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**The Effect of the Handwriting Without Tears Program
On Student Cursive Writing Achievement
At Central Institute for the Deaf (CID)**

by

Julie A. Galanis

**An Independent Study
Submitted in partial fulfillment of the requirements for the
degree of:**

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**Approved by:
Barbara A. Lanfer, M.A.Ed., Independent Study Advisor**

Abstract: Handwriting Without Tears (HWT) is a multi-sensory program that provides a simpler approach to the instruction of cursive handwriting. It was administered to a sample of third graders to assess the effectiveness of the program and determine if it would be a viable option for handwriting instruction at CID.

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I would like to thank my advisor, Ms. Barb Lanfer, for her assistance and patience with this project. I would also like to thank Ms. Ann Holmes and Ms. Julia West for their participation and advice.

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TABLE OF CONTENTS

Acknowledgements	ii
Introduction	2
Purpose	3
Rationale	3
Methods	4
Literature Review	7
Results	13
Discussion	13
Conclusion	15
References	16
Appendix A - Teacher Questionnaires	19
Appendix B - Complete Minnesota Dexterity Test (CMDT)	24
Appendix C - Evaluation Tool of Children's Handwriting-Cursive (ETCH-C)	26
Appendix D - Example of HWT Cursive Writing Style Versus Typical	28
Appendix E - Missouri School Districts using HWT Curriculum	30
Appendix F - Missouri Handwriting Standards	32

Introduction

One of the most important and complex childhood occupations is learning to transmit thoughts and information through written language (Amundson, 1992). Even with recent technological advances that have reduced the need for handwritten communication, handwriting continues to be important throughout a student's elementary school education (Amundson, 1992; Lindsay & McLenna, 1983). Without legible handwriting, children are denied a mode of communication that is still heavily relied on within our society. At school, children are required to write for a variety of academic purposes, including in-class assignments and tests. At home, children may be required to take phone messages, complete homework assignments, or write letters to family members (Woodward & Swinth, 2002). Functional written communication is founded on two cornerstones – legibility and speed. Children's handwriting must not only be readable, but it must be performed in a timely fashion in order for children to perform written school assignments adequately at their grade levels (Amundson & Weil, 1995).

The children who attend Central Institute for the Deaf in St. Louis, MO, are no exception to these demands. In addition, their ideal and ultimate goal is to enter the mainstream, where the demands on work production and timeliness are much higher. Competency in handwriting is critical in order for them to be competitive, successful, and experience an easier transition between CID and an inclusive, mainstream setting. With that thought in mind, the current investigation was undertaken to ascertain whether a multi-sensory approach to handwriting could benefit these children. In general, children who are deaf and hard of hearing rely more on vision than do their normal hearing peers. The children involved in this study have learning disabilities in addition to their profound hearing losses. They both are also seen by the school's occupational therapist to address fine motor, visual motor, visual perception, and attention issues

that affect their classroom performance. Therefore, a more visually pleasing and multi-sensory based handwriting program may prove to be beneficial and allow these children to direct more of their time and energy towards other content areas, rather than on improving handwriting skill and speed.

Purpose

The purpose of this study was to determine the effect, if any, that a multi-sensory handwriting program would have on the cursive success of a sample of third grade students, who are deaf or hard of hearing, at CID. If the results proved that this program was effective, it could then be considered as a viable option for the school's handwriting curriculum.

Rationale

Due to the multi-sensory issues present in two of her students, this study was implemented in Ms. Holmes' third grade classroom. Both students utilize bi-modal amplification (one hearing aid and one cochlear implant). The control group of children is not seen by occupational therapy and does not suffer from additional learning disabilities beyond their hearing impairment. The two children in this group are also diagnosed with profound hearing losses. One is amplified bi-modally and the other uses bilateral hearing aids.

In a study of the relationship between visuomotor and handwriting skills, Weil and Amundson (1994) concluded that most children who are typically developing will be ready for standard handwriting instruction in the latter part of their kindergarten year. Although students who are typically developing are fairly competent at printed writing tasks by six or seven years of age, students with learning disabilities, developmental delays, or neurological impairments may struggle with a standard handwriting curriculum and the task of writing legibly (Bergman & McLaughlin, 1988).

