

Learning and Using Print and Braille: A Study of Dual-Media Learners, Part 2

Kelly E. Lusk and Anne L. Corn

Abstract: This is the second part of a two-part report of a study about the instruction of children who are learning or using both braille and print simultaneously (dual media). It explores the instructional methods and curricular decisions of teaching dual media to students with low vision and reports the students' current literacy levels and reading rates and their teachers' expectations for future levels of literacy.

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When an Individualized Education Program (IEP) team determines that a student with low vision should be taught dual media, several decisions need to be made regarding the methods of instruction, the curriculum, and the instruments for assessing the student's acquisition of literacy skills. Generally, the teacher of students with visual impairments guides these decisions and facilitates their implementation, along with general education teachers and reading specialists or other special educators as appropriate.

Koenig and Holbrook (2000) and Corn and Koenig (2002) conducted Delphi studies to develop frameworks for delivering instruction in literacy media to students who use braille and those with low vision, respectively. In both studies, panels of experts were asked to recommend the consistency, total time per day,

time span, and duration of instruction that these groups need. For students in kindergarten to Grade 3 who are initially learning dual media and for print readers who are learning braille, high consistency (daily contact), a long time per day (one to two hours per session), and a long duration (throughout at least one school year) were recommended.

In addition to how much time is allocated for a child's instruction, other issues include whether initial instruction should be in contracted or uncontracted braille and when to start instruction in the second medium, depending on the student's level of literacy in the first medium. If students are efficient print readers for their age who are adding braille, they will not require an approach that actually teaches them how to read. Students for whom receiving instruction in dual media is the initial decision for literacy media will require comprehensive reading instruction that includes tactile reading, as well as learning the print alphabet and the braille code.

Although there are no data to support the use of various curricula for teaching students in dual media, several types of curricula are available. Using the student's grade- and age-appropriate basal reader or a whole-language approach has advantages because it is the same curriculum that the student's sighted classmates are using, and braille instruction can be added to the print instruction. However, with these approaches, the introduction of braille contractions cannot be controlled and, as with the whole-language approach, may be incompatible for some students. This may be especially true if a teacher of students with visual impairments is itinerant and unavailable for ongoing and sometimes immediate transcribing (Holbrook & Koenig, 1992).

Separate curricula have advantages as well, since they are specifically designed to teach the braille code, and contractions are introduced in a controlled and systematic manner, as in *Patterns: The Primary Braille Reading Program* (Caton, Pester, & Bradley, 1980). However, these approaches have

disadvantages, too. *Patterns*, a "basal reading program for young students who are blind" (Holbrook & Koenig, 1992), may pose problems for students who are learning print in the regular classroom because of differences in vocabulary, punctuation, and spelling. *Read Again* (Caton, Pester, & Bradley, 1990) and *Braille Too* (Hepker & Cross-Coquillet, 1994) are also specifically designed to teach braille separately from print, but are to be used with older students who have an adventitious visual impairment or a progressive condition and are already established print readers. Therefore, some of the disadvantages with other braille-specific programs do not apply to these curricula. As with the decision to teach dual media, the choice of a curriculum and instruction should be based on each student's instructional needs.

Assessing a student's current level of literacy is also important when deciding on curricula and instructional methods for a student who is learning dual media. While reading speed should not be the only criterion used, it is important that a student develop a functional and competitive reading speed in either print or braille. The reading speeds of students with visual impairments may be compared to those of sighted students as more data are compiled on reading processes. Wolffe (2000) stated that for any job in which literacy is used, a minimum reading rate of 150 words per minute (wpm) should be expected.

Various studies have found that braille readers do not acquire reading rates that meet Wolffe's (2000) estimate. In the 1960s, Lowenfeld, Abel, and Hatlen (1969) found that typical rates of braille reading were 84 wpm in local schools and 72 wpm in residential schools at the fourth-grade level and 149 wpm and 116 wpm in local and residential schools, respectively, at the eighth-grade level. In the 2001 Iowa Study of Braille Literacy (K. Blankenship, personal communication, 2005), 50% of the participants (students who were reading only braille or both print and braille) read at a rate of fewer than 30 wpm, with an average rate of 34.8 wpm. Trent and Truan (1997) studied braille readers who reached a minimum of a sixth-grade reading level on the

Gilmore Oral Reading Test at the Tennessee School for the Blind. Among the students who had a comprehension rate of 80% or higher, the fastest rate was 98 wpm, which is equivalent to the reading rates of sighted third graders (see Guszak, 1985). These studies combined students for whom braille reading was their sole reading medium with those who may have been reading both braille and print. Outcomes for braille readers who are dual-media readers have not been disaggregated from such studies.

