signed or spoken language other than English at home. In either case, Paul [19] is certainly justified in arguing that "the disputatious ASL-English combo represents only a small portion of the EL (or DML) situation in this country" [19] (p. 4).

Multilingual deaf children are worthy of continued research attention because they represent a kind of linguistic diversity that has not been adequately addressed by our nation's schools. Research over the past two decades has consistently demonstrated, for example, that Latinx deaf children demonstrate lower academic achievement than their White or African American deaf peers [20]. As many multilingual deaf children may arrive at school with no prior exposure to ASL or English, Gerner de Garcia [21] argues that a trilingual approach, including the child's home language, might be most appropriate. The limited research that exists on this growing population is outlined below. It consists of investigations into effective early intervention with infants and families, case studies on language and literacy development, single subject or pre- and post-test group studies to assess the efficacy of specific instructional interventions, and between-group comparisons of multilingual deaf learners who either are, or are not, receiving dual language support.

Over twenty-five years ago, Grant [22] noted the particular difficulties faced by parent-infant service providers in working with deaf multilingual learners, a group she referred to as "a small minority of an already small minority" [22] (p. 135). Like many of her colleagues since, Grant argued for service provision in the family's home language, explaining that even though the vast majority of parents want English to be the ultimate outcome for their children, it is not possible to offer counseling to parents in a language they do not understand. More recently, Sacks et al. [23] have worked on developing effective ways to help Spanish-speaking parents foster the spoken language development of their deaf children. In a pilot study on the effectiveness of Project ASPIRE (Achieving Superior Parental Involvement for Rehabilitative Excellence), the researchers worked with eleven parents of deaf children from typically underserved populations, including five parents who spoke Spanish at home. Sacks et al. used Language Environment Analysis (LENA) technology to record sixteen hours of each home's auditory environment. Quantitative summaries of the audio data were shared with parents in parent education sessions during four linguistic feedback reviews. These educational sessions were conducted in Spanish when Spanish was the parent's native language. Results indicated an increase in both child vocalization and parent-child linguistic interactions post-intervention.

Case studies have provided another means of understanding the language and literacy development of deaf multilingual learners. Wang, Andrews, Liu, and Liu [24] used questionnaires, interviews, and self-appraisal instruments to uncover the language and literacy histories of two

adults who had learned Chinese in its spoken and written forms, English in its written form, Chinese Sign Language, and American Sign Language. Their analysis revealed a number of factors that contributed to the participants' multilingual, bimodal, and biliterate development: the home literacy environment; support from parents, siblings, and educators; the presence of role models; visual access to the languages; and Deaf identity. In a single subject case study, Baker and Scott [25] examined interviews, assessments, school records, and anecdotal records to elucidate the factors influencing the K-12 language and literacy development of one deaf Latina student. Like Wang et al., their research points to the critical importance of early and continued support of L1, but they also note the importance of ongoing assessment to determine appropriate placements and instructional strategies for deaf multilingual learners.

Similarly, Cannon, Guardino, and Gallimore [26] offer detailed vignettes of three multilingual learners—Victor, David, and Javier—each based on real students. The researchers discuss each child's language and literacy development, beginning with early intervention and access to communication and language, then proceeding to school-age social and academic issues and assessment, and concluding with the student's transition to postsecondary contexts. They explain that a main purpose for their research is to make "a resounding call to recognize and address the need for the field to learn as much as possible about DMLs through the use of consistent and clear terminology, expansion of available demographic information, research-based instructional strategies, and examination of all issues through a multicultural lens so that a more open and inclusive environment for learning and development can be provided" [26] (p. 15).

Drawing from Linguistically Responsive Teaching (LRT) [27] as a theoretical and research base, Pizzo [16] argues that teachers of deaf multilingual learners need "a broad range of knowledge and skills, including deep content knowledge, pedagogical content knowledge, knowledge of how children and adolescents learn in a variety of settings, skills for creating a classroom community that is supportive of learning for diverse students, knowledge about multiple forms of assessment, and the ability to reflect on practice" [16] (p. 161). However, as Cannon and Guardino [28] note, the Report of the National Literacy Panel on Language-Minority Children and Youth, which presents research to support improved practices for linguistically diverse classrooms, does not contain any studies that focus on deaf multilingual learners. As a result, some researchers have turned to the broad body of research on hearing bi/multilingual learners, with and without disabilities, for guidance. In their synthesis of relevant evidence-based research, Cannon et al. [26] identified four strategies that might prove promising with deaf multilingual learners: guided reading, visual phonics, pre-teaching via chaining and multimedia tools, and peer tutoring that uses metacognitive strategies.

Research into effective instructional approaches for working with this population who has been historically overlooked in both deaf education and English as a second language research is emerging. Given the heterogeneity of the population, single subject designs have been an effective means of conducting such research. Cannon et al. [29] investigated the value of pre-teaching vocabulary with four deaf multilingual learners between the ages of 10 and 12. All four participants had recently immigrated to the United States and exhibited only emergent literacy skills. The results indicated that vocabulary recognition was enhanced when vocabulary was pre-taught, and that participants needed three pre-teaching sessions to demonstrate comprehension of the new vocabulary. Guardino, Cannon, and Eberst [30] replicated this study with five participants. Again, their results indicated that three sessions of pre-teaching were sufficient for participants to understand 90% to 100% of the new vocabulary.

Finally, the research community has focused on the question of whether or not deaf multilingual learners should receive listening and spoken language therapies in both English and their home language. While some research suggests that supporting the development of two spoken languages may be detrimental to deaf children (see [31]), there is also compelling research evidence to support the practice of developing both spoken languages. Bunta and Douglas [32], for example, compared the performance of 20 bilingual Spanish–English-speaking and twenty monolingual English-speaking deaf children, all who used either cochlear implants or hearing aids, on a set of expressive and receptive language measures and found that the language skills of the two groups were similar

across all measures. Bunta and Douglas explain that these results are particularly impressive given that they were unable to match the bilingual and monolingual children on maternal education level; the mothers of the bilingual participants had lower education levels than the mothers of the monolingual participants, yet the language outcomes of the bilingual children were commensurate with those of their monolingual peers. Thus, the researchers argue, "it can be reasonably hypothesized that supporting both languages via individual treatment with parent involvement as well as encouraging the parents to use Spanish at home could have resulted in the relative success of the bilingual children who participated in our study" [32] (pp. 287–288). In a follow-up study, Bunta et al. [31] performed a retrospective analysis of just the 20 bilingual Spanish–English-speaking children from their 2013 study to investigate the effects of dual-language instructional support across measures of receptive and expressive language. They found that the bilingual deaf children who had received dual-language support did significantly better on the assessments of Total Language and Expressive Communication than those who had not received dual-language support. There was no significant difference in the Auditory Comprehension scores of the two groups. In light of these results, the researchers argue that "dual-language support may yield better overall and expressive English language outcomes than English-only support for this population" [31] (p. 1).

2.3. Deaf Children Whose Home Language Is Spoken English

A third group of deaf children, those whose parents communicate solely via spoken English, is also relevant to this conversation due to some deaf childrens' limited auditory access to English. Developments in cochlear implant (CI) technology have meant that more deaf children have more auditory access than ever before, and that many deaf children raised in spoken English homes are meeting language milestones on par with their hearing peers and succeeding in mainstream educational contexts. This has led to cochlear implantation becoming the standard of care for deaf children in developed countries. In many cases, parents are discouraged from signing with their deaf children based a limited set of studies that suggest that the acquisition of sign language may interfere with speech development (see [33,34]). Even where parents are not explicitly discouraged from signing, the success of cochlear implants—coupled with the difficulties associated with acquiring a new language—mean that the vast majority of hearing parents are not choosing to sign with their deaf children [3]. However, for reasons not fully understood, not all deaf children receive the same auditory benefit from amplification, and thus many deaf children raised in spoken English households do not acquire English as L1. In this way, such children are still 'English Learners' when they enter school. The important distinction between this group of deaf 'English Learners' (who cannot rightly be called bilingual) and hearing 'English Learners' is that deaf 'English Learners' have no L1.

It is well-documented that early access to language input and linguistic interaction is critically important for the language and literacy development of children with typical hearing [35–40] and children who are deaf [41–50]. In fact, the linguistic benefits of early language exposure are the primary argument behind the push for earlier and earlier cochlear implantation [34,51–55]. It is certainly true that many children, particularly those implanted early, are highly successful with their implants, and that children who are successful with their cochlear implants can achieve literacy outcomes that surpass those of their peers without implants (see [4]).

However, other studies point to significant within group variation, demonstrating that not all infants who receive implants gain adequate access to the auditory language present in their environments [4,33,56–59]. Deaf children raised in spoken English environments who do not have full access to English exhibit language delays not only in the acquisition of English, but also in ASL [16,60]. In 2019, Hall, Hall, and Caselli [33] report that deaf children are still "significantly underperforming on standardized assessments of speech and spoken language, even after early identification, early amplification, and early enrollment in intervention and support services" (p. 3).

For these reasons, it has been argued that cochlear implants are "an unreliable standalone first-language intervention for deaf children" [61] (p. 1). In their call to revisit language policy for deaf children following the rise of cochlear implantation, Knoors and Marshark [4] argue that parents

should still be encouraged to sign with their deaf children, especially as a support to the spoken language. "Not only will sign language provide early identified deaf children with access to the fundamentals of language prior to implantation," they explain, "but learning to perceive spoken language after implantation takes time and sign language can serve as an effective bridge, perhaps with as yet unexplored long-term benefits" [4] (p. 299).

But some go beyond merely recommending the use of sign, insisting that access to sign language is the deaf child's right [62–64]. Historically, such arguments have centered primarily on the deaf child as a member of a cultural minority with rights to access the "linguistic identity of the deaf community" (Article 24, Section 3 in [65]). More recently, however, advances in linguistic and neuroimaging research have led to a new set of arguments that highlight not only the benefits of cultural identity, but also the extreme risks associated with lack of early exposure to language. These newer arguments, reviewed in the following section, lead to the conclusion that all deaf children should be multilingual learners, either in the sense that the spoken/written language is their L2, or as simultaneous bilinguals with concurrent exposure to both signed and spoken language(s).

3. The Psycholinguistic Turn in Deaf Education

What we are referring to here as the psycholinguistic turn in deaf education represents a shift away from the notion of 'language delay' toward a focus on the potentially lifelong effects of language deprivation. It is not new to acknowledge that many deaf children arrive at school without the foundational language skills to be successful, nor is it new to suggest that this early lack of language often leads to continued academic underachievement. What is new is the suggestion that deaf children are not merely struggling with language delays, but that early language deprivation has affected their cognitive and linguistic development in ways that are potentially irreversible.

3.1. The Critical Period Hypothesis

Much of the work motivating the psycholinguistic turn in deaf education comes out of the field of linguistics, where deaf children are interesting, in part, because they allow linguists to study the critical period hypothesis [66]. Over twenty years ago, Chomsky compared the seemingly effortless way in which young children seem to absorb the language of their environments with the difficulties faced by most adult learners of language. "For most people," he explained, "after adolescence, it becomes very hard. The system is just not working for some reason, so you have to teach the language as something strange" (p. 128) (as cited in [67]). For decades, linguists have been interested in post-childhood L2 acquisition, but deaf children offer a unique opportunity for linguists to study post-childhood L1 acquisition because deafness blocks the infants' exposure to the language of their environment [67]. If deaf children of hearing parents are exposed to sign language, it tends to be well past infancy [68].

By studying the language development of deaf children raised in spoken language environments, linguists can gain insight into "the extent to which the neural processing system for language requires linguistic experience during early life to develop fully" [69] (p. 1). In short, we can gain insight into the potential cognitive and linguistic effects of language deprivation. Language deprivation is a very rare phenomenon among hearing children, typically only seen in cases of severe abuse or neglect [59], and it would clearly be unethical to intentionally deprive a child of language for research purposes. But, as Hall et al. [33] note, language deprivation is "so common among DHH children and adults that it often fails to provoke the alarm it deserves" (p. 2).

Early research into the cognitive and linguistic effects of language deprivation in deaf children used a between-groups design to examine age of acquisition (AoA) effects. Three decades ago, Mayberry and Fischer [70] compared the narrative shadowing abilities—simultaneously receiving and producing a narrative—of college-age native deaf signers with those of children who did not have access to ASL until later in their childhoods. The native signers outperformed the late signers on this task. In a later study, the researchers [71] examined the sentence recall skills of signers who had used ASL for a minimum of twenty years. They found that recall accuracy declined as a linear function of AoA and was not related to years of experience using the language. In a follow-up study,

Mayberry [72] compared the sentence recall skills of 27 native deaf signers, who had acquired ASL at ages ranging from early infancy to late childhood, with those of nine subjects who had lost their hearing in late childhood and learned ASL as an L2 at that time. The researchers again found that participants' sentence processing skills declined as AoA increased, and they also found that the children who had learned ASL as an L2 in late childhood outperformed those who had learned ASL as L1 at the same age.

Ten years later, Mayberry and Lock [73] turned their attention to the effects of post-childhood L1 acquisition on L2 learning later in life. Participants—deaf and hearing adults who had learned English as an L2—performed grammaticality judgements and sentence to picture matching in English. Both the hearing and deaf adults who had acquired L1 early in life performed the L2 tasks at near-native levels, while the deaf participants who had little or no accessible language early in life performed poorly across tasks. Based on their findings, Mayberry and Lock argue that "the onset of language acquisition in early human development dramatically alters the capacity to learn language throughout life, independent of the sensory-motor form of the early experience" [73] (p. 369). In 2006, Boudreault and Mayberry [74] also found that the accuracy of grammaticality judgments in ASL among native and non-native deaf signers declined as a function of AoA, a finding corroborated by earlier research.