Previous studies appear to provide support for the use of a multi-sensory approach for children with learning disabilities, but findings are preliminary (Woodward & Swinth, 2002). Although many occupational therapists recommend specific programs to teach handwriting – such as HWT (Olsen, 1994) or Loops and Other Groups (Benbow, 1999)- little evidence exists to clarify the advantage of one program over another (Scheerer, Reed, & Skiver, 2004; Sheffield, 1996). In remediation of writing, decisions as to whether to skill train (a behavioral approach) or process intervene (using sensory-perceptual-motor methods) can currently draw little on the research literature (Henderson & Pehosi, 1995). Scant evidence about the success of either method exists (Laszlo & Bairstow 1985; Oliver, 1990). Taking this into account, the current investigation was undertaken to critique the results of a student-tested program. In addition to the objective assessment results obtained, teacher perspective and feedback were also included, to provide greater data and detail for cursive curriculum recommendation.

Methods

With the assistance of my advisor, Ms. Barbara Lanfer, it was determined that the HWT program would be implemented with two children (one male and one female) in Ms. Ann Holmes' third grade class. Two female students in Ms. Julia West's third grade class would serve as a control group and would utilize the current handwriting program in place at CID.

A pre-program questionnaire was given to both teachers. These can be found in Appendix A. An informal HWT in-service was given to Ms. Holmes and the HWT materials were distributed to her. The materials included a classroom alphabet wall runner, individual desk alphabet strips, chalkboard and sponges, a Teacher's Guide, and individual HWT workbooks for each child.

The Complete Minnesota Dexterity Test (CMDT) was also given to each child to establish a pre-program baseline of fine and gross motor skill. This test is used to measure a subject's simple but rapid eye-hand coordination as well as arm-hand dexterity, during five different test batteries. Significant differences were not found among the subjects. The results for each child were recorded and can be found in Appendix B.

The Evaluation Tool of Children's Handwriting- Cursive (ETCH-C) was administered to each child after 5 weeks of cursive writing instruction. It was done at this time so the children would have had greater exposure to cursive writing, as each letter is tested on the ETCH-C. Its focus is to assess a student's legibility and speed of handwriting tasks similar to those required of students in the classroom. There are six subcategory tasks which include alphabet and numerical writing, near-point and far-point copying, dictation, and sentence generation. It also assesses legibility components, pencil grasp, hand preference, pencil pressure, manipulative skills with the writing tool, and classroom observations. Scoring of the ETCH-C targets legibility and speed of the individual tasks. The definition of legibility within the ETCH-C is being able to identify the child's letter, numeral, or word *out of its context and at first glance*. The primary focus is whether or not the handwritten word, letter, or numeral is readable in the examined script (manuscript or cursive). Legibility in terms of grade level is not considered; it is only approached in terms of readability. A scoring standard for legible letters and words has been established and an interrater reliability study is also available. Scoring of legibility is a subjective process and what might be readable to one examiner may not be to another. To rule out one's own subjective judgments of legibility, complicated and detailed scoring criteria must be followed when scoring the ETCH-C tasks. Results of the ETCH-C can be found in Appendix C.

The Handwriting Without Tears program was introduced to the children on Jan 7, 2008 in Ms. Holmes' Writing class. The children participated in the program for 12 weeks. At that time a post-program questionnaire was given, the ETCH-C was again administered and scored, and the data was reviewed.

Literature Review

Proficiency in handwriting is essential if students are to accomplish an acceptable amount of work in the classroom and meet the standards of the teacher and the curriculum. Elementary school children typically spend up to 50% of the school day engaged in paper-and-pencil tasks (McHale & Cermak, 1992). Many of these tasks, including most tests and examination papers, are performed under time constraints (Amundson & Weil, 1996). Unfortunately, although a traditional instructional approach is sufficient for many children to become competent handwriters by six or seven years of age, handwriting difficulties are common among children in both regular and special education classrooms (Bergman & McLaughlin, 1988).

Handwriting is a complex skill. Competent handwriting depends on the maturation and integration of cognitive, visual-perceptual, and fine motor skills (Maeland, et al. 1992).

Handwriting requires finely graded manipulation of pencils to produce letter forms, in a fluent and ballistical manner, with a specific orientation and size, in a specific serial order, and in specific positions on a writing surface (Van Galen, 1993). Further, according to Sovik and Arntzen (1991), fluent writing is produced by an integrated pattern of coordinated movements subject to visual monitoring and sensorimotor feedback.

