THE QUALITY OF BRAILLED INSTRUCTIONAL MATERIALS PRODUCED IN TEXAS PUBLIC SCHOOLS

A Dissertation

by

TINA SUE HERZBERG

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2006

Major Subject: Educational Psychology

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ABSTRACT

The Quality of Brailled Instructional Materials

Produced in Texas Public Schools. (August 2006)

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This study investigated the quality of braille transcription in public schools in Texas. In the first phase, an electronic survey of 94 school personnel across the state found that instructional materials are often transcribed by a variety of personnel not certified by the Library of Congress. In addition, the majority of survey respondents felt that their initial training had not adequately prepared them. Not surprisingly, transcribers and braillists reported that they spent more time each week transcribing materials than did teachers of the visually impaired.

In the second phase, 40 transcriptions prepared by school personnel were examined. The quality of the transcriptions varied greatly. More than 30% (n=13) of the transcriptions contained four or less errors. The other transcriptions (n=27) contained a variety of contraction errors, misspelled words, misformed characters, omission of letters or words, insertion of additional letters, detectable erasures, and formatting errors. Perception of quality by the person transcribing often did not reflect the actual quality of the transcription. The data in this study indicated that neither years of experience nor certification status have a decisive effect on quality. On the other hand, the salient characteristic in predicting the quality of braille produced by the participants was time

spent each week transcribing materials, which, in turn, was associated with the job role of the participant.

In the third phase, members of a focus group assessed a representative subset of the transcriptions. The findings of the focus group revealed that errors would prevent legibility for some students, and that errors in transcribing negatively affect the academic performance of braille readers. The data in all three phases supported the need for developing a formal definition of quality in braille transcribing and providing ongoing, standardized training for school personnel. Perhaps most importantly, the data gained from this study supported the hypothesis that braille readers receive instructional materials that are not equal in quality to those received by other students.

DEDICATION

With love, to my husband, Mike

Thank you for always believing in me!

I couldn't have done it without you!

To my dear children, Robert and Ryan

Thank you for helping me with my "homework"!

I love you!

To my parents, Robert and Brenda Williamson

Mom, thank you for sharing your love of learning and education.

Dad, thank you for teaching me the value of hard work.

To my siblings, Dina, Robert, and Karen

Thank you for your support and encouragement along the way!

A girl couldn't ask for better siblings!

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CHAPTER I

INTRODUCTION

Braille is a tactual system of reading and writing for individuals who are blind or visually impaired. The braille code uses different combinations of raised dots to represent letters of the alphabet as well as numbers, punctuation marks, and other print notations. The dots are dome-shaped and are 16 thousandths of an inch high (Ashcroft, Henderson, Sanford, & Koenig, 1991). Braille is read by moving the hands from left to right over the raised dots.

History of Braille

Louis Braille created the braille code in French in the 1820s by adapting Charles Barbier's nocturnal writing system for the military. Barbier's system was unique in that it used raised dots, rather than simply a raised version of the print alphabet. Braille published a description of his dot system in 1829, and many Europeans who were blind began using his code (Irvin, 1955). After a visit to Europe in the mid-1800s, Dr. Simon Pollak, a member of the Board of the Missouri School for the Blind, introduced the braille code to the United States (Irvin, 1955). Following a prolonged and sometimes heated debate over the efficiency of braille versus other tactual systems, the American Association of Instructors of the Blind officially adopted the braille code for use in U.S. schools in 1918 (Irvin, 1955). Around the same time, the American Printing House for the Blind began publishing books in braille. By 1950, all U.S. texts designed for tactual

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This dissertation follows the style of *Journal of Visual Impairment & Blindness.*

readers, with the exception of first grade books, were published in braille (Troughton, 1992).

Decrease in Braille Literacy

The number of braille readers began to decrease in the 1960s (American Printing House for the Blind, 1991) and this decrease continued until the mid-1990s. Researchers have investigated several hypotheses for this decline including; negative teacher attitudes toward braille (Rex, 1989), the increase in children with visual impairments who have additional disabilities (Rex, 1989; Amato, 2002), a greater reliance on speech output and magnification technologies (Paul, 1993), the lack of high-quality braille textbooks (Amato, 2002), and teachers' perceived lack of proficiency in braille (Wittenstein, 1994). Experts in the field are also concerned about current practices that are used to assess and teach braille (Mangold, 1997; Ryles, 1996; Schroeder, 1997; Wittenstein, 1994). An associated concern is the lack of a consistent standard for training of teachers in braille (Rex, 1989; Wittenstein, 1993; National Association of State Directors of Special Education, 1997; Amato, 2002). Although not previously explored in the literature, the lack of individuals qualified to transcribe braille materials, along with the corresponding lack of braille materials, may also be contributing to the aforementioned decline in literacy skills in braille readers.

Braille Transcribers and the Quality of Their Work

In a survey of directors of instructional materials centers, state vision consultants, and superintendents of special schools in 40 states, 76.9% felt that their state did not have a sufficient number of transcribers to meet their needs (Corn & Wall, 2002). The

average number of transcribers needed per state in order to complete current requests for braille materials was estimated to be an average of 7.6 transcribers (Corn & Wall, 2002). As the majority of states do not have a sufficient number of certified transcribers, they have been found to use a wide variety of alternatively trained personnel for transcribing braille. Certified transcribers, non-certified transcribers, volunteers, paraprofessionals, and teachers of the visually impaired all are regularly used to transcribe materials (Allman & Lewis, 1996; Corn & Wall, 2002; Wall & Corn, 2002), and states anticipate a continued and perhaps even more critical shortage of braille transcribers within the next five to ten years (Corn & Wall, 2002). This shortage may lead to students receiving late or improperly transcribed braille materials as there are simply not enough competent transcribers available to produce the materials in a timely fashion.

The quality of instructional materials that exist in braille has not received attention in the literature until recently. In a Corn and Wall study (2002), respondents were asked to rate the quality of braille materials produced in their state. While these researchers did not formally define “quality” they did specify that quality included the components of both formatting and accuracy. Eighty percent of the 42 states who responded to this study stated that the quality of brailled materials in their state was either good or excellent, while 17.2% of the states reported that the quality of their braille materials was fair or poor. However, a direct examination of instructional materials in braille was not done to determine if these perceptions, indeed, reflected the actual quality of braille materials used in the classroom.

Statement of Problem

Little is known about the quality and production of braille instructional materials produced by public schools. In addition, little is known about *what* instructional materials are transcribed into braille by public school staff, *who* is responsible for transcribing these instructional materials, or the *level of quality* of these transcribed materials.

Although there is not a universally accepted definition of "quality" as it relates to braille transcribing, most researchers and braille transcribers would agree that accuracy is an essential characteristic of quality. The authors of the National Library Service (NLS) braille certification manual, Risjord, Wilkinson, and Stark (2000), define accuracy as

> … a thorough and exact reproduction of the print text with respect to wording, spelling, punctuation, the correct formation of braille characters, the proper use of contractions, the correct application of all rules of braille transcribing, and the use of correct braille formats (p. 20-3).

For example, dots 1, 4, and 5 represent the letter *d* in a word. If an incorrect formation of dots 1, 2 and 4 was used inadvertently, the dots would then represent the letter *f*. Depending on the experience of the reader and context clues, this error could cause the word to be read incorrectly or cause confusion for the reader.

Incorrect application of rules also affects accuracy of braille transcribing. Depending on how and where a contraction is used, the dots 2, 5, and 6 can represent the period, *dd*, *dis*, or the numeral *4* in brailled math materials. According to one of the rules

that govern double letter contractions in braille, *dd* can only be used in the middle of words (Ashcroft et al., 1991). If a braille transcriber incorrectly uses the *dd* contraction at the end of the word such as Todd, the braille version would then be read as *To.* Again, this would cause misunderstanding when read by the braille reader.

Accurate and consistent formatting is a third essential characteristic of quality in braille writing. Accurate and consistent formatting provides clarity for the reader and allows the braille reader to easily navigate braille materials (National Braille Association, 2002). In contrast, inconsistent or incorrect formatting can slow the reader and lead to frustration (National Braille Association, 2002). Although Risjord et al. (2000) does not formally define formatting in the NLS certification manual, they do devote two entire chapters and part of four other chapters on how various materials such as paragraphs, poems, letters, tables, and lists should be formatted.

Formatting is sometimes problematic for braille transcribers as some principles of braille formatting parallels that of print materials, while others do not. For example, capitalization and punctuation of items in a list would follow the same format as that in print. However, lists transcribed into braille are always preceded and followed by a blank line, regardless of whether a blank line would be used in print. In addition, when bullets precede all items in a list in print, then the bullets are ignored in braille. Thus, depending on the format of what is being transcribed, materials may or may not follow the same format as the print version.

Significance of the Study

The quality of braille instructional materials has become particularly critical as more than 85% of students with visual impairments are currently being served in general education classrooms (U.S. Department of Education, 2002). General education classrooms typically utilize a variety of instructional materials such as teacher-made tests, worksheets, ancillary workbooks, and novels in addition to textbooks. However, the only materials that are typically provided in braille for public schools are textbooks. The schools themselves are then responsible for transcribing and providing all other instructional materials in braille to readers who are visually impaired. As discussed, these materials are transcribed by a variety of school personnel, and public schools in Texas do not have a standard system of reviewing the quality or readability of these materials. Thus, we have little information about how the quality of these materials may be affecting the literacy of students with visual impairments and whether these students receive materials that are equitable in quality to those received by students without visual impairments.

Purpose of This Study

The purpose of this project was to investigate the quality of braille transcription in public schools in Texas. Three primary methods were used to collect the data: 1) a statewide survey of school districts currently serving braille readers; 2) an evaluation of the quality of teacher-produced worksheets transcribed into braille by both certified and uncertified employees of school districts; and 3) a focus group session conducted with

certified teachers of the visually impaired and certified transcribers to determine the level of readability of text transcribed by school districts.

Definition of Terms

The following terms were used in this research:

Literary Braille Code. The literary braille code involves the use of the traditional alphabet along with 189 different characters and contractions that represent a group of letters or whole words (Ashcroft et al., 1991). There are more than 450 rules that govern the use of these contractions (Miller & Rash, 2001).

Nemeth Braille Code. The Nemeth braille code is used when transcribing text that includes mathematical equations or scientific notation. This code consists of braille indicators and 63 braille characters that provide an equivalent for hundreds of mathematical and scientific symbols, signs, numerals, and variables (American Printing House for the Blind, 1972). According to the American Printing House for the Blind, the Nemeth code "has been formulated in such a way that the same construction gives the same information to the braille reader from elementary through the most advanced mathematics" (p. 2).

Braille Transcriber. A braille transcriber presents information from a print source into a braille version for persons who are blind or have low vision. According to the American Foundation for the Blind (2004), braille transcribers should have specialized computer skills, be fluent in the literary braille code, and able to format the braille version using the principles prescribed by the Braille Authority of North America. However, many individuals responsible for transcribing print materials into braille are

not certified and may lack the skills necessary to produce accurate transcribing. Furthermore, as there is not an educational law or regulation that requires transcribers to be certified in braille, many transcribers employed by school districts are not certified (Corn & Wall, 2002).

Braillist. A braillist also presents information from a print source into a braille version for persons who are blind or have low vision. This term usually applies to personnel who are not certified by the National Library of Congress. This term may also be unique to Texas; in other states; terms such as transcriber, paraprofessional, or teaching assistance may be used to describe personnel in comparable positions.

Teacher of the Visually Impaired. A teacher of the visually impaired is responsible for providing specialized instruction and support services necessary to meet the unique needs of students with visual impairments. Depending on the teacher's caseload, support services may include adapting instructional materials for students who are blind or have low vision. According to the Texas State Board for Educator Certification (2006), candidates for certification must have a bachelor's degree and pass both the visually impaired test and the braille test. In order to pass the braille test, the candidate must be able to read and produce materials that require the use of the literary braille and Nemeth codes. Interestingly, proper formatting is not listed as part of the competency concerning the production of brailled materials.

National Library Service for the Blind and Visual Handicapped (NLS). NLS is the national certifying body for braille transcribers in the United States. NLS offers a variety of correspondence courses that can lead to certification in literary braille

transcribing, braille music transcribing, Nemeth (mathematics) braille transcribing, and braille proofreading (Cylke, 1999). It is estimated that only 51.8% of persons transcribing braille for public school students across the United States are certified by NLS (Corn & Wall, 2002).

National Braille Association (NBA). NBA offers a braille formatting course in conjunction with the National Library of Congress. The self-study course is divided into two primary sections: a) rules of braille formats and b) general structuring strategies. Upon successful completion of the course and a final examination, the National Braille Association issues a certificate. According to NBA, the purpose of the training is "to provide the certificate holder with the skills to produce consistent and easily recognized formats for the braille reader" (p. xi).

Braille Contraction. A braille contraction is "a sign which represents more than one letter" (Ashcroft, Henderson, Sanford and Koenig, 1991. p. 2). Braille contractions are primarily used to save space. In a study of a random selection of almost 40,000 words, Durre (1996) discovered that the use of braille contractions decreased the space used by approximately 20%.

CHAPTER II

REVIEW OF LITERATURE

This chapter will review the relevant literature regarding quality of braille transcribing. The review will summarize the legislation, laws, and bills that affect the education of braille readers. This will be followed by a discussion of the increase in the use of transcribers and two landmark studies conducted by Anne Corn and Robert Wall on braille transcribing. Afterwards, studies on the background and proficiency of braille transcribers will be addressed. In the final section of the review, the production, timeliness, and quality of braille instructional materials will be discussed.

Legislation, Laws, and Bills

Literacy is a primary component of recent federal legislation, and the No Child Left Behind (NCLB) Act of 2002 specifically targets reading proficiency as a priority. NCLB mandates that all students educated within the United States public school system should be able to read at grade level by the end of third grade. This law applies equally to the almost 9,000 students with visual impairments that use braille as their primary reading medium. However, in order for these students to learn to read proficiently, they need brailled materials that are both accurate and legible.

Other federal legislation supports the use of quality braille materials. The Individuals with Disabilities Act (IDEA) of 1997 and 2004 requires that literacy instruction in braille be considered for all students who are blind or visually impaired. While IDEA does not detail how these materials should be prepared or delivered, it does require that all students with disabilities be given a free, appropriate public education in

the least restrictive environment. Logically, in order for braille readers to be able to access the general education curriculum, they must have access to legible braille materials.

Other national efforts and state legislation have also supported the use of braille with students who are visually impaired. Since the late 1980s, 32 states have passed so called "Braille Bills" in response to the growing decline of literacy skills among students with visual impairments (Koenig & Holbrook, 2000; Wall & Corn, 2002). These bills were instituted as a result of pressure from consumer and advocacy groups who sought to guarantee that students who were legally blind received appropriate assessment and instruction in braille (Ryles, 1996). Braille experts also developed the *National Agenda for the Education of Children and Youths with Visual Impairments, Including Those with Multiple Disabilities* in 1995. The seventh goal of the *National Agenda* called for the timely provision of appropriate media, which include materials in braille (Corn, Hatlen, Huebner, Ryan, & Siller, 1995). These efforts appear to have been somewhat successful; in the most recent study of braille literacy in Texas, 70% of braille readers were reported to be reading on grade level (Wall & Corn, 2004).

Increasing Use of Transcribers

The use of transcribers appears to be increasing nationally. In an earlier Allman and Lewis (1996) study of teachers of the visually impaired, only 7% of the respondents reported that transcribers were available to assist them in materials preparation. In contrast, in a study of 51 teachers of the visually impaired in Minnesota, which accounts for slightly more than 50% of all teachers of the visually impaired in the state, all 51

teachers reported that they had access to a braille transcriber (Knowlton & Berger, 1999). These teachers felt that it was absolutely necessary for teachers of the visually impaired to be able to locate information in appropriate manuals and be familiar with various sources for braille materials (Knowlton & Berger, 1999). These same teachers felt that it was also absolutely necessary for teachers of the visually impaired to be able to correctly transcribe daily assignments and have the skills to prepare materials to be transcribed by others. The essential role of transcribers in materials preparation was echoed in a pilot study involving the support of 10 highly academic braille readers in high school. The teachers of the visually impaired reported they extensively used braille transcribers to produce materials for eight of their students (Leigh & Barclay, 2000). In a recent study of 107 teachers of the visually impaired from 41 states, 37 (35%) of the teachers reported that a transcriber was available to assist them in the preparation of materials (Rosenblum & Amato, 2004). Although the increasing reliance on transcribers to produce braille materials has been documented in the literature, it appears that still not all teachers of the visually impaired have access to this critical resource.

Crucial Studies Concerning Braille Transcription

Until recently, the production of materials in braille and the characteristics of braille transcribers that produced them received very little attention in the research literature. This has changed in recent years with the inclusion of access to braille materials emphasized as part of the *National Agenda for the Education of Children and Youths with Visual Impairments, Including Those with Multiple Disabilities* in 1995 and the formation of the *Textbooks and Instructional Materials Solutions Forum* by the

American Foundation for the Blind. These summits included representatives from various agencies and organizations throughout the United States that were involved in braille production as well as parents of children who are visually impaired and adults who are visually impaired. The members of these organizations sought to increase the number of qualified braille transcribers and examined the issue of insufficient instructional materials in braille and a shortage of braille transcribers. Consequently, the forum conducted a national survey, and the American Foundation for the Blind funded two landmark studies.