Researchers have also used language sample methodology to investigate the potential effects of language deprivation on deaf children. The results of these studies suggest that post-childhood L1 learners of ASL achieve many of the same linguistic milestones associated with infant L1 acquisition—relatively rapid acquisition of nouns and verbs combined in two-word utterances [75]—but that development seems to slow after this stage, with no evidence that the language of post-childhood L1 learners develops to the level of complex sentence structure [76,77]. As Mayberry and Kluender [68] note, these findings are in line with those of Curtiss [78], who noticed that Genie—a hearing child virtually deprived of language until the age of thirteen—could acquire new vocabulary and achieve basic word order patterns, but never succeeded in producing complex morphology or syntax. They explain:

> Late L1 learners exhibit initial rapid learning of lexical items in different grammatical categories and subsequent word combinations that are reminiscent of the acquisition of young child language learners, but at a faster pace. At the same time, however, accumulating evidence suggests that two major characteristics of language acquisition begun for the first time at age 12 or older are, first, rapid initial language acquisition, and second, a subsequent protracted period of limited language development, despite rich linguistic environments and language instruction. The language development of adolescent late L1 learners does not progress to complex morphosyntactic structures, but remains limited to simple structures [78] (p. 896).

In the last ten years, neuroimaging has been increasingly used as a tool to better understand the cognitive and linguistic effects of early language deprivation. When reviewing neuroimaging studies involving deaf participants with varying AoAs, it is important to bear in mind that children of deaf parents—who constitute the majority of native signers—are typically genetically deaf, while children of hearing parents are more often deaf due to a traumatic or medically-related cause (e.g., low birth weight, high fever, oxygen deprivation) that may impact cognitive processes. Even so, the results of recent neuroimaging research strongly suggest that neurolinguistic processing is adversely affected by delayed L1 acquisition.

In two different studies, Ferjan Ramirez et al. employed anatomically constrained magnetoencephalography (aMEG) to investigate the "neural underpinnings" of ASL in two deaf adolescents who did not receive sustained language input until they were around 14 years old. In the first study [79], they observed the brain activity of the two participants after two to three years of language, during which they were exposed to new sign vocabulary. The researchers found activation in different areas of the brain (i.e., the right superior parietal, anterior occipital, and dorsolateral prefrontal areas) than are typically activated in native ASL signers and hearing young adults learning ASL as a second language, namely a left frontotemporal pattern. In the second study [69], the

researchers examined the adolescents' neural activity after fifteen more months of language experience, and the participants' neural responses remained atypical for less familiar signed words; only for highly familiar signed words did responses become more concentrated in the left perisylvian language network. Mayberry et al. saw further evidence of similar neural patterns in two different aMEG studies, one with a deaf adult who had been using sign language for thirty years, but who was not exposed to language until young adulthood [80] and one with two deaf adolescents who were not exposed to language until their early teens [68]. Considered together with the results of an earlier fMRI study of 22 signers with varying AoAs [81], these studies suggest that cognitive processing of linguistic information is negatively affected by post-childhood L1 acquisition, even though the left hemisphere does retain some capacity to process highly familiar words.

3.2. The Bilingual Paradox

According to Petitto et al. [82], the 'bilingual paradox' is "the perception that very early bilingual language exposure is both good and bad for a child" (p. 489). It is important to address the bilingual paradox here because the research on language development presented above indicates that deaf children would benefit from early access to sign language as L1, yet some argue that learning sign language interferes with spoken language development.

One study that is frequently cited to support arguments against signing with deaf children is that conducted by Geers et al. [83], in which the researchers consulted a national database of cochlear implant users and analyzed their academic progress in elementary school in light of their duration of early sign language exposure. They found that the children with the least sign language exposure outperformed the other groups in speech recognition, spoken language, reading, and speech intelligibility. The researchers concluded that their study offered "the most compelling support yet available in CI literature for the benefits of spoken language input for promoting verbal development in children implanted by 3 years of age" (p. 1). However, as Hall et al. [33] explain, the study presents no evidence that there is a causal relationship between the use of signing and lower achievement, and it is quite possible that Geers et al.'s results "reflect a self-selection effect, where children who fare best in spoken language gravitate to oral-only environments while children who struggle in spoken language remain in or seek out sign language and manual communication environments" [33] (p. 6).

According to Knoors and Marschark [4], "there is no published evidence that sign language interferes with spoken language," either for deaf children who receive implants or for those do not (cf. [34], (p. 294)). Indeed, some compelling recent research indicates that the development of sign language as an L1 can support the development of a spoken language L2 [84,85]. In fact, Hall [61] suggests that the "brain changes associated with language deprivation may be misrepresented as sign language interfering with spoken language outcomes of cochlear implants" (p. 1) and thus warns that professionals not spread misinformation by advocating for preventing sign language exposure before implementation. Given the vast research support for avoiding language deprivation, and the very limited research support for withholding sign language, Bley-Vroman's [67] summary of our current understanding of L1 and L2 development seems apt:

> From a 21st century vantage point, it is difficult to recall that, at least through the 1950s, knowledge of a first language was believed to be an obstacle to the acquisition of a second language, rather than a help. Habitual first-language language patterns interfered, rather than helped, in the formation of new habits. The picture, rather, is that post-childhood language acquisition cannot proceed as in childhood, but that an existing L1 can provide a kind of scaffold on which to build L2 knowledge. In Chomsky's metaphor, adults approach a foreign language as "something strange." Building on this metaphor, we might say that learning one language makes learning the second less strange [67] (p. 914).

3.3. Cognitive Effects of Language Deprivation

Given the intimate relationship between thought and language, it is not surprising that lack of early access to language has also been associated with cognitive deficits in memory, executive function, and theory of mind. Importantly, the studies reviewed here involved deaf participants with no cognitive disabilities.

Early language deprivation has been associated not only with deficits in verbal memory [86], but also with deficits in non-verbal working memory (NVWM). Marshall et al. [87] designed a study to ascertain the effects of language deprivation on memory in which they controlled both for deafness itself and for language knowledge. By comparing hearing children with two groups of signing deaf children—native signers and non-native signers (those who experienced late acquisition)—on two NVWM tasks, they showed that there was no meaningful difference between the performance of the native signers and the hearing participants in NVWM function, but that the non-native signers performed less well than both of the other groups. According to the researchers, their results suggest that "whatever the language modality—spoken or signed—rich language experience from birth, and the good language skills that result from this early age of acquisition, play a critical role in the development of NVWM and in performance on NVWM tasks" (p. 1).

Deaf children are often described by practitioners and researchers as having difficulty with executive functions (EF) [88], and research has demonstrated that deaf children with and without cochlear implants struggle in this cognitive domain [89]. It is often assumed that deaf children's EF difficulties are associated with their auditory deprivation, but recent research strongly suggests that deaf children's EF difficulties are more likely a result of their lack of early language development. Research has consistently shown that bilinguals have more cognitive flexibility and control than monolinguals [11], and studies have suggested that EF skills and language are strongly correlated [90]. Until recently, however, cognitive science researchers have not been able to fully disentangle language skill and EF skill because most people with reduced linguistic skills also have associated cognitive deficits. Once again, deaf people offer researchers a unique opportunity because their reduced linguistic skills have a sensory, not a cognitive, basis. Based on this unique characteristic, Botting et al. [90] designed a study in which deaf (n = 108) and hearing (n = 125) 8 year-olds were assessed on both their language skills and a set of nonverbal EF tasks. Results showed that the deaf children performed significantly less well on EF tasks, even when controlling for nonverbal intelligence and processing speed. The researchers concluded that language "is key to EF performance" (p. 1689). Hall, Eigsti, Bortfeld, and Lillo-Martin [88] were also interested in disaggregating the effects of language deprivation from auditory deprivation on deaf children's EF skills. They used the BRIEF EF parent report questionnaire to assess behavioral problems in deaf native signers (n = 42) and a hearing sample (n = 45). The EF scores of the deaf native signers were not only age-appropriate, but similar to the scores of their hearing peers. The researchers argue that their findings "are most consistent with the language deprivation hypothesis" [88] (p. 1).

Theory of mind (ToM) is another area of weakness for deaf children [91,92]. Defined as the ability to "impute mental states to [oneself] and others" [93] (p. 515), it is often considered the basis of social cognition. As with the linguistic and social-emotional delays described above, however, research in the last two decades indicates that it is lack of access to language—rather than lack of access to audition—that causes delays in ToM development.

Courtin and colleagues have conducted several studies demonstrating a strong relationship between AoA and ToM development in deaf children. Comparing 155 deaf children between the ages of five and eight—grouped according to the hearing status of their parents—with 39 hearing children between four and six, Courtin [94] found that deaf children with deaf parents, but not deaf children with hearing parents, had ToM abilities comparable to those of hearing children. In a later study of second generation deaf children, deaf children with hearing parents, and hearing children, Courtin and Melot [95] found that early exposure to language, either signed or oral, led to better performance on two ToM tasks. The native signers in this study performed equally to the hearing children in an appearance-reality task and surpassed them on a false belief task. Similarly, Schick, De Villiers, and Hoffmeister [96] conducted a study of 176 deaf children between three and eight years old and found

that deaf children with deaf parents performed identically to hearing children on the ToM tasks, outperforming deaf children with hearing parents on a battery of tasks tapping false belief, knowledge states, and language skills. Furthermore, both vocabulary knowledge and the ability to comprehend syntactic structures were predictive of success on verbal and low-verbal ToM tasks. The strong connection between language skills and ToM development is corroborated by Courtin's [97] research on homesigners, which demonstrated that the use of homesigns is not sufficient to develop ToM. Further research suggests that it is not only the home language environment, but the language environment of school, that can influence ToM development. Tomasuolo, Valeri, Di Renzo, Pasquletti, and Voltera [98] compared six to 14 year-olds in a bilingual program (Italian Sign Language and Italian) and an oral program with one signing teaching assistant, and they found that the children who attended the bilingual school performed significantly better in tasks assessing lexical comprehension and ToM.

Taken together, the research on deaf children's ToM clearly indicates that language development is critically important for ToM development, but that ToM can be developed later in life even if children do not have early access to language. Some research suggests a critical period for ToM development at around ten years [97,99], but on the whole, it appears that the length of language exposure is more relevant to ToM development than AoA [91,98,100].

3.4. Social-Emotional Effects of Language Deprivation

While the linguistic and cognitive effects of lack of early language exposure have been thoroughly considered, the psycholinguistic turn also shines a light on the social-emotional effects. Not surprisingly, two predictors of sound mental health for deaf adolescents are early signed communication in the home and the ability of deaf teenagers to communicate effectively with their parents [4]. Furthermore, Allen, Letteri, Choi, and Dang [101] found a statistically significant relationship between early language development and the socialization of young deaf children, "including less impulsivity and greater social adaptation" (p. 352). There is also research to suggest that a strong Deaf identity, which often has its foundation in the use of a signed language within a Deaf community, leads to improved social relations, self-evaluation, academic achievement, and perceived family acceptance, as well as to higher levels of self-esteem, psychological well-being, and overall life-satisfaction [102].

Humphries et al. [59] explicate the dangers of not meeting the language needs of deaf children in terms of their psycho-social health, citing increases in depression, behavioral problems, juvenile delinquency, abuse, and lack of access to critical social, mental health, and educational services. Hall, Levin, and Anderson [103] go so far as to posit the existence of what they refer to as 'language deprivation syndrome,' which they argue may be present in deaf patients with severe language deprivation. Based on their review of thirty-five publications pertaining to the mental health of the deaf population, they argue that possible features of this syndrome may include "language dysfluency, fund of knowledge deficits, and disruptions in thinking, mood, and/or behavior" [103] (p. 761). The researchers admit that the empirical evidence in support of 'language deprivation syndrome' is very limited. Regardless, clear research evidence exists to suggest that early and effective communication with one's caregivers is a critically important component of a deaf person's mental health.

3.5. Ought Every Deaf Child Learn to Sign?

The mounting evidence regarding the linguistic, cognitive, and social-emotional effects of early language deprivation—coupled with what we now know about the benefits of bilingualism—has led many in the field to argue that all deaf children should have access to sign language as early in their lives as possible. This suggestion may seem nonsensical to those who have witnessed the listening and spoken language development of deaf children who have been successful with their implants; why, they might ask, would we compel hearing parents to learn sign language when their children can be successful without it? There are important cultural and philosophical answers to that question (see [104–107]), but the answer offered by the psycholinguistic turn is that the risks associated with

failure are simply too great. Success with cochlear implants is far from universal and, at present, there are no reliable means of predicting success. Of even greater concern, the diagnostic procedures available for assessing success cannot identify failure until children have potentially moved beyond the critical period for L1 development [4].

The LEAD-K campaign grew out of these concerns and is self-described as "a direct response to the alarming number of Deaf and hard of hearing children arriving at school without language" [108]. Researchers, educators, and pediatricians are also making social justice arguments about the need for parents to be informed about the risks associated with language deprivation. As Lillo-Martin [109] explains, "there are serious long-term effects of delayed access to linguistic input. There are crucial implications for the decisions to be made by hearing families who find out their child is deaf. Putting off input in sign language for later because "it can wait" won't do. Language deprivation has lifelong effects" (p. 925). A growing number of pediatricians are echoing these concerns [110,111].

