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Trends in Braille and Large-print Production in the United States: 2000-2004

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Abstract: This study investigated practices in the production and distribution of braille and large-print textbooks, highlighting changes in production and delivery systems from 2000 to 2004. The findings indicate that fewer states use production models for the statewide acquisition and distribution of special materials and that there is a greater reliance on materials from the American Printing House for the Blind and a greater use of publishers' electronic files for production.

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Students who are visually impaired frequently experience inconsistencies and problems in the delivery of curricular materials in braille. For these students to have full access to the general education curriculum would mean they should receive textbooks in alternate formats--braille or large print--when school begins, so that they have access to information and the general education curriculum at the same time as do their sighted peers.

However, the manner in which students receive their textbooks in alternate media differs from state to state.

One of the goals of the *National Agenda for the Education of Children and Youths with Visual Impairments, Including Those with Multiple Disabilities* (Corn, Hatlen, Huebner, Ryan, & Siller, 1995; Huebner, Merk-Adam, Stryker, & Wolffe, 2004) addresses the need for timely delivery of special materials. It states: "Access to developmental and educational services will include an assurance that instructional materials are available to students in the appropriate media and at the same time as their sighted peers" (p. 5). In working toward this goal, the American Foundation for the Blind (AFB) has led a national coalition of all the groups concerned with access to instructional media, including publishers, educators, braille production personnel, access technology specialists, parents, and consumers. This national collaborative coalition, known as the AFB Textbooks and Instructional Materials Solutions Forum, has led a six-year effort to develop an infrastructure to achieve the goal.

In 2000, three national surveys were conducted to investigate the production of textbooks and instructional materials in alternative media, how students access these textbooks, and the training and availability of braille transcribers. The findings of these studies (Corn & Wall, 2002a; Corn & Wall, 2002b; Wall & Corn, 2002) provided important national foci for addressing the identified needs. One result was the creation of a new career, launched with a series of nine courses leading to an associate's degree with licensure as a braille textbook transcriber. The program, piloted at Northwest Vista Community College in San Antonio, Texas, was a collaborative effort with AFB and the Texas Education Agency. Completion of the curriculum enables transcribers to have a viable career path as professionals, rather than as volunteers.

Another outgrowth of the 2000 national surveys were activities of

the AFB Solutions Forum, in partnership with many other national organizations, to advocate for language in the Individuals with Disabilities Education Improvement Act of 2004 (IDEA; P. L. 108-446) to address the provision of textbooks and instructional materials in accessible formats for students who are blind or have low vision. The *Federal Register* noted that "proposed §300.172, regarding access to instructional materials, would incorporate the new language in section 612(a)(23) of the Act regarding the timely provision of instructional materials to blind persons or other persons with print disabilities" (Office of the Federal Register, 2005, p. 35793). This addition will raise national awareness of the importance of braille and those who produce it, thereby increasing the demand for skilled braille transcribers.

IDEA 2004 also mandates the adoption of the National Instructional Materials Accessibility Standard (NIMAS), a standard established by the secretary of education to be applied in the preparation of suitable electronic files that are used solely for efficient conversion in specialized formats (AFB, n.d.). The NIMAS resulted from recognition of the redundancy and cost of acquiring accessible materials. Proposed §300.172(a) repeats section 612(a)(23)(A) of the act, which states that a state must adopt the NIMAS in a timely manner after its publication in the *Federal Register* (Office of the Federal Register, 2005). When textbooks and classroom materials are produced using the NIMAS, they will be more efficiently adapted and produced as products, including braille, audio, large-print, and digital editions of textbooks.

A central component of IDEA 2004's instructional materials-accessibility component is the establishment of the National Instructional Materials Access Center (NIMAC). The secretary of education was directed to establish and support the NIMAC through the American Printing House for the Blind (APH). The

NIMAC will provide the needed infrastructure to produce materials in multiple formats. The following conditions were placed on the NIMAC, that it should:

- Receive and maintain NIMAS files and print instructional materials made available by the textbook publishers, state educational agencies, and local education agencies.
- or publish procedures to protect against copyright infringement in the NIMAS files.
- Provide NIMAS files to authorized entities, so they can produce student-ready alternate-format versions of publications.

In addition, since 2002, AFB and the Verizon National Campaign for Literacy, Textbooks, Transcribers, and Technology have highlighted the critical shortage of braille transcribers and the lack of timely and appropriate textbooks and instructional materials for students who are blind or have low vision. The purpose of the study reported in this article was to determine if the initiatives since 2000 have had an impact on the acquisition, production, and distribution of braille and large-print textbooks by state and local school systems.