The Corn and Wall (2002) study explored the training and employment of braille transcribers throughout the United States. Surveys were sent to all 50 states, and specialists in the area of visual impairments from 40 (80%) of these states responded. Results from this study supported anecdotal reports of a shortage of braille transcribers and projected a continued need for additional transcribers. At the time of the study, respondents reported that approximately 350 additional transcribers were needed immediately in order to meet current needs for braille. In particular, they identified the need for transcribers competent in both the Nemeth code and tactile diagrams as priorities. They also estimated that more than 1,000 additional transcribers would be needed within the next 10 years if the projected trends in requests of braille books continued.

Corn and Wall (2002) discovered that the pay, training, and recruitment of transcribers varied greatly from state to state. The range of yearly salaries for full-time transcribers ranged from $10,000 to $50,000. Potential transcribers were recruited by

word of mouth, newspaper advertisements, personal contact of current teachers/aides by school districts, and recruitment of inmates in state prisons. However, almost 70% of respondents assessed their own recruitment efforts as being ineffective. In area of training, the NLS correspondence course and on-the-job training were the most frequently utilized options reported by the respondents. The respondents also reported that they felt that training for transcribers was underfunded and lacked an organizational structure. Even though individuals and various entities have sought to increase the number and proficiency of braille transcribers, both the lack of a formalized national plan and the lack of consistency from state to state in training and recruitment has led to less than desired results.

The second study by Wall and Corn (2002) examined the production of textbooks and instructional materials in braille in the United States. Representatives from 42 states responded to the survey in the study. Almost 80% of respondents reported that the majority of their needed braille materials were delivered on time. The researchers also discovered that while computer translation software was being used by transcribers to convert print into braille, processes requiring the use of the Internet or downloading files from the publishers were underutilized. Although the issue of quality was not formally explored in the study, 33 of the 39 states reported that they had no policy in place for the purchase of braille materials, and two-thirds of the states reported no standards for braille production. Since there has been no national system or even uniform procedures for the production, purchase, or delivery of specialized materials, it follows that some states have adopted standards and others have not. It also logically

follows that the efficiency and effectiveness of the various state systems have also probably varied greatly.

Moreover, respondents in the Wall and Corn (2002) study noted there was inadequate funding as well as a need for a national centralized system of operation for braille production. The respondents suggested that braille production might be improved at the state level if there were additional supports at the national level, such as from the American Printing House for the Blind or if a new entity coordinated all production and delivery of specialized materials. In their conclusion, the authors recommended that a national repository be created and that each state should establish or upgrade their centralized production centers. Once again, this study highlighted the need for increased coordination and leadership at the national level in order to improve current systems for braille production at the local level.

Training Options for Braille Transcribers

Diversity in training options. U.S. employers utilize a variety of options for training teachers and other personnel in braille (Corn & Wall, 2002). Options may include (a) the NLS correspondence course, (b) locally developed courses, (c) on-the-job training developed by individual employers, (d) college courses, or (e) the independent study of textbooks (Corn & Wall, 2002). In the Corn and Wall study, 41% of the specialists surveyed rated their current training methods as effective, 36% rated their efforts as ineffective, and 18% responded that their training efforts were neither effective nor ineffective. In Texas, the most used training options in order of frequency were (a) the NLS correspondence course, (b) on-the-job training by teachers of the visually

impaired, (c) braille courses sponsored by education service centers, and (d) college courses (Texas Education Agency, 2000). These four training formats will be discussed in greater detail in the following section.

NLS certification course. In order to begin the certification process, individuals seeking certification as a transcriber voluntarily contact the National Library Service (NLS). Then, the individual completes a comprehensive correspondence course that includes 19 lengthy assignments. Afterwards, they submit a 35-page braille transcription of a print book to the NLS for evaluation. Only 30.7% of those who begin the NLS certification course ultimately become certified (Corn & Wall, 2002). According to respondents in the study of NLS certification, this low completion rate was reported to be the result of (a) the lack of funding; (b) the lack of organizational structure; (c) ineffective recruitment methods; and (d) the lack of support to persons enrolled in the NLS course (Corn & Wall, 2002).

On the job training by teachers of the visually impaired. When aides and paraprofessionals are initially assigned to transcribe materials, teachers of the visually impaired (who also may or may not be certified by NLS) are often assigned the task of training these paraprofessionals (Curry & Hatlen, 1989; Allman & Lewis, 1996). In Texas, training by an itinerant teacher of the visually impaired is the most commonly utilized method for training novice braille transcribers (TEA, 2000). While this method has not been evaluated in the literature, the effectiveness of this approach obviously may vary greatly in that it is highly dependent on the teacher-trainer's own skills in braille transcribing.

Although most teachers of the visually impaired value braille as an important instructional medium, the transcribing skills of an individual teacher can fluctuate across the length of their professional career. For example, if a teacher does not use braille for an extended period of time, braille skills may deteriorate. Amato's (2002) study of teacher preparation programs in the United States and Canada supports this assumption: More than 70% of the 45 teacher-trainers who responded to their survey felt that a teacher's competence was a function of continuing braille practice. Although not currently required in any state, 42 of these 45 respondents in this study also reported that refresher braille courses should be required at regular intervals or when an educator felt it was necessary to refresh his or her skills (Amato, 2002). Due to the low incidence of braille readers in public schools, teachers of the visually impaired may have several consecutive years in which they do not teach a student who is a braille reader. Allman and Lewis (1996) learned that 51% of the teachers of the visually impaired in their study were not currently using braille with students at all. Similarly, DeMario and Lian (2000) discovered that 22% of the 205 teachers of the visually impaired from Illinois and Massachusetts participating in their study currently had no students who read braille. It follows that the braille skills of these teachers who did not have recent braille practice would not be as likely to be maintained as those of teachers who used braille on a daily basis.

Preparation by university programs. Another critical factor in the quality of braille production is the quality of the teacher's braille training program. Amato's (2002) study of 34 teacher preparation programs found a lack of consistency in the content of

university-level braille courses. These programs also reported differing formats for instruction, differing instructional materials and textbooks, differing length and complexity of outside assignments, a range of expected student outcomes, and different criteria used to determine minimum exit-level braille competence. In addition, Amato's study reported that 20% of the 34 programs surveyed provided no instruction at all in the braille math (Nemeth) code. A teacher graduating from one of these universities thus may not have adequate brailling skills to transcribe high school level math materials nor be able to provide training to a paraprofessional responsible for transcribing high school level math materials.

Interestingly, certification by NLS is also not mandatory for those teaching braille courses at the college level. While Amato (2002) found that 93% of the 45 instructors in her study had taught braille for more than 10 years, only one-third of the respondents were certified by NLS. Even more surprising, Amato discovered that none of the instructors were currently NLS certified in the Nemeth code. Instructors can only teach what they know, and those with limited knowledge about braille will only teach others to have an equally limited knowledge base.

Proficiency of Braille Transcribers

Currently, states utilize a variety of methods to determine proficiency, which makes comparing the skills of transcribers difficult. Corn and Wall (2002) reported that braille proficiency is usually assessed in the U.S. through (a) certification by NLS, (b) review of transcriber's work, (c) customer feedback, and (d) state examinations. Currently, Texas determines proficiency by (a) NLS certification, (b) review of

transcriber's work, and (c) examination (Texas Education Agency, 2000). Unlike other states, employers in Texas may also use a grade on a braille course to determine proficiency (Texas Education Agency, 2000). While many employers use such measures to determine initial proficiency, they do not assess the quality of braille on an ongoing basis so there is no check on a transcriber's proficiency level over time. Similarly, neither NLS certification, nor university examinations, nor grades in braille coursework require the reexamination of skills beyond the initial demonstrated proficiency level reached after training.

Even if teachers are not training transcribers, their own proficiency as transcribers is important as they may be personally responsible for transcribing some instructional materials into braille for their students. For example, in a pilot study of five teachers serving braille readers, the teachers reported that they regularly transcribed some materials themselves. These teachers gave estimates of transcribing which ranged from .5 to 15 hours per week with an average of 2 hours per week, even though 4 of the 5 had access to a braille transcriber (Leigh & Barclay, 2000). Similarly, 23 teachers of the visually impaired in Colorado reported that they spent an average of almost 10% of their time adapting materials and brailling materials (Correa-Torres & Howell, 2004). If teachers of the visually impaired will be responsible for transcribing materials intermittently throughout their teaching career, it is critical that their transcribing skills remain proficient across time.

Providing refresher braille courses may be a practical solution when teachers and transcribers need to update their skills. During the 1995-1996 school year, the Florida

Department of Education officials designed and provided four regional braille refresher workshops. The rules of braille were discussed throughout the four day workshop, and the 58 participants worked on practice exercises that contained the alphabet and the majority of the contractions. Analysis of pre-test and post-test data revealed the teachers improved their braille skills and reported a higher level of confidence of their braille skills (Allman & Holbrook, 1999). On the post-test which contained a possible 929 errors, 21 of the participants made less than 10 errors (Allman & Holbrook, 1999). Based on the careful review of the data, the authors suggested that special attention should be given to final-letter contractions, lower whole-word signs, and part-word signs. States and other entities should consider establishing refresher braille courses or other types of follow-up training as a way of ensuring teacher proficiency across time.

Preparation of Braille Instructional Materials

A national perspective. Braille materials are produced by a variety of sources in the U.S. The majority of states have some capacity for producing braille materials (Corn & Wall, 2002). In fact, state education agencies internally produce about one-third of the needed brailled instructional materials by utilizing some sort of computer-translation software (Wall & Corn, 2002). Other materials are purchased from the American Printing House for the Blind, other state agencies, and private vendors (Wall & Corn, 2002).

A Texas perspective. The state of Texas contracts with several independent braille production centers to produce a limited selection of state-issued braille materials, such as textbooks. The Texas Education Agency commissions a panel of teachers and

braille experts to review sample braille materials from different braille production centers and then recommends selected centers for contracts. Once a braille production center is offered the contract, the center is then responsible for creating its own procedures for ensuring high-quality braille materials. Each of the three braille production centers in Texas that were awarded contracts for the 2003-2004 school year uses a different process for quality-control (Robert Walling, personal communication, May 7, 2004). These centers primarily transcribe textbooks, not teacher-made exams or classroom materials. After the production of the state-adopted textbooks in braille is completed, the state then examines the quality by monitoring customer feedback.

A local perspective. At the school level, timeliness of braille materials is dependent on the timely submission of the instructional materials that are to be transcribed by the general education teacher. In one study involving 23 itinerant teachers of the visually impaired in Colorado, many of the participants reported frustration with general education classroom teachers who changed lesson plans or did not plan far enough in advance so that the materials could be transcribed into braille (Correa-Torres & Howell, 2004).

With the exception of textbooks, instructional materials are transcribed by a variety of school personnel, and there is normally not a system of reviewing the quality or readability of these materials by school districts. The quality of materials transcribed into braille by school districts and school personnel has received almost no attention in the literature. This is an especially problematic oversight as initial training of teachers

and transcribers vary greatly and no assessment is made of the ongoing quality of a braille transcriber's work.

Timeliness and Quality of Materials

Timeliness of instructional materials in braille. A lack of qualified personnel leads to subsequent delays in delivering braille materials to students. Corn and Wall (2002) reported that 77% of states responding to their survey did not have a sufficient number of transcribers to meet current needs. In a related study, states reported that only 79.2% of all braille textbooks are delivered in a timely manner to students (Wall & Corn, 2002). A pilot study of 10 braille readers found that, when asked what they would change about their educational experience, two students reported that "they would like to have braille materials at the same time that print is available" (Leigh & Barclay, 2000, p. 129). Braille readers, in essence, do not always have equal access to the general education curriculum when textbooks and other braille materials do not arrive in a timely manner. Even with a short delay at the beginning of the year, braille readers may miss key concepts or important information included in the text, leading to gaps in learning. Braille readers may also have difficulty completing assignments and adequately preparing for tests without their textbooks. With longer delays, braille readers may experience even more difficulty in keeping up with sighted peers. Unless more transcribers are recruited and adequately trained in the near future, individual braille readers across the U.S. will continue to receive textbooks later than their nondisabled peers and experience associated negative affects upon their academic achievement.

Quality of instructional materials in Nemeth. The quality of mathematics and science materials transcribed into braille has received very little attention in the literature until recently. Amato (2002) polled 45 instructors from 34 teacher preparation programs in the United States. Only 22% of the respondents felt that students completing their university-based braille courses would be capable of transcribing math materials independently. In this same study, several participants reported that the lack of good-quality braille textbooks, particularly in mathematics, was a concern when responding to a question concerning factors for a possible decline of braille literacy. This may be especially problematic as teachers and transcribers at the public school level may not have adequate training to produce quality math materials. A perceived lack or inadequate pre-service training in the Nemeth code was also noted in a recent Rosenblum and Amato (2004) study. In their survey of 128 teachers of the visually impaired trained by 36 universities, Rosenblum and Amato (2004) found that only 28.9% reported that their university preparation in the Nemeth code had provided the information they needed in order to do their jobs. The teachers reported that they most often prepared materials that involved basic operations, word problems, tactile graphics, and fractions. More than one half of the participants reported that they were currently responsible for transcribing algebra and geometry materials, even though some had not received pre-service training in the Nemeth code at all (Rosenblum & Amato, 2004).

Although they did not directly study the quality of math materials, DeMario and Lian (2000) surveyed 205 teachers of the visually impaired from Illinois and Massachusetts about their perceived competency in the Nemeth code. The majority of

respondents (78%) reported that they were currently serving students who were braille readers or students who were potential braille readers. When these participants were asked about transcribing complex math materials, their self-assessed anxiety ratings escalated. The majority of respondents reported that their competence in the Nemeth code was less than what was required for the transcription of materials for high school mathematics courses such as algebra and geometry. In the conclusion of the article, the authors recommended that national standards for competence in the Nemeth code at the university level be set and that the Nemeth code be taught as a separate course. With very limited structures for in-service training in the Nemeth code coupled with inadequate or no pre-service training, these increased anxiety ratings may be indicative of an awareness of personnel that they do not have the skills needed to transcribe the math materials correctly.

The research literature has examined current systems for recruiting, training, and certifying braille transcribers at the national and state level. Initial training varies greatly, and braille instructional materials are transcribed by a variety of school personnel. The use of transcribers is on the rise; however, there is currently no universal standard to determine ongoing quality of a braille transcriber's work. Although 80% of state officials recently rated the quality of braille produced in their state as excellent or good (Corn & Wall, 2002), a direct examination of instructional materials in braille has not been performed to determine if these perceptions reflect the actual quality of braille materials used in the classroom. A direct examination of braille materials may provide valuable information about patterns of errors to improve both pre-service and in-service

training programs for both teachers of the visually impaired and braille transcribers. The direct examination of braille materials might also either confirm or refute anecdotal records that braille readers are receiving materials that are inequitable in quality to those received by other readers.

CHAPTER III

METHOD

The purpose of this chapter is to provide an explanation of the methods and procedures that were used in this study. This chapter will discuss the design, research questions, subjects, instrumentation, procedures, and data analysis.

Design

This study consisted of three separate procedures. The first phase consisted of an electronic survey that focused on the demographic characteristics and training of braille transcribers across Texas and how print materials were transcribed into braille at public schools in which they worked. The second phase involved an in-depth analysis of the quality of braille transcriptions produced by transcribers who worked in public schools in Texas. The third phase used a focus group to review the transcriptions produced in phase two and to assess the legibility and readability of these transcribed materials.

Research Questions

The following research questions were investigated:

1) Who is currently transcribing instructional materials into braille in public schools in Texas?

2) What is the background, including training and certification level, of persons transcribing instructional materials into braille in public schools?

3) How are print materials transcribed into braille in public schools?

4) How accurate is the print that is transcribed into braille in public schools?

Sample

Participant recruitment for the three phases included approximately 140 school personnel responsible for transcribing literary materials into braille in public schools in Texas. These participants included teachers of the visually impaired, transcribers, aides, and paraprofessionals. Only those personnel who were currently employed to transcribe print into braille by independent school districts, regional service centers, or the Texas School for the Blind and Visually Impaired were included in the sample. Employees of the Texas Education Agency (TEA) and the three braille production centers that had received contracts from TEA in either 2003 or 2004 were not included as part of the sample as these transcribers primarily produce braille textbooks instead of classroom-based materials. In addition, only personnel who were currently assigned to positions in which they were not currently transcribing materials in these positions were excluded from this sample.

At the beginning of this investigation, the researcher estimated that there were currently 130 to 150 braille transcribers employed in Texas. According to the most recent report by the Texas Education Agency (2000), school districts, education service centers, and not-for-profit businesses employed 24 certified transcribers and 105 non-certified transcribers during 1999-2000. All active braille transcribers for Texas schools were sent an anonymous survey that was forwarded via an e-mail in the first phase. The original design called for 20 NLS certified transcribers and 20 non-certified transcribers, but less than 10 certified transcribers volunteered to participate. Due to the level of response, all volunteers were selected as participants for the second part of the study. For

the third part of the study, five teachers of the visually impaired who were responsible for transcribing materials were invited to participate in a focus group session. Some of the teachers from the third phase also may have participated in the first phase of this study.

Instrumentation

Survey development. The researcher developed the first draft of the survey, which was designed to gather information pertinent to the first three research questions. The survey began with a brief description of the purpose of the study and contained 24 items divided into five sections. The survey was designed to be completed in less than 10 minutes.

