# Research Report

## Results of an Online Refresher Course to Build Braille Transcription Skills in Professionals

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Certified transcribers, non-certified transcribers, volunteers, paraeducators, and teachers of students with visual impairments transcribe braille materials for K-12 students (those in kindergarten through 12th grade), and their training and level of preparedness varies greatly (Corn & Wall, 2002; Herzberg & Stough, 2007; Rosenblum & Herzberg, 2011). With the exception of conference sessions, courses offered by the Hadley School for the Blind, and university courses, there is not a national vehicle for individuals to easily and inexpensively refresh their knowledge of braille formatting, tactile graphics production, and braille codes, including the Nemeth Braille Code for Mathematics and Science Notation (hereafter referred to as Nemeth code). In 1999, Allman and Holbrook advocated for refresher braille courses based on the analysis of pretest and posttest data from their successful regional braille refresher workshops (Allman & Holbrook, 1999). Amato's 2002 study of teacher preparation programs in the United States and Canada also supported the use of refresher courses (Amato, 2002). Forty-two of the 45 respondents in that study reported that refresher courses should be required at regular intervals or when a teacher thought it was necessary to update skills.

Distance education provides access to learning without requiring one to simultaneously be with the instructor. Distance education avenues have been used as a part of braille instruction over the last two decades. In 1997, Kapperman and others developed a computer-based Nemeth Braille Code Tutorial, which is still used by individuals to refresh their knowledge (Kapperman, Henry, Cortesi, Heinze, & Sticken, 1997). Wormsley (2001) reported on a successful literary braille refresher course that incorporated video teleconferencing. Given the increase of distance education options, there was a need to explore the feasibility and effectiveness of online braille courses, including those that focus on Nemeth code, formatting, and tactile graphics.

It has been anecdotally hypothesized that K-12 students who read braille receive materials that are not equal in quality to materials received by sighted peers (Corn & Wall, 2002). This hypothesis was supported by a direct examination of braille transcriptions of mathematics materials. More than half of the transcriptions contained errors (Herzberg & Rosenblum, 2014). In addition, in a recent study of 12 students in grades 6–12, 11 of the youths reported that there were times when they were not provided materials in braille at the same time sighted peers received print materials (Rosenblum & Herzberg, 2015).

The data from the Herzberg and Rosenblum (2014) study regarding frequently occurring Nemeth code and formatting errors as well as variability in the production of tactile graphics were used in the development of an online refresher course. This article reports the results of a follow-up survey (referred to as the survey) of individuals who completed all course requirements. The University of South Carolina Upstate and the U.S. Department of Education (H235E090010) funded

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the development of the course. The following research questions were explored:

1. What knowledge about the Nemeth code, formatting of mathematics materials, and producing tactile graphics was gained through the completion of the online course?
2. What, if any, impact did the completion of the online course have on the way in which participants prepared mathematics materials in braille?
3. What course features were helpful?

## Methods

### *Participants*

The project was approved by the Institutional Review Committee at the University of South Carolina Upstate. Recruitment for the refresher course occurred through postings on electronic discussion groups in the field of visual impairment in early 2014. The course ran from March 1 to April 15, 2014, at no cost to individuals who were currently preparing mathematics materials for K-12 students and wanted to refresh their knowledge of some aspects of the Nemeth code, formatting, and tactile graphics production. One hundred thirty-five individuals began the course. All 72 individuals who completed the course, including the pre- and posttest, were sent an e-mail in early April 2014 inviting them to participate in this study. The survey remained open for approximately one month, with a reminder e-mail sent halfway through the month. Seventy-one of 72 individuals (98%) completed the survey.

### *Procedures*

The authors developed a self-paced refresher course using the web-based Moodle learning management system. For each lesson, individuals viewed content, completed self-assessment questions and a quiz at the end of the lesson, and for most lessons completed a transcription of mathematics exercises or a commercially generated mathematics worksheet. Prior to beginning the first unit, individuals completed a 20-item multiple choice pretest designed to assess their current knowledge on course topics. After completing the last lesson, participants completed a 20-item posttest. The same items were used for the pre- and posttest. During the development of the content for the refresher course, material was reviewed by a National Library Service for the Blind and Physically Handicapped (NLS) literary certified braille transcriber who was also a certified teacher of students with visual impairments; however, even with this person's input, there were still minor errors within the course content. Some errors were content related, some were related to the Moodle format, and some were typographical errors. Throughout the six weeks that the course was open to users, minor changes were made to the actual course content; however, none of the questions or answer choices on the pretest and posttest were changed.