Methods

On the basis of the surveys conducted in fall 2000, a committee, consisting of representatives from the AFB Solutions Forum, Instructional Resource Centers for the Blind and Visually Impaired, and university faculty members altered the survey to determine what changes had occurred since 2000 and added questions pertaining to newer approaches to the production and delivery of textbooks. The survey was pilot-tested in 4 states and refined on the basis of responses from these states. The survey was then sent to individuals in each of the 50 states whom the

committee considered to have comprehensive knowledge of statewide production facilities and resources. Telephone calls and e-mail messages were used to contact those who had not returned their surveys within two months. No individuals reported that other individuals within their state would be more knowledgeable.

Results

Forty-nine of the 50 state surveys were returned. Because some surveys were returned with minimal information, only 45 surveys were used in the overall analysis. The 45 surveys represented 12,503 school districts in 2,721 counties and 66 specialized schools and center-based educational settings. The 5 states for which full data were not available represented 1,754 school districts in 454 counties and 8 specialized schools. Thus, the data that we analyzed reflect 88% of the nation's school districts. Since each respondent represented one state, the findings are reported using "state" interchangeably with "respondent."

Models for acquisition, production, and delivery

Definitions were given on the survey instrument for four models that are typical in states that produce or acquire and produce and deliver textbooks and instructional materials (see Box 1). Twenty states reported using the depository-producer model. The remaining 25 states reported using nonproduction models, including 17 as depositories, 4 as clearinghouses, 3 as acquisition-delivery centers, and 1 as a limited-acquisition program.

Informative differences were seen between states that have and do not have production models when the respondents described limitations in systems that are used for producing and delivering special materials in their states (see Table 1). The lack of funding and of a centralized means of organizing production and delivery were greater concerns for states that do not use a production

model. The lack of trained personnel (transcribers) was a top concern for the respondents in all the models. When asked what was needed to create an ideal production and delivery system, the respondents in states that used the production and nonproduction models agreed that the top three needs were the development of a centralized system, more funding, and more braille transcribers. They generally gave several answers to each question, so the number of responses to a given question add up to more than the total number of respondents.

Acquisition and production of large-print materials

The states were asked where they obtained new acquisitions of large-print textbooks (not those obtained from in-state depositories). They reported that a median of 48% of new large-print acquisitions come from APH (range = 0 to 98%)--the largest source indicated for large-print textbooks. The second-largest source was commercial vendors (median = 17%). Although some states indicated that up to 100% of their large-print textbooks came from volunteers or paid employees, this response was so rare that the median result for both categories was 0.

Of the 28 states that responded to a question on the print size of textbooks that were distributed to schools, 13 states stated they provide only one font size, while the remaining 15 produced font sizes as requested for individual students. Thirty-five of 41 states indicated that 100% of their large-print textbooks are made from standard-print copies. Only 3 states reported that they used publishers' electronic files to produce large-print textbooks. Of the 20 states that reported the size of the production of large-print textbooks, the sizes ranged from 500 pages to 1.9 million pages annually.

One factor that may influence the number of large-print textbooks that are provided (by APH, commercial vendors, or state

production) is the degree to which optical devices are consistently provided across a state. Data for states were separated according to whether the respondents indicated that their states had agencies that provided -closed--circuit televisions, monoculars, magnifiers, and telescopes to students. The data were compared according to states in which various agencies provided all these items and states that provided none. States that did not have an organized provision of low vision devices indicated that a higher percentage of large-print textbooks were obtained from APH (50% versus 31%) and from commercial vendors (23% versus 8%) than did states that had an organized provision of low vision devices. This finding is in the face of the fact that both groups of states indicated similar increases in requests for large-print textbooks in the previous three years (20% and 28%).

Acquisition and production of braille

With 41 states responding, the greatest source for newly created braille textbooks was vendors or paid braillists (median = 70%). Other sources were APH (median = 10%, range = 0 to 60%) and volunteers (median = 4.4%, range = 0 to 84%). These figures show a larger distribution of sources being used for braille textbooks than for large-print textbooks. Many states created their braille from standard-print copies (median = 90%), but 28 states were using publishers' electronic files, 9 states were using CD-ROM texts, and 18 states were using other sources for their production of braille. Of the 28 states that used publishers' electronic files, the proportion of braille that was produced from these files ranged from 2% to 85%.