The opening section contained demographic items that asked respondents to identify their sex, job title, level of education, certification status, braille reading proficiency, and current contact with braille readers. The next section asked respondents about their training. The third section requested information about the types of materials that the respondents were currently transcribing. Some of the questions in the second and third sections were modeled after the surveys designed by the American Foundation for the Blind (AFB) Solution Forum committee (2002) and the Texas Education Agency (2000). It was anticipated that these data could then be compared with the data from the national survey distributed by the AFB Solution Forum committee and compiled by Corn and Wall in 2002 as well as with the unpublished TEA report from 2000. In the fourth section, respondents were asked about how they currently transcribe materials. The last section requested that respondent rate their perceptions of the quality of the

materials that they transcribe at their schools. A copy of this instrument is in Appendix A-1.

Pilot testing of instrument. The instrument was emailed to three NLS certified transcribers, a regional consultant for the visually impaired, and the State of Texas vision consultant to review. They were asked to provide comments and suggestions for improvements on the content, wording, and overall design of the survey. Suggestions for modification consisted of clarification of wording, additional resources commonly used by transcribers, and one typographical error.

Next, the survey was revised and then sent as a pilot to five braille transcribers that worked for regional or state agencies to identify any additional problems with the instrument. The researcher wanted to ensure that the instrument was understandable and interpreted similarly by various respondents. These respondents were the same five certified braille transcribers who had voluntarily participated in the pilot testing. After reviewing the comments obtained from these transcribers, the researcher then revised the instrument. The instrument was also reviewed by four faculty members from the Texas A&M University, which resulted in additional clarification of items. The survey was then finalized and approval for the study was obtained from the Institutional Review Board at Texas A&M University.

The Flesch-Kincaid test for readability was used to analyze the survey. The survey scored a grade level of 8.0, meaning that a person in the eighth grade could read the survey and understand it. An additional readability measure, the Flesch Reading Ease score, was determined. This score is based on a 100 point scale, with 100 being easiest to

read. Passages with a score between 90 and 100 are considered suitable for upper elementary students, while a college degree is considered essential to understand text with a score of less than 30 (Konradt, n.d.). The Flesch Reading Ease score for the survey was 60.2 which was deemed appropriate as standard documents and magazines like *Time* and *Reader's Digest* typically score between 50 and 70 (Wikipedia, online encyclopedia, n.d.). Due to the education level of the potential respondents and reading level of the survey, comprehension of the survey can be assumed.

Procedures

This study was divided into three distinct phases. As described above, the researcher collected data via a survey in the first part of the project in order to answer the first three research questions, which were concerned with the background of braille transcribers and types of materials transcribed by school districts in Texas.

First phase. The researcher began recruitment for the study by sending an email to the consultants for the visually impaired at each of the 20 Education Service Centers (ESCs) in Texas. The email explained the purpose of the project, included the electronic link for the survey, and asked the ESC consultants to report the number of braille transcribers that worked in public schools in their region. The email also requested that the consultants forward the email and link to all braille transcribers and other personnel who routinely transcribed braille in their region. Once the ESC consultants forwarded the materials, they were asked to send an email to the researcher confirming that they had forwarded the survey information. As the researcher had worked extensively with these consultants over ten years in her position as an education specialist at an ESC, she

felt confident that most of the consultants would agree to forward the survey. In addition, it was common practice for ESC consultants to be asked to forward surveys from researchers to teachers and transcribers in their region.

As the Texas School for the Blind and Visually Impaired (TSBVI) served several braille readers, an email explaining the purpose of the project was also sent to the principal of this school. The email similarly included the electronic link to the survey and requested permission for TSBVI personnel to participate in the study. Permission was granted, and the principal forwarded the e-mail to those school personnel that transcribed for individual students.

Two weeks later, a follow-up email with the same information described above was sent to the ESC consultants who had not yet confirmed that they had sent out the survey. After confirmation was not received within a month for two of the twenty educational regions, the researcher directly contacted these ESC consultants at a statewide ESC meeting. After learning that the survey had not been forwarded in one area due to computer difficulties and that schools in the other area had been affected by a natural disaster, the link to the survey was resent and data was collected for two additional weeks. Fourteen additional responses were received during this time period.

Second phase. In the second part of the project, the researcher sought to quantifiably determine the accuracy of the print that was transcribed into braille by the participants. This data was then used to determine if there was a correlational relationship between the quality of brailled instructional materials and the transcriber characteristics of certification status and level of education.

In Texas, brailled textbooks are provided to individual students directly by the Texas Education Agency. However, teachers often utilize instructional materials such as worksheets, hand-outs and teacher-produced tests in their classrooms in addition to textbooks. This study focused on materials such as worksheets and teacher-produced tests that are typically developed in the public school classroom. The researcher collected a variety of teacher-produced materials at the upper elementary and middle school level before selecting two worksheets as the sample to be transcribed by the participants. The selected worksheet included a title, instructions, a short reading passage, and at least five questions to be transcribed (See Appendix A-2). The selected material was developed and utilized by a fourth grade general education teacher. The worksheet included 235 words and required the usage of a heading, italics, and a special symbol for the print degree sign in order to be correctly transcribed. Accurate transcription of the worksheet also required the use of 178 contractions and short form words. The Flesch-Kincaid test for readability was also used to analyze the worksheet. It scored a grade level of 4.2, meaning that a person who reads at the fourth grade level could read the worksheet and understand it. The transcription was estimated to take approximately 10 to 15 minutes to complete.

In order to strengthen internal validity, the transcribers were asked to transcribe a second, yet comparable worksheet into braille. Identical code numbers were utilized for the participants so that the researcher could compare the accuracy on the two selections to determine if the transcription of the first passage adequately and realistically depicted the transcribers' skills.

The second worksheet also included a title, instructions, and at least five questions to be transcribed. It was originally written and utilized in class by a third grade general education teacher. The selected material included 205 words and accurate transcription of the worksheet required the usage of a heading, italics, and 179 contractions and short form words (See Appendix A-3). Again, the Flesch-Kincaid test for readability was used to analyze the worksheet. It scored a grade level of 3.5, meaning that a person who reads at the third grade level could read the worksheet and understand it. The second transcription was estimated to take between 10 to 15 minutes to complete.

The selected worksheets or tests were sent to three NLS certified transcribers at regional or state agencies. The transcribers were asked to transcribe the worksheet and provide comments concerning the appropriateness of the worksheet and the adequacy of the instructions. As recommended by the transcribers, slight adjustments to the instructions were made. The transcriptions completed by these three transcribers were used in conjunction with the grading procedures of NLS to develop a rubric for evaluating the quality of the braille transcribed by the participants in the second phase of this study.

To measure the accuracy and quality of braille transcribed by school districts, all participants from the first phase were invited to transcribe a braille selection. Due to the limited number of responses, all volunteers (n=40) who reported that they were in positions where they regularly transcribed were accepted. The transcribers were sent a signed informed consent form, instructions, the worksheet to be transcribed into braille, a demographic questionnaire, and a return envelope. Participants were given two weeks

to return the braille transcription, consent form and demographic questionnaire. Background information such as years of experience, resources used to complete transcription, and certification status were gathered on the demographic questionnaire. Upon receipt of a packet, each participant and transcript was assigned a code number. In return for submitting a transcription, the participants were given a complimentary tea bag and entered in a lottery to win one of four $25 Wal-Mart gift cards.

Third phase. Qualitative findings from a focus group session were used to supplement the quantitative findings from the first two phases. After the forty braille transcriptions from the second phase were received, the researcher read what had been transcribed, character-by-character, and then wrote the corresponding print translation out in longhand directly above each braille line. These annotated transcriptions were used to determine the legibility of transcriptions as well as used to facilitate the discussion of the focus group members.

In order to select participants with special knowledge in both teaching braille and transcribing print materials into braille, a purposive sampling strategy was used. With this technique, the researcher selects “a sample from which the most can be learned” (Merriam, 2001, p. 61). Three criteria were used in establishing eligibility for participation in the focus group: five or more years of experience teaching students with visual impairments, identified as knowledgeable in the literary braille code, and current responsibility for either teaching a braille reader or transcribing materials into braille. Nine teachers of the visually impaired were originally invited to participate in the third phase of this study. These teachers were recruited from a variety of rural, suburban and

urban districts across the state. The focus group session was then held in conjunction with a statewide workshop that six of the nine recruited teachers attended. Three of the nine teachers did not attend the workshop; thus, they did not participate in the focus group session.

The focus group session was held immediately following a day-long training; thus the researcher rearranged the tables and set up the tape recorders while the teachers arrived and began to informally converse with each other. One of the recruited teachers announced that she was unable to stay and participate in the focus group session due to an unexpected family situation. It quickly became apparent that each of the other five group members knew at least one of the other teachers who was participating in the focus group. One teacher showed new pictures of her child to the others, and various plans for later that evening were discussed by the group members.

Before the session formally began, each teacher was asked to sign a consent form which included information about the audiotaping procedure. While the researcher briefly discussed the purpose of the project and guidelines for participation, the teachers were offered refreshments. While background information was being collected on the participants by the researcher, the teachers shared personal accounts of learning, teaching, and transcribing braille with each other. Afterward, they reviewed a subset of the braille transcriptions along with the accompanying annotated print translations from the second phase. During the review of transcriptions, teachers were invited to take notes and share their initial impressions. Afterwards, the researcher asked a series of seven pre-determined focus questions (See Attachment A-4).

Of the five teachers of the visually impaired who participated in the focus group session, one was employed by a single entity district outside of Dallas, one was employed by a rural cooperative in Central Texas, one was employed by a rural cooperative in the Panhandle area, and two were employed by regional education service centers (one from the North Texas area and one from the western part of the state). As a group, the participants were currently teaching six braille readers ranging in age from first grade to tenth grade, and spent a mean of six hours per week transcribing materials into braille, with a range from approximately 6 times a year to 10 hours a week. Three of the teachers indicated that they were assisted by a paraprofessional or a braillist in the transcription of materials for their students. These five participants had a mean of 27 years of teaching experience, ranging from 18 to 42 years. All the participants had bachelor's degrees, and 60% (n=3) had master's degree. None of the participants were certified in literary braille or in the Nemeth code by the National Library of Congress.

The teachers appeared to be comfortable throughout the 90 minute session. They joked and laughed informally with each other, often nodded their head in agreement, and voluntarily shared experiences and stories with one another. The researcher acted as a moderator and asked questions that were developed by consulting with professionals in the field and teachers of the visually impaired. The session was semi-structured, and the researcher used seven pre-determined questions to determine if the meaning of the text was changed due to errors and how irregular or inconsistent formatting might affect readability for students. The group discussion moved from questions concerning initial impressions of the transcriptions, through questions concerning readability, formatting,

and how errors change meaning, into an extended discussion about quality in transcribing and possible explanations for errors.

Additional probes and questions were asked during the session in order to solicit more details, examples, and clarification as needed. The researcher took notes throughout the session, and the session was recorded so that a verbatim transcription could be used in the analysis. Upon completion, the transcription was a 29-page, single-spaced document.

Analysis

The first three research questions for this study were addressed by using descriptive statistics. These statistics provided a description of personnel who transcribe braille in public schools in Texas, as well as an analysis of the types of materials being transcribed in Texas public schools. The researcher calculated descriptive statistics on the transcribers' characteristics, including their current position and job title, years of experience, level of education, certification status, and time spent each week on braille transcribing. Qualitative responses such as the resources these participants used when transcribing and the types of instructional materials that they transcribed on a regular basis were compiled and categorized.

To measure the accuracy of braille transcribed in public schools, both the researcher and a NLS certified proofreader separately examined each returned braille transcription for errors in phase two. Neither the researcher nor the proofreader knew the identity of the braille transcriber who had submitted the transcription, and each transcription was reviewed independently. A procedure that mirrored the NLS scoring

system was used (Risjord, Wilkinson, & Stark, 2000) in that each of the following were considered an error: a) letters and text that were inserted, repeated, or omitted; b) contractions that were omitted or misused; c) characters that were misformed; d) words that were divided incorrectly; e) spacing errors or irregularities; f) formatting errors or irregularities; g) punctuation and/or composition signs that were omitted or inserted incorrectly; and h) detectable erasures. If the same error, such as a missed contraction, occurred repeatedly, it was counted each time.

The total number of errors was recorded for each transcription. Accuracy was thus measured by a single score that reflected the number of errors on the transcription. The scores were used to determine the range, mean, and standard deviation of errors on the transcriptions for both the certified transcribers and the non-certified transcribers. The researcher also reviewed the transcriptions in order to determine if similar or identical errors frequently occurred.

Afterwards, the researcher determined the degree of association between the type of certification status of the transcribers and the accuracy of transcription by computing a point biserial correlation. A second analysis was performed to determine the strength of the relationship between years of experience of the transcriber and the accuracy of the transcription by computing a Pearson-product moment correlation. A third analysis was performed to determine the degree of association between the job role of the participant and the accuracy of transcription by computing a point biserial correlation.

Qualitative findings from the focus group session were used to supplement the quantitative findings from the first two phases. Focus group members reviewed a subset

of the transcriptions and compiled results. They provided feedback concerning the legibility of the documents, informally ranked the severity of the errors, and shared possible explanations of how and why errors were made in the transcriptions. Their experiences and elaborations informed the researcher's understanding of how the errors on the transcriptions could affect the readability as well as the overall academic performance of the students.

Limitations

This project had three primary limitations. First, as there was not an existent database of braille transcribers that worked for Texas public schools, the researcher had to rely on intermediaries to obtain the sample. Each of the 20 Education Service Centers in Texas had a designated consultant that worked with teachers of the visually impaired and braille transcribers and who were usually in close contact with teachers and paraprofessionals that served students who are visually impaired. However, if these consultants did not have a complete, updated listing of emails for braille transcribers in their region, the survey may not have reached all transcribers and teachers of the visually impaired at the school district level in Texas.

Second, participants were volunteers for the project instead of randomly sampled. As the respondents self-selected to participate, there was no way of knowing how the results of the survey would be different given responses from other braille transcribers in the state. Similarly, in phase two of the study, participants volunteered to transcribe the worksheet. While the researcher was able to examine the differences in the demographic characteristics between this subgroup and the larger group who

participated in the first phase of the study, she was not be able to determine the difference in the actual quality of braille submitted from this group and that would have been submitted by the larger sample.

Third, the last portion of the project involved the detailed examination of four braille pages of transcription completed by the sample of 40 transcribers. As the sample to be transcribed could not include all the contractions and rules possible in braille, the analysis of these transcripts may not have been a true reflection of the quality of braille provided to individual students. Thus, this limited scope may also have limited the expression of the true range of the participants' braille transcribing abilities and skills.

CHAPTER IV

RESULTS

The purpose of this project was to investigate the quality of braille transcription in public schools in Texas. This chapter presents an analysis of the data on who was transcribing instructional materials into braille in these schools, the background of these persons, how print materials were transcribed into braille, and how accurately these print materials were being transcribed into braille. Each of these research questions is addressed separately in the following section.

Research Question 1

The first research question focused on who transcribing instructional materials into braille in public schools in Texas. Potential respondents were given the option of completing the survey electronically or submitting a hard copy of the survey to the researcher. A total of 98 surveys out of an estimated number of 120 email distributed surveys were returned electronically. No potential respondent requested a hard copy of the survey, and no surveys were submitted by fax or mail. The overwhelming majority of these respondents reported that they were currently in positions in which they were responsible for transcribing instructional materials into braille. Of the 98 respondents, only four (4.1%) reported that they spent no time each week preparing instructional materials into braille and, these four responses were not included in the database as these respondents did not meet the criteria required for participation in the study. Therefore, of the surveys returned, only 94 were utilized in the analysis of data.

The sample had the following characteristics: 95.75% (n=90) were female and 4.25% (n=4) were male for a total of 94 respondents. Almost two-thirds of respondents were either teachers of the visually impaired or braillists. Of the 94 respondents, 43.6% (n=41) were teachers of the visually impaired, 23.4% (n=22) were braillists, 13.8% (n=13) were paraprofessionals/aides, 10.6% (n=10) were transcribers, 4.3% (n=4) were dually certified teachers of the visually impaired and orientation and mobility (O&M) specialists (See Table 1). Of the remainder, 2.1% (n=2) were O&M specialists, and 2.1% (n=2) respondents indicated “other”, a category that included an education service center educational specialist and a liaison for the vision impaired. One braillist also noted that she was a parent of a child with a visual impairment.

The level of education of the 94 respondents was high; only 5.3% (n=5) respondents reported that their highest level of education was a high school diploma or successful completion of the general educational development testing. Another 34.1% (n=32) of respondents reported that they had completed some college or had associate’s degrees. The remaining respondents (n=57) reported that they had either bachelor’s or master’s degrees.

Table 1

Characteristics of respondents participating in the initial survey (n=94).

Variable	Response	
	Number	Percentage
Job title		
Teacher of the visually impaired	41	43.6%
Braillist	22	23.4%
Paraprofessional/aide	13	13.9%
Transcriber	10	10.6%
Dually certified teacher and O&M specialist	4	4.3%
Orientation and mobility specialist	2	2.1%
Other	2	2.1%
Level of education		
High school diploma or GED	5	5.3%
Some college	28	29.8%
Associate's degree	4	4.3%
Bachelor's degree	29	30.9%
Master's degree	28	29.8%
Years of experience		
0-1	13	13.8%
2-5	24	25.5%
6-10	33	35.1%
11-15	9	9.6%
16-19	5	5.3%
20+	9	9.6%
No response	1	1.1%

Of the 93 participants who responded to the question about years of experience, 13.8% (n=13) had one year of experience or less, 25.5% (n=24) had two to five years of experience, 35.1% (n=33) had six to 10 years of experience, 9.6% (n=9) had 11 to 15 years of experience, 5.3% (n=5) had 16 to 19 years of experience, 9.6% (n=9) had 20 or more years of experience. Thus, more than one-third of respondents had five or less years of experience. The years of experience for respondents ranged from one month to 30 years with a mean of 8.3 years.

