

Article

Reading Development of Students Who Are Deaf and Hard of Hearing in Inclusive Education Classrooms

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Abstract: The purpose of this article is to discuss the major research findings associated with the reading/literacy development of students who are d/Deaf and hard of hearing (d/Dhh) in inclusive education classrooms. The conditions for developing effective literacy skills are also described. A professional review approach was utilized, and relevant journal articles from 1985 to 2019, inclusive, were selected and analyzed. Other relevant publications including selected chapters and books were used to support the available salient findings. Results of the reviews, recommendations for future research and the limitations of the review process are also provided.

Keywords: d/Deaf and hard of hearing students; inclusive education classroom; professional literature review; literacy; reading instruction

1. Introduction

Many countries have enacted legislations that give students with disabilities the right to be educated with typical peers in inclusive education classrooms [1,2]. For example, the number of d/Dhh students in inclusive education classrooms has rapidly increased in the United States (USA) after the Individuals with Disabilities Education Act (IDEA) was enacted in 1975. This act asserted that children with disabilities should receive their education in their neighborhood public schools, unsegregated from their typical peers to the maximum extent possible [3]. This implies that students with disabilities, include those with hearing loss, should receive appropriate education in inclusive education classrooms, regardless of the type and severity of the disability. According to the IDEA, schools are not allowed to move students with disabilities to segregated classrooms if the students' needs can be met satisfactorily with additional support services in inclusive education classrooms.

Statistical information from the US Department of Education [4] indicate that approximately 19.4% of d/Deaf and hard of hearing (d/Dhh) students receive 40% to 70% of their education in general education classrooms and about 61.8% of those students receive 80% or more of their education in general education classrooms. In addition, it has been reported that about 13.8% of students with hearing loss receive less than 40% of their education in general education classrooms, and about 2.9% are in special schools for d/Dhh students. About 2.1% of those students are placed in separate residential facilities or regular private schools, such as homebound/hospital placements, and correctional facilities.

It is expected that the number of d/Dhh students in inclusive education classrooms will increase because of the development of early hearing loss identification and intervention techniques, in particular, cochlear implants that assist those students to access spoken phonology [5,6]. There are other factors that may influence the educational placement of d/Dhh students, including the development of technology, financial pressures, and parental expectations [7]. In addition, in light of research results documenting low reading levels among students with hearing loss, there is an ongoing debate about the role of the educational environment on the development of language and literacy skills of this group of students [8,9]. The main question that must be answered is whether the inclusive education

classroom is considered a rich literacy and language environment that can assist students to improve their reading skills.

To answer this question, it is important to describe various variables that relate to the inclusive environment, including teachers' qualifications, reading instruction, access to the general education curriculum, communication and language skills, and support services. It is necessary to understand how these variables influence the development of language and literacy for students with hearing loss, considering the tremendous variations in aspects such as degree of hearing loss, factors associated with the home and school's environment (e.g., parents' age, parental involvement; language and literacy experiences, number of students in the classroom), early identification, early intervention, and language and communication skills [5,10,11].

The present article provides a description of the method used for selecting and analyzing research and scholarly findings. Then, a discussion of the "optimal" conditions for developing language and literacy for d/Dhh students in inclusive education classrooms is undertaken. Next, the researcher discussed the methods used to measure the reading levels of d/Dhh students. This is followed by a synthesis of research findings on reading development of d/Dhh students in inclusive education classrooms. The article concludes with recommendations for further research.

2. Methods

The present researcher conducted a professional literature review. According to Gall, Gall, and Borg [12], there are two categories of literature reviews, including professional reviews and narrative reviews. These two categories of review follow specific steps for selecting and reviewing previous publications. In this article, a professional literature review was utilized because this type of review is often used in chapters as well as other manuscript-length genres that provide an extensive review of a specific topic—such as the topic of inclusion and reading development of d/Dhh students, which is discussed in this article. In addition, this type of literature reviews covers both primary (original or empirical) and secondary sources. It also allows authors to use both technical or non-technical language in presenting and interpreting research results. The researcher who uses a professional literature review may not synthesize all selected publications, in particular those that did not have a representative sample of participants. This is because there are some publications that are included that can be used to provide recommendations for further research and effective instructional practices.