The follow-up survey was developed using the online tool Survey Monkey. The online survey began with a brief description of the purpose of the study and contained 27 items. The majority of the questions used a Likert scale and asked the participants about their experience with the course, including their satisfaction with the organization and content of the course as well as how valuable the content was in advancing their transcribing skills. The survey ended with two demographic questions and four open-ended questions about the effect of the course on how participants prepare materials and what participants liked best about the course.

Survey responses were not matched with pre- and posttest data, since survey responses were anonymous. Pre- and posttest data and survey data was entered into SPSS and analyzed using descriptive statistics. Qualitative data was analyzed by compiling the data for the open-ended questions and identifying

 

themes both within and among the questions (Merriam, 2009).

## Results

### *Demographic data*

The only demographic information collected was the respondent's job role and the amount of time spent completing the course. Of the 70 participants who provided their job role, 33 were teachers of students with visual impairments, 28 were transcribers, 7 were paraeducators with some responsibility for preparing braille materials, and 2 listed "other." Two of the 71 participants spent 0–5 hours on the course, 16 spent 6–10 hours, 38 spent 11–15 hours, 10 spent 16–20 hours, 3 spent 21–25 hours, and 2 spent more than 26 hours.

### *Pre- and posttesting*

The mean on the pretest for the teachers of students with visual impairments was 12.54 and on the posttest it was 16.54. The mean for the other participants on the pretest was 13.38 and on the posttest it was 16.86. A $2 \times 2$ repeated measures analysis of variance was conducted to examine whether there was a significant difference from the pretest to the posttest for those who were teachers of students with visual impairments and those in other roles. There was a significant difference for all participants between the pretest and posttest scores, $F(1, 65) < 1.091$, $p < .001$. There was not a significant interaction effect between groups (teachers of students with visual impairments and others), $F(1, 65) < .607$, $p < .439$. Nor was there a significant overall difference between groups (teachers of students with visual impairments and others), $F(1,65) < 1.091$, $p < .300$.

### *Satisfaction with course features*

Participants were provided with a series of statements about the helpfulness of course features. The highest-rated features were: print-and-braille examples provided in the Nemeth and formatting modules, examples of tactile graphics, quizzes at the end of each lesson, and practice mathematics materials to transcribe accompanied with an answer key in simulated braille. Participants were asked what they liked best about the course. Many of the comments related to the most highly rated course features. One participant commented, "I liked the automatic feedback in the check-your-comprehension passages and the print/braille examples. I also greatly appreciated the final copies of the whole course that I will refer to often with my braille students." Another said, "I learn best through practice; having the practice exercises was very valuable to me."

The online, self-paced, incremental learning, and immediate feedback was viewed as a plus by many participants, as illustrated by this comment: "I liked that we were able to work at our own pace, that it was not timed other than the fact that we had a starting date and a deadline." For those who had not completed an online course before, it was reported that the format was easy to learn, as indicated by this comment: "I enjoyed the whole course. Especially when you walk away with a feeling of accomplishment due to learning something new and the anticipation to implement it."

### *Value of content*

Participants rated how valuable the content in each module was in helping them advance their skills. A 4-point Likert-type scale with values from not valuable to extremely valuable was used. The mean and standard deviations are reported in Table 1. The higher the mean, the more valuable participants found the topic. Participants were then given the statement: "In the future, I would enroll in a course that expanded on the topics covered in this pilot course." Participants used a 5-point Likert-type scale of strongly disagree to strongly agree to rate this item. For the 71 participants, the mean was 4.69 ($SD < .550$).