Thirty percent to sixty percent of the child's time is spent in fine motor activities, with writing as the predominant task (McHale & Cermak, 1992). Children who find handwriting difficult cannot always finish assignments on time, may try to use as few words as possible, and most importantly, when focusing on the mechanical aspects of writing, cannot attend to cognitive content (Graham & Weintraub, 1996; Karlsdottir & Stefansson, 2002; Tseng & Cermak, 1993).

Inadequate handwriting can impair academic performance, an important occupation of childhood, adolescence and adulthood (Bergman & McLaughlin, 1988). When handwriting is

poor (i.e., illegible) a teacher may interpret the student's written responses as incorrect or as an indication of noncompliance (i.e. the student is not making an effort to be neat). Students who have difficulty with handwriting must concentrate on correctly forming letters and may attend less to the subject matter or to the instructor. The student may turn in shortened written responses because the motor effort is fatiguing. Academic failure can result from any of these problems associated with poor handwriting (Tseng & Cermak, 1993).

Proficient handwriting has also been considered a prerequisite for later academic achievement (Graham, Berninger, Abbott, Abbott, & Whitaker, 1997; Graham & Harris, 2000). With the children at CID later transitioning into a mainstream setting, this proficiency becomes even more critical.

Unfortunately, handwriting difficulties are commonly observed in children at primary schools, particularly in boys. Prevalence has been estimated to range between 5% and 27% depending on grade, selection criteria, and instruments used (Hamstra-Bletz & Blote, 1993; Karlsdottir & Stefansson, 2002; Maeland, 1992; Mojet, 1991; Smits-Engelsman & Van Galen, 1997). Failure to attain handwriting competency during the school-age years often has far-reaching negative effects on both academic success and self-esteem.

This complex occupational task has many underlying component skills that may interfere with handwriting performance. Fine motor control, bilateral and visual-motor integration, motor planning, in-hand manipulation, proprioception, visual perception, sustained attention, and sensory awareness of the fingers are some of the component skills identified. (Feder & Majnemer, 2007). These are some of the issues that the children in this study are working on with the school's occupational therapist.

Poor handwriting may be related to intrinsic factors, which refer to the child's actual handwriting capabilities, or extrinsic factors which are related to environmental or biomechanical components, or both. It is important that handwriting performance be evaluated using a valid, reliable, standardized tool combined with informal classroom observation and teacher consultation (Feder & Majnemer, 2007). This study utilized the Minnesota Rate of Manipulation Test and Evaluation Test of Children's Handwriting-Cursive, which both meet the aforementioned requirements of validity, reliability, and standardization.

Common handwriting problems such as incorrect letter formation, poor alignment, reversals, uneven size of letters, irregular spacing between letters and words, and slow motor speed (Alston & Taylor, 1987; Johnson & Carlisle, 1996) do not necessarily arise from identical underlying mechanisms. Some children struggle more with the visual perception component of handwriting. They may not be able to write within a line boundary and their letters seem to just float in space. Their words may crowd together illegibly on the page. Others have difficulty with the proprioceptive (information received through our muscles and joints) component of writing. This would manifest as either too hard or weak of a grip, or too light or intense pencil pressure.

The underlying mechanisms responsible for handwriting difficulties are not yet understood. Handwriting is a complex activity in which lower-level perceptual-motor processes and higher-level cognitive processes continuously interact (Berninger & Swanson, 1994; Graham & Weintraub, 1996; Van Galen, 1991). It is assumed that when a child knows what to write, he or she first has to retrieve the correct letters or words from memory, put them in the right order, and convert phonemes into graphemes (higher level processes), before the corresponding motor program can be selected and executed (lower level processes). Although higher-level processes

precede lower-level ones, it is further assumed that handwriting involves not only serial hierarchical processing, but also parallel processing; for example, during the evaluation and revision of what was written (Berninger & Swanson, 1994). Perceptual-motor processes in handwriting consist of perception of either visual (e.g., copying text) or auditory (e.g., dictation) information, fine motor coordination, and visual-motor integration (e.g., hand-eye coordination). Cognitive processes involved in handwriting can be divided in more generic processes, such as cognitive planning or working memory processes (McCutchen, 1995, 2000), and more specific language processes, such as phonological and orthographic coding (Berninger & Swanson, 1994).