In this article, several electronic search engines, including EBSCOhost, Education Full Text (Wilson), ERIC, PsycInfo, and Google Scholar, were used to identify relevant research studies. Further, certain journals that publish research on d/Dhh students, such as the *Journal of Deaf Studies and Deaf Education*, *American Annals of the Deaf*, *Deafness & Education International*, and the *Volta Review*, were used to search for articles. The researcher utilized specific literature phrases and terms including the following: Inclusion, academic achievement of deaf and hard of hearing students, reading development of deaf and hard of hearing students, inclusion and reading development, and deaf students. In addition, to locate articles, the researcher searched for books related to the topic of the current article. These books provide a critical analysis of the investigated topic and discuss factors that affect the inclusion process of d/Dhh students.

After the electronic search was completed, the researcher reviewed the reference list of each article and book in order to identify additional sources. Other sources including dissertations, theses, conference presentations, and unpublished studies were not included. The participants in the publications must include or concern d/Dhh children and adolescents. In addition, the publications must include a discussion related to the topic of the current article. Because of the dearth of publications on inclusion and reading development of d/Dhh students, the publications included in this article were published between 1985–2019. All other publications that did not meet the foregoing inclusion criteria were excluded.

I synthesized a selection of 69 primary (i.e., original, empirical) and secondary (i.e., research reviews) investigations to address the following questions:

- (1) What are the conditions for developing reading for d/Dhh students in inclusive education classrooms?
- (2) What are the major research findings associated with the reading development of d/Dhh students in inclusive education classrooms?
- (3) What are the recommendations for further research on the reading development of d/Dhh students in inclusive education classrooms?

3. Conditions for Developing Literacy in Inclusive Education Classrooms

There are several variables that affect the reading development of d/Dhh students in inclusive education classrooms. These variables should be considered by educators and researchers who work in inclusive education classrooms or who investigate the process of inclusive education.

3.1. Teachers' Qualifications

Literature reviews indicate that one of the main goals of including d/Dhh students in the inclusive education classroom is to improve their reading achievement [5,13–15]. However, research has identified several challenges that might limit the accomplishment of this goal, the most important of which is the teachers' knowledge and skills in teaching reading to d/Dhh students [16,17]. When teachers do not have the necessary knowledge and skills to teach reading, students are more likely to struggle throughout school. Research has reported that there is a direct relationship between teachers' knowledge and skills and students' academic outcome [18]. For d/Dhh students, the role of teachers in reading development is probably more important than other factors associated with students' family and peers [19]. This is because these students spend more than six hours a day in schools with their teachers. In addition, parents of children with hearing loss always expect that teachers can assist their children to learn to read effectively. In general, teaching reading to this group of students is not an easy task because teachers need to understand the specific logical conceptual framework of reading in order to provide high quality instruction [20,21]. Teachers must have mastery of the knowledge-based reading curriculum as well as possess the best instructional tools to teach reading successfully. Specifically, it is necessary for teachers to understand the reading challenges faced by d/Dhh students, which consist of two broad components—the challenge of accessing spoken phonology and recognizing differences between the structure of a signed language and the written language of print [8]. Stanovich [22,23] investigated several components of reading development; specifically, the relationship between word identification and print comprehension and the use of specific reading cognitive skills. Stanovich found that early phonological difficulties, including the inability to access the phonemic level of speech as well as the inability to cognitively manipulate phonemic representations, were significant impediments to reading, resulting in a slower reading development. Stanovich asserted that phonological awareness is causally related to early reading development. In other words, it is challenging for individuals to learn to read adequately without access to the spoken phonology of the language of print [8]. The second broad component of the reading challenges faced by d/Dhh students is that many students with profound hearing loss, in particular those who use only a signed language, experience difficulty in understanding the relationship between the through-the-air form of a language and its written representation. Understanding the above two issues is necessary for teachers to know how to use effective reading teaching methods.

In addition to identifying reading challenges among students with hearing loss, it is important for teachers to know the essential components of reading including phonics, phonemic awareness, vocabulary, fluency, and reading comprehension [8,9]. These five components were reported by the National Reading Panel (NRP) [24] after a comprehensive evidence-based review on how children learn to read. The NRP found a systematic relationship between these five components and reading

development. Furthermore, the report indicated that explicit instruction is the most effective evidence-based method for teaching these five reading components [8,25,26]. Accordingly, teachers of d/Dhh students in inclusive education classrooms should have sufficient knowledge of these reading components and the skills to teach them through instruction that includes a combination of methods.