The respondents were asked, given a forty hour work week, how much time they spent preparing print materials into braille each week. Ten of the respondents provided a range of time rather than an estimate. These responses were averaged using the low and high number of hours that they listed. For example, one respondent gave a range of two to three hours each week. This range was averaged, and the value of 2.5 was assigned. Of the overall 91 respondents who answered this question, time spent transcribing braille each week ranged from one hour to 45 hours with a mean of 8.67 hours.

Table 2 details the data on the percentage of time spent each week transcribing by respondents. In general, teachers of the visually impaired reported less time each week spent transcribing than did transcribers or braillists. For the teachers of the visually impaired (n=41) participating in the study, time spent transcribing each week ranged from one to 32 hours weekly with a mean of 6.85 hours.

Table 2

Time spent transcribing print materials into braille each week by respondents.

Time (in hours)	Teachers of the visually impaired (n=41)	Transcribers (n=10)	Braillists (n=22)	All other respondents (n=21)
1-10	80.5%	20%	9.0%	52.3%
11-20	14.6%	0%	13.6%	33.3%
21-30	0%	10%	4.5%	9.6%
31-40+	2.4%	60%	68.4%	4.8%
No response	2.4%	10%	4.5%	0%

In contrast, 60% (n=6) of the 10 transcribers participating in the study indicated that they spent all forty hours a week transcribing materials into braille. The time for transcribers ranged from 10 to 45 hours each week with a mean of 37. Similarly, 68.2% (n=15) of 22 braillists participating in the study reported that they spent 35 hours or more each week transcribing materials into braille. The time for braillists ranged from 5 to 40 hours each week with a mean of 30 hours.

With regard to where respondents transcribe materials, almost 50% (n=45) of 91 respondents that answered the question indicated that they transcribed in a school that was currently educating one or more braille readers. Other locations included: a special education office/cooperative office (28.6%), home (5.5%), schools not currently educating a braille reader (4.4%), and VI office (3.3%). The next question asked

respondents how much direct contact they had with the student(s) who used the braille materials that they produced. The responses of the 91 respondents were the following: daily contact (50.5%), at least once a week (18.3%), at least once a month (4.3%), less than once a month (3.2%), and no direct contact (23.7%).

Research Question 2

The survey was also designed to collect data about the professional background, including training and certification level, of persons transcribing instructional materials into braille in public schools in Texas.

Respondents who reported that they were certified were asked which certifications they held. Of the 92 who responded to the question, 10.9% (n=10) were certified as a braille transcriber, and 89.1% (n=82) were not certified as a braille transcriber. All certified respondents (n=10) reported that they were certified by the Library of Congress as a literary braille transcriber. Twenty percent of the ten certified transcribers (n=2) reported that they were also certified in the Nemeth code by the Library of Congress. None of the respondents reported that they were certified in the areas of braille music or proofreading. One respondent that was literary certified noted that she was currently working on obtaining Nemeth certification, but was not currently certified.

Of the 82 respondents that were not certified, one documented that she was currently working on literary braille certification, while another respondent noted she was certified by the state of Texas as a teacher of the visually impaired.

Data was also collected on the training that has been received by the 93 respondents (see Table 3). Respondents were directed to choose more than one response if they had completed more than one type of training. The most commonly reported types of training were workshops that had focused on braille transcribing (n=49) or on the job training (n=45). The least frequently reported types of training were correspondence courses in braille transcribing (n=10) or the completion of one or more braille courses designed for transcribers through a university or college (n=6).

Table 3

Types of training completed by respondents in initial survey (n=93).

Training options	Number	Percentage
University or college training options		
One braille course designed for teachers	37	39.8%
Two or more braille courses designed for teachers	19	20.4%
One or more braille course designed for transcribers	6	6.5%
Non-university training options		
Workshops focusing on braille transcribing	49	52.7%
On the job training	45	48.4%
Conference sessions focusing on braille transcribing	32	34.4%
Correspondence course	10	10.8%
Other	17	18.3%

Of the 93 respondents, 17 indicated “other” in response to the question concerning training. The “other” category included a wide array of training experiences including: self-study, completion of graphic classes at the National Braille Association convention, training as part of an alternative certification program for teachers of the visually impaired, and numerous courses offered by various agencies such as the regional education service centers and the former Dallas Services for Visually Impaired Children. One respondent indicated that she had assisted teach braille classes for parents at her school and was involved in helping college students learn braille.

Table 4 reports the areas of braille specialization in which respondents received training. Of the 90 respondents that answered the question, the vast majority (n=85) had received training in the literary braille code and slightly more than 75% (n=69) had received training in the Nemeth code. Thirty respondents indicated that they had received training in computer braille.

The last question requested that respondents evaluate how well their training had prepared them to transcribe braille. Of the 91 who responded, 28.6% (n=26) felt that they had learned most of what they needed to know while on the job, 22% (n=20) felt that there were many gaps in their training that they had to fill in once they began their job, and 27.5% (n=25) believed that there were some gaps in their training that they had to fill in once they began their job. Only 20.9% (n=19) felt that their training had provided them with all the information needed to do their job. Less than two percent (n=1) reported that she had not received any training prior to beginning their job.

Table 4

Areas of training (n=90).

Categories	Number	Percentage
Literary braille	85	94.4%
Nemeth code	69	76.7%
Formatting	49	54.4%
Proofreading	32	35.6%
Computer braille	27	30.0%
Braille music	8	8.9%

Almost 80% of respondents stated that they had begun their transcribing career less than adequately prepared. Additional comments at the end of the survey may at least partially explain the data. One respondent wrote, “I was extremely unprepared with one course in my certification classes. I am still brailling with minimal formatting. Graphics are [my] biggest concern.” Several other respondents noted the difficulty of obtaining training in the more advanced aspects of braille transcribing. One commented, “I have found that it is easier to get training on the beginning levels of braille transcription but high[er] level trainings are few and far between.” The lack of training in the Nemeth code for math and science material was specifically mentioned. Another respondent added, “I have complained for years that there needs to be somewhere to get Nemeth instruction. The Library of Congress does not allow you to go through the Nemeth [course] without getting the Literary Certification.” Similarly, one respondent stated, “I

feel I produce excellent braille most of the time, however I do get concerned when transcribing chemistry – since there is no actual training available in this area…"

Research Question 3

The third research question focused on how the participants prepared print materials into braille. The most frequent types of materials prepared by these school district personnel were classroom tests, teacher-produced worksheets, and hand-outs (See Table 5). State-adopted textbooks, standardized tests, and state-adopted ancillaries were rarely or never prepared by the majority of the respondents.

Table 5

Percentage with which the participants prepared materials.

Type of Materials	Often	Sometimes	Never
Teacher-produced worksheets and hand-outs (n=90)	70	24	6
Classroom tests (n=90)	68	21	11
State-adopted ancillaries (n=78)	29	17	54
Novels assigned to read by teacher (n=84)	26	39	35
Non-state-adopted textbooks (n=81)	22	33	44
Non-state-adopted ancillaries (n=78)	19	32	49
Standardized tests (n=79)	18	30	52
Library books (n=82)	13	48	39
State-adopted textbooks (n=80)	9	31	60

Table 6 reported the frequency in which the respondents prepared materials for students in different subject areas at the time of the survey. Materials for language arts

were transcribed into braille more frequently than were materials in other subject areas. Slightly more than 50% of the respondents reported that they often transcribe math and science materials. On the other hand, materials for music, computer courses, and health were rarely or never mentioned as being prepared by most of the respondents.

Table 6

Percentage with which the participants prepared materials for different subject areas.

Subject areas	Often	Sometimes	Never
Language arts (n=91)	66	27	7
Science (n=87)	53	22	25
Mathematics (n=90)	51	32	17
Social studies (n=89)	51	29	20
Geography (n=84)	40	25	35
Electives (n=84)	32	32	36
Health (n=79)	24	24	52
Computer (n=74)	14	18	69
Music (n=73)	10	16	74

Respondents were asked what resources and specialized technology such as the Perkins braillewriter or computer programs they used when transcribing the materials into braille. Table 7 reports the percentage with which the participants used various items and specialized technology. More than 90% of respondents reported that they often or sometimes used the Perkins braillewriter to transcribe materials. The majority of respondents also reported that they used some type of computer-assisted translation

program when preparing materials into braille. However, direct entry computer programs such as Pokadot and Perky Duck were used the least frequently by the respondents.

The next question asked the respondents which support materials they used when preparing materials into braille. Of the 86 respondents, 54.7% (n=47) used the *Braille Enthusiast's Dictionary* (Koenig & Holbrook, 1995), 39.5% (n=34) used publications from the National Braille Association, and 38.4% (n=33) used the National Library Service correspondence course, *Instruction Manual for Braille Transcribing* (Risjord, Wilkinson, & Stark, 2000). Almost 33% (n=28) consulted the *New Programmed Instruction in Braille* (Ashcroft, Henderson, Sanford, & Koenig, 1991; Ashcroft, Sanford, & Koenig, 2001), and an identical number reported that they use *Braille Formats: Principals of Print to Braille Transcription* (Braille Authority of North America, 1997). Almost 13% (n=11) reported that they use *Braille Codes and Calculations* (Pesavento, 1993). The least commonly utilized resources (n=3 and n=2 respectively) were the Hadley School for the Blind professional development courses and the Braille Tutor, a free download from the website http://www.tsbvi.edu/math/math-resources.htm#Download (Kapperman, Henry, Cortesi, Heinze, & Sticken 1997).

Table 7

Percentage with which the participants prepared materials using these items.

	Often	Sometimes	Never
Duxbury Braille Translation software (n=82)	57	18	24
Perkins braillewriter (n=89)	43	48	9
MegaDots software (n=75)	29	15	56
Direct entry programs (n=69)	3	9	88
Braille 2000 software (n=67)	1	4	94

Of the 86 respondents, 31 indicated “other”, a category that included a variety of formal resources not included on the original list. The most common resource (n=11) mentioned in the other category was the *Nemeth Braille Code for Mathematics & Science Notation* (American Printing House for the Blind, 1972). Eight respondents also listed that they use other publications from the American Printing House for the Blind such as the Nemeth Code reference sheet (nondated) and *Guidelines for Tactile Graphics*. Three others indicated that they use *Braille Code for Chemical Notation* (Braille Authority of North America, 1997).

Several informal resources were also included by respondents on the “other” category. Three respondents indicated that they use unattributed hand-outs and braille “cheat sheets”. Similarly, two respondents reported that they use self-created “cheat sheets”. Personal contacts were also used as a resource. Three respondents reported that they contacted another transcriber or teacher of the visually impaired whenever they had questions. One respondent indicated that she used the Internet as a resource. With regards to how frequently they consulted resources during material preparation, the

responses of the 91 respondents were the following: almost always (5.5%), often (39.6%), sometimes (39.6%), rarely (13.2%), and never (2.2%).

Two questions focused on how personnel proofread the materials they prepared for their students. The results indicated that the majority of respondents regularly proofread their transcriptions (see Table 8). As a follow-up question, respondents were asked if others proofread their materials. Slightly less than 20% (n=17) reported that they had someone else proofread their materials on a regular basis.

Table 8

Percentage that proofread materials.

	Self	Another
Almost always	73.3%	9.9%
Often	15.6%	8.8%
Sometimes	7.8%	23.1%
On rare occasions	2.2%	20.9%
Never	1.1%	37.4%

Research Question 4

Data from first phase. The last research question focused on the accuracy of print transcribed into braille in public schools in Texas. The survey included an item designed to elicit the respondents' perceptions of the quality of the braille instructional material that they produced. Ninety-one percent (n=81) of the 89 respondents that answered the question rated the quality of the braille materials that they produced as being either

excellent or good. Nine percent (n=8) rated their materials as fair, while none of the respondents rated their materials as being poor in quality.

Respondents were also asked if they receive feedback from others concerning the quality of the braille materials that they produced. Almost 60% (n=53) of the 89 respondents reported that they receive feedback from a teacher or another staff member concerning the quality of the materials often, or almost always (see Table 9). Slightly fewer (n=48) of the 90 respondents reported that they receive feedback about the quality of the materials directly from the braille reader for whom they transcribed the materials.

Table 9

Percentage of respondents that received feedback from others.

	Staff Member	Braille Reader
Almost always	12.4%	13.3%
Often	14.6%	14.4%
Sometimes	32.6%	25.6%
On rare occasions	15.7%	25.6%
Never	24.7%	21.1%

Data from the second phase. The second phase of this study was designed to directly answer the fourth research question concerning the accuracy of print the participants transcribed into braille. In mid-October and November 2005, 55 volunteers from the initial procedure were sent a packet containing a consent form, instructions, questionnaire, return envelope, and two print worksheets. A total of 44 (80%) packets were returned. The overwhelming majority of these participants

reported that they were directly and currently responsible for transcribing instructional materials into braille. Of the 44 participants, only one (2.3%) participant reported that she spent no time each week preparing instructional materials into braille. Another participant submitted the questionnaire and a consent form, but no transcription. Data from these two participants were not included in the database or analyzed as these participants did not meet the criteria required for participation in this part of the study. One participant also sent the completed transcriptions on a floppy disk as she did not have access to a braille embosser. The researcher was unable to open or import the documents so this transcription was not reviewed for accuracy, nor was it included in the database.

Of the transcriptions returned, only 41 were initially reviewed by the researcher and certified proofreader in order to determine accuracy and possible patterns of errors. During the review process, it was discovered that one participant had not used contracted braille at all on her transcription, thus, only 40 transcriptions were utilized in the analysis of data.

Participant characteristics. In order to determine the degree of association between accuracy of transcriptions and participant characteristics such as certification status and job position, each participant submitted a demographic questionnaire along with their transcriptions. The questions were identical to the questions asked in the first phase and were used to analyze the data during the second phase. The sample for the second phase had the following characteristics: 97.5% (n=39) were female and 2.5% (n=1) were male for a total of 40 participants. All participants reported their certification

status and job position. Twenty percent (n=8) were certified as a literary braille transcriber by the National Library of Congress, and 80% (n=32) were not certified as a literary braille transcriber. None of the participants reported that they were certified in the Nemeth code, braille music, or proofreading. Job titles for the participants varied. Thirty percent (n=12) were braillists, 25.0% (n=10) were teachers of the visually impaired, 20% (n=8) were transcribers, 12.5% (n=5) were dually certified teachers of the visually impaired and O&M specialists, 7.5% (n=3) were paraprofessionals, 2.5% (n=1) was a library assistant, and 2.5% (n=1) was an aide.

Data collected on years of experience in the second phase also followed those used in the first phase of this study. Of the 38 participants who responded to the question about years of experience, 7.5% (n=3) had one year of experience or less, 37.5% (n=15) had two to five years of experience, 22.5% (n=9) had six to 10 years of experience, 7.5% (n=3) had 11 to 15 years of experience, 7.5% (n=3) had 16 to 19 years of experience, and 12.5% (n=5) had 20 or more years of experience. Thus, 45% of participants had five or less years of experience. The years of experience for participants ranged from zero to 30 years with a mean of 9.03 years of experience.

The participants were asked, given a forty hour work week, how much time they spent preparing print materials into braille each week. Nine of the respondents provided a range of time rather than an estimate. These responses were averaged using the low and high number of hours that they provided. Of the overall 38 participants who answered this question, time spent transcribing braille each week ranged from .5 hour to 40 hours with a mean of 20.4 hours. In general, teachers of the visually impaired and

dually certified teachers of the visually impaired and O&M specialists reported that they spent less time each week transcribing than did transcribers, braillists, or paraprofessionals.

Data about how worksheets were transcribed. Table 10 illustrates the time that participants spent transcribing the two worksheets into braille. Of the 38 participants who recorded time that they spent, more than 50 percent (n=24) of the participants spent less than 20 minutes transcribing the two worksheets. Time for participants to complete the transcriptions ranged from 5 minutes to 2 hours with a mean of 23.12 minutes.

Table 10

Time spent transcribing the two worksheets by participants in phase two.

Time in minutes	Frequency	Percent
5 to 10 minutes	13	34.2%
11 to 20 minutes	11	28.9%
21 to 30 minutes	9	23.7%
31 to 40 minutes	1	2.6%
41 to 50 minutes	2	5.2%
51 to 60 minutes	1	2.6%
More than 60 minutes	1	2.6%

Table 11 reports how the participants elected to complete the transcriptions. In order to simulate how participants typically transcribe materials for students, they were invited to complete the transcriptions by using specialized equipment such as a Perkins braillewriter, a direct entry computer program such as Perky Duck, or a braille translation software program such as MegaDots or Braille 2000. Eighty percent (n=32)

of participants used a computer-assisted translation program, and twenty percent (n=8) of participants used a direct entry program or a Perkins braillewriter. The most commonly utilized computer-assisted translation program was Duxbury.

Table 11

Percentage with which the participants prepared transcriptions using equipment.