In support of this range of requirements, visual-motor integration was found to be the best predictor of legibility for both American and Norwegian children (Sovik, 1975) and for a group of Chinese school-age children (Tseng & Murray, 1994). These authors also cited other empirical evidence which attribute problems in handwriting to a deficit in perceptual-motor function.

The role of a deficiency in cognitive function as another possible variable to explain poor quality or slow speed, or both, in children with handwriting problems has not yet been investigated. It is known that young novice writers require full use of their attention resources on the lower-level processes of handwriting, and that this may be detrimental for fluent higher-level encoding processes during writing (Graham et al., 1997; Graham & Harris, 2000; McCutchen, 1988, 1995). Levine (1981) found that inadequate attention span has also been clinically observed to impair handwriting proficiency.

Although theories and strategies to remediate handwriting problems have proliferated in recent years, empirically based evidence documenting handwriting intervention effectiveness is

minimal (Case-Smith, 2002). However, studies of handwriting remediation do suggest that intervention is effective. There is evidence to indicate that handwriting difficulties do not resolve without intervention and affect between 10% and 30% of school-aged children. Despite the widespread use of computers, legible handwriting remains an important life skill that deserves great attention (Feder & Majnemer, 2007).

Although traditional writing instruction involves sitting at a desk with paper and a no. 2 pencil, a multi-sensory approach to handwriting uses a plethora of modalities and activities (Amundson, 1992). One such multi-sensory approach is Handwriting Without Tears. I have used this program extensively in my work as an occupational therapist and have witnessed the success that children can attain.

HWT was developed by Jan Olsen, an occupational therapist, who has specialized in handwriting for more than 25 years. HWT is a simple, developmentally based curriculum for writing readiness, printing, and cursive. The multi-sensory lessons teach to all learning styles-visual, auditory, tactile, and kinesthetic. The unique materials and appealing workbooks eliminate problems with letter formation, reversals, legibility, sentence spacing, and cursive connections. Teachers and parents find the program to be very user-friendly and children find the program enjoyable, fun, and the results very satisfying. Ms. Olsen's goal is to make handwriting available to all children as an automatic and natural skill. She maintains what many studies have shown: children who write well perform better in school, enjoy their classes more, and feel proud of their work.

The program is based on the theory that, developmentally, vertical strokes are easier than diagonal strokes. The HWT vertical cursive style looks very similar to the printed style of writing that is so familiar to children. Children can easily identify cursive letters because they

don't look so different. They can actually read what they write, because they are not confused and distracted by the elaborate swirls and loops of other cursive methods.

Ms. Olsen maintains that vertical cursive is easier for children for many reasons. It is developmentally easier than the slanted line, both to perceive and copy. Vertical letters in cursive are easier for children to recognize. When learning other cursive techniques, children must learn new letter formations and letter connections. There is no reason to complicate the learning process with a superfluous slant. HWT vertical cursive does not look as intimidating and has a more manageable appearance to children.

The HWT workbook itself is very simple in visual design. It has basic black and white pages, which are furnished with generous room to write. It has a left hand friendly design, which avoids the typical frustrations that left hand users experience. Each page has double line guidelines, which help those children with visual perceptual difficulties. The methodology is similarly non-threatening. Student friendly, consistent terminology is used throughout and reinforced by the teacher. Practice time is short, in that only 15 minutes a day is recommended. This can be done in a group or individual format. There is a strong emphasis on basic connections between letters and there are frequent review and mastery pages to develop fluency. Huge, step-by-step illustrated directions are provided throughout the workbook. The letter demonstrations in the HWT workbooks are easy to follow and large enough to finger trace. Finger tracing helps students learn through their tactile (touch) and kinesthetic (movement) senses. Also emphasized is the Wet-Dry-Try method. This involves a small chalkboard, small sponges, and chalk. The teacher introduces the letter by writing it on the chalkboard for all of the children to see. Each child then uses a wet sponge to trace the letter and then dry it with a

paper towel. This helps to reinforce the shape of the letter, as well as provide tactile cues to aid with muscle memory and sequencing.