*Table 1*
**Value of the course content in advancing your skills.**

| Content | *N* | *M* | *SD* |
|---|---|---|---|
| **Nemeth** | | | |
| ELI | 70 | 3.56 | .555 |
| Omitted material | 69 | 3.49 | .633 |
| Spatial problems | 70 | 3.36 | .615 |
| Linear problems | 70 | 3.34 | .657 |
| **Formatting** | | | |
| Formatting headings or subheadings | 70 | 3.57 | .579 |
| Formatting worksheets | 68 | 3.56 | .583 |
| Transcriber's notes | 70 | 3.51 | .583 |
| Page numbering | 69 | 3.35 | .660 |
| **Tactile graphics** | | | |
| Preparing tactile graphics | 71 | 3.52 | .606 |
| When to use a tactile graphic | 71 | 3.44 | .626 |

Note: ELI = English letter indicator.

### *Effect of the course*

More than 80% of the participants reported that they learned content in at least one topic covered in the course that then changed the way they now prepare mathematical materials. The most frequently mentioned topics were the English letter indicator (ELI), how to format headings, and deciding if and when a tactile graphic is needed. Other common areas of change related to the Nemeth code and formatting included: use of the general omission symbol and the long dash; formatting of spatial and linear problems; use of punctuation and a numeric indicator; when to use and not use the ELI when creating labels on a tactile graphic; page numbering; formatting of directions and exercises, including multiple-choice problems; and formatting of tables. More than half of the participants said that they create tactile graphics differently now due to what they learned about creating keys for a graphic, preparing clocks, techniques for keeping graphics uncluttered, where to place graphics on a page, and spacing required for tactual discrimination of objects. One participant noted, "The basic rules such as sizing and spacing were of tremendous help to me. I feel as if I go about tactile graphics with more confidence."

## Discussion

This article shares information gathered from 71 individuals who completed an online refresher course about Nemeth code, formatting, and tactile graphics. More than 80% of the participants provided specific examples of how they prepare mathematical materials differently after taking the course. Ongoing professional development and continued practice are essential for building and maintaining transcribing skills. Individuals transcribing braille materials should continue to learn and improve their skills across time, especially since the United States has recently transitioned to Unified English Braille (UEB) and guidelines for formatting and mathematics materials will likely change. It will be essential for individuals to obtain initial certification in UEB and stay up to date with the changes in guidelines for formatting and using Nemeth code within UEB contexts. Otherwise, individuals are at risk of transcribing materials that are not equal in quality to materials received by sighted peers. As one participant said, "It was embarrassing to know how incorrectly I had formatted for some of my previous students, but learning on the fly is always difficult."

In addition to the information that participants shared about what they learned, the pre- and posttest data supported the Allman and Holbrook (1999) findings that refresher courses were an effective method for maintaining and building braille skills across time. The findings of this study also supported the delivery of information in an online format for not only refreshing the knowledge of individuals, but also of assuring that the transcriptions that they produce are more accurate in terms of the Nemeth code rules and more in line with the existing guidelines for formatting and tactile graphics. A future study to evaluate braille materials produced by

 

participants prior to a refresher course and following participation in a refresher course would allow researchers to test this hypothesis.

### *Limitations*

The minor errors in the content of the refresher course might have been prevented by having an NLS Nemeth–certified transcriber review it. Participants in this study self-selected to participate. Thus, it is very probable that this small sample of individuals were highly interested in the topics covered in the course. They also may have been familiar with online learning and may have had confidence in using technology. They participated in an online course that was on the Moodle platform; it was structured in such a way that several participants reported difficulty navigating the website. Thus, their impressions of what they learned and what should be included in a future course may have been influenced by their own frustrations with the platform used for this pilot course.

### *Implications for the future*

Based on the responses of the 71 individuals who completed the course survey, it is clear that there are a number of professionals preparing braille materials who would like to have continuing education opportunities. Overwhelmingly, the ability to move at one's own pace and receive feedback privately was valued by participants. Access to examples with explanations of why items were transcribed in specific ways was also valuable. Individuals designing in-service activities, especially regarding mathematics materials and UEB, should take these valued aspects into consideration when planning delivery methods and content.

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