Excerpted from :
Goldin-Meadows, S. & Mayberry, R. I. (2001). How do profoundly deaf children learn to read? Learning Disabilities Research and Practice (Special issue : Emergent and early literacy : Current status and research directions), 16, 221-228.

How do Profoundly Deaf Children Learn to Read?

Susan Goldin-Meadow
University of Chicago
and
Rachel I. Mayberry
McGill University

Blackwell Publishing
Dir. For learning disabilities of for exceptional Children
Journal Rights & Permissions Coordinator
BP
Osney Mead
Oxford OX2 OEL
JournalRights@BlackwellPublishers.co.uk

In the United States, only 15 of white deaf students who graduate from high school, and only 5 of Black and 6 of Hispanic deaf high school graduates, read above the sixth grade level (Allen, 1994). Indeed, the median reading level of deaf high school graduates is fourth grade (Allen, 1989; Trybus & Karchmer, 1977). This level barely approaches newspaper literacy, and does not actually require the reader to have cracked the print code. Even children who are "hard of hearing" - that is, children who have only mild to moderate hearing losses - read at lower median levels than do normally hearing children (Allen & Schoem.1997). Thus, a majority of deaf children (and deaf adults) are not able to get much meaning from print.

However, some profoundly deaf individuals *do* learn to read, and are as proficient at reading as their normally hearing peers. How do they do it, particularly given the stumbling blocks we have identified that stand in their way? How is it possible to learn to read without a deep understanding of the phonological code upon which the print System is based? The importance (or non-importance) of understanding the phonological code.

Surprisingly, it turns out that the best profoundly deaf readers are not necessarily the children who have received the most intensive oral training (Hansen & Fowlers, 1987:206; Waters & Doehring, 1990:351). We might have guessed that oral training would promote understanding of the phonological code which, in turn, would lead to good reading. But there's no good evidence to support this guess. In fact, the findings are, at best, contradictory. For example, Miller (1997) found that deaf sixth graders educated via speech showed levels of phonemic awareness that were no better than those attained by children educated via sign.

Moreover, unlike hearing readers, orally trained deaf children do not always use phonological information in reading tasks. Waters and Doehring (1990) found that a group of orally trained, school-aged deaf children did not use phonological information on word recognition tasks. Nemeth (1992) found that a group of orally trained, deaf high school students did not use phonological information on a pseudo-homophone task despite the fact that they were

good readers. Confounding the issue further, Hanson and Fowler (1987) found that college-aged deaf students who knew and used sign language (and not speech) did use phonological information on word rhyming tasks. It is clear that profound deafness does not preclude the development of phonological processes. However, it is very unclear what conditions lead to the development and deployment of these processes in profoundly deaf children.

In addition, once having acquired phonological skills, deaf children may find that they are not as useful as they are for hearing children. For example, phonological decoding helps hearing children at the early stages of reading "sound out" words that they recognize orally but do not yet recognize in print. However, decoding printed words phonologically is of little value if the profoundly deaf child doesn't know the word in the first place (cf. Lederberg, Prezbindowski & Spencer, 200; Waters & Doehring, 1990). Thus, even when profoundly deaf children do have knowledge of the phonological patterns that underlie orthographic patterns, this knowledge may not serve the same functions during reading that it does for hearing readers (Chamberlain & Mayberry, 2000).

Undermining the importance of the phonological code even further, profoundly deaf children can be good readers and still not rely on phonological encoding when they read. Treiman and Hirsh-Pasek (1983) studied deaf and hearing readers who had achieved 7th and 8th grade reading levels. They gave these readers sentences that contained words with several initial sounds in common and thus were phonologically confusable (e.g., "she chose three shows to see at the theatre"). They then compared performance on these potentially confusable sentences with other control sentences that had approximately the same meaning but no possible phonological confusions (e.g., "she picked two movies to see with her friend"). The readers were asked to judge whether each sentence was grammatically correct. If the readers were using phonological encoding when processing the sentence, they ought to make more errors on the sentences with confusable sounds than on the control sentences. As expected, the hearing readers did. However, the deaf readers did not.