	Frequency	Percent
Duxbury braille translation software	18	45.0%
MegaDots software	12	30.0%
Braille 2000 software	4	10.0%
Perkins braillewriter	4	10.0%
Direct entry computer program	1	2.5%
Combination of scanner and MegaDots software	1	2.5%

Participants were encouraged to use support materials when transcribing the worksheets. Of the 40 participants, precisely 50% (n=20) elected to consult support materials while transcribing. The most commonly utilized resources were the *Braille Enthusiast's Dictionary* (Koenig & Holbrook, 1995), *Braille Formats: Principals of Print to Braille Transcription* (Braille Authority of North America, 1997), and the National Library Service correspondence course materials, *Instruction Manual for Braille Transcribing* (Risjord, Wilkinson, & Stark, 2000).

Participants were also given the option of proofreading their transcriptions of the two worksheets and rating the quality of the braille materials that they had produced. Ninety percent (n=36) of participants reported that they proofread their transcriptions

before submitting them, and ten percent (n=4) of participants reported that they did not proofread their transcriptions. Of the 37 participants who responded about the quality of brailled instructional materials that they produced, 43.2% (n=16) rated their materials as excellent, 48.6% (n=18) rated their materials as good, and 8.1% (n=3) rated their materials as fair. None of the participants rated their materials as poor.

Scoring of the transcriptions. In order to develop a model for scoring purposes, the selected worksheets were sent to five NLS certified transcribers at state agencies, regional service centers, and a nationally recognized braille transcribing entity. Four out of the five transcriptions of the selected worksheets were identical. Rather than beginning a new page for the second worksheet like the four other transcribers, the fifth transcriber used a separation line and began transcribing the second worksheet on the same page as the first worksheet. These transcriptions were then used by the researcher to develop a grading tool which closely aligned with the NLS scoring system (Risjord, Wilkinson, & Stark, 2000). The researcher and certified proofreader then reviewed the grading tool together. Both the researcher and proofreader were certified by NLS and were familiar with the literary braille code as well as the rules for braille formatting outlined in *Braille Formats: Principals of Print to Braille Transcription* (Braille Authority of North America, 1997). The researcher and proofreader then collaboratively scored a sample transcription to test the tool. The remaining 39 transcriptions were then independently reviewed by both the researcher and proofreader. In order to review internal consistency between the two raters, Cronbach's alpha was determined. The

reliability of the two raters on all 39 transcriptions was .9963, and the agreement ratios ranged from 92% to 100% across the individual transcriptions.

Accuracy of the first transcription. The first worksheet that was transcribed by the 40 participants included two paragraphs and two sets of numbered exercises. The worksheet included 235 words and an accurate transcription of the print worksheet required the usage of a heading, italics, and a special symbol for the print degree sign. Accurate transcription of the worksheet also required the use of 178 contractions and short form words. Overall accuracy was measured by a single score that reflected the number of total errors on the transcription of the worksheet. The highest possible score was 0; this meant that the transcription contained no errors. Table 12 illustrates the accuracy of the transcriptions completed. Accuracy scores for all participants on the first transcription ranged from 38 mistakes to 0 mistakes with a mean of 14.6 mistakes and a standard deviation of 11.367.

Table 12

Accuracy scores for first set of transcriptions.

Number of errors	Number	Percentage
0	5	12.5%
1-10	11	27.5%
11-20	11	27.5%
21-30	10	25.0%
31-38	3	7.5%

There is not currently a universally accepted standard of "quality" in braille transcribing or a published definition of accuracy in braille transcribing necessary to ensure readability. The National Library of Congress and the National Braille Association use different evaluation tools and grading procedures. The National Braille Association requires the successful completion of an eight to ten page examination for braille formatting certification. Examinations are reviewed by a panel of three transcribers, point deductions for errors range from less than one point to two points, and more than approximately 10 to 20 errors will result in a score below passing (Damm, 2006). So far, less than 50 evaluations have been returned nationwide for review (Damm, 2006). In contrast, the National Library of Congress requires the successful completion of a 35 page manuscript for literary braille certification. Point deductions for errors range from one to three points and more than 10 to 15 errors on a 35 page transcript will result in a score below passing (Risjord, Wilkinson, & Stark, 2000). As the grading procedures currently used by the two certifying agencies differ greatly, no pre-set standard of "quality" was established in this study. However, this study did use the convention of assigning a one point deduction for each error and used the total number of errors as reflective of the individual score.

Accuracy of the second transcription. In order to strengthen internal validity, the 40 participants were asked to transcribe a second, yet comparable worksheet into braille. Identical code numbers were utilized for the participants so that the researcher could compare the accuracy on the two selections to determine if the transcription of the first passage reliably depicted the transcribers' skills. The second worksheet included

one set of 10 numbered exercises. The selected material included 205 words and accurate transcription of the worksheet required the usage of a heading, italics, and 179 contractions and short form words.

Once again, overall accuracy on the second worksheet was measured by a single score that reflected the number of total errors on the transcription of the worksheet. The highest possible score was 0; this meant that the transcription contained no errors. Table 13 illustrates the accuracy of the transcriptions completed for the second worksheet. Accuracy scores for the participants ranged from 45 to 0 with a mean of 13.9 mistakes and a standard deviation of 11.0.

Table 13

Accuracy scores for second set of transcriptions.

Number of errors	Number	Percentage
0	3	7.5%
1-10	16	40.0%
11-20	10	25.0%
21-30	8	20.0%
31-39	2	5.0%
40-45	1	2.5%

As shown in Table 14, the mean difference between the scores for individuals was determined to be .78. Reliability analysis between the transcriptions (in the form of a Pearson's product-moment correlation coefficient) was determined to be .836. According to *Applied Statistics for the Behavioral Sciences* (Hinkle, Wiersma, & Jurs,

1998), if a correlation coefficient is determined to be between .70 and 1.0, it may be interpreted that there is a high positive correlation. Thus, it was determined that the first transcription realistically depicted the transcribers' skills.

Table 14

Differences between the two groups of transcriptions.

Items	*Mean*	*Std. Deviation*	*Std. Error of Mean*
Errors on first transcription Errors on second transcription	.78	6.399	1.012

Descriptive data about categories of errors. The initial transcriptions were reviewed a second time to determine if patterns of errors could be detected. Possible errors were divided into eight categories patterned after the NLS scoring categories (Risjord, Wilkinson, & Stark, 2000). Table 15 illustrates the occurrence of contraction errors, characters that were misformed, insertion of additional letters or words, and omission of letters or words in the transcriptions submitted by participants.

Table 15

Number of transcriptions with errors in each category that may cause words to be misread or prevent easily navigated braille materials.

Categories of errors	*N*[a]	*X* of errors[b]	*SD*	Range of errors per transcription
Omission/insertion of a letter or word	30	4.4	2.6	1-14
Inconsistent or incorrect formatting	26	7.4	7.0	1-18
Composition signs omitted or used incorrectly	19	1.2	1.5	0-4
Spacing errors or irregularities	18	2.7	3.2	1-15
Punctuation signs omitted or used incorrectly	10	1.0	N/A	N/A
Misformed characters	6	1.3	0.5	1-2
Contraction errors	6	6.8	8.1	1-21
Detectable erasures	1	2.0	N/A	N/A

[a]N values represent number of total transcriptions submitted with a certain type of error. For example, 6 of the 40 transcriptions contained a contraction error. Thus N=6. [b]*X* of errors represents the mean number of errors related to the category for transcriptions submitted with a certain type of error. Of the 6 transcriptions containing contraction errors, they had a mean of 6.8 contraction errors per transcription.

The most frequently occurring error was the insertion of a letter, letters, word, or words within the transcription. For example, several participants added words such as *got, to,* and *has* not located within the print copy to their braille transcription, and one participant transcribed an additional e in the word them. Two errors within this category

seemed to be especially problematic for the participants. Seventy percent (n=28) of the participants added blanks for recording the student's name and date to the worksheet containing numbered exercises even though there was not sufficient space for students to answer the questions on the transcription. According to *Braille Formats: Principles of Print to Braille Transcription* (Braille Authority of North America, 1997), blanks for recording the student's name, class, and date should be omitted in the braille edition of exercises, drills, and tests. In addition, 35% (n=14) of the participants inserted the word *degree* instead of using the proper letter abbreviation for the print symbol for degrees.

Sixty-five percent (n=26) of the 40 transcriptions submitted by the participants contained formatting errors or irregularities which may have prevented braille readers from easily navigating the materials. A unit of space in braille is known as a cell (American Foundation for the Blind, 2004). The most frequently occurring formatting errors on the worksheet containing numbered exercises were the incorrect placement of the directions (n=23) in either the first or third braille cell, incorrectly beginning numbered exercises in the third or fifth braille cell (n=16), and incorrectly placing runovers of numbered exercises in the first or fifth braille cell (n=21). Nine participants also failed to center the directions, and three participants incorrectly indented paragraphs in the second braille cell.

There are five composition signs which are unique to the braille code. They are dots that are placed before a braille cell in order to designate a change in the print typeface or give the following character or letter a special meaning (Risjord, Wilkinson, & Stark, 2000). For example, the addition of a dot 6 before a letter indicates that the

letter is capitalized. The first transcription required the use of three composition signs: the capital sign, the number sign, and the italics sign which is sometimes called the emphasis indicator.

Almost one-half (n=19) of the 40 transcriptions contained the incorrect usage or omission of a composition sign. Thirty percent of the participants (n=12) did not italicize the bolded information that students should use complete sentences when answering each question in the directions. Twenty percent of the participants (n=8) incorrectly italicized the title, and 2.5% (n=1) of the participants italicized a word on the braille transcription that was not italicized or bolded on the print worksheet. One participant did not capitalize a word by adding a capital sign immediately before the letter to be capitalized, and a different participant did not use the number sign before an intended page number.

Forty-five percent (n=18) of the transcriptions contained spacing errors or irregularities. The most frequently occurring spacing error was incorrectly leaving a space before (n=10) or after a dash (n=13) on the braille transcription as in print. According to the National Library Service correspondence course, *Instruction Manual for Braille Transcribing,* "In braille, no space is left between a dash and the words that immediately precede and follow it, regardless of print spacing." (Risjord, Wilkinson, & Stark, 2000, p. 2-7).

Other spacing irregularities and errors occurred less often. For example, one blank line should have been left between the centered title of the worksheet and the directions. Seven and one-half percent (n=3) skipped two lines, and five percent (n=2)

did not skip a line. Other spacing errors on the transcriptions included: no space between two words (n=1), incorrectly leaving a space between the whole-word contractions *of* and *the*, insertion of two spaces between the number and the question in the exercises (n=1), insertion of two spaces between four sentences (n=1), skipping two lines between the paragraph and the beginning of the numbered exercises (n=1), and failing to skip a line between the paragraph and beginning of the numbered exercises (n=1).

Twenty-five percent (n=10) of the transcriptions included a punctuation sign that was omitted or used incorrectly. Ten percent (n=4) omitted the dash located within the directions and incorrectly inserted a colon instead. Other punctuation errors were: omission of a period at the end of a sentence (n=2), omission of a period following a number in the numbered exercises (n=1), omission of a dash (n=1), insertion of two commas instead of one (n=1), and the use of a comma instead of a period at the end of a sentence (n=1).

Omission of a letter or word can also cause confusion for the braille reader. Twelve and one-half percent (n=5) of the transcriptions contained an omission of a single letter or word; an additional 10% (n=4) of the transcriptions contained two or more omissions. The majority of the errors within this category was the omission of a single word such as *dry*, *then*, and *got*. One participant omitted a complete sentence in the text of the first paragraph, and another participant omitted nine letters or contractions at the end of lines.

Fifteen percent (n=6) of the 40 transcriptions contained contractions that were omitted or misused. The most frequent contraction error was the omission of the

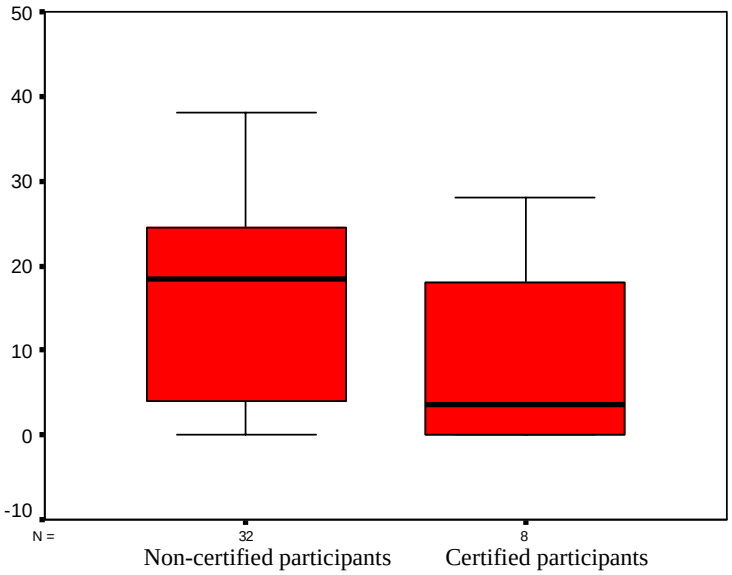
contraction. For example, three participants failed to use the alphabet contraction *do* and two other participants used the contraction *th*, instead of the preferred contraction *the*, in words such as *then, them*, and *clothes*. Contractions were misused less frequently by participants. To illustrate, one participant used the contraction *shall* for she, and another participant used the contraction *that* for they. Alphabet signs, lower part-word signs, and lower whole-word signs seemed especially problematic for the six participants who submitted transcriptions with braille contraction errors.

Less than 20 percent (n=7) of the transcriptions contained detectable erasures or characters that were misformed. Ten percent (n=4) of the transcriptions contained one character that was misformed; an additional five percent (n=2) of the transcriptions contained two characters that were misformed. No patterns of errors emerged in this category. Examples of words that contained misformed characters included: *jid* instead of did, *thoum* instead of them, *filded* instead of folded, and *chat* instead of what. Only 2.5% (n=1) of the participants had detectable erasures which could have easily led to misread words.

Degree of association between accuracy and certification status. Afterwards, the researcher determined the degree of association between accuracy of the transcriptions and four participant characteristics. The first participant characteristic examined was certification status. A boxplot in Figure 1 pictorially illustrates the median, quartiles, and range of accuracy for both the certified and non-certified participants.

Figure 1

Boxplot depicting accuracy scores for both certified and non-certified participants.



Scores for the eight certified participants ranged from 28 to 0 with a mean of 8.75, a median of 3.0 and a standard deviation of 11.055. Fifty percent (n=4) of the certified participants had transcriptions with a score of 0, which indicated no errors. Scores for non-certified participants ranged from 38 to 0 with a mean of 16.1, a median of 19, and a standard deviation of 11.127. Thus, the mean of errors for non-certified participants was almost double the mean of errors for certified participants.

An analysis was performed to determine the degree of association between the certification status of a transcriber and the accuracy of transcription by computing a point biserial correlation. The correlation coefficient between certification status and accuracy was $r = .26$. This equated to $r^2 = .0676$ (see Table 16). According to *Applied Statistics for the Behavioral Sciences* (Hinkle, Wiersma, & Jurs, 1998), there is little if

any correlation if a correlation coefficient is determined to be between .00 and .30. Therefore, this analysis indicated that there was no significant correlation among the number of errors on a transcription and the certification status of the participant. However, there may have been a ceiling effect as the people who did have certification status had fewer errors that approached 0.

Table 16

Correlation between accuracy and certification status (n=40).

Variable	R	r^2
Accuracy and certification status	0.26	.0676

The scores for the certified participants were plotted on a coordinate plane, and one outlier was visually located. Afterwards, an additional analysis was performed to determine if the outlier within the certified category might be affecting the distribution of the accuracy scores as well as the degree of association between the certification status of a transcriber and the accuracy of transcription. If the outlier of 28 errors was excluded in the certified group, scores for the other seven certified participants ranged from 18 to 0 with a mean of 6.0 and a standard deviation of 8.49. The correlation coefficient between certification status and accuracy without the outlier was $r = .34$, rather than the original $r = .26$. This equated to $r^2 = .1156$ (see Table 17). According to *Applied Statistics for the Behavioral Sciences* (Hinkle, Wiersma, & Jurs, 1998), there is a low positive correlation if a correlation coefficient is determined to be between .30 and

.50. Therefore, if the outlier is excluded, there is a low positive correlation among the number of errors on a transcription and certification status of the participant.

Table 17

Correlation between accuracy and certification status if an outlier within the certified category is excluded (n=39).

Variable	R	r^2
Accuracy and certification status	0.34	.1156

Correlation between years of experience and accuracy of transcription. A second analysis was performed to determine the strength of the relationship between years of experience of the transcriber and the accuracy of transcription by computing a Pearson-product moment correlation. The correlation between years of experience and accuracy was r = -0.23. This equates to r^2 = .0529 (see Table 18). This analysis indicated that there was no significant correlation among the number of errors on a transcription and years of braille transcribing experience of the participant.

Table 18

Correlation between accuracy scores and years of experience (n=38).

Variable	R	r^2
Accuracy and years of experience	-0.23	.0524

Accuracy and job role. The third participant characteristic examined was job role. Job roles were collapsed into five primary categories: a) braillists, b) teachers of the visually impaired, c) transcribers, d) dually certified teachers of the visually impaired and O&M specialist, and e) paraprofessionals. Table 19 reports the descriptive statistics for the five primary categories of job roles. Twenty-five percent (n=3) of the braillists and 17% (n=2) of the transcribers had transcriptions with no errors. None of the teachers of the visually impaired, dually certified teachers of the visually impaired and O&M specialists, or paraprofessionals produced transcriptions that had no errors.