The overall premise of HWT is less is more. Teaching letters with flamboyant start-up and ending strokes complicates the letter and makes connecting the letters more difficult. The Cursive Handwriting workbook used in this study teaches a clean, vertical style that is easy to write and easy to read. Lowercase letters are introduced first, beginning with letters that are similar in print. The emphasis is on correct habits for forming and connecting letters. Please see Appendix D for a comparison of cursive writing styles.

Results

Comparison of pre- and post-test scores of the ETCH-C reveal that success was achieved by both groups, however, the results with Ms. Holmes' class show more statistically significant improvements in overall legibility. Handwriting speed remained roughly the same for both groups. Please see Appendix C for these results in greater detail.

Discussion

This investigation has provided a viable alternative for teaching handwriting at Central Institute for the Deaf, as the results show. The multi-sensory aspect of the program appeared to have quite a positive effect on the experimental group's scores. It should be noted that although there was a decrease in Student D's test results in the control group, I believe that this was due to rushing through the test itself, rather than any particular decrease in overall function or skill. It was interesting to note that each student's numeral legibility was consistently high in both groups.

Ms. Holmes reported that she found the program to be very user-friendly and that she was seeing improvement in the children's writing. Ms. West also reported a willingness to employ

the HWT program. The children themselves have mentioned that they enjoyed using their workbooks and think that they are improving in their cursive penmanship, although they still find it very difficult to write in cursive and prefer to use print.

After the results of the ETCH-C were shared with the childrens' occupational therapist, it was recommended that the writing focus for Student B return back to printing. Although the student did make progress, as reflected in the post-test score, cursive writing is clearly frustrating for this student. The occupational therapist attributes this to the student's decreased visual memory, as well as visual perceptual difficulties. It is felt that this student could benefit more greatly from either keyboard instruction or printing. Student A will be mainstreaming in the near future and, fortunately, the HWT program is utilized at this school as well. The occupational therapist attributes this student's success with the program to the systematic building upon previous skill and letter knowledge, as well as the specific, visual layout of the pages. This student does well with routine and this program tapped well into that organizational strength.

Further research in this area may benefit from a larger sample size encompassing a larger age range of students, particularly when the program can be instituted with younger children, before handwriting difficulties emerge. At these younger ages, the program even more greatly emphasizes the multi-sensory approach and children participate in songs, games, and gross motor handwriting exercises and activities.

Conclusion

Handwriting is a difficult skill to learn and success is sometimes difficult to achieve. Many children who are deaf or hard of hearing also present with other delays and difficulties in addition to their hearing impairment, which affect their handwriting success. The multi-sensory nature of the HWT program helps children learn and succeed with their handwriting skill.

Facility with handwriting will serve the children at CID well, not only as preparation for the mainstream, but in their future lives and with future ambitions. Since they already have to struggle with being a little different than their peers, ease of expressing themselves with the written word should be one less thing to be concerned about. Handwriting Without Tears has proven to live up to its name in this study.

References

- Alston, J. and Taylor, J. (1987). *Handwriting: Theory, research, and practice*. New York: Nichols. (EDS. 285 203).
- Amundson, D. (1992). Intervention for children with hearing impairment in general education settings. *Language, Speech, and Hearing Services in Schools*, 28, 355-382.
- Amundson, S. J. (1995). *Evaluation Tool of Children's Handwriting (ETCH) Examiner's Manual*. O.T. Kids, Homer, AK.
- Asher, A. (2006). Handwriting instruction in elementary schools. *American Journal of Occupational Therapy*, 60, 461-471.
- Benbow, M. (1999). *Loops and Other Groups*.
- Bergman, K.E. and McLaughlin, T.F. (1988). Remediating handwriting difficulties of learning disabled students: A review. *British Columbia Journal of Special Education*, 101-120.
- Case-Smith, J. (2002). Effectiveness of school based occupational therapy on handwriting. *American Journal of Occupational Therapy*, 56(1), 17-25.
- Complete Minnesota Dexterity Test (Model 32023A). Lafayette Instruments, Lafayette, Indiana.
- Erhardt, R.P. and Meade, V. (2005). Improving handwriting without teaching handwriting: The consultative clinical reasoning process. *Australian Occupational Therapy Journal*, 52, 199-210.
- Feder, K. & Majnemer, A. (2007). Handwriting development, competency, and intervention. *Developmental Medicine and Child Neurology*, 49(4), 312-317.
- Graham, S. and Weintraub, N. (1996). A review of handwriting research: Progress and prospects from 1980-1994. *Educational Psychology Review*, (8)1, 7-87.
- Graham, S. and Harris, K. R. (2000). The role of self regulation and transcription skills in writing and writing development. *Educational Psychologist*, 35, 3-12.
- Graham, S., Harris, K. R., and Fink, B. (2000). Is handwriting causally related to learning to write? Treatment of handwriting problems in beginning writers. *Journal of Educational Psychology*, 4, 620-633.
- Graham, S. and Harris, K. R. (2005). Improving the writing performance of young struggling writers. *The Journal of Special Education*, 39, 19-33.
- Hamstra-Bletz, L. and Blote, A. (1993). A longitudinal study on dysgraphic handwriting in primary school. *Journal of Learning Disabilities*, 26(10), 689-699.