In general, many inclusive classroom teachers who have graduated from universities may not have the knowledge and skills to teach reading [27]. These teachers may have sufficient knowledge about the educational practice of inclusion and characteristics of d/Dhh students. However, they lack understanding of the foundational and language concepts of reading [28,29]. In addition, many of these teachers lack language and communication skills, such as improving access to spoken phonology as well as using a signed language with those d/Deaf students who use only a signed language. Research has reported that teachers who cannot sign effectively often face challenges in delivering instruction and assessing the progress of d/Dhh students in inclusive education classrooms. More importantly, d/Deaf students, who sign, lose confidence in their teacher's ability to assist them to improve their knowledge and skills [30].

3.2. Reading Achievement in Relation to Spoken Phonology

According to the qualitative similarity hypothesis (QSH), developed by Paul, Wang, and Williams [8], in order for children to become good readers, they need to understand, from an early age, English language and literacy fundamentals and skills, such as phonological processing, phonemic awareness, decoding, and print conventions. It should be noted, however, that there is a debate as to whether it is necessary for children with severe to profound hearing loss to acquire and learn certain fundamental skills of a sound phonology (phonological awareness, phonemic awareness, and phonics) as a part of the reading process, due to the fact that these children have limited access to auditory information [31–33]. This debate is seen as the most challenging issue addressed by the implications of the QSH (see Paul et al. [8]).

Several researchers have argued that the five English language components, including phonology, morphology, syntax, semantics and pragmatics, play an essential role in reading development [32–36]. They asserted that access to spoken phonology alone is not the only tool needed for reading development; however, it is necessary for all children who are learning English as their first or second language. They also argued that the function that spoken phonology plays in reading acquisition cannot be accomplished by sign or English orthographic representation alone. Phonology is also important to enhance vocabulary knowledge in through-the-air and written English. Particularly, phonemic awareness was identified in several empirical studies as important for developing students' word identification skills as well as to facilitate their understanding of the relationship between through-the-air English and English print [8].

Several empirical studies that investigated the general relationship between spoken phonology and reading development have supported the above argument [25,33,37–39]. Therefore, it is important for teachers of d/Dhh students to have the knowledge and skills to use effective techniques such as visual phonics and cued speech that represent running speech stream visually and tactilely, particularly the phonemes and syllables [40]. Mayer and Trezek [41] cited empirical evidence that indicated that d/Dhh students can access spoken phonology for reading purposes through using techniques such as visual phonic and cued speech. For example, Narr [34] investigated the impact of the length of reading instruction time supplemented by visual phonics on phonological awareness, decoding skills and reading ability of 10 students with hearing loss from kindergarten to third grade. Teachers used sign English and American Sign Language (ASL) during reading instruction. A direct and positive relationship was found between time spent in direct reading instruction using visual phonics and students' reading development. The researcher concluded that using visual phonics as part of the reading instruction improved the decoding skills and phonological awareness of d/Dhh students.

Another study conducted by Trezek et al. [36] investigated the effectiveness of utilizing visual phonics and a direct instruction reading program with students with hearing loss. The study aimed

to evaluate the outcome of using visual phonics to supplement a phonics-based reading curriculum for students. Researchers conducted the study with twenty d/Dhh students in kindergarten and first grade with different degrees of hearing loss. The findings showed that the beginning reading skills of students in kindergarten and first grade were improved after receiving instruction for one year.

In essence, d/Dhh students might struggle to develop their reading skills in inclusive education classrooms if the teacher does not have knowledge of effective reading instruction techniques. This implies that implementing inclusive education alone for students with hearing loss is not a guarantee that students' reading skills will improve.

3.3. Access to the General Education Curriculum

The most significant amendment of IDEA (Public Law 105-17) was passed in 1997, which asserted that children with disabilities, including those with hearing loss, should access the general education curriculum in the inclusive education classroom [3,42]. Access to the general education curriculum implies that d/Dhh students should study the academic curriculum content (reading, mathematics, science, etc.) of their hearing peers at the same grade level. According to this IDEA's amendment, it is not allowed for schools and teachers to develop or use specialized curricula for d/Dhh students. Therefore, the main role of teachers is to address the unique needs of d/Dhh students and ensure that curricular content is delivered to meet the common core and content standards [43,44]. Indeed, the special education discourse after this amendment of IDEA has shifted from the question of where d/Dhh students must be educated to the issue of how to provide effective educational support and other services to ensure students' access to the general education curriculum [45]. More importantly, IDEA ignited a controversial discussion among educators and researchers about the knowledge and skills of inclusive education teachers. These teachers need to use efficient accommodations and modifications to address the reading challenges of d/Dhh students.