The deaf readers did not appear to be relying on phonological encoding. What then were they using to encode the sentences? In a second study, Treiman & Hirsh-Pasek (1983) gave the readers sentences containing words which were confusable only when translated into ASL. For example, the sentence "I ate the apples at home yesterday" contains four signs that are all produced with a fist handshape placed somewhere around the mouth and cheek area. In other words, if the sentences were translated into ASL, most ofthe signs would "rhyme" in ASL. If the deaf readers were translating the printed sentence into ASL, they might find sentences of this sort difficult to process relative to control sentences - and, indeed, they did. In contrast, hearing readers should have no particular difficulty with these sentences as they are not confusable in English - and, as predicted, they did not.

Thus, the hearing readers had difficulty with sentences whose words were phonologically confusing (with sounds in common). However, the deaf readers had difficulty with sentences whose words were confusing only when translated into sign (with place of articulation and handshape in common). These findings suggest that deaf children read by using a code that is not based on sound.

Yet some deaf readers, often very good readers, do seem to know the sound code of English. The question, whose answer awaits future research, is whether phonological awareness precedes or follows excellence in reading in profoundly deaf individuals. That is, do profoundly deaf individuals become excellent readers because they know something about the sound System

of English? Or did they learn something about the sound System of English after having become excellent readers of English orthography? The only way to answer this question is to conduct longitudinal studies of profoundly deaf children as they become proficient readers.

The importance (or non-importance) of understanding the language that is mapped by the print system

We have seen that children can learn to read without a firm grounding in the phonological System. Can children learn to read English without a firm grounding in English? Interestingly, deaf children born to deaf parents tend to be better readers than deaf children born to hearing parents (see below). But American Sign Language (ASL) is their native language, not English. How can deaf children of deaf parents be better readers than deaf children of hearing parents?

There are several possible reasons. Deaf children of deaf parents are more likely to have their hearing losses identified early in life and thus are more likely to be placed earlier into appropriate educational environments. In contrast, many hearing parents are surprised to find that their children are deaf and require some period of adjustment to the fact that the children will have difficulty learning English. It is not surprising that deaf parents find it easier to accept and be comfortable with deafness in their children than hearing parents. Deaf parents are therefore often better able to provide social and emotional support within the family.

Although these factors are undoubtedly important in fostering a child's educational growth, they cannot account for ail of the differences in reading skills between deaf children born to deaf vs. hearing parents. An alternative hypothesis recognizes that most deaf children of deaf parents are in fact fluent users of a language (ASL) at an early age - this expertise may be useful in learning to read. For example, Mayberry (2002) studied reading in relation to signing skills in a cross-sectional study of deaf children of deaf vs. hearing parents. The children in both groups ranged in age from 7 to 15, and had the same degree of hearing loss. Most were in day schools (as opposed residential schools) for the deaf. The language of instruction at school was Manually Coded English (MCE) along with spoken English. Importantly, ail of the children with deaf parents received sign language input routinely, both at school and at home. By contrast, many of the children with hearing parents only received sign language input during school hours. There were no differences between the groups in nonverbal intelligence (as measured by block design or picture arrangement on the Weschler Intelligence Scale for Children, WISC-R), nor in speech production.

Mayberry (2002) gave the children stories with simple narrative structure and asked a series of comprehension questions after each story. The stories were presented in 3 formats: American Sign Language to test the children's knowledge of a natural sign language; Manually Coded English to test their knowledge of English as conveyed in the manual modality; and Printed English to test their knowledge of English as conveyed through print. The questions for each story were asked in the same format as the story. The child could answer the questions in any language he or she chose.

Considering first deaf children born to deaf parents, Mayberry (2002) found significant and steady increases in the number of correctly answered questions for ail three types of stories - ASL, MCE, and Printed English - as the children grew older. It is very clear that knowing ASL did not in any way hinder a child's ability to learn to read English.