Technology and expertise used for production

Twenty-eight states reported using publishers' electronic files to produce braille textbooks, while 34 states reported having the capacity to do so. Three states reported using publishers'

electronic files to produce large-print textbooks, while 11 states indicated they had the capacity to do so. Of the 45 states that responded to the survey, 73% reported that they downloaded files to format and emboss braille. Less common uses of publishers' electronic files were providing the file to another agency (36%), sending electronic files directly to students (27%), and sending textbooks to students on CD-ROM (18%). Sixteen percent of the respondents indicated that they did not use publishers' electronic files.

Although the majority of states used electronic files for consistent formatting, only 18% reported having written guidelines for the formatting of these files. These findings indicate that while states recognize the advantages of using publishers' electronic files for the production of both braille and large-print textbooks, there are barriers to making efficient use of these files. In fact, 22 states reported that they needed to increase their expertise in this area. In response to another question, the most common barrier to achieving a greater capacity to use publishers' electronic files was the lack of knowledgeable personnel (61%). Other frequently noted barriers included the lack of financial resources (48%), limited access to training (36%), and an insufficient number of files to make allocating resources worthwhile (25%).

Delivery, systems, and guidelines

There are many ways to look at the efficiency of an acquisition-and-delivery system, but one way is to consider the number of braille and large-print textbooks that are delivered on the first day of school. This measure was estimated by the respondents as a function of the time of year when the texts were ordered. Responses regarding the lateness of the arrival of such textbooks at schools followed an expected pattern, based on when requests for the textbooks were made. If textbooks were requested in January of the previous year, an average of over 90% of both

braille and large-print textbooks were predicted to arrive before the start of school in the fall. However, delays in requesting textbooks led to fewer textbooks that were projected to arrive at schools at the beginning of school, this was especially true for braille textbooks and especially true for textbooks ordered after July 1 (see Figure 1).

Two other factors that may affect the timeliness of the provision of textbooks were whether a state had a -state--adoption process for textbooks and whether a state had in-state production facilities for special materials. A Kruskall-Wallis test of medians indicated that for each month for which the respondents estimated the percentage of orders that would arrive on time, states with a state-adoption process did not differ significantly from states without such a process for braille textbooks until late requests were considered (such as requests made in July) ($H = 55.1$). In this case, the states with a state-adoption process estimated higher rates of timeliness for braille textbooks than did the states without such a process. (The state-adoption process is the method by which a state, typically through its Department of Education, identifies certain texts as meeting content specifications, which are thus "sanctioned" as official texts for the state.) In every month for which hypothetical requests for textbooks were made, there was a significant difference between adoption and nonadoption states in their estimates of the timeliness of receiving large-print textbooks (January, $H = 4.61$; March, $H = 5.77$; May, $H = 5.20$; July, $H = 8.77$). The states with a state-adoption process tended to have higher estimates of the timeliness of providing both braille and large-print textbooks; but, for braille, this difference was not apparent until requests were made in May and June, whereas for requests for large-print textbooks, the difference existed no matter when the requests were made. Figure 2 shows the median estimated percentage of requests that would arrive on time for braille and large-print textbooks for states that

have and do not have a state-adoption process. The boxes in the figure illustrate the middle 50% of the responses, while the bars above and below a box illustrate the range through the upper and lower quartiles of the spread.

A Kruskall-Wallis test of medians indicated that for each month for which the respondents estimated the percentage of orders that would arrive on time, states with production capability did not differ significantly from states without production capability for either large-print or braille textbooks except for requests for large-print textbooks made in March ($H = 9.37$) or May ($H = 6.30$). Figure 3 shows the median estimated percentage of requests that would arrive on time for braille and large-print textbooks for states that have production capability and for states that do not. The boxes in the figure contain the middle 50% of the responses, while the bars above and below a box illustrate the range through the upper and lower quartiles of the spread. In general, both the states with and without in-state production facilities estimated declines in on-time arrivals of textbooks the later the orders were placed.

Figure 4 shows the timeliness of the receipt of braille and large-print textbooks according to the four most commonly identified kinds of production-delivery models that the states use. Limited responses in several categories did not allow us to analyze the data statistically, but the figure shows that the acquisition--delivery model has a much lower estimate of on-time deliveries for large-print orders in July, and the clearinghouse model estimates much higher on-time deliveries for braille orders in July.

The timeliness of delivery was also analyzed according to the number of school districts in a state. It was thought that more school districts might lead to a more cumbersome process for tracking and delivering orders. The number of school districts in a state was not significantly correlated with the percentage of

requests that were delivered on time from January through May. For requests made as late as July, however, there were significant correlations between the number of school districts in a state and the timeliness of the delivery of both braille (r = .32, p = .05) and large-print (r = .34, p = .04) textbooks, with states with more school districts estimating a higher percentage of textbooks arriving on time. However, since there were fewer states with a large number of school districts, these few cases may have happened to have better "on-time" estimates, whereas the larger group of states with fewer school districts had more variability in their predictions. Without further data collection, it is difficult to tell whether these correlations are indicative of a true effect.