To address reading challenges, teachers need an adequate understanding of the reading curriculum content, their students' demographic information, and skills to modify and accommodate the reading content based on their students' individual differences [8,46,47]. Specifically, students with hearing loss come to schools with a rich diversity of experiences [48]. Several researchers attribute the academic achievement differences among d/Dhh students to their individual characteristics and demographic differences [49]. For example, these students often have different degrees of hearing loss and come from different ethnic, and economic backgrounds. In addition, d/Dhh students who have received effective early intervention services may possess better communication and learning skills than those who did not receive such services [2].

With respect to the diversity among d/Dhh students, it becomes more challenging for inclusive education teachers to help students access the general education curriculum. According to Mayer and Trezek [41], it is necessary for teachers to obtain information about their students' cultures and backgrounds, such as their home language and parents' educational level and involvement. This information helps teachers to develop effective reading instructional and appropriate learning activities for their students. Another essential element for ensuring the use of necessary modifications and accommodations of the reading curriculum content is to develop an individual education plan (IEP) [44,46]. The IEP team works together to identify and describe conditions to facilitate a child's access to the general education curriculum. Also, the team develops effective and appropriate instructional strategies to meet the student's needs and assist her/him to reach specific academic goals. In general, the IEP must have clear annual goals that are appropriate to the student's needs. Furthermore, it includes educational supports and services that the student will need in the inclusive education classroom [44]. The most significant section of the IEP is related to instruction, assessment and the accommodations and modifications of the curriculum, which focus on motivating d/Dhh students to continue in the inclusive education classroom as well as to maintain access to the general education curriculum [50].

The implementation of universal design for learning by inclusive education teachers also may facilitate d/Dhh students' access to the reading curriculum content. This approach provides specific principles that give students equal opportunities to learn in the inclusive education classroom [51]. It provides a blueprint to develop appropriate goals, instruction, assessment and learning materials that considers students' differences. A universally designed curriculum is necessary to improve the learning environment and educational practice that accommodate all students regardless of their individual and background differences [51]. Wehmeyer et al. [52] emphasized that the utilization of a universal design for learning has a positive impact on the academic achievement of students with disabilities and is effective in facilitating access to the general education curriculum.

There are three principles of universal design for learning that might be directly related to access to general reading curriculum content [51,52]. First, inclusive education teachers can provide multiple means of representation, where the instructional, assessment, and learning activities are presented in different formats and at different levels of complexity. Second, teachers can provide multiple means of expression, which means students can use a variety of formats in terms of answering questions or expressing their ideas and information. Specifically, this principle encourages teachers to provide students an opportunity to use different forms to engage in the discussion and learning activities in the inclusive classroom. The last principle is providing multiple means of engagement, which means that teachers focus on each individual's prior knowledge, attention, curiosity, and motivation, to engage them in learning. This principle emphasizes the importance of gathering information about the students' background, knowledge and culture, and then use this information to encourage students to engage in classroom activities and dialogues.

In essence, d/Dhh students gain access to the general reading curriculum when they receive effective and appropriate educational supports and services from staff in schools, in particular, teachers. Hence, teachers should be aware of their students' individual differences and have the best educational tools to use with them.

