

Eastern Kentucky University

Encompass

Occupational Therapy Doctorate Capstone
Projects

Occupational Science and Occupational
Therapy

2017

The Effectiveness of Occupational Therapist Guided Remediation Through Handwriting Home Programs

Cindy W. Poole Mrs.

Eastern Kentucky University, cindy_poole4@mymail.eku.edu

Follow this and additional works at: <https://encompass.eku.edu/otdcapstones>



Part of the [Elementary Education Commons](#), [Occupational Therapy Commons](#), and the [Special Education and Teaching Commons](#)

Recommended Citation

Poole, Cindy W. Mrs., "The Effectiveness of Occupational Therapist Guided Remediation Through Handwriting Home Programs" (2017). *Occupational Therapy Doctorate Capstone Projects*. 23. <https://encompass.eku.edu/otdcapstones/23>

This Open Access Capstone is brought to you for free and open access by the Occupational Science and Occupational Therapy at Encompass. It has been accepted for inclusion in Occupational Therapy Doctorate Capstone Projects by an authorized administrator of Encompass. For more information, please contact Linda.Sizemore@eku.edu.

REMEDICATION THROUGH HANDWRITING HOME PROGRAMS

The Effectiveness of Occupational Therapist Guided Remediation through Handwriting Home Programs

Presented in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Occupational Therapy

Eastern Kentucky University
College of Health Sciences
Department of Occupational Science and Occupational Therapy

Cindy W. Poole
2017

REMEDICATION THROUGH HANDWRITING HOME PROGRAMS

**EASTERN KENTUCKY UNIVERSITY
COLLEGE OF HEALTH SCIENCES**

DEPARTMENT OF OCCUPATIONAL SCIENCE AND OCCUPATIONAL THERAPY

This project, written by Cindy W. Poole under direction of Dr. Colleen Schneck, Faculty Mentor, and approved by members of the project committee, has been presented and accepted in partial fulfillment of requirements for the degree of

DOCTOR OF OCCUPATIONAL THERAPY

CAPSTONE COMMITTEE

Colleen Schneck

11-28-17

Date

Faculty Mentor: Dr. Colleen Schneck

Julie Baltisberger

11/28/2017

Date

Committee Member: Julie Baltisberger

REMEDICATION THROUGH HANDWRITING HOME PROGRAMS

EASTERN KENTUCKY UNIVERSITY

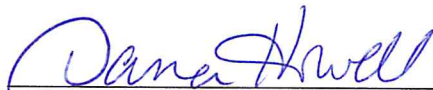
COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF OCCUPATIONAL SCIENCE AND OCCUPATIONAL
THERAPY

Certification

We hereby certify that this Capstone project, submitted by Cindy W. Poole, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the project requirement for the Doctor of Occupational Therapy degree.

Approved:




Dana Howell, PhD, OTD, OTR/L, FAOTA



Date

Program Coordinator, Doctor of Occupational Therapy



Colleen Schneck, ScD, OTR/L, FAOTA



Date

Chair, Department of Occupational Science and Occupational Therapy

Copyright by Cindy W. Poole, 2017

All Rights Reserved

Executive Summary

Background: Research supports the effectiveness of occupational therapy for the remediation of poor handwriting. With school-based service guidelines limiting access to only those students who receive special education, parents and teachers become responsible for remediation of handwriting issues without adequate preparation. There is a void of research on the role or effect that an occupational therapist guided handwriting remediation program can play in improving skill mastery, with parents as the primary supplemental educators.

Purpose: The purpose of this quasi-experimental pilot-study research was to examine the effectiveness of a parent taught, occupational therapist guided, home handwriting instruction program on the outcome measure of performance with the production of alphabet letters, words, and sentences as a potential school system service delivery model for students who do not qualify for occupational therapy services.

Theoretical Framework: The remedial intervention approach to improve the automaticity of alphabet letter formation for kindergarten students, and the development of teacher and parent training sessions was grounded in the principles of Motor Learning, Dynamic Systems, and the Skill Acquisition theories.

Methods: Kindergarten students were pre-selected by teacher referral to participate in summer handwriting remediation due to poor performance on year-end writing standards. Two groups were pre-and post-tested to comparatively measure the effectiveness of a home handwriting program intervention. Parent surveys supplemented the standardized effectiveness data to determine the characteristics of struggling students, parent perceptions of their educator role, the training program, and their child's response to the potential remediation intervention.

Results: An occupational therapist guided, parent-taught handwriting home program was effective to improve the formation of alphabet letters, words, and sentences based on both parent and statistical posttest comparative results. The greatest mean changes were evident in intervention group lowercase sequential memory, lowercase letter, and sentence copy subtests. Mean scores for the intervention group improved from the 25th to 53rd percentile. At posttest both groups were statistically equal despite significant changes between members of each group.