On the basis of data from Heinze (1986) and Lowenfeld et al. (1969), Koenig (1996) discussed the range of typical reading rates and concluded that a rate of 100–125 wpm (the expected third-grade silent reading rate for typically sighted students) (Carver, 1989) was a good starting point for reading print on the basis of the objective reading rates in braille. Therefore, if a student is reading print at 100–125 wpm, changing the student's primary reading medium to braille may not result in an increase in reading speed. Koenig (1996, p. 261) also suggested plotting a student's reading rates "over the first three to four years of school" and then drawing a "prediction line ... to determine whether a rate of 100–125 words per minute is achievable." If a student is not expected to be able to attain a level of 100–125 wpm in print, a teacher may need to consider braille as an alternative medium.

Although these studies had many drawbacks (for example, they did not differentiate between students with and without additional disabilities and used many different assessments to measure reading speed or level), they all indicated that students' reading performance was poor for competing in academic classes and for future employability. These measures can help teachers determine each student's individual needs, so as to adjust the instructional program accordingly.

There are also no data to document ongoing instructional practices for children who are learning or using dual media or the success with which dual-media learners become proficient in their primary or secondary medium or in both media if they are

initially taught braille and print. These data would be helpful for designing curricula and predicting the acquisition of literacy skills.

When writing goals and objectives for students' IEPs, teachers need to set short- and long-term expectations for students' literacy levels and reading rates in each medium and to consider the purposes and future uses of literacy skills. Students with low vision may read standard print with or without standard optical corrections, standard print with optical devices, large print, electronically enlarged images, and braille.

Expectations for Visual Function (Corn & Webne, 2001) is an instrument that is used to determine levels of expectations for independent visual functioning with or without optical devices. Of the 20 items, 17 involve reading print at a near or far distance and are related to such tasks as reading print in standard sizes on maps and books, reading street signs at specific distances, and reading for specific periods of time. Corn, Wall, and Bell (2001) used this instrument with students who were reading print or dual media and who received clinical low vision evaluations, prescribed optical devices, and instruction in their use over a six-month period. During that period, the expectations of the students with visual impairments and their teachers' expectations for the students' ability to use vision increased, whereas the parents' expectations remained the same. To date, there have been no studies of the expectations of students who are learning braille or dual media.

This second part of a two-part series of articles--the first of which appeared in the October 2006 issue of the journal--presents data on the methods and instructional practices used by teachers of students who are learning or using dual media and the students' current reading levels and reading speeds. It includes an analysis of the portions of the questionnaire that focused on curricular decisions and instructional methods for teaching dual media, as well as literacy outcomes and future expectations and levels of

literacy for dual media learners.

Methods

The study used a 66-item questionnaire that was distributed through flyers, e-mail, and word of mouth. The questionnaire and all procedures were approved by Vanderbilt University's Institutional Review Board before any data were collected. Questionnaires were received electronically. For more detailed information on the methods of the study, see Lusk and Corn (2006).

Results

The participants included 95 teachers from 21 U.S. states and 1 Canadian province who gave information on 108 students who were learning or using dual media. These students ranged in age from 4 to 21 and in grade level from prekindergarten to the 12th grade. Further demographic data can be found in Lusk and Corn (2006).

CURRICULUM AND TEACHING STRATEGIES

The teachers were asked to describe their strategies for teaching braille code to their students who were learning dual media and could choose from multiple techniques listed on the questionnaire. More than one technique was used with several students; contracted braille was initially taught to 54 students, uncontracted braille was taught to 49 students, and braille was taught to 39 students through the *Patterns* (Caton et al., 1980) curriculum. Other techniques were used to teach 27 students.

There were also multiple possible techniques for teaching a student to read and write print. Again, the teachers used a combination of visual displays. Thus, 65 students learned or were learning to read print using large print, and the remainder did so with closed-circuit televisions (57 students), standard print and optical devices (34 students), standard print (26 students), added

illumination (15 students), eccentric viewing techniques (9 students), other techniques (5 students), and diminished illumination (2 students).

The teachers were also asked how their students learned to write in print and braille. The most popular tools for writing print were using bold-lined paper ($n = 70$) and standard writing implements ($n = 61$) or bold markers ($n = 58$); many students also used standard notebook paper ($n = 40$) and keyboarding with a print image ($n = 44$). The most popular tool for writing braille was a Perkins Braillewriter ($n = 77$); some students used an electronic braille ($n = 28$) or a slate and stylus ($n = 11$), and 14 students used other tools.