One research team of specialists in education, linguistics, pediatric medicine, and psychology has joined forces in the past few years in a concerted effort to make sure that parents of deaf children are informed about critical issues that affect language and learning, including current understandings of how the brain's plasticity changes with age and what we know about the connection between language and cognition. The group has published in journals of medicine [112–116], linguistics [59], social services [117], speech language pathology [118], law [59], and ethics [119] and they work together on lobbying and legislative efforts, at all times arguing for the following set of recommendations:

> (1) Medical education must be updated and include linguistic considerations. Medical professionals should be trained in recent research about language acquisition, particularly with respect to the issues of linguistic deprivation for those children at risk, primarily deaf children. Medical schools, nursing schools, and schools of public health should include this information in their curriculum.
>
> (2) Delivery of medical care to deaf children should be coordinated across the relevant health professionals, including audiologists, psychologists, surgeons, and rehabilitation teams. These teams should stay in constant contact with and respond to input from parents, sign language teachers, and classroom teachers. This way, the risk of linguistic deprivation can be caught early and responded to appropriately.
>
> (3) Advice from medical professionals must be accurate and adequate. Parents of deaf newborns and newly deafened small children should be advised to teach their child sign language, regardless of whether the child also uses hearing aids or a CI. This means the entire family should learn sign language; and since the biological health of the language mechanism is at stake, this is properly a medical matter, so it is the medical profession's responsibility to tell the parents this [59] (pp. 36–37).

4. Literacy Acquisition in a Bimodal Bi/Multilingual Context

To the extent that deaf children are 'English Learners', approaches to their literacy development should be informed by research on the English literacy development of other bi/multilingual learners [120]. Furthermore, when the deaf child's L1 is a signed language—as is often the case—research on the relationship between language modality and literacy will be informative. It is thus important to consider not only the ways in which signed languages can serve as foundations for literacy, but also the ways in which educators can draw on children's home languages—whether they be spoken and/or signed—in order to support their continued literacy development.

4.1. Sign Language as a Foundation for Literacy

There is no debate around the argument that spoken language serves as a foundation for literacy development. There are obvious connections between the ability to understand and speak a language and the ability to read and write with it. Less obvious are the connections between L1 knowledge and

L2 literacy, particularly when the L1 and L2 make use of different communicative modalities. Nonetheless, the research suggests that there are important cognitive connections between these two forms of language knowledge. The focus in this section will be the current state of knowledge regarding the relationship between sign language knowledge—including the age of acquisition (AoA) of sign language—and deaf children's reading abilities.

It has long been recognized that deaf children's receptive and expressive ASL abilities are predictive of reading achievement [4,7,60,101,121–131]. Additionally, recent neuroimaging research has produced evidence that bilingualism, regardless of language modality, yields language-specific plasticity in the brain's left hemisphere that supports later literacy development [132–134]. Taken together, these research findings have led Humphries et al. [59] to argue that "the cognitive factor that correlates best to literacy among deaf children is a foundation in a first language" (p. 39). However, Knoors and Marchark [4] caution that, although knowledge of sign language appears to help deaf children develop their reading vocabularies in the early years of schooling, "after a period of growth,…stagnation occurs, and the reading skills tend to lag or asymptote among deaf children both with and without cochlear implants" (p. 297). If we are going to maximize the literacy outcomes for bi/multilingual deaf children, it will be important to understand both the mechanisms through which sign language supports literacy development and the reasons why so many signing deaf children do not become proficient readers and writers.

4.2. The Value of Shared Attention

Research suggests that it is not only the presence of ASL in the home that influences later literacy achievement, but the particular culturally-bound ways in which deaf parents interact with their children, particularly around books [101]. Research on the behaviors of deaf mothers, in particular, demonstrates that they are skilled at eliciting and sustaining their children's visual attention, especially during literacy activities [135]. Such behaviors call deaf children's attention to English print in a rich, communicative context, arguably providing deaf children with the kinds of quality input in L2 required for language transfer. Specifically, "the child's ability to alternate gaze between pictures and language input during joint storybook reading sets the basis for the acquisition of literacy skills" [125] (p. 11).

In a six-year case study, Bailes et al. [136] followed Ann, a deaf child with deaf parents, through three years of her early home life and three years of her life in preschool. Ann was of particular interest to the researchers because, upon entering preschool, her linguistic, cognitive, and literacy development were all on par with her hearing peers. As the researchers note, Ann was atypical by nature of the very fact that she showed typical development. It is also important to note that Ann had the advantage of growing up in a white, middle class family, with two college-educated, professional, ASL-English bilingual parents. Nonetheless, it is the characteristics of Ann's home language and literacy environment that are of particular interest here. The researchers found that Ann's parents "immersed her in meaning making" and "mediated her language acquisition and literacy learning through a shared visual language" [136] (p. 422). The researchers observed the ways in which Ann's parents used their own talk, in the form of ASL, to scaffold Ann's developing understanding of the things, people, and activities in her world. Furthermore, they guided her in making metalinguistic connections between her native language, ASL, and her emerging knowledge of written English. Essentially, Ann was raised with full access to language and communication, and her parents helped her to engage with printed English in much the same way that hearing parents engage their children with print: by helping them see connections between the print and what they already know about the world. "Because Ann and her parents could and did converse in a shared signed language," Bailes et al. conclude, "Ann developed in predictable ways for a child her age" [136] (p. 448).

4.3. The Critical Role of Linguistic Segmentation

It is widely acknowledged that phonological skills are highly correlated with reading ability (see [137]), and there is a substantial body of research that indicates a strong correlation between deaf children's phonological skills in English and their English reading skills [60,138–140]. However,

recent research suggests that deaf children's phonological knowledge may not be as significant a predictor of reading ability as was once assumed. For example, in their meta-analysis of the factors influencing reading skills in deaf children, Mayberry, del Giudice, and Liberman [141] found only a modest relationship between spoken language phonological awareness and reading ability. Similarly, a recent study by Clark et al. [142] separated out the effects of early language access, phonological skills, and written orthography on reading development to determine the extent to which the deaf child's ability to understand letter-sound relationships was critical to reading success. The study included 857 participants—hearing with dyslexia, hearing without dyslexia, deaf early signers, and deaf late signers—from four countries whose written languages have both shallow and deep orthographies (American English, Hebrew, German, and Turkish). The researchers found that the deaf participants, unlike the hearing dyslexic participants, did not demonstrate a phonological processing deficit. Instead, they argued that the "early language access theory" best explained their results" [142] (p. 128). Indeed, as Petitto et al. [143] explain, "if regularity of sound-to-letter mapping is required [for reading], then we should find 'deep' orthographies to be comparatively unreadable as compared to 'shallow' orthographies. This is not the case" (p. 9).

A growing body of research suggests that, in fact, "phonological awareness is not to be equated with decoding" [60] (p. 108). For example, Morford, Wilkinson, Villwock, Piñar, and Kroll [144] have demonstrated that deaf bilinguals are actually activating ASL phonological representations during their processing of written English words. Similar processing strategies have been observed by deaf bilinguals in Germany and the Netherlands [145]. The activation of signed L1 phonology during reading predicts, accurately, that deaf children who do well on phonological assessments in their signed L1 perform comparable to hearing children on reading assessments [60]. Conversely, deaf children who lack L1 skills should perform poorly on assessments of reading when compared to deaf native signers, which they do (see [60]).

Petitto et al. [7,143] offer a compelling theoretical explanation for the cognitive mechanisms underlying reading. Their hypothesis explains the data not only from the language and literacy studies referenced above, but from qualitative studies aimed at gaining an emic perspective on strategies used by deaf readers (see [146]) and from their own neuroimaging studies. It is a "myth," they argue, that "speech and sound are absolutely necessary to become a healthy and successful reader" [7] (p. 4). Instead, Petitto et al. posit the existence of visual sign phonology (VSP):

> The crucial link for early reading success is not between segmental sounds and print. Instead the human brain's capacity to segment, categorize, and discern linguistic patterning makes possible the capacity to segment all languages. This biological process includes the segmentation of languages on the hands in signed languages. Exposure to natural sign language in early life equally affords the child's discovery of silent segmental units in visual sign phonology (VSP) that can also facilitate segmental decoding of print [143] (p. 1).

In short, Petitto et al.'s [143] argument is that early access to sign language provides deaf children with the cognitive and linguistic tools necessary to segment written language into meaningful units for linguistic processing. Importantly, they argue that early access to spoken language provides hearing children with precisely the same sort of linguistic tools. Petitto et al. note that hearing readers, just like deaf readers, "use multiple pathways to successful reading" [7] (p. 9); in their view, the modality of those pathways is irrelevant. The researchers have hypothesized that the primary brain system for processing phonology, whether auditory or visual, is located in the superior temporal gyrus (STG), and their neuroimaging research has shown activation of this region when both hearing and deaf readers engage in phonological processing [143].

Further evidence that the STG is not modality-specific is offered by Kovelman and colleague's [147] recent analysis of the brain patterns of Chinese readers. Written Chinese differs from written English in that knowledge of morphological compounds is more salient to reading Chinese than knowledge of phonological compounds. Importantly, in Kovelman et al.'s study, the brain regions associated with auditory processing were not activated while Chinese speakers were reading, but the STG was. Kovelman et al. suggest, then, that what we've been referring to as "phonological

processing" may actually be a more general brain function that has both phonological and morphological components, depending on the salient characteristics of a given language.

The observation that the brain segments written languages according to the salient features of those languages—and so not necessarily by their auditory features—has important implications for the nature of the elusive 'bridge' between sign language and written language. To wit, Petitto et al. [143] acknowledge a common argument against their hypothesis, which they refer to as "the mapping problem" (p. 8). This is the argument that the lack of 1:1 correspondence between individual signs (e.g., /CAT/) and English letters (e.g., 'c'), renders VSP useless for deaf readers. Petitto et al. respond that the mapping problem argument "represents a failure to recognize that sound-to-letter (sound to print) mapping is not obligatory for reading acquisition—neither in English, nor is it universal to reading in other world languages" (pp. 8–9). "Our model," they explain, "corroborates the classic observation that the orthographic-semantic link may be a quicker pathway in activating a semantic representation as compared to the ortho-phono-semantic pathway" (p. 10). The findings of neuroimaging research, thus, support Humphries' [125] argument that "the persistent belief that reading a spoken language like English requires phonological coding has distracted deaf education from considering other pathways that might be logical for deaf children in learning to read" (p. 11).

4.4. Qualitative Similarity or Qualitative Dissimilarity?

We would like to briefly consider the implications of accepting both the critical period hypothesis [66] and the VSP [143] for the Qualitative Similarity Hypothesis (QSH) [148], or the hypothesis that the process of learning to read is qualitatively similar for deaf and hearing children. The critical period hypothesis, coupled with the VSP, would predict that learning to read would be qualitatively different for deaf children who did not receive adequate access to language during the critical period because those children would not have developed either the spoken language phonology or the visual sign phonology (VSP) necessary to map the salient segmented features of print to meaning. For deaf native signers—or deaf children who had received adequate access to spoken language through amplification—learning to read should be qualitatively similar for deaf and hearing children, though, so long as the QSH is taken to be modality-independent (see also [101]).

However, it seems there is another important difference between hearing children and at least some deaf children in regard to learning to read, and it brings us back to the argument that a great many deaf children are rightly conceptualized as 'English Learners.' Whether they be native signers, children from homes where a language other than English is spoken or signed, or children with hearing parents whose spoken language is not fully accessible, many deaf children who approach the task of learning to read are—at the very same time—approaching the task of learning a new language. As Koulidobrova [60] notes, for many deaf children, "the process of learning to read and write is more a task of learning a new language that is based on orthography, rather than a task of mapping print onto spoken language" (p. 112). Hearing people, as well, sometimes experience learning a new language based on orthography, when they learn to read ancient Greek or Aramaic, for example. But none would argue that learning a new language based on orthography is qualitatively the same experience as learning to read the language one speaks.

In short, our answer to the question of whether the QSH holds true is that it depends, in part, on the child's pre-literate language experience. For any deaf child, though, who is learning to read a language they do not already know, the process will be qualitatively different from that experienced by a child who already knows the language. We have long known that deaf readers are a diverse group, and their varied language experiences contribute in critically important ways to that diversity.

4.5. Bimodal Bi/Multilingual Reading Instruction

To the extent that deaf children are 'English Learners', their reading instruction should be appropriate to their bi/multilingual backgrounds. For children who come to school with no language, this will mean ensuring that they have access to an L1, most likely a signed language, so that literacy instruction can begin in earnest. For deaf children who come to school with an established L1 that is not spoken English, instructional approaches should take into account the linguistic resources

children bring to the table as they work to develop L2 literacy. This section will review the existing research on effective bimodal bi/multilingual practices for the teaching of reading, which—though limited—provides rich insights into quality literacy instruction for deaf children who are learning with more than one language.