Need for braille transcribers

The respondents (n = 38) reported that their states had an average of 4 paid transcribers (SD = 5.0) and 15.1 volunteer transcribers (SD = 28.3). This finding indicates that states still rely on volunteers for much of their braille production. Of the 42 states that responded, 26 said they required their transcribers to have National Library Service certification. The respondents were asked to indicate, without thought to cost, how many transcribers were needed to fill current requests for braille textbooks and educational materials. Their estimates of their current needs averaged 4.8 transcribers per state. For projected needs in 5-10 years, the respondents thought they would need similar increases in the number of transcribers in each of the 5-year periods (an average of 4 more in 5 years and 5 more in 10 years). These are additive estimates and do not reflect the need for transcribers at the level of local school districts.

Comparison of studies

Four years elapsed between the initial surveys and the gathering of these latest data. In this analysis, we looked at common

measures within both studies. One of the important ways to gauge the changes in how special materials are handled is to look at changes in the models that states have been using. The depository-producer model was used by 52% of the states in 2000 but 44% in 2004. An increase from 29% to 38% was seen in the use of the depository model. The use of the clearinghouse model fell from 19% to 9%, but the acquisition model rose from 2% to 7%. These changes imply a general decrease in the states' capacity to produce materials, with more states opting to use some version of a depository model.

Across the models, the most common disadvantages that were noted in 2000 were that the processes were cumbersome and that storage was expensive. It appears that local education authorities were not sufficiently involved in the process, resulting in the need for more transcribers and delays in ordering, producing, or receiving materials. Whereas 8% of the respondents in the 2000 survey noted no disadvantages in their state's system, no respondents did so in the 2004 survey. In 2004, the most commonly cited disadvantages were the lack of transcribers, of a strategic plan or interagency cooperation, of a centralized center, of in-state production, and of funding. Although the lack of transcribers and cooperation among agencies remained issues, in 2004 a wider variety of disadvantages was noted. In addition, the disadvantages that were noted indicated more depth of reflection on the problems that are associated with the production and delivery of special materials.

Because APH is a major source for large-print and braille textbooks, it is important to gauge how the use of APH resources may be changing. Table 2 shows states' use of APH and other sources for obtaining new materials (not in-stock items). The use of APH increased for both large-print and braille textbooks from 2000 to 2004. This shift makes sense when it is considered together with states' lower focus on in-state production. In the

2000 study, 76.6% of braille and 70.3% of large-print textbooks were newly acquired or produced items. In the 2004 study, however, 55% of the requests for braille and large-print textbooks were filled by newly acquired or produced items. Thus, states are not only relying on APH for new materials, but, in general, they are relying more on in-stock items. In the 2000 study, 15 of 30 states indicated that they would produce large print in a font size that was based on students' needs. The ratio in 2004 stayed about the same, with 15 out of 28 states reporting that they produce textbooks in more than one font size.

In the 2000 study, the respondents indicated that 17% of students who used braille and 11% of students who used large print received their textbooks after the first day of school. In the 2004 study, the respondents projected that 20% of the orders intended for the fall would be received after school started. The respondents in the 2000 study showed that, starting in June or July, braille textbooks requested in those months would likely not be available at the beginning of the school year. The 2004 study showed a similar pattern, with 33% of the braille requests made in May and 76% of those made in July estimated not to be available at the start of school. In the 2000 study, requests for large-print textbooks did not have a high potential for being late until orders received in August were considered. This finding was supported in the 2004 study, since the respondents indicated that 47% of the requests made in July would not be available when school started.

From 2000 to 2004, the percentage of braille textbooks made from standard-print copies decreased from 90% to 72%, and the use of publishers' electronic files doubled from 6.2% to 15% (see Table 3). In the 2000 study, 43% of the 42 responding states indicated some capacity to download publishers' electronic files for the production of braille and large-print materials--a figure that increased to 79% in the 2004 study. The percentage of states that indicated that they had no capacity to use publishers'

electronic files declined from 19% to 2%. However, 43% of the states in 2000 and 51% of the states in 2004 indicated that they needed more capacity to use publishers' electronic files. It is important to note that even though a much higher percentage of the states indicated that they had a greater capacity to use publishers' electronic files in 2004 than in 2000, there was not a similar increase in the amount of braille and large-print textbooks that were produced using the files, perhaps because states did not perceive that they had the necessary expertise to use the files efficiently.