3.4. Communication and Language Skills

In addition to the academic benefits, the goal of inclusion for d/Dhh students is to develop their communication and social interaction skills with hearing teachers and peers [1,46]. The active interaction and participation in the classroom is essential for students' acquisition of effective communication and language skills and strategies [53]. Further, when d/Dhh students interact with hearing students, this assists them to improve their experiences and their prior knowledge of the topics discussed in the classroom—and, subsequently, this should enhance the development of reading/literacy skills. However, many d/Dhh students feel isolated in the inclusive education classroom because they cannot make friends and participate in classroom activities due to their communication difficulties [46,54]. The lack of communication skills and difficulty in accessing spoken phonology might also negatively influence the students' abilities to learn to read. Particularly, students may not possess an adequate language to express thoughts, ideas, feelings, and information. In other words, there is a relationship between students' communication skills and their abilities to organize ideas during reading in different contexts. This implies that language and reading skills must be developed together and are interconnected. d/Deaf and hard of hearing students who have adequate communication and language skills are more likely to understand the relationship between the through-the-air form of English and its corresponding print form, that is, the fact that spoken sounds correspond with letters or groups of letters [9,53]. Further, these students can obtain sufficient knowledge and skills in areas such as English phonology, vocabulary, and syntax [55].

It is important to distinguish between students who have a severe-to-profound hearing loss (about 70 dB or greater), often labeled traditionally as "deaf", and students who are hard of hearing (about 21 to 69 dB), as separate groups with different communication and hearing needs [56]. This is because a number of students with severe-to-profound hearing loss rely predominantly on a signed language and may not access spoken (or a sound) phonology. On the other hand, the majority of students

who are hard of hearing and even some “deaf” students who have had access to early amplification, often can access a spoken phonology. For example, students who are hard of hearing often use a wide variety of communication options such as loop systems, hearing assistive devices, digital hearing aids, and cochlear implants which can assist access to a spoken phonology. Also, the inclusive classroom teacher can capitalize on students’ residual hearing and communication skills to assist their access to phonology in order to develop their reading skills.

From another perspective, educational interpreters are necessary for many students with profound hearing loss who are primarily dependent on a signed language to facilitate their communication with teachers and hearing peers [57]. Particularly, the interpreter provides communication access for d/Dhh students by translating and clarifying the teacher’s instruction and the spoken language used by other students. Further, the interpreter facilitates d/Dhh students’ access to the content of the reading curriculum by translating and clarifying teachers’ reading instruction, questions, and comments [58,59]. The interpreter’s role is difficult because it requires not only adequate communication skills, but also sufficient knowledge of reading content and children’s reading needs in order to deliver all information appropriately and help d/Dhh to interact and communicate with hearing peers. Particularly, with the service of an interpreter, d/Dhh students in the inclusive education classroom can fully participate in learning and extracurricular activities and engage with hearing peers [58].

3.5. Supports and Services

With the development of the digital media, technology, and educational tools, teachers are able to deliver information to their students in different ways in the inclusive education classroom [60]. Appropriate classroom supports and services enhance the teaching and learning of reading and assist students with hearing loss to gain increased access to the reading curriculum [61,62]. Further, the provision of supports and services motivates students with hearing loss to engage in the inclusive education classroom—to be active in academic lessons and to participate effectively in reading activities. With respect to teaching reading to d/Dhh students, the use of educational tools, such as visual materials, is even more important, because this can reduce the potential quantitative delay in the acquisition of knowledge. Specifically, sufficient educational materials in the inclusive education classroom improves the quality of instruction and the interactions between teachers and their students [57]. However, it is important that the selection of educational materials takes into account individual differences among students with hearing loss. In other words, these students have diverse needs that require teachers to use a variety of educational materials that offer more feasible supports for their learning needs [61].

Several studies have examined the effectiveness of methods of teaching reading using materials, such as pictures and videos, with d/Dhh students [63]. For example, Alqraini (2017) examined the effectiveness of teaching multiple-meaning words to fourth grade d/Deaf and hard of hearing students in the kingdom of Saudi Arabia, using a picture-based intervention. It was found that there was a significant improvement in the recognition and comprehension of multiple meaning words among students who received the intervention. In another study, Aceti and Wang [63] examined the effects of explicit instruction, using pictures, on teaching multiple meanings of words to four d/Dhh students with and without additional disabilities. The researchers found that the students were able to select correctly all pictures that illustrated the correct meanings of the words on a posttest.