On the whole, practices that value and support the acquisition of both (or all) languages are beneficial for bi/multilingual deaf readers [149]. Bagga-Gupta [150] notes that the teachers' ability to embrace the 'linguistic complexities' in a bimodal bilingual classroom is one of the hallmarks of effective instruction in that context. In her observations of bilingual teachers in Sweden, Bagga-Gupta explained that four different modalities were the focus of ongoing comparison, contrast, and analysis: visual Swedish Sign Language, oral Swedish, written Swedish, and fingerspelling. Similarly, Evans [151], in her study of the literacy strategies used by teachers and parents with three elementary school deaf children in a bilingual/bicultural environment, found that the teachers used ASL as the language of instruction, because it was the most accessible language, and "made constant translation and switching between the two languages an ongoing part of the school day" (p. 21). Howerton-Fox [152] also noted this practice of constant translation in her observations of two experienced bilingual teachers at a school for the deaf in Sweden. The term 'code-switching', which typically refers to the switching back and forth between two or more languages that is often exhibited by people who know more than one language, has also been used to refer to this teaching strategy. Andrews and Rusher [153] define this second use of codeswitching as "a purpose-driven instructional technique in which the teacher strategically changes from ASL to English print for purposes of vocabulary and reading comprehension" (p. 407).

Research suggests that fingerspelling, as a visual representation of written English, is also an important language mode to be included in instructional codeswitching [154]. By representing written English at the orthographic level, fingerspelling may allow deaf readers to bypass phonology in their acquisition of print literacy. Studies on the reading practices of deaf readers indicate that they may make use of fingerspelling in the decoding process to help them access English at the phoneme level. In a series of immediate recall experiments, Sehyr, Petrich, and Emmorey [155] found a strong link between fingerspelling and English phonology for deaf adults who were skilled readers. Furthermore, in a hierarchical multiple regression analysis of the relationships among age of ASL exposure, ASL fluency, fingerspelling skill, and reading fluency, Stone et al. [156] found that fingerspelling skill significantly predicted reading fluency. Based on their results, the authors argue that "the development of English reading proficiency may be facilitated through strengthening of the relationship among fingerspelling, sign language, and orthographic decoding en route to reading mastery" (p. 1).

Chaining is a bimodal bilingual literacy strategy often observed in bimodal bilingual contexts that makes extensive use of fingerspelling. Chaining is described by Humphries and MacDougal [157] as a technique "for emphasizing, highlighting, objectifying and generally calling attention to equivalencies between languages" (p. 90). In practice, chaining can take multiple forms. A teacher may fingerspell a word and then immediately point to that word in print. Alternatively, a teacher may point to a printed word, fingerspell the word, offer the sign equivalent, and then point back to the printed word. The chain must have at least two parts, but it can have four or more. Sometimes, chains can take the form of a similar technique, called a 'sandwich' [158], in which a word is signed, fingerspelled, and then signed again, or vice versa. Bagga-Gupta [150] also observed what they refer to as 'local-chaining' in their ethnographic analysis of the bilingual instructional interactions in Sweden, and Padden and Ramsey [127] observed teachers explicitly linking written words, fingerspelling, and signs together in their descriptive study of teaching practices in residential and public educational settings for bilingual deaf students. By engaging in continuous cross-lingual, cross-modal comparisons, teachers can continually "cultivate associations between signs and words" to help students develop their vocabulary across languages [129] (p. 194).

Constant comparison among languages is not limited to vocabulary support, however. In what they call 'cultivated transfer,' Hermans et al. [129] describe an intentional process on the part of teachers and speech language pathologists to make use of deaf children's knowledge of the grammar

of sign language to support their acquisition of spoken language, in written (and perhaps oral) form. Citing Cummins [159], they explain that automatic transfer will be limited to cognitive skills and conceptual knowledge. Therefore, if teachers want deaf children to learn the grammar of written language, they must explicitly teach that grammar in comparison to the grammar the children already know. As they note, the more proficient the children are in their signed language, the "more efficient" such techniques will be (p. 195). Research has clearly demonstrated that hearing bilingual children benefit from explicit grammar instruction [160,161], and recent research suggests that deaf bilingual children do, too. Specifically, Silvestri and Wang [146,162], in their grounded theory study of the factors that influence high reading achievement for profoundly deaf readers who do not use hearing technology, identified "explicit instruction in language patterns" as one of the most effective literacy strategies for deaf bilingual learners. The researchers note that the effectiveness of this approach was based largely on the extent to which the explicit instruction was both accessible and meaningful.

Shared Book Reading (SBR) is another instructional approach with demonstrated success in the bimodal bilingual context. In the SBR approach, the teacher and students interact in sign language during a shared reading of a printed text. Schleper [163] details fifteen components of SBR, drawn from observations of deaf parents reading with their deaf children. Among the fifteen are many of the elements of effective bimodal bilingual literacy instruction outlined above: the regular use of fingerspelling, repeated readings with a growing focus on the print, following the child's lead, making the implicit explicit, connecting the story to the child's experience, and maintaining attention. Wolsey, Clark, and Andrews [164] wanted to evaluate the applicability of this approach—which had previously focused on reading at home—to the classroom setting. They designed a quasi-experimental pre- and post-test study to analyze the effectiveness of a 10-week American Sign Language (ASL) and English bilingual SBR intervention. Using a combination of standardized and research-made instruments, the researchers found that participants showed improvements in receptive ASL skills, book reading, and the ability to draw and describe drawings in both languages. The researchers argue that growth in visual phonology was also evident in the students' drawings, as the number of alphabet letters and ASL handshapes included in their drawings increased.

Finally, pre-teaching of vocabulary, an instructional strategy with demonstrated success in hearing bilingual contexts, has also been shown to be effective in a deaf bilingual context. Cannon, Fredrink, and Easterbrooks [29] used single study design to measure the effectiveness of a DVD-based ASL storytelling curriculum with four deaf multilingual learners. Each DVD gave participants an opportunity to view the printed target vocabulary words along with the associated sign. The researchers found, however, that the DVDs alone were less effective for teaching vocabulary than when they were accompanied by explicit pre-teaching of the target vocabulary.

4.6. Bimodal Bi/Multilingual Writing Instruction

Research on effective writing instruction for bi/multilingual deaf students is fairly limited, much of it focused on Strategic and Interactive Writing Instruction (SIWI) [165]. SIWI is an approach to writing instruction specifically designed for deaf children. The approach draws upon the following evidence-based practices in writing instruction: explicit instruction in writing strategies and skills, focus on the writing process, writing for authentic purposes, learning from model texts, and interactive writing. SIWI also incorporates "the language zone," an interactive, meaning-focused space where deaf students who struggle to communicate their ideas in language can use multimodal resources—including gestures, role play, images, and videos—to make themselves understood [166]. Research has shown that SIWI helps students to do all of the following: write longer pieces with more complex syntax; improve their writing skills across multiple genres; transfer writing strategies across genres; develop positive writer identities; gain writing independence; improve their editing and revising skills; and develop their ASL skills [167–175].

A second, related, focus of research on the SIWI curriculum involves the sign language features that tend to appear in deaf children's writing—just as hearing bilinguals include L1 features in their L2 writing [176]—and the responsiveness to instruction of those features. In examining the writing

of 29 bilingual deaf adolescents, Wolbers, Graham, Dostal, and Bowers [177] found the following six categories of language transfer, in order of prevalence: unique glossing and substitution, adjectives, plurality and adverbs, topicalization, and conjunctions. They also found that all six categories responded similarly to instruction [178]. Based on their findings, the researchers argue that "bilingual literacy programs where there is an emphasis on implicit language competence and metalinguistic knowledge can support d/hh students in the development of written English" (p. 410).

5. Questions for Future Research

5.1. What Is the Nature of the 'Bridge' from Sign to Print?

The fact that "the cognitive and cross-linguistic mechanisms permitting the mapping of a visual-manual language onto a sound-based language have yet to be elucidated" [156] (p. 1) remains one of the most pressing problems in our field. Despite improvements in amplification technology, many children born deaf still do not have sufficient access to sound to use sound-based phonology as a reliable tool in cracking the code of print. From an ethical standpoint, too, parents should not feel compelled to choose surgery for their infants because it is the only way to ensure their child's academic success. It is thus incumbent on the field to identify, describe, and make effective use of the cross-modal mechanisms at play when profoundly deaf readers learn to read.

Neuroimaging research is promising in this regard. Specifically, Petitto et al.'s [143] work on visual sign phonology (VSP) and Kovelman et al.'s [147] recent work suggesting that the superior temporal gyrus (STG) is responsible for processing both phonological and morphological segmentation depending on the salient features of the given language, may give rise to new understandings not only about how sign language exposure influences brain development, but also about how native signers may best be helped to transfer their linguistic knowledge to the segmentation of print features required for reading. Continuing to look closely at how skilled deaf readers make sense of print will also be beneficial. Banner and Wang [179] lament a "lack of investigation into the reading strategies utilized by deaf readers in text comprehension" and a concurrent "overemphasis of most research on studying less skilled deaf readers" (p. 2). Further study of the eye movements of skilled deaf readers [180] may be fruitful, as well. Taken together, it is plausible that such research could flip the script, as it were, on the qualitative similarity hypothesis. As we learn more about the cognitive processing employed by skilled deaf readers, we may find that such research actually informs a more expansive understanding of the strategies used by hearing readers; the pathways to literacy may indeed be less modality-constrained than we once assumed.

Finally, further research is warranted into the question of whether or not written signed language (WSL) would be a useful instructional tool to help bilingual deaf children transfer their signed L1 skills to their written L2. The argument in favor of developing WSL and employing it as an instructional tool, based largely on Cummin's linguistic interdependence hypothesis [181], is that WSL will help deaf readers to develop phonological en/decoding skills in their signed L1 and that these skills will then be more readily transferable to phonological en/decoding skills in their written L2. Grushkin [182], a proponent of WSL as an instructional tool, argues further that, even if language segments beyond the phoneme (i.e., semantic, morphological, or syntactic) turn out to be more essential to deaf readers than phonemes, WSL would still be effective in helping to make the linguistic differences between signed and spoken language more readily apparent in a static format. Other researchers in the field argue that the use of WSL in literacy instruction for bilingual deaf students lacks a strong theoretical base [183–185]. As of yet, however, there is no research evidence available to answer the question that Grushkin himself poses: "Does the development of writing for signed languages hold any true benefits for Deaf people, as individuals and as a community?" [182] (p. 521).

5.2. Is the Bimodal Bilingual Approach Effective?

Before our discussion regarding much-needed research on the bilingual approach, it is important to heed Humphries et al.'s [59] reminder that "the questions of how to ensure access to language in the early years of life and how to educate deaf children are distinct" (p. 39). In other

words, those who insist that all deaf children should have early access to sign do not (necessarily) also insist that all deaf children should be educated in bilingual programs. These are important arguments to disentangle, as the two concepts are often conflated in the literature. For example, in Delana, Gentry, and Andrews [186], the authors include a table entitled, "Investigations that Present Empirical Data on ASL/English Bilingual *Methodology*" [italics added] (p. 75). However, of the 11 studies listed in the table, only two were inquiries into bilingual methodology; the other nine were inquiries into the relationship between depth of ASL knowledge and reading ability.

Merging these two questions is particularly dangerous given the extent to which bilingual education for deaf children continues to be a "hot button" topic [4] (p. 293). It is important to remember that one can reject deaf bilingual education as an approach without also rejecting the notion that all children should have unencumbered early access to language. By the same token, while evidence that native ASL users are better readers provides theoretical support for the viability of bilingual deaf education, it does not provide empirical support for the effectiveness of the model; it supports the argument that bilingual deaf education should be effective, not that it is. We emphasize this distinction not because we do not believe in the value of bilingual education for deaf children, but because we do believe in its value and bemoan the lack of evidence in its favor. Bilingual deaf education programs have been under-studied, and there is very little research regarding how, or if, they lead to successful outcomes for deaf children.

Mixed results on the effectiveness of bilingual deaf education have come out of Sweden, where the national schools for the deaf adopted a bilingual approach over 35 years ago. In 1998, it was found that the first experimental group of children educated via a bilingual approach attained reading levels corresponding to those of their hearing same-age peers [187]. Ten years later, national exam results indicated that 66% of bilingually-educated deaf students passed the Swedish test (compared with 96.5% of hearing students), while 59% of deaf students passed the English test (compared with 94.3% of hearing students) [188]. These results were disconcerting to the Swedish government, and so it initiated a study to compare the achievement of deaf and hearing students across different deaf education contexts [187]. In Sweden, the majority of deaf children are in mainstream environments; only about 10% are educated in the five national bilingual schools [189]. This national study found that a large disparity existed between deaf and hearing students regardless of educational placement. A similar disparity was found by Rydberg, Gellerstedt, and Danermark [190] across educational contexts. Svartholm [187], however, points to a different data set to argue for the positive impact of bilingual deaf education: the marked increase in the number of signing deaf adults attending Swedish universities. In 1993–1994, there were 48 students using sign language interpreters in higher education settings; in 2003, that number had tripled to 149 [187]. The number remained constant for at least the next ten years, with 141 signing deaf students enrolled in Swedish universities in 2013 [191].

Denmark also transitioned to a bilingual approach in its national schools for the deaf in the mid-1980s. However, a shift back to focusing on spoken language for deaf children began in the mid-2000s, motivated largely by improvements in cochlear implant technology, even though very little empirical data existed on the effectiveness of the bilingual programs. Recently, Dammeyer and Marschark [192] attempted to redress this lack of data by conducting a study of 408 deaf people who attended school either before or during the period of bilingual deaf education in Denmark. They found that deaf people who received a bilingual education made significantly greater educational gains than the deaf people educated before the introduction of bilingual education. However, "while the percentage of more highly educated deaf people increased 11% (from 22.9% to 34.2%), the percentage of more highly educated hearing people also increased 11% (from 41.9% to 53.2%)" (p. 397). As a result, in comparison to the hearing population, the deaf population did not make any gains during the period of bilingual education.