Table 19

Accuracy as categorized by job role.

Job title	*N*[a]	*X* of errors[b]	*SD*	Range
Braillists	12	7.2	8.021	0-24
Teachers of the visually impaired	10	24.7	10.275	3-38
Transcribers	8	9.1	10.398	0-23
Dually certified teacher/O&M	5	20.8	5.805	12-27
Paraprofessionals	5	15.0	9.670	4-28

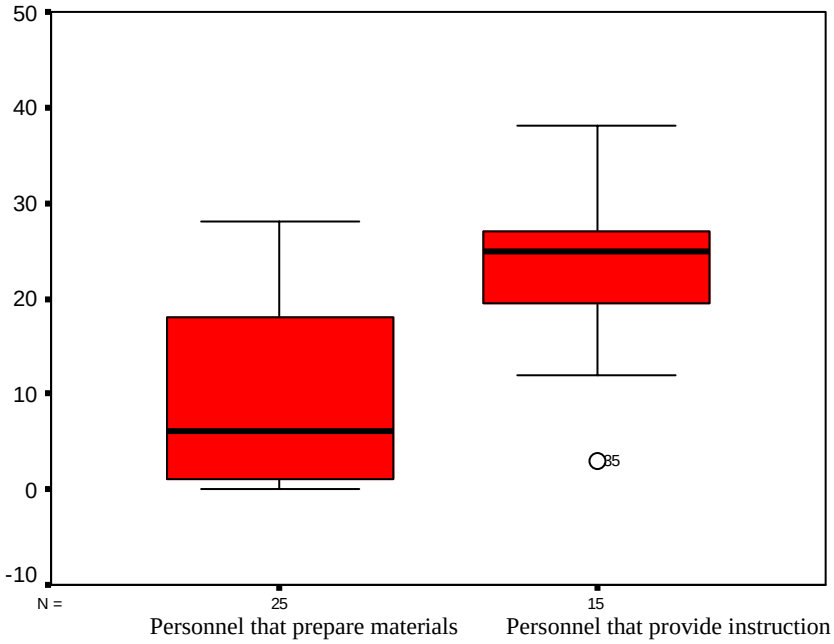
[a]N values represent number of total transcriptions submitted by participants within each job role category. For example, 12 braillists submitted transcriptions. [b]*X* of errors represents the mean number of errors per transcription as categorized by job role of participants.

Afterwards, primary job roles were collapsed into two dichotomous categories, those that primarily provide instruction and those that primarily prepare materials and

assist with instruction. The job roles were collapsed after determining that the responsibilities of transcribers and braillists were comparable and that dually certified teachers were, in fact, teachers of the visually impaired with additional job responsibilities. Within the category of preparing materials (n=25), the number of errors ranged from 0 to 28 with a mean of 9.3 and a standard deviation of 9.185. Within the instruction category (n=15), the number of errors ranged from 3 to 38 with a mean of 23.4 and a standard deviation of 9.006. A boxplot is used in Figure 2 to pictorially illustrate the median, quartiles, and range of accuracy for the dichotomous categories, teachers and support personnel.

Figure 2

Boxplot depicting accuracy scores for personnel that primarily prepare materials and personnel that primarily provide instruction.



Degree of association between job role and accuracy of transcription. After further collapsing the categories into instruction and preparing materials, an analysis was performed to determine the degree of association between the job role of a participant and the accuracy of the transcription by computing a point biserial correlation. The correlation between those responsible for instruction and those preparing materials was r = .600. This equated to $r^2 = .36$ (see Table 20). According to *Applied Statistics for the Behavioral Sciences* (Hinkle, Wiersma, & Jurs, 1998), if a correlation coefficient is determined to be between .50 and .70, it may be interpreted that there is a moderate positive correlation. Thus, this analysis indicated that there was a moderate correlation among the number of errors on a transcription and job role.

Table 20

Correlation between accuracy scores and job role (n=40).

Variable	R	r^2
Accuracy and job title	.600	.36

Degree of association between time spent transcribing each week and accuracy of transcription. In general, teachers of the visually impaired and dually certified teachers of the visually impaired and O&M specialists reported that they spent less time each week transcribing than did transcribers, braillists, or paraprofessionals. As there was a moderate correlation between job role and accuracy, a fourth analysis was performed to determine, if perhaps, time spent each week transcribing is the salient characteristic in predicting the quality of braille produced by the participant.

A Pearson-product moment correlation was computed in order to determine the strength of the relationship between time spent transcribing each week and the accuracy of transcription. The correlation between time spent and accuracy was r = -0.52. This equates to r^2 = .2704 (see Table 21). This analysis indicated that there was a moderate correlation among the number of errors on a transcription and time spent each week transcribing.

Table 21

Correlation between accuracy scores and time spent each week (n=38).

Variable	R	r^2
Accuracy and job title	-.520	.2704

Data from the Focus Group

The primary intent of the focus group session was to provide feedback concerning the legibility and readability of the transcriptions submitted by participants in the second phase. During the focus group, the five teachers discussed errors in terms of impact on learning for students and provided plausible explanations of how and why errors were made by school personnel submitting transcriptions in the second phase. The data revealed little difference of opinion among participants; usually difference was a matter of degree, not a true difference in perception or experience.

Background of Participants

Susan. Susan was a 40 year old, Caucasian woman who had a total of 18 years of experience as a teacher in both Illinois and Texas. She was certified as an elementary

teacher and as a teacher of the visually impaired. After moving to Texas almost nine years ago, she worked as an itinerant teacher of the visually impaired for two cooperatives serving several rural districts. At the time of this study, she was teaching a ninth grade braille reader and spent approximately 10 hours a week transcribing. She reported that she used a scanner and Duxbury when transcribing; she also had access to a certified transcriber to assist in the preparation of math materials.

Judy. Judy was a woman of Hispanic descent in her late forties. She was a certified teacher of the visually impaired and had a master's degree with orientation and mobility as her area of concentration. She vividly remembered transcribing years before computer translation programs were available. During that time, she used the Perkins braillewriter years and often put three sheets of braille paper into the braillewriter so that she would have three hard copies of what she was brailling. She believed that there had been a dramatic downward change in expectations of universities of the level of acceptable quality in braille assignments over the years.

At the time of this study, Judy worked for an education service center in North Texas and had a total of 26 years of teaching experience. She estimated that she transcribed materials with the assistance of Duxbury approximately six times a year. She also reported that she routinely provided Duxbury training to teachers and transcribers throughout her region.

Terry. Terry was a 48 year old, Caucasian woman who had been teaching 23 years. She began her teaching career as a resource teacher. At the time of this study, she was completing her 13th year as an itinerant teacher of the visually impaired. She was

serving three braille students: a sophomore in high school and two kindergarten students who are currently just beginning to learn to read braille. She was one of two teachers of the visually impaired working for a cooperative that served ten rural districts. She also reported that she spent approximately eight hours a week transcribing and that a paraprofessional assisted her in the preparation of literary braille materials. She had used MegaDots and a scanner to transcribe materials in the past, but she preferred to prepare materials with either the Perkins braillewriter or a combination of Duxbury, scanner, or Tiger MaxSuite.

Rhonda. Rhonda was a 73 year old, Caucasian woman who, at the time of the study, worked for a single entity suburban district. She had been teaching 42 years in Alabama and Texas, with 30 years of experience as certified teacher of the visually impaired. She also has a master's degree in reading. She was currently teaching two braille students: a seventh grade braille student and a first grade braille student. She reported that she spent approximately 10 hours a week transcribing, and that both a braillist and another teacher of the visually impaired assisted her with the transcription of materials. It was Rhonda's responsibility to create tactile graphics and band music for a seventh grader and transcribe part of the materials for a younger braille student.

Rosa. Rosa was a 55 year old woman of Hispanic descent. She learned to read braille as a young child as she was visually impaired herself. She reported that she utilized Duxbury to prepare materials for herself. At the time of this study, she was completing her 28th year as a certified teacher of the visually impaired and spent approximately two hours a week transcribing materials into braille. She had her master's

in guidance and counseling. She worked for a regional service center in West Texas and served as a facilitator and grader for a braille distance-learning university course. She felt that the results of allowing errors in assignments during teacher training may have contributed to the errors found on the transcriptions submitted in the second phase.

Focus Group Findings

How focus group members prepare materials. Similar to the participants in the other phases, the teachers of the visually impaired participating in the focus group reported that they used a variety of tools and technology when transcribing print into braille. Two of the participants reported that they used the Perkins braillewriter when transcribing, especially for math and music materials. All of the teachers participating had used either MegaDots or Duxbury, two commonly used braille translation software programs. In contrast with the participants in the other phases, most of the focus group members reported that they did not proofread their transcriptions because of time limitations at their present job sites.

Beginning the session. The researcher began the focus group session by briefly discussing the purpose of the project. The teachers then reviewed a subset of the braille transcriptions and the accompanying written translations from the second phase. The six transcriptions viewed by the focus group participants ranged in accuracy from 0 errors to 28 errors. In order to provide a representative sample of the transcriptions to focus group members, five of the six transcriptions were selected on the basis of percentile: one at the 10^{th} error percentile, one at the 25^{th} error percentile, one at the 50^{th} percentile, one at the 75^{th} percentile, and one at the 90^{th} percentile. The final document selected was one of

the transcriptions that did not contain any errors. This transcription proved to be particularly useful in providing a model of accuracy for group members and facilitated in the comparison of transcriptions and patterns of errors. Afterwards, the researcher asked a series of seven pre-determined questions concerning how errors and irregular formatting affect readability of materials for students. Additional probes and questions were asked during the session in order to solicit more details, examples, and clarification as needed. The transcriptions remained available to the participants and were reviewed intermittently by them during the session. The entire session was recorded, and a verbatim transcription was used in the analysis.

Analyzation. The data was analyzed by reviewing the transcription "question by question," wherein the researcher looked for themes both within and across questions (Krueger, 1998). During this process, the transcription was carefully reviewed, and each response was coded. Afterwards, similar meaning units within and across responses were grouped into categories. The data was then examined for relationships and patterns across the categories and organized into subthemes and two broad themes. Table 22 presents the themes, subthemes and categories in terms of the number of references made by individual teachers during the session.

To increase the validity of the results, the participants were emailed a copy of the results of the analysis and asked if the results accurately represented their comments and perceptions. They were given one week to complete this review. Four of the five teachers responded; all felt that the results were an accurate reflection of their perceptions and experiences. Representative email responses included: "Quite

comprehensive. No additions as far as I'm concerned." and "You have done an excellent job. Those of us 'in the trenches' try very hard to meet the needs of our students… It is always a very good idea to stop and reflect on some of the 'bad habits' we no longer notice."

Participants were given approximately 15 minutes to individually review the six transcriptions. After reviewing the transcriptions, the five participants agreed the quality of the transcriptions greatly varied. According to Terry, "They go from one extreme to the other." Judy agreed, and said, "I've seen two alone that were quite different." When the researcher explained that 90% of the transcriptions had been proofread before they were submitted, the members of the focus group seemed surprised and made comments such as "Are you serious?" and "Oh, my gosh!"

Table 22

Responses grouped by themes, subthemes, and categories.

Theme	Frequency	
Learning of individual students	51	theme total
Students most likely impacted		
Young and beginning readers	7	
Struggling readers	3	
Ease of reading		
Decreased legibility/readability	11	
Struggle to comprehend	6	
Academic performance/Difficulty learning content		
Spelling	7	
Braille contractions	7	

Table 22 continued

Theme	Frequency	
Academic performance/Difficulty learning content		
Proofreading	6	
Test-taking skills	4	
Plausible explanations for varying quality	79	theme total
Barriers in regards to time		
Lack of adequate time	14	
Insufficient lead time/notice	9	
Barriers in term of knowledge and skills		
Lack of technology/technology skills	14	
Insufficient knowledge of proofreading	7	
Insufficient knowledge of braille code	7	
Varying levels of expertise of persons transcribing	5	
Insufficient knowledge of formatting	4	
Perceived decrease of expectations in training	8	
Consideration of the individual		
Needs	7	
Preferences	4	

Errors affect learning of individual students. Two broad themes emerged from the analysis of the data, and they are elaborated in the following paragraphs. Most importantly, the teachers believed that errors in transcribing affect the learning of a braille reader. Young, struggling, and beginning braille readers were especially vulnerable and may be impacted to an even greater degree than experienced braille readers. The stories and elaborations of the teachers repeatedly illustrated how errors in

transcribing affect the readability of materials as well as how braille readers learn. The teachers' comments often connected readability and learning. The participants pointed out that if students are struggling to read and comprehend the materials due to transcribing errors, then they will have more difficulty learning content. As a result, they may experience difficulty learning to consistently use contractions in their own writing, learning how to spell words correctly, and building effective test-taking skills. They believed that the materials with transcribing errors often serve as a less than positive model for students and may affect the students' willingness to proofread their own assignments and writing.

Errors affect legibility of materials for young, beginning, or struggling braille readers. Although the issues of legibility and readability were expressed in different ways by the focus group members, they unanimously agreed that experienced braille readers would be most likely able to ascertain the meaning of the braille transcriptions, even those with contraction and spelling errors. Terry aptly put it, "I think if it's a good braille reader, then they could make out what it was supposed to be. Yeah, probably. But for many beginning braille readers, this would be horrible." The others unanimously agreed; they felt that some of the transcriptions contained errors that would change the meaning or prevent comprehension for young, beginning, or struggling braille readers. For example, Rhonda commented, "On this one [transcription], she wrote shall instead of she. It read 'next shall' instead of 'she shall'. As I was reading, I said wait a minute to myself. It can't be shall, so I'll read on to figure out what the word should have been."

Rosa reviewed a different transcription that contained several omitted words and letters at the end of lines due to what appeared to be a misalignment of the margins on the braille embosser. She waited until no one was talking and then said, “Look right here. This word should be ‘each’. There’s an ‘ea’, and boom the ‘ch’ is missing. A young child wouldn’t know what that word is supposed to be.” After Rosa completed the document, the transcription was passed around the table to the others. Upon reviewing it, Susan said, “If the margins on your embosser are not quite set right, then this is what happens.”

Errors affect other areas of academic performance. Reading comprehension and legibility were not the only areas of concern for the focus group members. The prevalent feeling of the teachers was that the overall academic performance of students who were consistently exposed to errors, such as the errors displayed in these transcriptions, would suffer. They felt that errors on the braille transcriptions would have a negative impact on: a) spelling, b) proofreading, c) test-taking skills in connection with the statewide assessment, and d) learning and consistently using braille contractions. Terry described a personal experience that illustrated the impact of an error in braille transcribing on a student.

> Well, I sometimes have trouble with the Nemeth code, and I have to use my cheat sheet, especially when it gets up into algebra. Once I transcribed something wrong every single time, and I really thought I knew it so I didn’t look it up. My student attended a short course [at the Texas School for the Blind and Visually Impaired], and when she came back, she told me, ‘I don’t know what you’ve

> been teaching me, but it's wrong.' Sure enough, she had learned it wrong because of me. She corrected it because she's really smart, but I was like oh, my gosh.

Spelling. Four of the five teachers made unsolicited comments about spelling. According to these teachers, spelling errors affect the readability of the braille transcriptions for students and lead to students learning to spell words incorrectly. For example, Judy noticed that a misspelled word on a transcription, and commented, "Here's the word 'ingredient' spelled with 'ant' instead of 'ient'. With errors like this, beginning braille readers could learn to spell words incorrectly." Susan concurred and explained,

> Students have a hard enough time with learning how to spell. Spelling is already an issue for my braille student and errors [like the one in ingredient] would create even more of a problem. You don't want them to learn it wrong.

Braille contractions. The literary braille code involves the use of the traditional alphabet along with 189 different characters and contractions that represent a group of letters or whole words (Ashcroft et al., 1991). Four of the five teachers comprising the focus group made several comments about the transcriptions that contained contraction errors. Typical comments by the four teachers included, "Why aren't they using contractions?" and "Something as easy as not using a contraction. That's amazing." The fifth member made no comment during this section of the discussion and seemed to neither agree nor disagree. When braille characters and contractions are not transcribed correctly and consistently, the majority of the teachers felt that young or beginning

braille readers would subsequently experience difficulty learning and consistently using the different characters and contractions in their own writing. Terry discovered that the transcription she was reviewing contained ‘th’ instead of the preferred contraction ‘the’ in words such as clothes and them. She said, “Oh, yeah, my older ones would be okay, but my beginning student, now she might be learning [this contraction] incorrectly.” Judy agreed with Terry. Later in the session, Terry noticed that another transcription did not contain a contraction and pointed out, “This could be confusing for students. Using contractions, and then all of the sudden, turning to grade one [uncontracted] braille. They used the individual letters ‘e’ and ‘d’ instead of the contraction ‘ed’.” Students may become confused or uncertain when to use a contraction in their own writing if they receive materials that do not consistently use contractions.

Proofreading. When students proofread their assignments and when school personnel preparing braille materials proofread their own work, they have the opportunity to correct errors. The teachers felt that most spelling mistakes in transcribing by school personnel could be avoided by careful proofreading. The majority of the teachers also believed that proofreading was an important skill that students must learn and utilize independently. As Rosa was reviewing one transcription, she commented, “This error is glaring. I mean, just even quickly looking at it.” She stated that she believed braille materials act as a model to encourage younger students to develop good habits such as proofreading. According to Rosa, “Readability is important…you want your young and beginning students to have good habits.” Young and beginning students may not be the only students that require assistance in developing the good habit of

proofreading. Susan described how she supported a high school braille reader in proofreading her assignment,

> My student uses her Braille Note for assignments and then prints it for the teacher. I make her go back because she didn't spell check or proof it. I make her go back and tell her that she is not going to turn this in because if any other student turns a paper in with mistakes like this, they would be marked down.