Turning next to deaf children born to hearing parents, Mayberry et al. found that these children gave very few correct answers to the ASL stories, not surprisingly since they had little exposure to ASL. In contrast, the deaf children of hearing parents performed as well as deaf children of deaf parents on the MCE stories. Interestingly, the deaf children of hearing parents

differed from the deaf children of deaf parents most sharply on the Printed English stories. At ages 7 to 9, both groups of children answered fewer than half of the Printed English questions correctly. By ages 13 to 15, the deaf children of deaf parents answered nearly ail of the questions correctly but the deaf children of hearing parents as a group still answered only half correctly. Thus, the deaf children of deaf parents progressed steadily in reading Printed English, whereas the deaf children of hearing parents did not, despite the fact that both groups had made steady progress in MCE. There were, however, some deaf children of hearing parents who did read as well as the deaf children of deaf parents. In each case, the child had received sustained MCE input from his or her parents and were, in fact, fluent users of MCE. These children confirm our suspicion that robust language is the key to learning to read.

Researchers have noted that asymptotic performance on language tests is common during adolescence within the deaf student population (e.g., Osberger, 1986). Continued growth in a language-related skill such as reading appears to depend upon successful and steady language acquisition throughout early childhood and elementary school. If so, the delayed and diminished exposure to language that many deaf chiidren expérience may impede their ability to learn language-related tasks, including reading, not only during childhood but also later in life (Morford & Mayberry, 2000).

In sum, knowing ASL does *not* interfere with learning to read printed English. Indeed, ASL may actually help deaf children learn to read English. The deaf chidden who made steady progress in both ASL and MCE also made steady progress in reading English ; the children who made progress only in MCE did not. In fact, controlling for whether a child's parents were hearing or deaf, signing skills turn out to be the best predictors of reading skill (see also Hoffmeister, 2000; Padden & Ramsey, 2000; Strong & Prinz, 2000). Apparently, knowing a language - even a manual language with different structure from the language captured in print - is better for learning to read than not knowing any language.

What do we learn about reading from observing deaf children?

In addition to leading to a better understanding of how profoundly deaf children learn to read, studies of reading in deaf children can teach us about reading in general.

First, we learn the rather obvious but often ignored fact that children cannot read without knowing a language - children who have no language upon which to map the printed code never learn to read. Moreover, and most surprisingly, knowing *any* language helps children learn to read even if it is not *the* language captured in print. Deaf children who are proficient in ASL are often better English-readers than deaf children who are not, despite the fact that ASL is structured very differently from English. Indeed, many deaf readers appear to map English sentences onto a visual code based on sign. Thus, it may not be essential for deaf readers to be able to map the English sentences they read onto a phonological code. However, good deaf readers, both those who sign and those who speak, do appear to have a grasp of the phonological code on which English print is based. Whether this knowledge made them the good readers they are, or is a result of their becoming good readers is a central question, as yet unanswered. Whatever the importance of understanding the phonological code, it is essential for children to come to the reading situation knowing a first language.

Next, we learn the rather surprising fact that children cannot learn a first language through print. One might guess that a relatively easy way to teach profoundly deaf children English would be through the printed word - an approach that would kill two birds with one stone (the child would not only learn English, but would also learn how to read). The difficulty, however, is that the approach does not work - children do not seem to be able to learn a first language through

print (although they are able to learn a second language through print - consider English-speakers who develop a reading knowledge of German, or ASL-signers who develop a reading knowledge of English, without ever having spoken the language). The problem is not that print is processed in the visual modality - after ail, children have no trouble learning ASL as a first language and ASL is processed in the visual modality. The difficulty appears to be with the print System itself, perhaps with the fact that the printed code leaves out a great deal of information that is captured in a spoken or signed language. Or, perhaps the problem is that print is not used interactively. Whatever the reason, first language learning appears to come naturally to children when the language is spoken or signed, but not when it is printed.

Finally, children need to be taught to read. Learning to read thus differs fundamentally from learning to speak or sign a language. Children will effortlessly acquire the language of their community just by living in that community. Indeed, even if a child is not exposed to a model for a conventional language, that child can invent a simple gestural System that has many of the properties characteristic of natural languages (Goldin-Meadow & Mylander, 1984; Goldin-Meadow, 1997; 2001; although these self-generated gesture Systems are not sufficiently developed to serve as the foundation for reading). Language (either speaking or signing) is resilient in humans. Reading is not. Reading does not come naturally to ail individuals living in a community - it must be taught. The next frontier for reading research in deaf education is to understand how instruction can best be used to turn signers into readers.