Conclusions: There is preliminary support for team collaboration, parent coaching, and home programs as an alternative service delivery model for the improvement of handwriting in unserved kindergarten students.

Acknowledgements

This doctoral research and remediation program would not be possible without the generosity of time and compassion by those parents, administrators, and teachers who also have a sense of responsibility to improve the lives of all children, despite circumstances and qualification criteria. I would like to thank them all for allowing me the opportunity to explore uncharted collaborative territory, combine our knowledge resources, and make improved student achievement a reality. This pilot study research paves the way for educational initiatives which can be truly differentiated, student and family centered. It also builds support for the value of school-based occupational therapy services by linking education, research, and practice to students, families, and schools.

“When we do the best we can, we never know what miracle is wrought in our life,
or in the life of another” - Helen Keller

EASTERN KENTUCKY UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF OCCUPATIONAL SCIENCE AND OCCUPATIONAL THERAPY

CERTIFICATION OF AUTHORSHIP

Submitted to: Dr. Colleen Schneck

Student's Name: Cindy W. Poole

Title of Submission: The Effectiveness of Occupational Therapist Guided Remediation through Handwriting Home Programs

Certification of Authorship: I hereby certify that I am the author of this document and that any assistance I received in its preparation is fully acknowledged and disclosed in the document. I have also cited all sources from which I obtained data, ideas, or words that are copied directly or paraphrased in the document. Sources are properly credited according to accepted standards for professional publications. I also certify that this paper was prepared by me for this purpose.

Student's Signature: Cindy W. Poole

Date of Submission: 11 / 30 / 17

Table of Contents

Section 1: Nature of Project and Problem Identification.....	6
Introduction	6
Problem Statement	7
Purpose	7
Research Questions	8
Theoretical Framework	8
Significance of the Study.....	10
Section 2: Review of the Literature.....	15
Introduction	15
The Incidence of Poor Handwriting	15
The Correlation Between Handwriting and Occupational Performance	17
Curricular Influences on Student Achievement.....	19
Occupational Therapist’s Role in Handwriting Instruction	21
Collaboration and Parent Coaching.....	22
Key Elements of Handwriting Instruction Interventions.....	25
Parent Training Programs that Foster Capacity Building	28
Summary	30
Section 3: Methods.....	34
Project Design	34
Setting.....	35
Participants.....	35
Methods	37
Outcome Measures.....	41
Data Analysis	43
Ethical Considerations.....	44
Fidelity	47
Timeline.....	47
Summary	50
Section 4: Results and Discussion.....	52

Student Characteristics	52
Parent Perceptions	54
Program Effectiveness	57
Interpretation of Results	60
Strengths and Limitations	63
Implications for School-Based Practice	65
Future Research	66
Summary	67
References	69
Appendix A: IRB Approval	77
Appendix B: Whitfield County Schools Permission for Research	79
Appendix C: Checklist of Training and Design Components	80
Appendix D: Student Referral Form	86
Appendix E: Cover Letter and Parental Consent Agreement	87
Appendix F: Parent Survey One	95
Appendix G: Child Assent Script	99
Appendix H: Parent Training Survey	100
Appendix I: Parent Time Log Form	101
Appendix J: Parent Survey Two	102

List of Tables

Table 1. Parent Reported Student Characteristics.....	56
Table 2. Mean Change THS-R Scores Between Groups	57
Table 3. Group Mean Change Paired Samples Test	58
Table 4. THS-R Subtest Scaled Scores.....	60

List of Figures

Figure 1. Flow of Subject Group Selection 52

Section 1: Nature of Project and Problem Identification

Introduction

The ability to write to convey knowledge is the cornerstone of all educational occupations. The inability to write limits access to education, creates an educational disparity, and has lifelong consequences. Without a consistent approach to early evidence based instruction, even marginal writing success becomes problematic as poor performance becomes automatic. “Poor handwriting has detrimental effects on academic performance, social interactions, and affects successful participation in everyday school activities” (Preminger, Weiss, & Weintraub, 2004, p. 193). Over the past 30 years handwriting instruction has taken a back seat in elementary schools in favor of a whole language approach to literacy development. Simultaneously, teacher education programs have placed less emphasis on handwriting instructional techniques (Graham & Weintraub, 1996; Marr & Dimeo, 2006). This has resulted in an eclectic approach to handwriting instruction in today’s elementary school classrooms. Being able to write well is vital for school performance, and yet the research shows that most teachers do not have a strong base of knowledge in handwriting instructional methods, or a unified, consistent approach to handwriting instruction within schools to facilitate student mastery of legible alphabet letter forms. Teacher survey research results from one identified rural school district and historical research data indicate that between 70 and 88% of teachers report poor preparation to teach handwriting (Asher, 2006; Donica, Larson, & Zinn, 2012; Frances, 2008; Graham, et al., 2008; Kemmis & Dunn, 1996; Poole, 2016; Sheffield, 1996).