If students receive braille materials with errors, it may be even more difficult to encourage the good habit of proofreading. Rhonda noted that students might respond, "If you can make mistakes, then why should I have to go back and check?"

Test-taking skills in connection with statewide assessments. As the brailled version of assessments and textbooks provided by the state of Texas contain formatting according to *Braille Formats: Principals of Print to Braille Transcription* by the Braille Authority of North America, the majority of focus group members felt that consistent formatting for instructional materials produced by school personnel was also critical. Rosa, who has been a braille reader since childhood, found a transcription that did not include the italics sign within the directions. She felt that the italics sign was particularly important to a braille reader, and the two others verbally agreed. She stated, "It's important to know when I'm reading if something is underlined or bolded in print, because then I know that it's something that I am supposed to remember or pay special attention to." She later explained the relationship of formatting and performance on statewide assessments:

> Formatting is so critical, because of the TAKS test and all the other tests that our students are going to take will be prepared in a certain format… If we give materials to our students that do not have italics, then when they take the TAKS [Texas Assessment of Knowledge and Skills], and the test has something italicized, they will say 'what is that?'

When the participants were asked to identify other critical aspects of formatting in connection to statewide assessment, they identified beginning paragraphs in cell three, blocking the directions in cell five, and the correct placement of exercises. They felt consistent formatting would aid in easier navigation of materials and allow students to quickly and efficiently scan materials. This is sometimes problematic for school personnel as some principles of braille formatting parallels that of print materials, while others do not. For example, in braille, all lines containing directions begin in cell five, and exercises begin in cell one with runovers in cell three (Braille Authority of North America, 1997). Susan put it well, "If you need to refer back to the directions, how can you easily and consistently find them? By always blocking them in cell five, and placing the exercises in cell one."

Plausible explanations for varying quality of transcriptions. Another broad theme emerged concerning explanations for varying quality of transcriptions submitted in the second phase. The teachers reported that the quality of the materials that they produced varied and cited three potential barriers to producing quality braille instructional materials: lack of adequate time, inadequate or no proofreading of transcription, and lack of necessary knowledge and expertise. The teachers also felt that

a relatively new decrease of expectations in training and consideration of the individual needs and preferences of the student could also affect the transcription of documents.

Lack of adequate time. Judging by the number, content, and length of comments made by these five participants, adequate time appeared to be the most critical factor in the quality of transcribed materials. Without adequate time, they felt that they themselves sometimes produced materials that were not accurate or properly formatted. When the teachers were asked how the transcriptions matched the quality of what is produced by the places where they worked, they were initially silent. Then, Rhonda stated, “I think we’re doing the best we can with the time we have.” Terry concurred and continued, “We don’t always have help. You do it with the time you have, or it doesn’t get done. I don’t think any of us would intentionally mess up, but with the time that we’re allotted, it probably happens.” Susan agreed, “I definitely agree that it [quality of transcribing] is time-driven. I’m lucky that like your student, mine is smart enough and bright enough that if it’s not quite right, she can figure it out, not that she won’t tell me about it.”

Three of the teachers participating in the focus group believed that the time the participants from the second phase spent on the transcription in the second phase most likely impacted the quality of the transcription. These same participants noted an important connection between time spent preparing the document, proofreading, and overall quality of the document. Rosa summed the thoughts of three when she said, “I think that maybe they’re in a hurry. I guess they just threw it on the scanner, and just let it go.” Terry agreed, “That’s what I was going to say. They probably didn’t do much

proofreading or correction either." Another possible explanation was that expectations in training may have changed in recent years. Judy described this possibility,

> I'm not saying anything bad about the university program, but they no longer teach braille with the expectation of three or less errors. No more than three errors or you cannot go to the next test. Let me tell you, you learn it; we had to."

Rosa confirmed this, "The results of allowing so many errors [in training] are what we are seeing. Our students end up with braille that's not legible."

Insufficient notice. The participants expressed frustration with general education classroom teachers that do not allow sufficient time for materials to be adapted. As Terry said,

> I walk in at the first of the year, and I say that I need at least a week before you plan to use the paper in class. That's a joke. They give it to you on Friday afternoon and say I need it by Monday.

Susan had experienced similar difficulties. She reported that she brailled approximately ten hours a week at night after her kids go to bed. She explained,

> We aren't always getting enough time. They recently brought a test to me, and I'm thinking you have got to be kidding. And if I say that I'm sorry but I can't get around to this, the student goes without.
>
> I'm sure that you're all in the same boat. I don't want the child to be the one to pay the consequences, so I'm going to bend over backwards to make sure I do it, but that enables the teacher. They see that I can get it done, so they don't worry about the lack of notice.

Inadequate knowledge and skills. The knowledge and skill level of the persons who are preparing materials for students were seen as affecting the consistency and accuracy of materials produced. Staff members may have had differing levels of expertise in the use of technology and proofreading as well as varying knowledge of the literary braille code, the Nemeth braille code, and standard formatting. According to the five teachers, inadequate technology skills in the areas of using an embosser and translation software computer programs such as Duxbury may have proved especially detrimental in preparing quality materials. Typical comments about transcriptions with errors included: “They must not have realized that the margins of the embosser were off!” and “Why aren’t they using those programs? The program reads it for you at the bottom of the screen; it tells you what you’re reading on the line. So either they’re not being careful, or maybe they just don’t know [how to use] the programs.”

For the students served by the teachers in the focus group, multiple persons, not just one person, were often preparing their materials. Although Terry prepared materials on a weekly basis for her student, she worked with a paraprofessional who also assisted with transcribing. Terry explained that the paraprofessional “has taken it on herself to learn Duxbury and the Tiger embosser. She can get at least the spur of the moment assignments done with the exception of math.” Rhonda also had assistance in preparing materials for her students. She elaborated:

> We have a braillist who helps, but her mother has been very ill. We have a dually certified teacher that works with me, and she brailles with MegaDots, and I do all

> the braille graphics and sometimes braille for the first grader. We just have too many kids to serve, and we braille when we can.

Student needs and preferences. According to the focus group members, the student's needs and individual preferences must be considered when transcribing materials. At the state level, it may be difficult, if not impossible, to consider the individual needs of students as well as the need for accurate, consistently formatted materials. Rhonda explained one of the advantages of working with a braille reader for almost a decade, "After awhile, I know what my braille student likes, and I know what which graphics she can do orally, and which ones she needs in braille, so it definitely helps." At another point in the focus group session, she concluded, "I don't format necessarily like it's supposed to be. I format it the way my student can read it." Terry agreed, and Rosa added:

> I think we try to keep in mind the individual needs of our students. We might be working with a student with a visual impairment that also has a learning disability. They may need materials that are double-spaced or for us to use fewer contractions, and we can do that.

In summary, the qualitative findings from the focus group session reinforced the quantitative findings from the first two phases. The teachers agreed that the quality of the transcriptions greatly varied and that errors in transcribing might affect the readability of text, particularly for beginning and struggling braille readers. They also shared experiences which illustrated how lack of time, insufficient notice, and lack of knowledge about technology, braille contractions, formatting, and proofreading could

lead to errors in transcribing. Even more importantly, their elaborations revealed how errors affect the overall academic performance of students.

CHAPTER V

CONCLUSION

The purpose of this study was to investigate the quality of braille transcription in public schools in Texas. The study consisted of three separate procedures. In the first phase, an electronic survey was utilized in order to gather information about the demographic characteristics and training of braille transcribers across Texas. This first phase also described how print materials were transcribed into braille at the school level. In the second phase, 40 transcriptions were examined to directly assess the actual quality of braille produced by school district personnel. In the third phase, members of a focus group assessed a representative subset of the brailled transcriptions produced in phase two for readability and legibility.

School Personnel That Transcribe Materials

There is a significant body of research which indicates that a variety of school personnel are responsible for preparing instructional materials into braille (Allman & Lewis, 1996; Lewis & Barclay, 2000; TEA, 2000; Corn & Wall, 2002; Wall & Corn, 2002; Rosenblum & Amato, 2004). School personnel have been reported to include teachers of the visually impaired, paraprofessionals, aides, and dually certified teachers of the visually impaired and orientation and mobility specialists. Results from this study similarly found a wide variety of personnel with one noteworthy exception: the job title of braillist. Like transcribers, braillists present information from a print source into a braille version. It is a commonly used term in the field in Texas, and almost 25% of participants in this study reported that they were braillists. However, this terminology

may be unique to Texas; in other states; terms such as transcriber, paraprofessional, or teaching assistance may be used to describe personnel in comparable positions.

Background of Personnel Transcribing

The level of education of personnel responsible for transcribing materials was somewhat higher than expected, with more than one-half of the sample in the first phase holding either bachelor's or master's degrees. Transcribers and braillists in this sample also reported that they spent more time each week transcribing materials than did teachers of the visually impaired. Thus, the amount of time spent transcribing reported appeared to be linked to the type of position the person held.

Time spent by teachers of the visually impaired. More than forty percent of the respondents in this study were teachers of the visually impaired. As in two recent studies from other states (Leigh & Barclay, 2000; Correa-Torres & Howell, 2004), this finding illustrated that teachers of the visually impaired are often personally responsible for transcribing the instructional materials needed by their students. As teachers of students with visual impairments are often have this responsibility, it is imperative that their pre-service training includes instruction in the elements of proper formatting as well as the literary and Nemeth code, and that their transcribing skills remain proficient across throughout their teaching career. Currently, some pre-service training programs combine both the literary braille and the Nemeth code into a single university course (Amato, 2002; Rosenblum & Amato, 2004), which may not allow adequate time to teach formatting nor the Nemeth code for advanced math and science materials.

The mean of 6.85 hours spent per week transcribing by the Texas teachers participating in this study is more than triple the mean of 2 hours per week reported in the Leigh & Barclay (2000) study and 1.5 times more than the 4 hours per week reported by teachers of the visually impaired in Colorado in the Correa-Torres & Howell (2004) study. It should be explored why time spent brailling by participating teachers of the visually impaired in Texas seems to be significantly greater than that found in other studies. It is a distinct possibility that there is a shortage of braillists and skilled transcribers throughout the state. As Corn & Wall (2002) suggest, state regulations should be adopted that require school districts to hire a sufficient number of transcribers in order to provide braille readers with equivalent instructional materials that their peers receive in print. Two recently developed programs in the state of Texas should facilitate adequate training opportunities for newly recruited and hired personnel. A braille transcriber training program has been developed at a community college in San Antonio; an online option should be operational within the next few months. In addition, the National Braille Association now offers an online course for new transcribers.

Certification status. Data concerning certification status in this study was similar to that found in the national Corn & Wall (2002) study. The national study included information on transcribers at local education agencies, not-for-profit agencies, and state instructional materials center, and found that approximately one-third of full-time employees that transcribe materials were certified by the National Library of Congress. The vast majority of school employees participating in this study were not currently certified in the literary braille or the Nemeth code by the National Library of Congress.

Only 10.9% (n=10) of respondents reported that they were certified in literary braille. If this study had included personnel for not-for-profit agencies and entities that received textbook contracts from TEA, it is predicted that the percentage of personnel certified would have compared favorably with the national study.

When compared to the unpublished TEA report on training and availability of braille transcribers in Texas (2000), the number of certified transcribers participating in this study represents a higher number of certified transcribers employed by school districts in Texas. The 2000 statewide study found that only 7 certified transcribers were employed by school districts across the state, in comparison to the present study that found 10 certified transcribers. While the 2000 study did not report if the transcribers were also certified in the Nemeth code by the National Library of Congress, none of the respondents in this study reported that they were certified in the Nemeth code.

Training. As was the case in the landmark Corn & Wall (2002) study, the training experiences of the respondents in this study varied greatly. The most commonly reported types of training were workshops focusing on braille transcribing, on-the-job training, and a single braille course designed for teachers during their teacher training. According to the data provided by the respondents, there appeared to be no universal standard or consistent format used in training school personnel in Texas. This finding may be especially problematic as almost 80% of respondents also stated that they had begun their transcribing career less than adequately prepared. If minimal standards existed, competence in braille transcribing was defined, and training was standardized,

then personnel in the state might be more prepared, and in turn, be better equipped to provide students with accurate and properly formatted braille materials.

It appeared that most of the respondents had participated in continuing educational opportunities. Eighty-one of the 93 respondents reported that they had attended workshops or conference sessions on braille transcribing. These were offered by various organizations and agencies across the state including the regional education service centers, the Texas School for the Blind and Visually Impaired, National Braille Association, and the former Dallas Services for Visually Impaired Children. None of the respondents indicated that they had participated in online, university, or locally developed refresher braille courses; this may be an additional option to explore. As was the case with teachers participating in training by the Florida Department of Education (Allman & Holbrook, 1999), refresher braille courses could be another practical option when teachers and transcribers need to update, reinforce, or expand their skills.

Several respondents noted the difficulty of obtaining training in the more advanced aspects of brailled transcribing, especially the Nemeth code for math and science materials. This perceived lack or inadequate training echoed the findings of a recent Rosenblum and Amato (2004) study. As one experienced respondent commented, "I feel I produce excellent braille most of the time, however I do get concerned when transcribing chemistry – since there is no actual training available in this area…" Comments such as this and those of Rosenblum and Amato (2004) concerning preparedness following initial training demonstrate the critical need to develop a statewide organizational structure to explore and provide additional, ongoing

opportunities for training in the Nemeth code. Further research should also directly examine the quality of Nemeth materials produced by public schools.

How Materials Are Prepared

Types of materials transcribed. Rosenblum and Amato (2004) examined the types of materials that teachers were asked to prepare in the Nemeth code. Teachers participating in their study reported that they prepared materials requiring the use of basic operations, word problems, tactile graphics, and fractions (Rosenblum & Amato, 2004). TEA (2000) also examined the types of materials that public school personnel across the state of Texas prepared. To determine if there had been changes, respondents in the first phase were asked what types of materials they transcribed. It appears that personnel in Texas continue to transcribe a wide variety of materials that range from teacher-produced worksheets, classroom tests, state-adopted ancillaries, non-state-adopted textbooks, to novels assigned by the general education teacher. Not surprisingly, the transcription of classroom tests and teacher-produced hand-outs were the two most frequently named materials in this study, as was the case in the 2000 TEA report.

Resources and specialized technology used. In their study on the production of textbooks and instructional materials, Wall and Corn (2002) reported that computers are used in braille transcription for students with visual impairment across the United States. Similarly, the majority of respondents in all three phases of this study reported that they use computers and translation software programs at least part of the time when transcribing materials. Duxbury Braille Translation Software was the most commonly utilized software. Even a larger number of respondents in the first phase reported that

they still use the Perkins braillewriter when preparing at least some materials. In the second phase, eighty percent used a software program such as MegaDots, Duxbury, or Braille 2000 to prepare their transcription while twenty percent elected to use a direct entry program or a Perkins braillewriter. The five transcriptions prepared by a Perkins braillewriter or direct entry program contained an assortment of errors, with number of errors ranging from 18 to 38 with an average of 29. This finding suggests a need to further investigate the quality of materials prepared with direct entry methods to determine if other options or technological solutions should be explored or emphasized during training.

Accuracy of Transcription

The actual, rather than perceived, quality of brailled materials has received very limited attention in the research literature. Previous research has focused on state leaders' perceptions of the quality of braille produced by various personnel across their state. In order to compare data concerning perception, participants in the first and second phase were invited to rate quality of their transcribing. Afterwards, the researcher and focus group members directly examined the transcriptions of a teacher-produced worksheet to assess the actual quality of braille produced by school personnel in Texas.

Perceived quality of braille transcription. While there is not a universally accepted definition of quality in braille transcribing; most researchers would agree that "quality" in transcribing includes both accuracy and formatting. In the first phase, more than 90% of respondents rated the quality of the braille materials that they produced as being "excellent" or "good". Although this is somewhat higher than the 80% that was

reported in the 2002 study of state officials by Corn and Wall, it is almost identical to what was reported previously by personnel in the unpublished 2000 TEA report.

Perception was not indicative of quality. Slightly more than 90% (n=37) of the personnel submitting brailled transcriptions in the second phase rated their materials as "excellent" or "good" while less than 10% (n=3) of the participants rated their materials as "fair". Perception often did not reflect the actual quality of the transcription. Actual quality of transcriptions rated as "excellent" or "good" varied greatly with a range of 0 errors to 38 errors. Feedback about the quality of their transcriptions from braille readers and others that are knowledgeable concerning braille may lead to more accurate self-reports from personnel. The only self-assessment that appeared to be accurate was the perception of the three participants that rated their transcriptions as "fair". Accuracy scores for these transcriptions were in the bottom quartile and contained an average of 25 errors. Based on this finding, developing a self-evaluation tool may not prove helpful in determining which transcribers are in need of additional training.

Actual quality of transcriptions. Direct examination of the transcriptions led to the discovery that their actual quality greatly varied. More than 10% (n=5) of the transcriptions contained no errors at all, and 20% (n=8) of the transcriptions contained four or less errors. The issue of concern is that the majority of transcriptions (n=27) contained a variety of contraction errors, misspelled words, misformed characters, omission of letters or words, insertion of additional letters of words, detectable erasures, and formatting errors. The findings of the focus group reinforced that this was an unacceptable level of error. Comments about overall quality ranged from, "I just wasn't

impressed." to "Quite a variety." Terry summed the reaction of the group concerning the overall quality of the transcriptions with, "There's a h-u-g-e range."