To assist d/Dhh students to develop their reading skills in the inclusive education classroom, previous research has identified three types of educational materials, including audio, visual and audiovisual, that should be provided to students [64,65]. Specifically, students with hearing loss need audio and assistive listening devices, such as sound field amplification systems, telecommunication relay, induction loop, and FM systems, that can facilitate access to sound in order to assist students to understand that a word can be separated into smaller segments (e.g., phonemes, syllables) as well as to understand the relationship between the through-the-air and written forms of English [32,64]. Furthermore, visual materials, such as diagrams, charts, posters, formulas, pictures, graphs, slides, computer presentations, are useful for students because they often depend on their visual abilities for

learning. In addition, teachers of d/Dhh students prefer to use visual materials to facilitate instruction and apply learning strategies appropriately. More importantly, using visual materials makes the lesson more interesting for students and motivates them to engage in classroom activities [64,65]. Students who are d/Dhh benefit also from educational materials that include a combination of both audio and visual elements, such as televisions, projectors, computers, and films. In particular, these materials, which provide audio and visual components simultaneously, are useful in terms of improving students' ability to gain access to information while also increasing their motivation to learn [64,65].

4. Inclusion and the Development of Language and Literacy Skills

The majority of d/Dhh students encounter communication difficulties in the inclusive education classroom [66]. For students who have a profound hearing loss, communication and interaction with hearing students is more challenging than it is for students with mild to moderate or severe hearing loss because the former group often relies on a signed language for communication whereas hard of hearing students often use spoken language [5]. Despite the differences between the two groups, both need support services in the inclusive education classroom to ensure their success and access to the academic content, in particular reading. Considering the academic challenging faced by d/Dhh students in the inclusive education classroom, it is necessary to obtain current and accurate data on their academic status and progress. In addition, researchers need to conduct empirical research to measure reading achievement of d/Dhh students because previous research has indicated that d/Dhh students have significant weaknesses in this area [8]. For example, it was reported that the performance of 50% of d/Dhh students from a national sample was below a basic proficiency level in reading comprehension [67]. In addition, Geers and Hayes (2010) indicated that the reading achievement of a number of d/Dhh students at the end of high school is similar to the reading level of hearing students at third or fourth grade. It is, therefore, important to know whether the inclusion of d/Dhh students in the inclusive education classroom can contribute to the improvement of their reading ability.

The literature review has revealed that there is a dearth of research about the effects of inclusion on the development of language and literacy skills of d/Dhh students [5]. The available research that measured reading achievement of d/Dhh students in the inclusive education classroom often used standardized test scores or was based on teachers' perceptions. Specifically, many countries, such as the USA and United Kingdom (UK), used standardized tests to measure reading achievement of students, including students with hearing loss. These tests are considered effective tools to compare the reading levels of d/Dhh students before and after they are educated in inclusive classrooms as well as to compare their reading levels with those of typical hearing students [68]. Antia et al. [5] also asserted that teachers' perceptions are essential for obtaining information on the reading levels of d/Dhh students. Teachers spend several hours every day teaching and interacting with their students and thereby they can provide insights into their students' strengths and weaknesses in reading.

5. Research on Reading Development in the Inclusive Education Classroom

The available literature has revealed much controversy on the effects of inclusive education on reading development of d/Dhh students [7,10]. Opponents of inclusive education argued that the academic achievement of d/Dhh students is significantly behind that of hearing students [69]. They asserted that d/Dhh students may not perform better in inclusive classrooms, due to several factors, such as students receiving less attention from their teacher. In addition, the teacher may not understand the characteristics of hearing loss as well as the special classroom teacher, who is a specialist in the education of d/Dhh students. On the contrary, the majority of inclusive education supporters have asserted that classroom interaction and instruction in inclusive education classrooms can assist d/Dhh students to improve their academic achievement [2]. For instance, Harrison (1988) indicated that inclusive education provides specific academic goals, effective assessments, and a rich curriculum, which assist d/Dhh students to develop the necessary abilities and skills for reading achievement.

Although the results of research that investigated the reading achievement of d/Dhh students in the general education classrooms have been inconsistent, most available studies have found a positive relationship between inclusion and reading achievement [13,70]. For example, Antia et al. [5] investigated the academic achievement of 197 d/Dhh students who attended inclusive education classrooms for two or more hours per day. The researchers collected data via the use of a teacher rating scale—the academic competence scale of the social skills rating system. In addition, the researchers obtained both normative and classroom academic data to determine the academic progress of the students. The scores of most d/Dhh students on standardized achievement tests indicated that their academic achievement was in the average or above-average range in reading. Specifically, it was found that 48% to 68% of the students scored in the average or above-average range for reading, and 55% to 76% scored in the average or above-average range for language and writing. In general, teachers rated 69–81% of students with hearing loss in the general education classroom as average or above average in academic achievement.