- Henderson, A. and Pehoski, C. (1995). *Hand Function in the Child, Foundations for Remediation*. St. Louis: Mosby, Inc.
- Johnson, D., Carlisle, J.F. (1996). A study of handwriting in written stories of normal and learning disabled children. *Reading and Writing*, 8(1), 45-59.
- Karlsdottir, R., Stefansson, T. (2002). Problems in developing functional handwriting. *Perceptual Motor Skills*. 94(2) 623-662.
- Kelley, R. (2007, November 9). The writing on the wall, *Newsweek*, 150, 20.
- Laszlo, J. I., Bairstow, P. J., and Bartip, J. (1988). A new approach to treatment of perceptuo-motor dysfunction: Previously called clumsiness. *Support Learn*, 3 35-40.
- Levine, M. D., Oberklaid, F., and Meltzer, L. (1981). Developmental output failure: A study of low productivity in school-aged children. *Pediatrics*, 67, 18-25.
- Lindsay, G. A., and McLennan, D. (1983). Lined paper; It's effects on the legibility and creativity of young children's writing. *British Journal of Educational Psychology*, 53.
- Maeland, A. F. (1992). Handwriting and perceptual-motor skills in clumsy, dysgraphic, and 'normal' children. *Perceptual and Motor Skills*, 75, 1207-1217.
- McCutchen, D. (1988). A Capacity theory of writing, working memory in composition. *Educational Psychology Review*, 8(3) 299-325.
- McCutchen (1995). Cognitive processes in children's writing: Developmental and individual differences. *Educational Psychologist*, 35, 13-23.
- McCutchen, D. (2000). Knowledge, processing, and working memory: Implications for a theory of writing. *Educational Psychologist*, 16, 226-238.
- McHale, K. and Cermak, S.A. (1992). Fine motor activities in elementary school: preliminary findings and provisional implications for children with fine motor problems. *American Journal of Occupational Therapy*, 46(10), 898-903.
- Mojet, J. W. (1991). Characteristics of the developing handwriting skill in elementary education. In: Wann, J., Wing, A. M., and Sovik, N. (eds.). *Development of Graphic Skills*, Academic Press, London, England, pp. 53-74.
- Oliver, C.E. (1990). A sensorimotor program for improving writing readiness skills in elementary-age children. *American Journal of Occupational Therapy*, 44, 111- 116.
- Olsen, J. (1999). Handwriting Without Tears Program.