Limited research on the literacy gains of children in bilingual deaf programs in the United States has also had mixed results. Delana et al. [186] evaluated the reading comprehension gains of 25 deaf students enrolled in a bilingual program within a public school over the course of 7 years. They found that all but a few participants made reading progress of approximately one grade equivalency per

year of the study, although only 25% of the students were reading on grade level. Similarly, Nover, Andrews, Baker, Everhart, and Bradford [193] analyzed the reading comprehension scores of eight to 12-year-olds enrolled in a bilingual program and found that their scores were significantly above the national norms for deaf children. Finally, a study of seven deaf children enrolled in a bilingual program in Texas found that they all finished first grade reading at grade level [194]. However, as the researchers note "the real test … [would] be the children's reading levels in elementary school" (p. 25). To the best of our knowledge, no further studies were published on these children.

5.3. Who Are Deaf Bimodal Bi/Multicultural Learners?

Cannon et al. [26] make clear that "research related to DMLs (deaf multilingual learners) is severely lacking" (p. 14). First of all, they explain, we do not even have a good sense of who the deaf multilingual children in this country are because the data currently being collected are not specific enough. While districts have to report on the number of 'English Learners' they are serving, they do not have to report on how many of those children have disabilities. Furthermore, the Gallaudet Research Institute [3] survey only asks what language is spoken at home. Cannon et al. urge the Office of Research Support and International Affairs to ask the much more specific questions recommended in the English Learner Toolkit published by the National Clearinghouse for English Language Acquisition [195]: "Which language did your child learn first? Which language does your child use most frequently at home? Which language do you most frequently speak to your child? In what language would you prefer to get information from the school?" (p. 12). Including such questions in the Annual Survey, alongside questions pertaining to deafness, would offer a much clearer picture of who the multilingual deaf children are in the United States.

Beyond that, Cannon and Guardino [28] call for more descriptive case studies focused on multilingual deaf children and their families to "provide a foundation for informing researchers what type of background and needs this unique population exhibits" (p. 94). Such studies should include, they argue, descriptions of the metacognitive strategies multilingual deaf children employ while making sense of text. Longitudinal studies, as well, on how deaf children acquire multiple languages and the factors that influence their learning would be helpful. We simply do not know what the effects are of multiple languages being used across settings on a child's language learning and literacy development [26]. Finally, Cannon et al. [28] strongly encourage researchers in the field to begin developing the evidence-base of effective strategies for working with multilingual deaf children, particularly through single subject design, given the low-incidence of the population. Specifically, their review of the literature revealed four promising interventions for use with this population that are in need of further research: guided repeated reading, visual phonics, pre-teaching vocabulary, and peer-tutoring.

5.4. How Can Hearing Parents Become Proficient Signers?

At present, only about 23% of families regularly sign with their deaf children [3]. A persistent argument against the use of sign with all deaf infants is that hearing parents cannot or will not learn sign language, at least not to the level of proficiency necessary to serve as a foundation for later literacy development [4]. Koulidobrova et al. [60] argue that more resources need to be allocated to parents who want to learn ASL and that more research needs to be done on how families can be helped to make the "shift to more visually based forms of communication" (p. 112). Humphries et al. [59] argue that government resources should be used to fund sign language instruction for families of deaf children, which should continue until at least age 12. They also call for more research on adult second language learning in a second modality so that we can improve the effectiveness of sign language instruction for hearing adults. In a similar vein, Hall et al. [33] argue for research into the effectiveness of the parent-infant services currently being offered to families of deaf children:

> For families who choose not to risk language deprivation by exposing their child to a sign language, it is critical to evaluate whether the professionals working with the family are equipped to offer support in sign language acquisition. Do they have native or near-native

> proficiency in the signed language used in the region? Do they have training and expertise to support sign language acquisition (i.e., deep understanding of the linguistic structures of the relevant signed language and the methods for evaluating and promoting acquisition of these structures)? If not, are they able to refer the family to people who have such expertise? If they are hearing, do they know and seek guidance from DHH adults who have lived experience of being DHH? (pp. 17–18).

As a possible alternative to expecting hearing parents to become fluent signers, Knoors and Marschark [4] suggest that it might be sufficient for parents to learn how to use simultaneous communication (Sim-Com). Although the researchers acknowledge that this is another "hot button" issue, they note the lack of research evidence for or against it. Further research into the advantages and disadvantages of hearing parents using Sim-Com with deaf children might be instructive in this regard, particularly with parents who would otherwise be unwilling to sign, and particularly with children who have enough auditory access that the signs may act as a support to spoken language development.

5.5. How Can Deaf Ontologies and Epistemologies Improve Deaf Education?

We would also like to make a call for research that takes more deeply into account the lived experiences, ways of being, and ways of knowing of deaf people. There is a lack of such research in our field, and there is much of value to be gained from it.

> Aspects of the Deaf episteme, not caused by deafness but by Deafhood, have a positive impact on how deaf individuals learn, resist audism, stay healthy, and navigate the world [196] (p. 486).

> The vast knowledge generated by the collective experience of deaf people, all of whom have varying degrees of hearing and speaking capabilities, has the potential to provide the truth needed to achieve improved educational success for all deaf children [1] (p. 476).

> Studies of the everyday interactions within Deaf families can provide insight into the learning potential of deaf children when they have the same advantages at birth as hearing, speaking children, that is, when caregivers have the linguistic and cultural knowledge to fulfill the visual language needs of their deaf infant from the moment they are born [136] (p. 447).

> "A repertoire of teacher knowledge, skills, and tools that primarily originate in the Deaf community can infuse and enrich educational practice with the outcome of life-long learning, equity and social justice" [125] (p. 8).

6. Concluding Thoughts

To the extent that an individual deaf child is an 'English Learner' (according to the government's definition), it seems clear that child is entitled to at least the same supports, inadequate as they may be, that are mandated for hearing 'English Learners'. As Koulidobrova et al. [60] explain, however, that level of support is not currently being offered:

> Efforts on behalf of the US government and local educational agencies to improve outcomes for ELs are well documented. However, one type of student population has over the years not been included in policy discussions and therefore remains unaffected by the reforms and changes in the educational infrastructure that have otherwise—more or less positively—affected lives of school-aged ELs. These are users of American Sign Language (ASL) who are learning English. Literature has suggested that over 500,000 individuals use ASL as their L1 in the US, yet no data are currently available at the state or federal level that identifies children who fit such a profile as ELs (p. 100).

It also seems clear, though, that the task of learning a spoken/written L2 by a child with a signed L1 is qualitatively different from the task of learning a spoken/written L2 by a child with a

spoken/written L1. Singleton, Supalla, Litchfield, and Schley [197] acknowledge this difference, arguing that we should not think of deaf children as 'English language learners', but as learners of 'English as a spoken language.' In this argument, they are not emphasizing that acquiring speech skills is what differentiates the language learning task, but that the structural forms of spoken and signed languages differ in important ways that will require teachers of the deaf to use "instructional techniques beyond 'ESL methodologies'" (p. 21) to allow students to build semantic, morphological, and syntactic bridges between the two languages.

Finally, we would feel remiss if we did not address the role of ableism in all conversations about the nature of deaf children's learning. The dominate deficit model in deaf education perpetuates the fallacy that hearing people are superior to deaf people, and associates deafness with "ill-health, incapacity, and dependence" [107] (p. 88). This perspective leads to the generalized assumption that deaf people's under-achievement in education is a result of deficits within the children themselves, rather than a result of the 'disabling pedagogy' to which they are routinely subjected [198] (p. 91). We acknowledge that the ableist perspective is very often a subconscious mindset. We are not saying that individuals intentionally perform disabling pedagogies out of malice; it is much more likely that they do so out of charity. But the results are the same.

We can and must do better by deaf children. It is not enough, nor is it ethically responsible, to hope that hearing technologies will improve to the point that the nature of 'deaf education' becomes a non-issue. "Deafness is a part of, not apart from, humanity" [199]; we are not comfortable with a research agenda that, explicitly or implicitly, works toward the eradication of deafness. In the words of Humphries [105], one of the most resounding Deaf voices in our field: "Large numbers of deaf children continue to be harmed and isolated until they are old enough to take charge of their own lives. We cannot morally or ethically continue to leave the lives of these children to others who imagine futures for them that are based on hope. The other side of hope is risk" (p. 71).

Author Contributions: Conceptualization, A.H-F.; Methodology, A.H-F. and J.L.F.; Investigation, A.H-F. and J.L.F.; Writing-Original Draft Preparation, A.H-F.; Writing-Review & Editing, A.H-F. and J.L.F.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Holcomb, T.K. Deaf Epistemology: The Deaf Way of Knowing. *Am. Ann. Deaf* **2010**, *154*, 471–478.
2. García, O. Emergent Bilinguals and TESOL: What's in a Name? *Tesol Q.* **2009**, *43*, 322–326.
3. Gallaudet Research Institute. *2013–14 Regional and National Summary*; Gallaudet Research Institute: Washington, DC, USA, 2014.
4. Knoors, H.; Marschark, M. Language planning for the 21st century: Revisiting bilingual language policy for deaf children. *J. Deaf Stud. Deaf Educ.* **2012**, *17*, 291–305.
5. Sandler, W.; Lillo-Martin, D. *Sign Language and Linguistic Universals*; Cambridge University Press: Cambridge, UK, 2006.
6. Benetti, S.; van Ackeren, M.J.; Rabini, G.; Zonca, J.; Foa, V.; Baruffaldi, F.; Rezk, M.; Pavani, F.; Rossion, B.; Collignon, O. Functional selectivity for face processing in the temporal voice area of early deaf individuals. *Proc. Natl. Acad. Sci. USA* **2017**, *114*, E6437–E6446.
7. Petitto, L.-A. The Impact of Minimal Language Experience on Children During Sensitive Periods of Brain and Early Language Development: Myths Debunked and New Policy Implications. In *The Science of Learning*; Kuhl, P., Ed.; OECD: Paris; in press.
8. García, O. Education, Multilingualism and Translanguaging in the 21st Century. In *Multilingual Education for Social Justice: Globalising the L.*; Mohanty, A., Panda, M., Phillipson, R., Skutnabb-Kangas, T., Eds.; Orient Blackswan: New Delhi, India, 2009; pp. 128–145.
9. Herbert, M.; Pires, A. Bilingualism and bimodal code-blending among deaf ASL-English bilinguals. *Proc. Linguist. Soc. Am.* **2017**, doi:10.3765/plsa.v2i0.4054.
10. Berent, G.P. Sign Language—Spoken Language Bilingualism: Code Mixing and Mode Mixing by ASL-English Bilinguals. In *The Handbook of Bilingualism*; Blackwell: Malden, MA, USA; 2006.
11. Costa, A.; Sebastián-Gallés, N. How does the bilingual experience sculpt the brain? *Neuroscience* **2014**, *15*, 336–345.