In another study, Afzali-Nomani [21] examined the effects of inclusive education on the academic achievement and social development of hearing and d/Dhh students in the USA. The researcher used a multiple regression analysis to optimally combine scores on five educational conditions scales to enhance prediction. The participants in the study were 55 teachers of d/Dhh students and general education teachers who were employed in public school districts. All teachers had experience teaching in full inclusion programs. The teachers were asked to rate the effects of inclusive education on d/Dhh students based on three criteria: Academic achievement, social adjustment, and self-confidence/esteem. The results showed that inclusive education had a positive effect on the academic achievement of students with hearing loss. However, the positive effects of inclusion on d/Dhh students increased when those students received social encouragement, when teachers supported the program, and when there was a full range of placement options.

Similarly, Holt [13] examined the reading comprehension and mathematics computation achievement of d/Dhh students in a variety of school settings in the USA. The researcher relied on data that were collected by Gallaudet University Center for Assessment and Demographic Studies during its 1990 standardization of the Eighth Edition of the Stanford Achievement Test (SAT 8). Descriptive and inferential methods were utilized to analyze the relationships among the achievement scores of a sample of d/Dhh students, aged 6 through to 21 years. Findings showed that the reading comprehension scores of d/Dhh students who received their education in general education classrooms with hearing students were higher than those of students in segregated settings. However, the researcher reported that it was difficult to determine if the higher reading scores was due to the fact that the students were educated in inclusive education classrooms or because students who were selected to participate in inclusive classrooms already had higher achievement levels.

In another study, Kluwin [71] investigated the influence of inclusive education on the achievement and grade point average (GPA) of 451 d/Dhh students in 15 public school programs in the USA. The researcher utilized a comparison design, and data was collected via the Annual Survey of Hearing-Impaired Children and Youth. Findings indicated that the inclusion of d/Dhh students had a positive effect on their academic achievement; in particular, students who attended inclusive education classrooms exhibited higher scores on the achievement tests. The researcher asserted that the inclusion of d/Dhh students was beneficial because it engaged them in a high-quality academic atmosphere.

Most, Aram, and Andorn [72] investigated the early literacy skills of hearing and d/Dhh kindergartners who were enrolled in individual inclusion or group inclusion programs. The study also investigated the relationship between early literacy skills and background variables such as degree of hearing loss, type of sensory aid used, age at onset of rehabilitation, and family's socioeconomic status. Participants were 42 children, aged 62 to 84 months. There were 16 d/Dhh children in the group inclusive program whereas 15 children were in the individual inclusive program. The third group included 11 hearing children. The researchers evaluated early literacy skills, including word identification, writing level, phonological awareness, letter identification, orthographic awareness, general knowledge,

and vocabulary. Findings showed that d/Dhh children in the individual inclusive program exhibited higher achievement levels, compared to those enrolled in the group inclusive program, on phonological awareness, letter identification, general knowledge, and vocabulary. However, there was no significant differences between the individual and group inclusive programs on reading, writing, or orthographic awareness. Findings also revealed that the achievement of hearing children was higher than that of d/Dhh children in either of the inclusive programs. Further, although the achievement level of the hearing children surpassed those enrolled in the group inclusive program, this level was not statistically different from those enrolled in the individual inclusion program. Most et al. found also that there was a negative correlation between students' general knowledge and degree of hearing loss. That is, the greater the hearing loss, the lower the level of general knowledge. In addition, there was a positive correlation between general knowledge, reading, and writing with age at onset of rehabilitation, and there was no correlation between socioeconomic status and children's early literacy skills.

In general, the above research review has revealed that inclusion has a positive effect on the reading development of d/Dhh students. However, it is important to keep in mind that research conducted with students with hearing loss often revealed mixed results for several reasons. First, researchers have used different research methodologies or different measurements and tests, which has impacted the process of proffering generalizations [5]. Second, there is a rich diversity of experiences among d/Dhh students. The diversity among this group of students is due to factors related to the d/Dhh children themselves and their home and school environments [10,17,73,74]. For example, there are several factors that can affect research results, including degree of hearing loss, communication and language skills, age at hearing loss identification, receiving early intervention services, home related factors (e.g., parental involvement; language and literacy experiences), and school related factors (e.g., teacher competency; teachers' and students' attitudes). Additionally, d/Dhh students come from different racial, ethnic, and economic backgrounds [5–11]. As a result of this diversity, research conducted with d/Dhh students should provide sufficient information about students' individual characteristics, demography, and home and cultural backgrounds. This would increase the reliability and validity of the results and assists readers to understand the study context and characteristics of the participating sample.