- Scheerer, C. R., Reed, K., & Skiver, A. M. (2003). *Handwriting without tears: An outcome study of two kindergarten classrooms*. Short course presented at the Ohio Occupational Therapy Association Annual Conference, Akron, OH.
- Sheffield, B. (1996). Handwriting: A neglected cornerstone of literacy. *Annals of Dyslexia*, 46, 21-35.
- Smits-Engelsman, B. C. M., and Van Galen, G. P. (1997). Dysgraphia in children: Lasting psychomotor deficiency or transient developmental delay? *Journal of Experimental Child Psychology* 67, 164–184.
- Sovik, N. (1975). *Developmental Cybernetics of Handwriting and Graphic Behaviors*. Oslo, Norway: Universitetsforlaget.
- Swanson, H.L. and Berninger, V.W. (1994). Individual differences in child's working memory and skill. *Journal of Experimental Child Psychology*, 63(2), 358-385.
- Tseng, M. H., and Cermak, S. H. (1991). The evaluation of handwriting in children. *Sensory Integration Quarterly* XIX, 3–6.
- Tseng, M.H., Cermak, S.A. (1993). The influence of ergonomic factors and perceptual motor abilities on handwriting performance. *American Journal of Occupational Therapy*, 47, 919-926.
- Tseng, M. H. and Murray, E. A. (1994). Differences in perceptual motor measures in children with good and poor handwriting. *Occupational Therapy Journal of Research*. 14, 19-36.
- Tseng, M. H. and Chow, S.M.K. (2000). Perceptual motor function of school aged children with slow handwriting speed. *American Journal of Occupational Therapy*, 54(1), 83-88.
- Van Galen, G.P.(1991). Handwriting issues for a psychomotor theory. *Human Movement Science*, 10, 165-191.
- Van Galen, G. P. (1993). Handwriting: A developmental perspective: In Kalverboer, A.F., Hopkins, B. and Geuze, R. (Eds.), *Motor Development in Early and Later Childhood: Longitudinal Approaches*. New York: Cambridge University Press.
- Weil, M.J. and Amundson S.J. (1994). Relationship between visuomotor and handwriting skills of children in kindergarten. *American Journal of Occupational Therapy* (48) 11, 982-988.
- Woodward, S. and Swinth, Yvonne. (2002). Multisensory approach to handwriting remediation: Perceptions of school based occupational therapy. *American Journal of Occupational Therapy*, (56)3, 305-312.

Appendix A

Handwriting Questionnaire

1. How long have your students been studying cursive handwriting?

2. How would you rate their comfort level with cursive handwriting?

Minimal Comfort

0 1 2 3 4 5 6 7 8 9 10

High Comfort

3. How legible would you consider their cursive handwriting?

Barely

0 1 2 3 4 5 6 7 8 9 10

Extremely

4. Is their cursive ability consistent or does it fluctuate with the writing task?

5. Do you feel that their printing is more legible than their cursive writing?

6. What aspects of cursive are the most difficult for your students? (connecting letters, capital or lowercase letter formation, staying on the line, etc.)

7. What aspects of cursive are the easiest for your students? (connecting letters, capital or lowercase letter formation, staying on the line, etc.)

8. Do your students prefer to print or use cursive?

9. What cursive writing program have they been exposed to and for how long? What are they currently using?

10. Are the students encouraged to use cursive rather than print for classroom and homework activities?

Follow-Up Handwriting Questionnaire

1. How would you rate your students' comfort level with cursive handwriting?

Minimal Comfort									High Comfort	
0	1	2	3	4	5	6	7	8	9	10

2. How legible would you consider their cursive handwriting?

Barely									Extremely	
0	1	2	3	4	5	6	7	8	9	10

3. Have they improved in their consistency of legibility? If so, how?
4. Do you feel that their printing is still more legible than their cursive at this time?
5. Do your students continue to find certain aspects of cursive difficult? (speed, connecting letters, capital or lowercase letter formation, staying on the line, etc.)
6. What aspects of cursive are the easiest for your students? Has this changed? (speed, connecting letters, capital or lowercase letter formation, staying on the line, etc.)
7. Do your students continue to prefer one method of writing (printing or cursive) to the other? Has this changed?

8. Do you feel your students have improved overall with their cursive legibility?

Minimal Improvement
0 1 2 3 4 5 6 7 8 9 10 Much Improvement

9. How would you rate your students' ability to read cursive in general?

Little Difficulty
0 1 2 3 4 5 6 7 8 9 10 Much Difficulty

10. What aspects of the handwriting program your students participated in do you feel are particularly beneficial?

11. What aspects of the handwriting program your students participated in do you feel are not beneficial or could be better, if any?

12. Would you be open to using the Handwriting Without Tears program at CID in the future?

Appendix B

Complete Minnesota Dexterity Test (CMDT)Scoring Grid (in seconds)Student A

Placing Test	2:37
Turning Test	4:50 (attention issues)
Displacing Test	1:28
1-Hand Turning and Placing Test	3:16
2-Hand Turning and Placing Test	1:44

Student B

Placing Test	1:48
Turning Test	1:41
Displacing Test	1:27
1-Hand Turning and Placing Test	1:53
2-Hand Turning and Placing Test	1:41

Student C

Placing Test	1:24
Turning Test	1:18
Displacing Test	1:21
1-Hand Turning and Placing Test	1:30
2-Hand Turning and Placing Test	1:05