12. Bialystok, E.; Craik, F.I.M.; Green, D.W.; Gollan, T.H. Bilingual minds. *Psychol. Sci. Public Interest* **2009**, *10*, 89–129.
13. Jasińska, K.K.; Petitto, L.-A. How age of bilingual exposure can change the neural systems for language in the developing brain: A functional near infrared spectroscopy investigation of syntactic processing in monolingual and bilingual children. *Dev. Cogn. Neurosci.* **2013**, *6*, 87–101.
14. Kushalnagar, P.; Hannay, H.J.; Hernandez, A.E. Bilingualism and Attention: A Study of Balanced and Unbalanced Bilingual Deaf Users of American Sign Language and English. *J. Deaf. Stud. Deaf. Educ.* **2010**, *15*, 263–273.
15. Klatter-Folmer, J.; van Hout, R.; Kolen, E.; Verhoeven, L. Language Development in Deaf Children's Interactions With Deaf and Hearing Adults: A Dutch Longitudinal Study. *J. Deaf Stud. Deaf Educ.* **2005**, *11*, 238–251.
16. Pizzo, L. d/Deaf and Hard of Hearing Multilingual Learners: The Development of Communication and Language. *Am. Ann. Deaf* **2016**, *161*, 17–32.
17. Gallaudet Research Institute. *1999–2000 Regional and National Summary*; Gallaudet Research Institute: Washington, DC, USA, 2001.
18. Compton, S. American Sign Language as a heritage language. In *Handbook of Heritage, Community, and Native American Languages in the United States: Research, Policy, and Educational Practice*; Wiley, T.G., Kreeft Peyton, J., Christian, D., Moore, S.C., Liu, N., Eds.; Routledge: New York, NY, USA, 2014; pp. 272–283.
19. Paul, P.V. d/Deaf and Hard of Hearing Learners: DML, DLL, ELL, EL, ESL, …, or Culturally and Linguistically Diverse. *Am. Ann. Deaf* **2016**, *161*, 3–7.
20. Gerner de Garcia, B.A. Literacy for Latino Deaf and Hard of Hearing English Language Learners: Building the Knowledge Base. In Proceedings of the First Wednesdays Research Seminar Series; Gallaudet University: Washington, D.C.:; 2005.
21. Gerner de Garcia, B.A. ESL Applications for Hispanic Deaf Students. *Biling. Res. J.* **1995**, *19*, 453–467.
22. Grant, J. Hearing-Impaired Children from Mexican-American Homes. *Volta Rev.* **1993**, *95*, 131–135.
23. Sacks, C.; Shay, S.; Repplinger, L.; Leffel, K.R.; Sapolich, S.G.; Suskind, E.; Tannenbaum, S.; Suskind, D. Pilot testing of a parent-directed intervention (Project ASPIRE) for underserved children who are deaf or hard of hearing. *Child Lang. Teach. Ther.* **2014**, *30*, 91–102.
24. Wang, Q.; Andrews, J.F.; Liu, H.T.; Liu, C.J. Case Studies of Multilingual/Multicultural Asian Deaf Adults: Strategies for Success. *Am. Ann. Deaf* **2016**, *161*, 67–88.
25. Baker, S.; Scott, J.A. Sociocutural and Academic Considerations for School-Age d/Deaf and Hard of Hearing Multlingual Learners: A Case Study of a Deaf Latina. *Am. Ann. Deaf* **2016**, *161*, 43–55.
26. Cannon, J.E.; Guardino, C.; Gallimore, E. A New Kind of Heterogeneity: What We Can Learn from d/Deaf and Hard of Hearing Multilingual Learners. *Am. Ann. Deaf* **2016**, *161*, 8–16.
27. Lucas, T.; Villegas, A.M. Preparing Linguistically Responsive Teachers: Laying the Foundation in Preservice Teacher Education. *Theory Pract.* **2013**, *52*, 98–109.
28. Cannon, J.E.; Guardino, C. Literacy Strategies for Deaf/Hard-of-Hearing English Language Learners: Where Do We Begin? *Deaf. Educ. Int.* **2012**, *14*, 78–99.
29. Cannon, J.E.; Fredrick, L.D.; Easterbrooks, S.R. Vocabulary instruction through books read in American sign language for English-language learners with hearing loss. *Commun. Disord. Q.* **2010**, *31*, 98–112.
30. Guardino, C.; Cannon, J.E.; Eberst, K. Building the Evidence-Base of Effective Reading Strategies to Use With Deaf English-Language Learners. *Commun. Disord. Q.* **2014**, *35*, 59–73.
31. Bunta, F.; Douglas, M.; Dickson, H.; Cantu, A.; Wickesberg, J.; Gifford, R.H. Dual language versus English-only support for bilingual children with hearing loss who use cochlear implants and hearing aids. *Int. J. Lang. Commun. Disord.* **2016**, 1–13.
32. Bunta, F.; Douglas, M. The Effects of Dual-Language Support on the Language Skills of Bilingual Children With Hearing Loss Who Use Listening Devices Relative to Their Monolingual Peers. *Lang. Speech. Hear. Serv. Sch.* **2013**, *44*, 281–290.
33. Hall, M.L.; Hall, W.C.; Caselli, N.K. Deaf children need language, not (just) speech. *First Lang.* **2019**, doi:10.1177/0142723719834102.
34. American Cochlear Implant Alliance. *Position Paper: Supporting Parent Choice for Children Who Are Deaf and Hard of Hearing*; American Cochlear Implant Alliance: McLEAN, VA, USA, 2018.
35. Hart, B.; Risley, T.R. The Early Catastrophe: The 30 Million Word Gap by Age 3. *Am. Educ.* **1995**, *27*, 4–9.
36. John, L.K.; Loewenstein, G.; Prelec, D. Beyond the 30-Million-Word Gap: Children's Conversational Exposure Is Associated With Language-Related Brain Function. *Psychol. Sci.* **2018**, *29*, 700–710.
37. Hoff-Ginsberg, E. Function and structure in maternal speech: Their relation to the child's development of syntax. *Dev. Psychol.* **1986**, *22*, 155–163.
38. Hoff, E.; Naigles, L. How children use input to acquire a lexicon. *Child Dev.* **2002**, *73*, 418–433.

39. Hirsh-Pasek, K.; Adamson, L.B.; Bakeman, R.; Owen, M.T.; Golinkoff, R.M.; Pace, A.; Yust, P.K.S.; Suma, K. The Contribution of Early Communication Quality to Low-Income Children's Language Success. *Psychol. Sci.* **2015**, *26*, 1071–1083.
40. Rowe, M. A Longitudinal Investigation of the Role of Quantity and Quality of Child-Directed Speech in Vocabulary Development. *Child Dev.* **2012**, *83*, 1762–1774.
41. Vohr, B.R.; Topol, D.; Watson, V.; St Pierre, L.; Tucker, R. The importance of language in the home for school-age children with permanent hearing loss. *Acta Paediatr.* **2014**, *103*, 62–69.
42. VanDam, M.; Ambrose, S.E.; Moeller, M.P. Quantity of Parental Language in the Home Environments of Hard-of-Hearing 2-Year-Olds. *J. Deaf Stud. Deaf Educ.* **2012**, *17*, 402–420.
43. Ambrose, S.E.; VanDam, M.; Moeller, M.P. Linguistic Input, Electronic Media, and Communication Outcomes of Toddlers with Hearing Loss. *Ear Hear.* **2014**, *35*, 139.
44. Aragon, M.; Yoshinaga-Itano, C. Using Language ENvironment Analysis to Improve Outcomes for Children Who Are Deaf or Hard of Hearing. *Semin. Speech Lang.* **2012**, *33*, 340–353.
45. Rufsvold, R.; Wang, Y.; Hartman, M.C.; Arora, S.B.; Smolen, E.R. The Impact of Language Input on Deaf and Hard of Hearing Preschool Children Who Use Listening and Spoken Language. *Am. Ann. Deaf* **2018**, *163*, 35–60.
46. Ambrose, S.E.; Walker, E.A.; Unflat-Berry, L.M.; Oleson, J.J.; Moeller, M.P. Quantity and Quality of Caregivers' Linguistic Input to 18-Month and 3-Year-Old Children Who Are Hard of Hearing. *Ear Hear.* **2015**, *36*, 48S–59S.
47. Tomblin, J.B.; Oleson, J.; Ambrose, S.E.; Walker, E.A.; Moeller, M.P. Early Literacy Predictors and Second-Grade Outcomes in Children Who Are Hard of Hearing. *Child Dev.* **2018**, doi:10.1111/cdev.13158.
48. Henner, J.; Caldwell-Harris, C.L.; Novogrodsky, R.; Hoffmeister, R.J. American sign language syntax and analogical reasoning skills are influenced by early acquisition and age of entry to signing schools for the deaf. *Front. Psychol.* **2016**, *7*, 1–14.
49. Novogrodsky, R.; Henner, J.; Caldwell-Harris, C.L.; Hoffmeister, R.J. The Development of Sensitivity to Grammatical Violations in American Sign Language: Native Versus Nonnative Signers. *Lang. Learn.* **2017**, *67*, 791–818.
50. Farran, L.K.; Lederberg, A.R.; Jackson, L.A. Maternal input and lexical development: The case of deaf preschoolers. *Int. J. Lang. Commun. Disord.* **2009**, *44*, 145–163.
51. Connor, C.M.; Craig, H.K.; Raudenbush, S.W.; Heavner, K.; Zwolan, T.A. The Age at Which Young Deaf Children Receive Cochlear Implants and Their Vocabulary and Speech-Production Growth: Is There an Added Value for Early Implantation? *Ear Hear.* **2006**, *27*, 628–644.
52. Niparko, J.K.; Tobey, E.A.; Thal, D.J.; Eisenberg, L.S.; Wang, N.-Y.; Quittner, A.L. Spoken language development in children following cochlear implantation. *JAMA* **2010**, *303*, 1498–1506.
53. Fagan, M.K.; Pisoni, D.B. Hearing Experience and Receptive Vocabulary Development in Deaf Children With Cochlear Implants. *J. Deaf Stud. Deaf Educ.* **2010**, *15*, 149–161.
54. Anderson, I.; Weichbold, V.; D'Haese, P.S.; Szuchnik, J.; Quevedo, M.S.; Martin, J.; Dieler, W.S.; Phillips, L. Cochlear implantation in children under the age of two—What do the outcomes show us? *Int. J. Pediatr. Otorhinolaryngol.* **2004**, *68*, 425–431.
55. Valencia, D.M.; Rimell, F.L.; Friedman, B.J.; Oblander, M.R.; Helmbrecht, J. Cochlear implantation in infants less than 12 months of age. *Int. J. Pediatr. Otorhinolaryngol.* **2008**, *72*, 767–773.
56. Mauldin, L. Don't look at it as a miracle cure: Contested notions of success and failure in family narratives of pediatric cochlear implantation. *Soc. Sci. Med.* **2019**, *228*, 117–125.
57. Mayer, C.; Trezek, B.J. Literacy outcomes in deaf students with cochlear implants: Current state of the knowledge. *J. Deaf Stud. Deaf Educ.* **2018**, *23*, 1–16.
58. Pisoni, S.; Conway, C.; Kronenberger, W.G.; Horn, D.; Karpicke, J.; Henning, S. Efficacy and Effectiveness of Cochlear Impants in Deaf Children. In *Deaf Cognition: Foundations and Outcomes*; Oxford University Press: New York, NY, USA, 2008; pp. 52–101.
59. Humphries, T.; Kushalnagar, P.; Mathur, G.; Napoli, D.J.; Padden, C.; Rathmann, C. Ensuring language acquisition for deaf children: What linguists can do. *Language* **2014**, *90*, e31–e52.
60. Koulidobrova, E.; Kuntze, M.; Dostal, H.M. If you use ASL, should you study ESL? Limitations of a modality-b(i)ased policy. *Language* **2018**, *94*, 99–126.
61. Hall, W.C. What You Don't Know Can Hurt You: The Risk of Language Deprivation by Impairing Sign Language Development in Deaf Children. *Matern. Child Health J.* **2017**, *21*, 961–965.
62. Humphries, T.; Kushalnagar, R.; Mathur, G.; Napoli, D.J.; Padden, C.; Rathmann, C.; Smith, S.R. The right to language. *J. Law Med. Ethics* **2013**, *41*, 872–884.
63. Hermann-Shores, P. Enabling Pedagogy and Adragony for 21st-Century Sign Language Users and Learners. *Am. Ann. Deaf* **2017**, *162*, 360–364.

64. Grosjean, F. The Bilingual's Language Modes. In *One Mind, Two Languages: Bilingual Language Processing*; Wiley-Blackwell: Malden, MA, USA, 2001; pp. 37–66.
65. United Nations Division for Social Policy and Development Convention on the Rights of Persons with Disabilities (CRPD). Available online: https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities/convention-on-the-rights-of-persons-with-disabilities-2.html (accessed on 5 January 2019).
66. Lenneberg, E. *Biological Foundations of Language*; Wiley: New York, NY, USA, 1967.
67. Bley-Vroman, R. Language as something strange. *Biling. Lang. Cogn.* **2018**, *21*, 913–914.
68. Mayberry, R.I.; Kluender, R. Rethinking the critical period for language: New insights into an old question from American Sign Language. *Biling. Lang. Cogn.* **2018**, *21*, 886–905.
69. Ferjan Ramirez, N.; Leonard, M.K.; Davenport, T.S.; Torres, C.; Halgren, E.; Mayberry, R.I. Neural Language Processing in Adolescent First-Language Learners: Longitudinal Case Studies in American Sign Language. *Cereb. Cortex* **2014**, *26*, 1015–1026.
70. Mayberry, R.I.; Fischer, S.D. Looking through phonological shape to lexical meaning: The bottleneck of nonnative sign language processing. *Mem. Cogn.* **1989**, *17*, 740–754.
71. Mayberry, R.I.; Eichen, E.B. The long-lasting advantage of learning sign language in childhood: Another look at the critical period for language acquisition. *J. Mem. Lang.* **1991**, *30*, 486–512.
72. Mayberry, R.I. First-Language Acquisition After Childhood Differs From Second-Language Acquisition. *J.; Speechlang. Hear. Res.* **1993**, *36*, 1258–1270.
73. Mayberry, R.I.; Lock, E. Age constraints on first versus second language acquisition: Evidence for linguistic plasticity and epigenesis. *Brain Lang.* **2003**, *87*, 369–384.
74. Boudreault, P.; Mayberry, R.I. Grammatical processing in American Sign Language: Age of first-language acquisition effects in relation to syntactic structure. *Lang. Cogn. Process.* **2006**, *21*, 608–635.
75. Berk, S.; Lillo-Martin, D. The two-word stage: Motivated by linguistic or cognitive constraints? *Cogn. Psychol.* **2012**, *65*, 118–140.
76. Morford, J.P.; Carlson, M.L. Sign Perception and Recognition in Non-Native Signers of ASL. *Lang. Learn. Dev.* **2012**, *7*, 149–168.
77. Woll, B. The consequences of very late exposure to BSL as an L1. *Biling. Lang. Cogn.* **2018**, *21*, 936–937.
78. Curtiss, S. *Genie: A Psycholinguistic Study of a Modern—Day "Wild Child"*; Academic Press: New York, NY, USA, 1977.
79. Ferjan Ramirez, N.; Leonard, M.K.; Torres, C.; Hatrak, M.; Halgren, E.; Mayberry, R.I. Neural Language Processing in Adolescent First-Language Learners. *Cereb. Cortex* **2013**, *24*, 2772–2783.
80. Mayberry, R.I.; Davenport, T.S.; Roth, A.; Halgren, E. Neurolinguistic Processing When the Brain Matures Without Language. *Cortex* **2018**, *99*, 390–403.
81. Mayberry, R.I.; Chen, J.-K.; Witcher, P.; Klein, D. Age of acquisition effects on the functional organization of language in the adult brain. *Brain Lang.* **2011**, *119*, 16–29.
82. Petitto, L.-A.; Katerelos, M.; Levy, B.G.; Gauna, K.; Tetreault, K.; Ferraro, V. Bilingual signed and spoken language acquisition from birth: Implications for the mechanisms underlying early bilingual language acquisition. *J. Child Lang.* **2001**, *28*, 453–496.
83. Geers, A.E.; Mitchell, C.M.; Warner-Czyz, A.; Wang, N.-Y.; Eisenberg, L.S. Early Sign Language Exposure and Cochlear Implantation Benefits. *Pediatrics* **2017**, *140*, 1–9.
84. Yoshinaga-Itano, C.; Baca, R.L.; Sedey, A.L. Describing the Trajectory of Language Development in the Presence of Severe-to-Profound Hearing Loss. *Otol. Neurotol.* **2010**, *31*, 1268–1274.
85. Tang, G.; Lam, S.; Yiu, K.C. Language Development of Deaf Children in a Sign Bilingual and Co-enrollment Environment. In *Bilingualism and Bilingual Deaf Education*; Oxford University Press: New York, NY, USA, 2014; pp. 313–341.
86. Rönnberg, J. Working Memory, Neuroscience, and Language: Evidence from Deaf and Hard-of-Hearing Individuals. In *The Oxford Handbook of Deaf Studies, Language, and Education*, 2nd ed.; Oxford University Press: London, UK, 2011; Volume 1.
87. Marshall, C.; Jones, A.C.; Denmark, T.; Mason, K.; Atkinson, J.; Botting, N.; Morgan, G. Deaf children's non-verbal working memory is impacted by their language experience. *Front. Psychol.* **2015**, *6*, 1–12.
88. Hall, M.L.; Eigsti, I.M.; Bortfeld, H.; Lillo-Martin, D. Auditory deprivation does not impair executive function, but language deprivation might: Evidence from a parent-report measure in deaf native signing children. *J. Deaf Stud. Deaf Educ.* **2016**, *22*, 9–21.
89. Figueras, B.; Edwards, L.; Langdon, D. Executive function and language in deaf children. *J. Deaf Stud. Deaf Educ.* **2008**, *13*, 362–377.
90. Botting, N.; Jones, A.C.; Marshall, C.; Denmark, T.; Atkinson, J.; Morgan, G. Nonverbal Executive Function is Mediated by Language: A Study of Deaf and Hearing Children. *Child Dev.* **2017**, *88*, 1689–1700.