6. Recommendations for Further Research

Given the range of personal, social, and academic factors that needs to be considered, conducting research on the reading development of d/Dhh students is challenging and controversial [75]. Examining inclusive education for students with hearing loss is complex because of the number of impactful variables that should be described in detail in order to allow readers to understand the research context and the disparity among the results of studies. For example, the variables of interest for inclusive education research that have had direct effects on the reading development of students with hearing loss included, at least, those factors associated with the students themselves (e.g., age, degree of hearing loss, age at hearing loss identification, age at receiving early intervention services, communication and language abilities), home environment (e.g., home language, parents' education and involvement, number of family members), school environment (e.g., number of students in the inclusive classroom, awareness/attitudes of hearing students, availability of supports and services), the characteristics of the teacher (e.g., teaching knowledge, teaching or co-teaching skills, attitudes, teacher-student interactions, communication skills), and the curriculum (e.g., accessibility). Also important is the attitude and support of school administrators.

Although it is difficult to document or statistically control all of the above factors that affect reading development of d/Dhh students in inclusive education classrooms, it is necessary for investigators to at least understand these factors because of their significant effects on the academic performance of d/Dhh students. This facilitates the researchers' understanding of the complexity of inclusion as well as the limitations of their research. More importantly, consideration of these factors should influence

the development of effective research designs that would, hopefully, provide better and more useful or generalizable findings.

In general, previous research conducted with d/Dhh students has not provided sufficient demographic and achievement information about the participants, and this has led to equivocal results. Therefore, it is recommended that future investigators provide, at least, adequate information related to demography (e.g., degree of hearing loss, age at onset, amplification usage) and achievement (e.g., language and communication levels). It is also important to understand the individual differences of participants and how these differences affect their performances in inclusive education classrooms. Failure to provide adequate information contributes to the lack of understanding and misinterpretation of the results [8,32].

Finally, some researchers used surveys or collected information on teachers' perceptions to gain an understanding of the reading achievement level of d/Dhh students in inclusive education classrooms [5]. However, it is argued that the use of standardized or formal tests is critical to obtain a reasonably objective picture of the effects of inclusive education. It is also recommended that these formal measures be utilized in conjunction with other informal assessments to capture the range of students' individual differences and other factors related to home and school environments.

7. Conclusions

Due to the dearth of evidence-based research on d/Dhh students, reviewing studies on the literacy development of typical-developing students is a good starting point to understand the effects of inclusion on reading development as well as the factors of a successful inclusive education program. These studies may provide useful data about how inclusion may help d/Dhh students improve their reading and other academic skills. Of course, there is a great need for additional primary research with d/Dhh students. The literature review in the present article has indicated that there are several conditions, such as teachers' qualifications, access to phonology, access to the general curriculum, and the availability of supports and services, that may be critical for developing language and literacy skills of d/Dhh students in inclusive education classrooms. The effects of these conditions should be addressed further by investigators to understand how d/Dhh students can succeed in inclusive education classrooms and, specifically, how to improve their literacy and other academic skills.

In sum, there is a dearth of research on the reading development of d/Dhh students in inclusive education classrooms. In addition, several studies either did not document important factors that affect reading development or did not provide adequate background information about the participants. Nevertheless, in general, the findings revealed that inclusive education can have a positive effect on the reading achievement level of students with hearing loss. The positive effects of inclusive education increase when d/Dhh students receive supports and services.

Each literature review has limitations, and this article is no exception. This article utilized a professional review, which might be considered biased, based on the interpretations and discussion of the research findings by the present author. Second, there is a dearth of research, in particular evidence-based research, on the reading development of d/Dhh students in inclusive education classrooms, and this limits the generalizability of the findings. Generalization is also problematic because some of the reviewed studies did not provide adequate demographic and achievement information about the participants. Thus, considering these limitations, it is difficult to proffer reliable and valid information about the effects of inclusive education for d/Dhh students.

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