Student D

Placing Test	1:35
Turning Test	1:50
Displacing Test	1:12
1-Hand Turning and Placing Test	1:48
2-Hand Turning and Placing Test	1:09

Appendix C

Evaluation Tool of Children's Handwriting-Cursive (ETCH-C) Scores

	<u>Overall Legibility</u>		
<u>Experimental Group</u>	<u>Word</u>	<u>Letter</u>	<u>Numeral</u>
*Student A (Pre-Test)	81%	78%	100 %
*Student A (Post-Test)	90%	89%	100%
<i>% Difference</i>	<i>+11%</i>	<i>+14%</i>	<i>+0%</i>
	<u>Word</u>	<u>Letter</u>	<u>Numeral</u>
Student B (Pre-Test)	24%	26%	84%
Student B (Post-Test)	33%	38%	100%
<i>% Difference</i>	<i>+37.5%</i>	<i>+46%</i>	<i>+19%</i>

	<u>Overall Legibility</u>		
<u>Control Group</u>	<u>Word</u>	<u>Letter</u>	<u>Numeral</u>
Student C (Pre-Test)	81%	88%	92%
Student C (Post-Test)	86%	92%	92%
<i>% Difference</i>	<i>+6%</i>	<i>+5%</i>	<i>+0%</i>
	<u>Word</u>	<u>Letter</u>	<u>Numeral</u>
Student D (Pre-Test)	71%	70%	96%
Student D (Post-Test)	68%	75%	88%
<i>% Difference</i>	<i>-4%</i>	<i>+7%</i>	<i>-8%</i>

* Student A results reflect slightly modified directions during testing due to attention issues.

Appendix D

HWT Cursive Writing Style Versus Typical Cursive

Old-Fashioned Cursive

c a d g

h t p

e l f i u y j

k r s

b o w v

m n x z q

Handwriting Without Tears®

c a d g

h t p

e l f i u y j

k r s

b o w v

m n x z q

Appendix E

Missouri School Districts Using HWT Curriculum

Raymore Peculiar School District – Peculiar, MO

Ferguson Florissant School District – Florissant, MO

West St. Francois County R-IV School District – Leadwood, MO

Appleton City R-11 School District

Brentwood School District – Brentwood, MO

Orchard Farm School District – Saint Charles, MO

St. Clair R-13 School District – St. Clair, MO

Blue Springs R4 School District – Blue Springs, MO

St. Louis Charter School – St. Louis, MO

Mehlville R-9 School District – St. Louis, MO

Gasconade Co R-11 – Owensville, MO

Westran R-1 School District – Hunstsville, MO

Maries R-1 School – Vienna, MO

Forsyth School – St. Louis, MO

Dexter R-Xi – Dexter, MO

Sturgeon R V School – Sturgeon, MO

Appendix F

Missouri Handwriting Standards

(As per Missouri Department of Education, Communication Arts – Grade Level Expectations)

KINDERGARTEN

Compose well-developed text using standard English conventions

- Form letters correctly, using left-to-right directionality
- Capitalize first letters of own first and last names

FIRST GRADE

Compose well-developed text using standard English conventions

- Print upper and lower-case letters legibly, using left-to-right, top-to-bottom directionality and correct spacing between letters and words
- Capitalize names of people and beginning words of sentences

SECOND GRADE

Compose well-developed text using standard English conventions

- Print upper and lower-case letters legibly, using left-to-right, top-to-bottom directionality and correct spacing between letters and words
- Capitalize names of people and beginning words of sentences

THIRD GRADE

Compose well-developed text using standard English conventions

- Print upper and lower-case letters legibly, using left-to-right, top-to-bottom directionality and correct spacing between letters and words
- Capitalize names of people and beginning words of sentences

FOURTH GRADE

Compose well-developed text using standard English conventions

- Create legible compositions with correct spacing between words in a sentence and in margins
- Use conventions of capitalization in written text

FIFTH GRADE

Compose well-developed text using standard English conventions

- Capitalize names of people and beginning words of sentences and apostrophe in singular possessives
- Use parts of speech correctly in written text (verb tense, adjective forms)
- In composing text, write compound sentence, and identify and eliminate fragments in writing

Write effectively in various forms or writing

- Use a note-taking system to organize information from written text