91. Jones, A.C.; Gutierrez, R.; Ludlow, A.K. Confronting the language barrier: Theory of mind in deaf children. *J. Commun. Disord.* **2015**, *56*, 47–58.
92. Walker, E.A.; Ambrose, S.E.; Oleson, J.; Moeller, M.P. False Belief Development in Children Who Are Hard of Hearing Compared with Peers With Normal Hearing. *J. Speechlang. Hear. Res.* **2017**, *60*, 3487–3506.
93. Premack, D.; Woodruff, G. Does the chimpanzee have a theory of mind? *Behav. Brain Sci.* **1978**, *1*, 515–526.
94. Courtin, C. The impact of sign language on the cognitive development of deaf children: The case of theories of mind. *J. Deaf Stud. Deaf Educ.* **2000**, *5*, 266–276.
95. Courtin, C.; Melot, A.-M. Metacognitive development of deaf children: Lessons from the appearance-reality and false belief tasks. *Dev. Sci.* **2005**, *8*, 16–25.
96. Schick, B.; De Villiers, P.; Hoffmeister, R.J. Language and Theory of Mind: A Study of Deaf Children. *Child Dev.* **2007**, *78*, 376–396.
97. Courtin, C. A Critical Period for the Acquisition of a Theory of Mind? In *Deaf Around the World*; Oxford University Press: New York, NY, USA, 2010; pp. 184–193.
98. Tomasuolo, E.; Valeri, G.; Di Renzo, A.; Pasqualetti, P.; Volterra, V. Deaf children attending different school environments: Sign language abilities and theory of mind. *J. Deaf Stud. Deaf Educ.* **2013**, *18*, 12–29.
99. Morgan, G.; Kegl, J. Nicaraguan Sign Language and Theory of Mind: The issue of critical periods and abilities. *J. Child Psychol. Psychiatry Allied Discip.* **2006**, *47*, 811–819.
100. Remmel, E.; Peters, K. Theory of mind and language in children with cochlear implants. *J. Deaf Stud. Deaf Educ.* **2009**, *14*, 218–236.
101. Allen, T.E.; Letteri, A.; Choi, S.H.; Dang, D. Early Visual Language Exposure and Emergent Literacy in Preschool Deaf Children: Findings from a National Longitudinal Study. *Am. Ann. Deaf* **2014**, *159*, 346–358.
102. Chapman, M.; Dammeyer, J. The significance of deaf identity for psychological well-being. *J. Deaf Stud. Deaf Educ.* **2016**, *22*, 187–194.
103. Hall, W.C.; Levin, L.L.; Anderson, M.L. Language deprivation syndrome: A possible neurodevelopmental disorder with sociocultural origins. *Soc. Psychiatry Psychiatr. Epidemiol.* **2017**, *52*, 761–776.
104. Bauman, H.-D.; Murray, J. *Deaf Gain: Raising the Stakes for Human Diversity*; Uninersity of Minnesota Press: Minneapolis, MN, USA, 2014.
105. Humphries, T. Our Time: The Legacy of the Twentieth Century. *Sign Lang. Stud.* **2014**, *15*, 57–73.
106. Lane, H. *The Mask of Benevolence: Disabling the Deaf Community*; Dawn Sign Press: Washington, DC, USA, 1992.
107. Komesaroff, L.R. *Disabling Pedagogy: Power, Politics, and Deaf Education*; Gallaudet University Press: Washington, DC, USA, 2008.
108. LEAD-K. LEAD-K—Deaf Focus. Available online: https://www.deaffocus.org/lead-k/ (accessed on 15 February 2019).
109. Lillo-Martin, D. Differences and similarities between late first-language and second-language learning. *Biling. Lang. Cogn.* **2018**, *21*, 924–925.
110. Smith, J.; Wolfe, J. Should All Deaf Children Learn Sign Language? *Hear. J.* **2016**, *69*, 18–24.
111. Spellun, A.; Kushalnagar, P. Sign Language for Deaf Infants: A Key Intervention for a Developmental Emergency. *Clin. Pediatr.* **2018**, *57*, 1613–1615.
112. Humphries, T.; Kushalnagar, P.; Napoli, D.J.; Padden, C.; Mathur, G.; Rathmann, C.; Smith, S.R. Cochlear Implants and the Right to Language: Ethical Considerations, the Ideal Situation, and Practical Measures Toward Reaching the Ideal. *Cochlear Implant Research Updates*; IntechOpen: London, UK; 2012, 193–212.
113. Humphries, T.; Kushalnagar, P.; Mathur, G.; Napoli, D.J.; Padden, C.; Pollard, R.; Rathmann, C.; Smith, S.R. What Medical Education can do to Ensure Robust Language Development in Deaf Children. *Med. Sci. Educ.* **2014**, *24*, 409–419.
114. Napoli, D.J.; Mellon, N.K.; Niparko, J.K.; Rathmann, C.; Mathur, G.; Humphries, T.; Handley, T.; Scambler, S.; Lantos, J.D. Should All Deaf Children Learn Sign Language? *Pediatrics* **2015**, *136*, 170–176.
115. Humphries, T.; Kushalnagar, P.; Napoli, D.J.; Rathmann, C.; Mathur, G.; Smith, S.R. Support for Parents of Deaf Children: Common Questions and Informed, Evidence-based Answers. *Int. J. Pediatr. Otorhinolaryngol.* **2019**, *118*, 134–142.
116. Humphries, T.; Kushalnagar, P.; Mathur, G.; Napoli, D.J.; Padden, C.; Rathmann, C.; Smith, S.R. Language Choices for Deaf Infants. *Clin. Pediatr.* **2015**, *55*, 513–517.
117. Humphries, T.; Kushalnagar, P.; Mathur, G.; Napoli, D.J.; Padden, C.; Rathmann, C.; Smith, S.R. Avoiding Linguistic Neglect of Deaf Children. *Soc. Serv. Rev.* **2016**, *90*, 589–639.
118. Humphries, T.; Kushalnagar, P.; Napoli, D.J.; Padden, C. Bilingualism: A Pearl to Overcome Certain Perils of Cochlear Implants. *J. Med. Speech Lang. Pathol.* **2014**, *21*, 107.
119. Humphries, T.; Kushalnagar, P.; Mathur, G.; Napoli, D.J.; Padden, C.; Rathmann, C.; Smith, S. Discourses of prejudice in the professions: The case of sign languages. *J. Med. Ethics* **2017**, *43*, 648–652.

120. Piñar, P.; Dussias, P.E.; Morford, J.P. Deaf readers as bilinguals: An examination of deaf readers' print comprehension in light of current advances in bilingualism and second language processing. *Lang. Linguist. Compass* **2011**, *5*, 691–704.
121. Freel, B.L.; Clark, M.D.; Anderson, M.L.; Gilbert, G.L.; Musyoka, M.M.; Hauser, P.C. Deaf Individuals' Bilingual Abilities: American Sign Language Proficiency, Reading Skills, and Family Characteristics. *Psychology* **2011**, *2*, 18–23.
122. Chamberlain, C.; Mayberry, R.I. American Sign Language syntactic and narrative comprehension in skilled and less skilled readers: Bilingual and bimodal evidence for the linguistic basis of reading. *Appl. Psycholinguist.* **2008**, *29*, 367–388.
123. Scott, J.A.; Hoffmeister, R.J. American sign language and academic English: Factors influencing the reading of bilingual secondary school deaf and hard of hearing students. *J. Deaf Stud. Deaf Educ.* **2017**, *22*, 59–71.
124. Dammeyer, J. Literacy Skills among Deaf and Hard of Hearing Students and Students with Cochlear Implants in Bilingual/Bicultural Education. *Deaf. Educ. Int.* **2014**, *16*, 108–119.
125. Humphries, T. Schooling in American Sign Language: A paradigm shift from a deficit model to a bilingual model in deaf education. *Berkeley Rev. Educ.* **2013**, *4*, 7–33.
126. Allen, T.E. ASL Skills, Fingerspelling Ability, Home Communication Context and Early Alphabetic Knowledge of Preschool-Aged Deaf Children. *Sign Lang. Stud.* **2015**, *15*, 233–265.
127. Padden, C.; Ramsey, C. ASL and reading ability in deaf children. In *Language Acquisition by Eye*; Lawrence Erlbaum Associates: Mahwah, NJ, USA, 2012; pp. 165–189.
128. Harris, M.; Beech, J.R. Implicit Phonological Awareness and Early Reading Development in Prelingually Deaf Children. *J. Deaf Stud. Deaf Educ.* **1998**, *3*, 205–216.
129. Hermans, D.; Ormel, E.; Knoors, H. On the relation between the signing and reading skills of deaf bilinguals. *Int. J. Biling. Educ. Biling.* **2010**, *13*, 187–199.
130. Strong, M.; Prinz, P.M. A Study of the Relationship Between American Sign Language and English Literacy. *J. Deaf Stud. Deaf Educ.* **1997**, *2*, 37–46.
131. Hrastinski, I.; Wilbur, R.B. Academic achievement of deaf and hard-of-hearing students in an ASL/English bilingual program. *J. Deaf Stud. Deaf Educ.* **2016**, *21*, 156–170.
132. Jasińska, K.K.; Petitto, L.-A. Age of Bilingual Exposure Is Related to the Contribution of Phonological and Semantic Knowledge to Successful Reading Development. *Child Dev.* **2018**, *89*, 310–331.
133. Jasińska, K.K.; Berens, M.S.; Kovelman, I.; Petitto, L.-A. Bilingualism yields language-specific plasticity in left hemisphere's circuitry for learning to read in young children. *Neuropsychologia* **2017**, *98*, 34–45.
134. Jasińska, K.K.; Petitto, L.-A. Development of neural systems for reading in the monolingual and bilingual brain: New insights from functional near infrared spectroscopy neuroimaging. *Dev. Neuropsychol.* **2014**, *39*, 421–439.
135. Lieberman, A.M.; Hatrak, M.; Mayberry, R.I. Learning to Look for Language: Development of Joint Attention in Young Deaf Children. *Lang. Learn. Dev.* **2014**, *10*, 19–35.
136. Bailes, C.N.; Erting, C.J.; Erting, L.C.; Thumann-Prezioso, C. Language and Literacy Acquisition through Parental Mediation in American Sign Language. *Sign Lang. Stud.* **2009**, *9*, 417–456.
137. Sparks, R.L.; Humbach, N.; Patton, J.; Gaschow, L. Sub-components of second-language aptitude and second-language proficiency. *Mod. Lang. J.* **2011**, *95*, 253–273.
138. Wang, Y.; Silvestri, J.A.; Jahromi, L.B. Selected Factors in Reading Comprehension for Deaf and Hearing Adults: Phonological Skills and Metacognition. *Am. Ann. Deaf* **2018**, *162*, 445–462.
139. Harris, M.; Terlektsi, E.; Kyle, F.E. Concurrent and longitudinal predictors of reading for deaf and hearing children in primary school. *J. Deaf Stud. Deaf Educ.* **2017**, *22*, 233–242.
140. Webb, M.-Y.; Lederberg, A.R.; Branum-Martin, L.; Connor, C.M. Evaluating the structure of early english literacy skills in deaf and hard-of-hearing children. *J. Deaf Stud. Deaf Educ.* **2015**, *20*, 343–355.
141. Mayberry, R.I.; del Giudice, A.A.; Lieberman, A.M. Reading Achievement in Relation to Phonological Coding and Awareness in Deaf Readers: A Meta-analysis. *J. Deaf Stud. Deaf Educ.* **2011**, *16*, 164–188.
142. Clark, M.D.; Hauser, P.C.; Miller, P.; Kargin, T.; Rathmann, C.; Guldenoglu, B.; Kubus, O.; Spurgeon, E.; Israel, E. The Importance of Early Sign Language Acquisition for Deaf Readers. *Read. Writ. Q.* **2016**, *32*, 127–151.
143. Petitto, L.-A.; Langdon, C.; Stone, A.; Andriola, D.; Kartheiser, G.; Cochran, C. Visual sign phonology: Insights into human reading and language from a natural soundless phonology. *WIREs Cogn. Sci.* **2016**, *7*, 366–381.
144. Morford, J.P.; Wilkinson, E.; Villwock, A.; Piñar, P.; Kroll, J.F. When deaf signers read English: Do written words activate their sign translations? *Cognition* **2011**, *118*, 286–292.
145. McQuarrie, L.; Abbott, M. Bilingual Deaf Students' Phonological Awareness in ASL and Reading Skills in English. *Sign Lang. Stud.* **2013**, *14*, 80–100.