The best practice for teaching reading through braille to students with low vision is a controversial topic in the field of visual impairments. The teachers were asked how they teach braille to their students who have low vision and could give more than one answer for each student. Most teachers ($n = 82$) allowed the students to see their hands and the braille while reading. Other techniques included blindfolding during instruction ($n = 4$), allowing the students to see their hands through a clear or translucent partition ($n = 3$), and showing the students print in a book or on a screen while reading braille tactilely ($n = 3$). Twenty-two teachers listed various other techniques. No teacher reported blindfolding students for an extended period.

The teachers were also asked to describe their students' visual behaviors while learning to read and write braille and could list multiple behaviors for each student. Many students ($n = 49$) read or wrote with their eyes open, but the teachers did not think they were actively using their vision. Other students looked at their hands but could not see the dots ($n = 36$), tried to look at the dots ($n = 31$), used vision but did not appear to focus on anything in particular ($n = 25$), looked at the dots to try to check for mistakes while braille ($n = 23$), or seemed to focus on an object or a person ($n = 15$). Five students were listed as exhibiting other

visual behaviors during braille reading or writing.

As another component of instructional methods, the teachers were asked to report how much print and braille instructional time their students received each week and who provided this instruction. Although the questionnaire did not ask how long each student had been learning each medium, it did ask how much instruction was provided by persons other than the teacher of students with visual impairments, especially in braille. See [Table 1](#) for more information.

The teachers were asked to give the grade of their student when the decision was made to teach dual media, so as to determine the length of time each student had been learning or using both media. Students who were learning or using dual media for only a year or two would not be expected to be as proficient in both media as would students who were learning or using dual media for six or seven years. Data on students for whom the decision was made before or during kindergarten were analyzed further because this group shares similar experiences in learning each medium simultaneously. Data were available for 36 students. However, for 5 additional students, although the grade for the initial decision was not given, the current grade level was either prekindergarten or kindergarten. Therefore, if these students were currently dual media learners, the decision had to have been made before or during their kindergarten year. Thus, the decision to teach dual media was made before or during kindergarten for a total of 41 students. Data on the amount of instruction in print and braille that these students received per week, differentiating for grade levels and the person giving the instruction, are presented in [Table 2](#).

CURRENT LITERACY LEVELS IN PRINT AND BRAILLE

The teachers reported the current literacy levels in print for 76 students and in braille for 63 students. With regard to print reading levels, 26 of the 76 students were reading below their grade level; 12 were reading one year below their grade level, 10

were reading two years below their grade level, and 4 were more than two years below their grade level. Of these 26 students, we determined the length of time that 22 had been dual-media learners--an average of 3.45 years (range: less than 1 year to 9 years).

With regard to braille reading levels, 36 of the 63 students were reading below grade level; 11 were reading 1 year below their grade level, 8 were reading 2 years below their grade level, and 17 were reading more than 2 years below their grade level. Of the 36 students, we determined the length of time that 32 of them had been dual-media learners--an average of 3.33 years (range: less than 1 year to 11 years). From the data on print and braille reading levels, we determined that 15 students were reading below their grade level in both print and braille. These students had been dual media learners for an average of 3.33 years (range: less than 1 year to 9 years).

Of the 41 students for whom the decision to teach dual media was made before or during kindergarten, print reading levels were given for 29 students, and braille reading levels were given for 24 students. In print, 21 students were reading at their grade level, 6 were reading below their grade level (4 at one year below their grade level and 2 at two years below their grade level), and 2 were reading above their grade level. In braille, 11 students were reading at their grade level, 12 were reading below their grade level (7 at one year below their grade level, 4 at two years below their grade level, and 1 at three years below the grade level), and 1 was reading above the grade level.

Current reading rates are also a factor in dual-media learning because of their use in the choice of reading media and in tracking a student's progress. For print, reading rates were given for 38 (35.2%) students, and for braille, reading rates were given for 39 (36.1%) students; the results were spread evenly across grade levels. In print, 26 (68.4%) students read at 50 wpm or less, 9 (23.7%) read at 51–100 wpm, and 3 (7.9%) read at 101–150

wpm; no student read at more than 150 wpm. In braille, 33 (84.6%) read at 50 wpm or less, and 6 (15.4%) read at 51–80 wpm; no student read at more than 80 wpm. For more information on average reading rates by grade level, see [Figure 1](#), which shows averages of the sighted typical silent reading rates (Carver, 1989) and the reported print and braille reading rates of the students in this study.