In the 2000 study, 20 states (50%) indicated that they had deadlines for requests for textbooks, but that there were no set processes for dealing with late requests. The most common consequence was that the staff had to work harder and students received textbooks late. In the 2004 study, there was more evidence that states were developing processes to address late requests for textbooks. Six states required a syllabus with a late request to identify the portion that would be used first. Other states used ongoing updates from teachers of children who are visually impaired regarding the students' instructional needs or supplemented the planned braille materials with other materials.

In 2000, the respondents estimated that 380 braille transcribers were currently needed across the United States and that 735 would be needed in 5 years and 1,020 would be needed in 10 years. In the 2004 study, these estimates were slightly lower, with the current estimated need of 280 braille transcribers and the projected need of 545 in 5 years and 940 in 10 years. The respondents in both studies were reluctant to project needs to 5 and 10 years. In 2000 and 2004, 85% and 81.8% of them estimated the level of need at 5 years, and 70% and 68.2%, respectively, projected the level of need to 10 years.

Discussion

The many efforts of organizations and individuals to heighten awareness of the issues surrounding the delivery of textbooks on time and in the media that students need since the 2000 study need to be acknowledged. Through the national collaborative effort of stakeholders that are associated with the AFB Textbooks and Instructional Materials Solutions Forum, many issues have been addressed that have helped raise awareness of the barriers to and the plausible solutions for many of the issues addressed in the 2004 study. The 2004 study sought to assess the progress that had been made in the delivery of textbooks, the use of publishers' electronic files, the process that is used in the production of braille and large-print textbooks, and the perceived needs in the states' production and delivery systems.

Many states noted that they were hampered by the lack of funding and personnel but recognized the need to increase faster access to textbooks, if not production. For both braille and large-print textbooks, the estimate of how many would be completed by the start of school declined rapidly if requests were made after July 1. This finding indicates the need for a change in systems to make more textbooks available more rapidly. From a systems standpoint, a state with a textbook-adoption process appeared to have a positive influence on the estimate of how well a state could deliver specialized texts on time. That having an in-state production house did not have a positive influence on the timely provision of special materials may be affecting the apparent decline in the number of states that have a substantial production capability. Many states indicated that the processes involved in the production of braille and large-print textbooks were cumbersome and expensive. A partial solution may be to increase the use of materials on audiotape or CD-ROM to supplement braille and large-print materials (when appropriate for both the materials and the indivdual student). The use of modern production technology, publishers' electronic files, and more

efficient interstate lending systems would also help to fulfill the need for more rapid production and delivery. Although a number of respondents identified the ability to download publishers' electronic files, they felt ill equipped to deal with the demands of production. They are trying to make the move toward using publishers' electronic files, but they are doing so while continuing to experience significant needs in the areas of funding, personnel, and training. In addition to the great need to recruit transcribers, there is the need to train them in the use of electronic files and new technologies for the production of braille and large-print materials.

With their vast knowledge of these issues, the respondents may need to become active in advocating for the funding that is required to make significant changes. A national effort may also be needed for states to acquire additional funding and to address needs that cross states, such as the need for recruitment and training, as well as some problems of production that can be solved by finding regional or national solutions. In the present system, sharing materials across state borders may be challenging but not insolvable. There may also be other points in the production of materials that need to be rethought. If the production of braille textbooks is made much more rapid, the process of proofreading the texts may still slow down the entire production and delivery process. Thus, every step of the production and delivery process should be reviewed in terms of how it can be made more efficient.

One limitation of this study was that it looked only at braille and large-print textbooks. Further research is needed to investigate the extent to which braille and large print are available at the local level for day-to-day and school-based materials, such as tests. As the states incorporate the NIMAS into their production efforts, further research should consider the impact of such variables as cost, speed of production, and on-time delivery. Currently, it

seems that a major limiting factor in the on-time delivery of braille and large-print textbooks is requests that are received too late for the textbooks to be produced or acquired in time for the start of school. If more braillists were available and states had systems in place to produce textbooks more quickly and store them more efficiently, the critical time after the end of one school year and the beginning of the next could be made more productive. The NIMAC may be able to assume the role of leading states to find solutions to procedural problems.

In conclusion, we want to mention the overriding impression that we had from the responses to various questions and the difficulties encountered in obtaining information. It is our impression that incorporating a business model into the existing types of centers would be beneficial. Communities and states need to develop guidelines for the production and delivery of textbooks while building a viable infrastructure. In addition, it would be helpful if systems were instituted to look at ways in which local school systems and statewide entities could work together to produce braille and large-print materials that are beyond the scope of textbooks.

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