146. Silvestri, J.A.; Wang, Y. A Grounded Theory of Effective Reading by Profoundly Deaf Adults. *Am. Ann. Deaf* **2018**, *162*, 419–444.
147. Kovelman, I.; Ip, K.; Marks, R.; Tardif, T. Morphological Awareness Literacy Task in Chinese Engages Left Temporal Regions: An fMRI study. In Proceedings of the American Educational Research Association; Toronto, Canada, 7 April 2019.
148. Paul, P.V.; Lee, C. The Qualitative Similarity Hypothesis. *Am. Ann. Deaf* **2010**, *154*, 456–462.
149. Mounty, J.L.; Pucci, C.T.; Harmon, K.C. How deaf American sign language/English bilingual children become proficient readers: An emic perspective. *J. Deaf Stud. Deaf Educ.* **2014**, *19*, 333–346.
150. Bagga-Gupta, S. Explorations in bilingual instructional interaction: A sociocultural perspective on literacy. *Learn. Instr.* **2002**, *12*, 557–587.
151. Evans, C.J. Literacy Development in Deaf Students: Case Studies in Bilingual Teaching and Learning. *Am. Ann. Deaf* **2004**, *149*, 17–27.
152. Howerton-Fox, A. Teacher Language Awareness in a Swedish Bilingual School for the Deaf: Two Portraits of Grammar Knowledge in Practice. Ph.D. Thesis, Columbia University, New York, NY, USA, February 2013.
153. Andrews, J.F.; Rusher, M. Codeswitching Techniques: Evidence-Based Instructional Practices for the ASL/English Bilingual Classroom. *Am. Ann. Deaf* **2017**, *155*, 407–424.
154. Nicolarakis, O. Fingerspelling as Route to Phonology. In Proceedings of the American Educational Research Association; New York, NY, USA, 16 April 2018.
155. Sehyr, Z.S.; Petrich, J.A.F.; Emmorey, K. Fingerspelled and printed words are recoded into a speech-based code in short-term memory. *J. Deaf Stud. Deaf Educ.* **2017**, *22*, 72–87.
156. Stone, A.; Kartheiser, G.; Hauser, P.C.; Petitto, L.-A.; Allen, T.E. Fingerspelling as a Novel Gateway into Reading Fluency in Deaf Bilinguals. *PLoS ONE* **2015**, *10*, doi:10.1371/journal.pone.0139610.
157. Humphries, T.; MacDougal, F. "Chaining" and other links: Making connections between American Sign Language and English in Two Types of School Settings. *Vis. Anthropol. Rev.* **2000**, *15*, 84–94.
158. Kelly, A. Fingerspelling interaction: A set of deaf parents and their deaf daughter. In *Sociolinguistics in Deaf Communities*; Gallaudet University Press: Washington, DC, USA, 1995; pp. 62–73.
159. Cummins, J. The relationship between ASL proficiency and English academic development: A review of the research. In Proceedings of the Workshop Challenges, Opportunities, and Choices in Educating Minority Group Students, Hedmar University College, Elverum, Norway, 2006.
160. Ellis, R. Introduction: Investigating Form-Focused Instruction. *Lang. Learn.* **2001**, *51*, 1–46.
161. Lyster, R. Research on form-focused instruction in immersion classrooms: Implications for theory and practice. *J. Fr. Lang. Stud.* **2004**, *14*, 321–341.
162. Silvestri, J.A. An Analysis of the Reading Strategies Used by Deaf and Hearing Adults: Similarities and Differences in Phonological Processing and Metacognition. Ph.D. Thesis, Columbia University, New York, NY, USA, May 2016.
163. Schleper, D.R. *Principles for Reading to Deaf Children*; Gallaudet University Press: Washington, DC, USA, 1996.
164. Wolsey, J.-L.A.; Clark, M.D.; Andrews, J.F. ASL and English bilingual Shared Book Reading: An exploratory intervention for signing deaf children. *Biling. Res. J.* **2018**, *41*, 221–237.
165. Wolbers, K.A. Using Balanced and Interactive Writing Instruction to Improve the Higher Order and Lower Order Writing Skills of Deaf Students. *J. Deaf Stud. Deaf Educ.* **2008**, *13*, 257–277.
166. Dostal, H.M.; Wolbers, K.A.; Kilpatrick, J. Differentiating writing instruction for students who are deaf and hard of hearing. *Writ. Pedagog.*, in press.
167. Bowers, L.M.; Dostal, H.M.; Wolbers, K.A.; Graham, S.C. The Assessment of Written Phrasal Constructs and Grammar of Deaf and Hard of Hearing Students with Varying Expressive Language Abilities. *Educ. Res. Int.* **2018**, *2018*, 2139626.
168. Wolbers, K.A.; Dostal, H.; Graham, S.; Branum-Martin, L.; Kilpatrick, J.; Saulsburry, R. Strategic and Interactive Writing Instruction: An Efficacy Study in Grades 3–5. *J. Educ. Dev. Psychol.* **2018**, *8*, 99.
169. Dostal, H.M.; Wolbers, K.A. Examining Student Writing Proficiencies Across Genres: Results of an Intervention Study. *Deaf. Educ. Int.* **2016**, *18*, 159–169.
170. Wolbers, K.A.; Dostal, H.M.; Skerrit, P.; Stephenson, B. The impact of three years of professional development on knowledge and implementation. *J. Educ. Res.* **2017**, *110*, 61–71.
171. Wolbers, K.A.; Dostal, H.M.; Graham, S.; Cihak, D.; Kilpatrick, J.R.; Rachel Saulsburry The writing performance of elementary students receiving strategic and interactive writing instruction. *J. Deaf Stud. Deaf Educ.* **2015**, *20*, 385–398.
172. Bowers, L.M.; Dostal, H.; McCarthy, J.H.; Schwarz, I.; Wolbers, K.A. An Analysis of Deaf Students' Spelling Skills During a Year-Long Instructional Writing Approach. *Commun. Disord. Q.* **2016**, *37*, 160–170.

173. Dostal, H.M.; Bowers, L.; Wolbers, K.A.; Gabriel, R. "We Are Authors": A Qualitative Analysis of Deaf Students' Writing During One Year of Strategic and Interactive Writing Instruction (SIWI). *Rev. Disabil. Stud. Int. J.* **2015**, *11*, 1–19.
174. Wolbers, K.A.; Dostal, H.M.; Bowers, L.M. "I Was Born Full Deaf." Written Language Outcomes After 1 Year of Strategic and Interactive Writing Instruction. *J. Deaf Stud. Deaf Educ.* **2012**, *17*, 19–38.
175. Wolbers, K.A. Strategic and Interactive Writing Instruction (SIWI): Apprenticing Deaf Students in the Construction of English Text. *ITL Int. J. Appl. Linguist.* **2008**, *156*, 299–326.
176. Menéndez, B. Cross-modal bilingualism: Language contact as evidence of linguistic transfer in sign bilingual education. *Int. J. Biling. Educ. Biling.* **2010**, *13*, 201–223.
177. Wolbers, K.A.; Graham, S.C.; Dostal, H.M.; Bowers, L.M. A description of ASL features in writing. *Ampersand* **2014**, *1*, 19–27.
178. Wolbers, K.A.; Bowers, L.M.; Dostal, H.M.; Graham, S.C. Deaf writers' application of American Sign Language knowledge to English. *Int. J. Biling. Educ. Biling.* **2014**, *17*, 410–428.
179. Banner, A.; Wang, Y. An analysis of the reading strategies used by adult and student deaf readers. *J. Deaf Stud. Deaf Educ.* **2011**, *16*, 2–23.
180. Bélanger, N.N.; Rayner, K. What Eye Movements Reveal about Deaf Readers. *Curr. Dir. Psychol. Sci.* **2015**, *24*, 220–226.
181. Cummins, J. Linguistic Interdependence and the Educational Development of Bilingual Children. *Rev. Educ. Res.* **1979**, *49*, 222–251.
182. Grushkin, D.A. Written Sign Languages: What For? What Form? *Am. Ann. Deaf* **2017**, *161*, 509–527.
183. Moores, D.F. Writing Signed Languages: What For? What Form? A Response. *Am. Ann. Deaf* **2017**, *161*, 537–539.
184. Mayer, C. Written Forms of Signed languages: A Route to Literacy for Deaf Learners? *Am. Ann. Deaf* **2017**, *161*, 552–559.
185. Paul, P.V. Thoughts About a Possible Bridge From ASL to English Literacy. *Am. Ann. Deaf* **2017**, *161*, 505–508.
186. DeLana, M.; Gentry, M.A.; Andrews, J.F. The Efficacy of ASL/English Bilingual Education: Considering Public Schools. *Am. Ann. Deaf* **2007**, *152*, 73–87.
187. Svartholm, K. 35 Years of Bilingual Deaf Education-and Then? *Educ. Rev.* **2014**, *2*, 33–50.
188. SPM. *Årsredovisning—Specialskole Myndigheten [Yearly Reports—National Agency for Special Schools for the Deaf and Hard of Hearing]*; SPM: Örebro, Sweden, 2008.
189. Svartholm, K. Bilingual education for deaf children in Sweden. *Int. J. Biling. Educ. Biling.* **2010**, *13*, 159–174.
190. Rydberg, E.; Gellerstedt, L.C.; Danermark, B. Toward an equal level of educational attainment between deaf and hearing people in Sweden? *J. Deaf Stud. Deaf Educ.* **2009**, *14*, 312–323.
191. SPM. *Årsredovisning—Specialskole Myndigheten [Yearly Reports—National Agency for Special Schools for the Deaf and Hard of Hearing]*; SPM: Stockholm, Sweden, 2013.
192. Dammeyer, J.; Marschark, M. Level of educational attainment among deaf adults who attended bilingual-bicultural programs. *J. Deaf Stud. Deaf Educ.* **2016**, *21*, 394–402.
193. Nover, S.; Andrews, J.; Baker, S.; Everhart, V.; Bradford, M. *Critical Pedagogy in Deaf Education: Bilingual Methodology and Staff Development. Final Year Impact Report, USDLC Star Schools Project*; New Mexico School for the Deaf: Santa Fe, New Mexico, 2002.
194. Andrews, J.F.; Ferguson, C.; Roberts, S.; Hodges, P. What's Up, Billy Jo? Deaf Children and Bilingual-Bicultural Instruction in East-Central Texas. *Am. Ann. Deaf* **1997**, *142*, 16–25.
195. NCELA. English Learner Toolkit for State and Local Education Agencies; Synergy Enterprises, Inc.: Silver Spring, MD, USA, 2015.
196. Hauser, P.C.; O'Hearn, A.; McKee, M.; Steider, A.; Thew, D. Deaf Epistemology: Deafhood and Deafness. *Am. Ann. Deaf* **2010**, *154*, 486–492.
197. Singleton, J.L.; Supalla, S.J.; Litchfield, S.; Schley, S. From Sign to Word: Considering Modality Constraints in ASL/English Bilingual Education. *Top. Lang. Disord.* **1998**, *18*, 16–29.
198. Komesaroff, L.R.; McLean, M.A. Being There is Not Enough: Inclusion is both Deaf and Hearing. *Deaf. Educ. Int.* **2006**, *8*, 88–100.

199. Skyer, M.E. Deaf Gains in Education. In Proceedings of the National Technical Institute for the Deaf Conference, Rochester, NY, USA, 18 April 2018.