EXPECTATIONS FOR FUTURE LITERACY LEVELS IN PRINT AND BRAILLE

The teachers were asked to predict their students' future levels of literacy in both print and braille. The projected levels from which they could choose were emergent (no continuous reading ability), beginning (reading up to a third-grade level), intermediate (reading from a fourth- to an eighth-grade level), and advanced (reading at the ninth-grade level or higher). The teachers were also asked to note any additional disabilities or exceptionalities that their students had. The results presented here are grouped by reading medium and whether the students were reported to have one or more exceptionalities.

The results indicated that while some students were expected to attain only emergent or beginning levels of literacy in print or braille, most students were expected to attain an intermediate or advanced level of literacy. That is, 53 (49.1%) students were expected to attain advanced levels of literacy in print, and 47 (43.5%) students were expected to do so in braille. See [Table 3](#) for more detailed information.

Discussion

Although we did not draw conclusions regarding the best way to decide if dual-media instruction is appropriate or the best teaching technique to use, our study provides a foundation upon which to take a more in-depth look at the area of dual media. In this section, results from the questionnaire are discussed and the limitations of the study are noted.

STRATEGIES FOR TEACHING

When we reviewed the strategies that the teachers used for teaching print reading to students with low vision in light of the visual statuses of the students, the efficiency with which the students were learning to read print was called into question. For example, the findings revealed that 11.3% of the students with restricted visual fields who were reading large print had less than 20 degrees of their central visual field (see Lusk & Corn, 2006). This situation is worrisome because, as the visual field decreases and the print size increases, the amount of text that can be read without head or eye movement also decreases. Therefore, we question the effectiveness and efficiency of using large print as a primary reading medium with this population.

According to Delphi studies by Koenig and Holbrook (2000) and Corn and Koenig (2002), instructional time in braille for dual-media learners who are in kindergarten to Grade 3 should range from 5 to 10 hours per week, on the basis of the number of sessions (daily) and the length of each session (1–2 hours). According to this study's findings, the students in Grades 1–3 who began learning dual media in or before kindergarten were receiving adequate instructional time in print (9.7 hours per week), but were not receiving the recommended amount of instructional time in braille (4.6 hours per week).

Because of grade levels and levels of literacy in each medium, instructional time varies for each student in print and braille. However, for the students in this study, instructional time in print was far greater in each grade level than instructional time in braille. Although some students may have been learning braille at a slower pace because of a nonimminent but anticipated future need for a tactile medium, many of these students could be expected to use both media daily to complete educational and other tasks. These students spent far less time learning the braille code, writing braille, and doing tactile reading. How this difference in instructional time will affect these students is yet to be seen. One

explanation for this difference in instructional time may be that certain skills need to be taught only in one medium, and print is the easier medium because the student's classmates are learning through print. For example, capitalization rules may be taught in print by the general education teacher, and a student who is visually impaired may then be expected to generalize these print skills to braille as needed. We realize that the concept of composition signs, such as the capital sign, is unique to braille and must be specifically taught. However, when to use capitalization (for example, for names, months, and holidays) may be learned as a print skill and generalized to braille. Another explanation may be that a student's teacher of students with visual impairments is not available for more instruction because of his or her high caseload.

One finding of this study was that a wide age range of students were learning dual media, from early childhood to late adolescence and early adulthood. Most of the students who were not initially dual media learners were print readers who were learning braille. Therefore, a sufficient number of curricula and curriculum materials to address the learning needs of this wide range of age groups is needed, as well as various curricula for learning dual media.

OUTCOMES

The amount of time a student has been learning to use a new medium is important because even an advanced print or braille reader can take several years to become proficient in the new medium and may never reach his or her level of proficiency in the first medium. One disturbing finding was the low reading rates of students whose reading rates were known. No students were reported to read more than 150 wpm in print, which is the level of a typical fifth grader (Carver, 1989), and no students were reported to read more than 80 wpm in braille, which is the level of a typical first grader. It is difficult to compare these results to previous studies (Lowenfeld et al., 1969; Trent & Truan, 1997;

also K. Blankenship, personal communication) because these studies did not differentiate between students who read only braille and students who read dual media. However, it appears that the reading rates reported in all the studies reflect noncompetitive reading rates when using nonauditory media. On the basis of Wolffe's (2000) estimate, any person who has a job in which literacy is used needs to have a reading rate of at least 150 wpm. Based on their reading rates, these students do not have the skills that are necessary to compete in the workplace for jobs that require literacy.

It was also surprising to find that only roughly a third of the teachers reported reading rates (silent or oral) for their students. If teachers are not taking measures of their students' reading rates, they have no way to tell how the students are progressing in their acquisition of literacy skills or how competitive the students can be expected to be with their peers at the present time or in future employment situations.