Some of the transcriptions contained serious errors that would prevent legibility for braille readers. For example, one transcription included repeated contraction errors, misformed characters, and spacing irregularities. During the focus group session, a teacher had such difficulty reading another transcription due to missing letters and words that she requested a print copy of the worksheet so that she could understand the document. If a teacher experienced difficulty reading a transcription due to the errors, students will similarly have difficulty. Even if students use context clues to slowly ascertain what should have been transcribed, they may have difficulty comprehending what they are reading. A review of the literature did not reveal a universally accepted standard in braille transcribing or even a predetermined number of errors per braille page deemed to affect legibility or readability for students, but it does seem reasonable that transcriptions containing 10 to 20 errors per page would affect ease and pace of reading for students.

Perhaps most importantly, the data gained from this study supported the hypothesis that braille readers receive instructional materials that are not equitable in quality to those received by other students. In contrast, print materials given to sighted classmates rarely, if ever, contain a significant amount of errors. One can imagine the response of sighted students, teachers, parents, and administrators if sighted students received materials with misspelled words, misformed characters, detectable erasures, or omission of words at the end of lines. In part, these errors could be due to the limited

time that personnel have to transcribe materials for their students. Braille materials such as these are sometimes called “braille on the fly”, “braille on the run”, or “quick-and-dirty” braille within the field (Venneri, 2003).

Patterns of Errors

Proofreading. Although more than 90% of participants reported that they proofread their transcription, some of the errors, such as misformed characters and the omission of letters and words at the end of the line, could have been avoided or prevented with adequate time and knowledge of the braille contractions and proofreading techniques. Two factors could partially explain these errors. Only 37% (n=15) of the participants reported that they had received training in proofreading, and slightly more than two-thirds reported that they knew all of the contractions. In order to address this complex issue, it may be helpful to include how to proofread materials within pre-service and in-service training options and set minimal standards of skills for personnel responsible for adapting materials into braille. Additionally, both pre-service and in-service training should encourage personnel to carefully proofread the material themselves or have someone else knowledgeable about the braille code and proper formatting proofread the material.

Use of braille contractions. Teachers participating in the focus group agreed that the consistent and accurate use of contractions is a critical component of quality in brailled materials. Their examination of transcriptions indicated that most materials did not contain braille contraction errors. However, some of the transcriptions contained contraction errors; alphabet signs, lower part-word signs, and lower whole-word signs

seemed problematic. The results in this area underscore the findings of Allman and Holbrook (1999). Lower part-word signs and lower whole-word signs are areas that should receive special consideration in training. However, it should also be noted that the six transcriptions containing contraction errors also had a myriad of additional errors. Thus, making contraction errors may be indicative of an overall lack of knowledge of the braille code.

Accurate and consistent formatting. Another component of quality identified by the focus group was consistent and accurate formatting. Upon examination, it was discovered that more than one-half of the transcriptions contained formatting errors. There were patterns of formatting errors; repeated areas of concern included the format of titles, exercises, and directions. One possible explanation for these errors may be that the participants do not have adequate examples of properly formatted materials or necessary resources such as *Braille Formats: Principals of Print to Braille Transcription* (Braille Authority of North America, 1997). Another possible explanation for these errors is that transcribers may be unaware that some principles of braille formatting parallels that of print materials, while others do not.

This finding implies that school personnel may be transcribing materials for students that contain formatting and/or spacing errors on a regular basis. This data also supports the need to provide ongoing training for school personnel; as with more systematic and advanced training, school personnel will be better prepared to properly format their materials. Since quality in braille includes more than just knowing the

braille code, pre-service personnel are also urged to evaluate the preparedness of their students to properly format various instructional materials.

Predictors of Quality in Transcribing

Another result of the study revealed that neither years of experience nor certification status seem to have a decisive effect on quality. There are several potential explanations for this finding. Regardless of how long participants have been in their current position or certification status, they may only intermittently transcribe materials for students. Thus, these braille skills are not maintained by routine practice. Other possible factors for poor transcribing include the lack of quality of initial training and limited in-service training.

The researcher was initially surprised by the lack of relationship between the quality of transcribing and certification status. However, further analysis of the data in this study indicated that the salient characteristics in predicting the quality of braille produced by the participants was time spent each week transcribing materials, which, in turn, was associated with the job role of the participant.

The characteristics of time spent transcribing and job role of participant appear to be linked. If school staff members are primarily assigned to provide instruction to students, then they are likely to have far less time to assist in material preparation for students. They may not have the opportunity for ongoing practice or adequate time to utilize resources or proofread. The opposite is also true. If school staff members are primarily assigned to preparing materials, then they are likely to have more time to transcribe materials for students. They will have continuing opportunities to update and

maintain their braille skills and adequate time to utilize resources and proofread. As suggested in Allman & Holbrook (1999), ongoing practice could also decrease the time needed to transcribe materials. Thus, the critical feature in predicting the quality of these brailled materials was not certification type, but the amount of time they were currently spending transcribing.

Another implication of this finding, also suggested by Allman and Holbrook (1999), is that continued practice was associated with a lower number of errors. Frequent transcribing led to fewer errors and improved quality. Further research should be conducted in order to determine the exact nature of the relationship between continued practice, continued training, and quality of braille transcribing.

Summary of Recommendations

The following recommendations have been made throughout the discussion chapter:

1) There is a critical need to develop a formal definition of quality in braille transcribing and entry-level competence for personnel that transcribe instructional materials. Presently, both quality and competence in braille transcribing is defined by each school district.

2) Training for all personnel transcribing braille should be standardized in order to ensure adequate and consistent instruction throughout the country.

3) Alternative certifying configurations should be investigated.

4) The findings of this study indicate that future research should focus on the actual quality of other materials produced by public schools, including math, science, tactile graphics, and music.

5) The findings also indicate that future research is needed to determine the extent to which braille readers receive instructional materials that are comparable in quality to those received by their sighted peers.

6) It should be explored why time spent brailling by participating teachers of the visually impaired in Texas seems to be significantly greater than that found in other recent studies.

7) Further research should also investigate the quality of materials prepared with direct entry methods versus braille translation software to determine if braille translation software should be emphasized during training.

8) Future research should be also conducted in order to determine the precise nature of the relationship between continued practice, continued training, and quality of braille transcribing.

Conclusion

Very importantly, the results of this investigation clearly suggest that students in Texas receive brailled materials that vary greatly in terms of quality. Some of the brailled materials examined in this study contained errors that would greatly affect the legibility and readability for young or beginning students, as well as the pace and ease of reading for older, more experienced braille readers. Furthermore, information provided

by teachers in the focus group suggested that errors in transcribing may negatively affect the academic performance of braille readers.

The findings of this study support previous anecdotal reports that suggested that students with visual impairments receive materials that are not equal in quality to that received by their peers. As print materials given to sighted students rarely, if ever, contain a significant amount of errors, braille students deserve equitable, error-free materials. As suggested previously in the literature (DeMario, 2000; Corn & Wall, 2002; Wall & Corn, 2002; Rosenblum & Amato, 2004) and by the findings of this study, there is a critical need to standardize training, investigate alternative certifying configurations, and determine the extent to which braille readers receive instructional materials that are comparable in quality to those received by their sighted peers.

This investigation of braille instructional materials provides a direction for further research. Studies are needed to directly explore the quality of other brailled instructional materials, including math, science, tactile graphics, and music produced by school personnel. These studies would prove useful in providing direction to training programs on how to prepare personnel to prepare high quality brailled materials. It is hoped that this study will also serve as an impetus for developing a formal definition of quality in braille transcribing and provide an illustration of how errors in braille might affect legibility, academic performance, and access to the general education curriculum for students with visual impairments.

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APPENDICES

Appendix A-1

The Quality of Brailled Instructional Materials Produced in Texas Public Schools – Phase I

The purpose of this study is to gather information about the quality of instructional materials transcribed into braille in Texas public schools. If you do not currently transcribe materials into braille, please forward this survey and e-mail to another person in your district who transcribes materials into braille.

DIRECTIONS
Please complete the survey. It should take 5 to 10 minutes to complete.

INFORMATION ABOUT YOU

Gender
- ❑ Male
- ❑ Female

Job title
- ❑ Transcriber
- ❑ Teacher of the Visually Impaired
- ❑ Braillist
- ❑ Orientation and Mobility Specialist
- ❑ Aide
- ❑ Paraprofessional
- ❑ Other (please specify) _____

Level of education
- ❑ High school diploma or GED
- ❑ Some college
- ❑ Associate's degree
- ❑ Bachelor's degree
- ❑ Master's degree
- ❑ Doctorate's degree

How many years have you been transcribing materials into braille? _____

Are you certified by the Library of Congress as a braille transcriber?
- ❑ Yes
- ❑ No

If you are a certified transcriber, which certifications do you currently hold? List all that apply.
- ❑ Literary braille
- ❑ Nemeth Code
- ❑ Braille music
- ❑ Proofreading
- ❑ Other (please specify) _____

Given a typical forty hour work week, how many hours do you spend preparing instructional materials into braille? _____

Are you able to read uncontracted (alphabetic) braille?

- ❑ All
- ❑ Most
- ❑ Some
- ❑ None

Are you able to read contracted braille?

- ❑ All
- ❑ Most
- ❑ Some
- ❑ None

Where do you transcribe materials?

- ❑ School that currently educates one or more braille readers
- ❑ School that does not currently educate one or more braille readers
- ❑ Special education/cooperative office
- ❑ Resource center
- ❑ Home
- ❑ Other (please specify) _____

How much direct contact do you have with the student(s) who use the materials that you transcribe?

- ❑ Daily contact
- ❑ At least once a week
- ❑ At least once a month
- ❑ Less than once a month
- ❑ No direct contact

INFORMATION ABOUT YOUR TRAINING

Please check any of the following that applies to you.

- ❑ Completed a braille class/course designed for teachers through a university or college
- ❑ Completed two or more braille classes/courses designed for teachers through a university or college
- ❑ Completed a braille class/course designed for transcribers through a university or college
- ❑ Completed two or more braille classes/courses designed for transcribers through a university or college
- ❑ Completed a correspondence course in braille transcribing
- ❑ Attended workshops focusing on braille transcribing
- ❑ Attended conference sessions focusing on braille transcribing
- ❑ Received on the job training in braille transcribing

What areas did you receive training?

- ❑ Literary braille

- ❑ Nemeth Code
- ❑ Braille music
- ❑ Proofreading
- ❑ Formatting
- ❑ Computer braille
- ❑ Other (please specify) _____

How well did your training prepare you for what you needed to know to transcribe braille?

- ❑ It provided me with all the information that I needed to do my job.
- ❑ There were *many* gaps in my training that I had to fill in once I began my job.
- ❑ There were *some* gaps in my training that I had to fill in once I began my job.
- ❑ I learned most of what I needed to know while on the job.
- ❑ I did not receive any training.

INFORMATION ABOUT WHAT KIND OF MATERIALS YOU TRANSCRIBE

During the last year, how frequently did you transcribe these print materials into braille?

a.	State-adopted textbooks	often	sometimes	never
b.	State-adopted ancillaries	often	sometimes	never
c.	Non-state-adopted textbooks	often	sometimes	never
d.	Non-state-adopted ancillaries	often	sometimes	never
e.	Standardized tests	often	sometimes	never
f.	Classroom tests	often	sometimes	never
g.	Teacher-produced worksheets and hand-outs	often	sometimes	never
h.	Novels that class has been assigned to read	often	sometimes	never
i.	Library books	often	sometimes	never
j.	Other (please specify) _____			

During the last year, how frequently did you prepare materials for students in each of these subject areas?

a.	Language arts	often	sometimes	never
b.	Mathematics	often	sometimes	never
c.	Social studies	often	sometimes	never
d.	Geography	often	sometimes	never
e.	Science	often	sometimes	never
f.	Music	often	sometimes	never
g.	Computer	often	sometimes	never
h.	Health	often	sometimes	never
i.	Electives	often	sometimes	never

INFORMATION ABOUT HOW YOU TRANSCRIBE MATERIALS

How many minutes does it typically take you to transcribe one print page (one that does not require Nemeth, charts, graphs, or transcriber notes) into braille? ____

During the last year, how frequently did you prepare materials using these items?

- ❑ Perkins braillewriter often sometimes never
- ❑ Duxbury Braille Translation Software (DBT) often sometimes never
- ❑ MegaDots often sometimes never
- ❑ Direct entry program such as Pokadot or Perky Duck often sometimes never
- ❑ Braille 2000 often sometimes never

What kind of resources do you use when you transcribe materials into braille? Check all that apply.

- ❑ National Library Service correspondence course materials
- ❑ Braille Formats: Principals of print to braille transcription
- ❑ *Braille Enthusiast's Dictionary* (book by Koenig & Holbrook)
- ❑ *Programmed Instruction in Braille* (book by Ashcroft, Koenig, & Sanford)
- ❑ *Braille Codes and Calculations* (book by Pesavento)
- ❑ *Braille Tutor* (Kapperman, et al., disk available from AER)
- ❑ Hadley School for the Blind Professional Development Courses
- ❑ Other (please specify) _____

When you prepare materials for a student how frequently do you consult resources or the student's textbooks as a model?

- ❑ almost always
- ❑ often
- ❑ sometimes
- ❑ on rare occasions
- ❑ never

How often do you proofread your materials?

- ❑ almost always
- ❑ often
- ❑ sometimes
- ❑ on rare occasions
- ❑ never

How often does someone else proofread your materials?

- ❑ almost always
- ❑ often
- ❑ sometimes
- ❑ on rare occasions
- ❑ never

INFORMATION ABOUT QUALITY OF TRANSCRIBED MATERIALS

Please rate the quality of brailled instructional materials that you produce.

- ❑ Excellent
- ❑ Good
- ❑ Fair
- ❑ Poor

How often do you receive feedback from a teacher or another staff member concerning the quality of the materials that you produce?

- ❑ almost always
- ❑ often
- ❑ sometimes
- ❑ on rare occasions
- ❑ never

How often do you receive feedback from a braille reader concerning the quality of the materials that you produce for them?

- ❑ almost always
- ❑ often
- ❑ sometimes
- ❑ on rare occasions
- ❑ never

Thank you for your time in completing this survey. Your input is appreciated!

If you would like to participate in the second phase of this study, please send your name, address, phone number, job title and certification status to Tina Herzberg. You may reach her at mtherzberg@prodigy.net or (254)744-0674.

Appendix A-2

Name _____
Date _____
_____

Time Order Words

Directions – Read carefully, and then answer the question *in complete sentences.*

John was going on vacation. He had lots to do. The very first thing he did was make a list of what he wanted to take on vacation. After that, he got the suitcases down from the attic. Next he folded all of the clothes neatly. Before he packed them, he got out his book to take on the plane. Finally he loaded the bags in the car.

1. What was the first thing John did?
2. After he got the suitcases down, what did he do?
3. What did he do after he folded the clothes?
4. What did he do before he loaded the bags?

Tony wanted to make chocolate chip cookies. Before she got out the ingredients, she washed her hands. Then she turned the oven on to 375°. Next she got out a large mixing bowl. After that, she mixed all of the liquid ingredients. She then added the dry ingredients slowly. After she put them in the oven, she cleaned up the mess. Later they would eat the cookies, but first they had to cool off.

1. What was the first thing that Tony did?
2. What did Tony do right before she turned on the oven?
3. What did Tony do before she put the cookies in the oven?
4. When did Tony clean up?
5. What was the last thing they did?

Appendix A-3

Name _____
Date _____
_____

Tales of a Fourth Grade Nothing
Ch. 5 & 6

Directions – Answer the following questions in complete sentences. *You may use your book.*

1. Fudge had 3 children coming to his birthday party. As they came, there seemed something was wrong with all three. List each child and what was wrong with each.
2. Why was Mrs. Rudder complaining?
3. Peter thought Ralph weighed a ton. What part of SMAPHO is that?
4. Why did Peter and his mother laugh when his father asked how the party went?
5. What did you think was the funniest thing that happened at the party?
6. Peter wasn't looking forward to going shopping with Fudge and his mom. Why?
7. Why did Peter have to go back to the dentist?
8. After they found the right shoes, Mr. Berman asked wear or wrap. What did he mean?
9. Put the following statements in order of what Peter did when he cleaned Dribble's bowl.

    He puts Dribble in his bowl and feeds him.
    Peter puts Dribble in the tub and lets him crawl around in it.
    Peter washes the bowl.
    Peter puts the rocks back in the bowl and fills it with water.
10. Why did Peter not want to spend another day with Farley Drexel Hatcher again?

Appendix A-4

Questions for the Focus Group Session

1. After viewing the transcriptions, what is your initial impression?

2. Are you surprised? In what ways?

3. Did you find errors that could possibly change meaning or affect readability for students? Can you tell me about one that sticks out in your mind?

4. What did you notice about the formatting? Did you notice similarities across transcriptions? Differences? Could this affect the ease of reading for students?

5. Based on the transcriptions that you reviewed, are there implications for instruction? Are there implications for our field?

6. What would you have done differently if you had transcribed the passage?

7. How does your employer monitor the quality of braille that is produced locally?

8. How do these transcriptions match the quality of what is produced by the school district or agency you are employed by?

VITA

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