Although a review of these data may lead one to question the viability of teaching dual media to students with low vision, we caution readers about drawing such conclusions. Although the reading rates of dual-media learners may not be competitive with those of their peers, one of the many unanswered questions is: How would their reading rates compare if these students were learning or using only one medium? Also, if decreasing vision is the main reason for learning braille in addition to print, learning dual media may be the only feasible option for future literacy experiences. Therefore, dual media may not be the best option for students with low vision, but it may be a better option than the alternative of not being competitive in one medium or worse, not being proficient in any reading medium. For students with stable vision conditions who are clearly readers of either print or braille, these concerns may not be warranted.

EXPECTED FUTURE LEVELS OF LITERACY

The majority of the respondents to the survey reported that

students with only visual impairments and students who are visually impaired and gifted are expected to attain intermediate or advanced levels of literacy in print and braille. This expectation is encouraging. However, with the low reading speeds reported in this study, one must question whether high levels of reading ability will result in functional reading ability for work purposes without adequate reading rates.

LIMITATIONS

The portion of the questionnaire discussed in this article had several limitations. When the teachers were asked to report the students' reading rates, they were not asked specifically for silent or oral reading rates, nor were they asked to indicate whether the reading rates they reported were silent or oral. In addition, the teachers were not asked to list the name of the reading inventory or other method that they used to obtain the reading rates. Finally, the teachers were not asked to give information on the point of progress in each medium for their students. Therefore, the number of students who had completed instruction in one or both media and the number of students who were learning to read and write in print or braille could not be determined.

In this article, curricular decisions and instructional strategies that the teachers used to teach students who were learning dual media and the students' current and expected future literacy outcomes were reported. At this time, there is no guidance for determining which curricula or methods to use in providing instruction. In light of the concerns about the outcomes indicated by these data, better outcomes for students who are learning dual media cannot be expected unless such guidelines are developed.

Recommendations

In light of the findings discussed in this article, this section presents recommendations for teachers and questions for further study.

RECOMMENDATIONS FOR TEACHERS

1. Ensure that the print sizes that are used with dual-media learners are based on objective data that include considerations of optical and electronic enlargements.
2. Use the guidelines presented by Koenig and Holbrook (2000) and Corn and Koenig (2002) regarding literacy instruction for students reading braille and those with low vision, respectively.
3. Assess the reading rates of students who are learning dual media to track the students' progress in print and braille.

QUESTIONS FOR FURTHER RESEARCH

1. Is there an underrepresentation of students from minority groups and special schools who are learning dual media? If so, is this underrepresentation unique to the population of students who are learning dual media, or is it a problem within the larger population of all students with visual impairments?
2. Is there a threshold of visual acuity and visual field when dual media becomes a more appropriate instructional practice?
3. What evidence is there for or against the use of assessments in making decisions regarding reading media, including formal and informal learning media assessments, informal reading inventories, and measures of reading stamina?
4. What are parents' and students' attitudes and experiences regarding learning dual media compared to teachers' perceptions?
5. What are the minimal and average reading rates of those with and without visual impairments who are successfully employed in various job categories?
6. Is there evidence for using one or more specific curricula for teaching braille to students with low vision?

7. Are there one or more techniques (such as blindfolding or having students focus on print while reading braille tactilely) that should be used when teaching braille to students with low vision?
8. What are the differences in the acquisition of literacy skills for students with low vision who are learning print only, braille only, and both print and braille? Are there interventions to improve the acquisition of literacy skills for dual-media learners?

Conclusion

Educators of children with low vision continue to seek the best literacy outcomes for their students. The data presented in Parts 1 and 2 of this study are only a beginning to further studies that are needed to ensure that children learning to read both braille and print acquire literacy skills. Educators should hold high standards for students of various ability levels so their literacy will facilitate to the greatest extent possible independent living and employment.

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Kelly E. Lusk, M.Ed., instructor and doctoral candidate, Department of Special Education, Vanderbilt University, and teacher of students with visual impairments, Providing Access to the Visual Environment (Project PAVE) at the Vanderbilt University Medical Center. Address correspondence to her at Department of Special Education, Peabody College, Vanderbilt University, Box 328, Nashville, TN 37203; e-mail: <kelly.lusk@vanderbilt.edu>. Anne L. Corn, Ed.D., professor, Department of Special Education, Ophthalmology and Visual Sciences, Vanderbilt University; e-mail: <anne.corn@vanderbilt.edu>.

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