With a decreased curricular emphasis on handwriting instruction, inadequate teacher preparation in evidence based instructional practices, and limited instructional time in the school day, proficiency in handwriting and legible alphabet letter formation is compromised.

Occupational therapists are often identified as the handwriting remediation experts, yet most students do not have access to occupational therapy services for remediation programs.

School-based occupational therapy services are limited to only those students who receive special education services. Supplemental instruction and remediation responsibilities fall to the teachers and parents. Parents are not typically equipped with knowledge regarding research based intervention or effective teaching methods to help their children improve alphabet letter formation skills. In addition, parents often lack the support and guidance of a home instruction program combined with school collaboration (Beck, 2002). Since poor handwriting can have detrimental effects on academic performance and future occupational performance, occupational therapists have a responsibility to facilitate collaborative remediation interventions that are based on proven instructional practices, founded on current theoretical models of teaching and learning, and designed to meet the needs of the student, parent, teacher, and therapist.

Problem Statement

This research addressed the problem of poor alphabet letter formation for those kindergarten students who did not receive occupational therapy services, and demonstrated handwriting difficulties of sufficient magnitude to directly impact their overall writing abilities and academic performance (Donica, Larson, & Zinn, 2012; Graham, et al, 2008; Hammerschmidt, & Sudsawad, 2004; Parikh, 2015; Poole, 2016).

Purpose

The purpose of this quasi-experimental research was to examine the effectiveness of a parent taught, occupational therapist guided, home handwriting instruction program on the outcome

measure of kindergarten student performance with the production of alphabet letters, words, and sentences as a potential school system service delivery model.

Research Questions

1. Is there a significant improvement in alphabet letter formation accuracy upon completion of a home handwriting remediation program for the 22.4% of unserved kindergarten students in a specified school district?
2. What are the parent perceptions of student difficulty, collaborative training effectiveness, their instructional experiences, and their child's response to intervention with home program remediation?
3. Based on posttest handwriting evaluation mean change scores and parent survey responses, can occupational therapist guided remediation through home handwriting programs be a viable means to improve access to occupational therapy through an alternative service delivery model?

Theoretical Framework

Handwriting performance is the culmination of a complex system of physical, environmental, and task components. The ability to write with automaticity is vital for the student to be able to use the cognitive processing of information for academic learning, rather than for alphabet letter formation (Graham, Harris, & Fink, 2000; Sheffield, 1996; Spear-Swearling, 2006). The remedial intervention approach used to improve the automaticity of alphabet letter formation was grounded in the principles of Motor Learning, Dynamic Systems, and the Skill Acquisition theories.

Mackay, McCluskey, and Mayes (2010) found that the most effective remediation programs were based on the principles of motor learning theory, with an emphasis on specific

skills training. According to Kaplan (2010) it is the practice and experience of performing an action that leads to more permanent changes. It is those permanent changes in movement patterns that facilitate the automaticity in handwriting. Motor learning occurs through developmental stages and is influenced by the type of task, type of feedback, style, and frequency of practice. Based on the principles of motor learning theory, kindergarten students participating in remedial instruction were previously introduced to the requirements of alphabet letter formation in the classroom, but their performance was inconsistent. Correct alphabet letter formation did not reach the level of automaticity for the kindergarten intervention subjects.

The home program was designed to facilitate the transition from the cognitive stage to an associative stage of development, whereby students could demonstrate greater consistency of performance through distributed practice, intrinsic and extrinsic feedback, using a functional approach, and within their natural context of home (Poole, 1991; Zwicker & Harris, 2009). Practice is the most significant determinant to success in writing, as defined by Motor Learning theory, and Dynamic Systems theory (Hoy, Egan, & Feder, 2011; Kaplan, 2010; Mackay, McCluskey, & Mayes, 2010; Poole, 1991; Zwicker & Harris, 2009; Zylstra & Pfeiffer, 2016). According to Zwicker and Harris (2009) and Hoy, Egan, and Feder (2011) the optimal frequency of task-specific practice sessions varied from ten to at least twenty for optimal learning and generalization to occur. In contrast, Feder, Racine, and Majnemer (2008, as cited in Hoy, et al., 2011) concluded that it was the handwriting practice alone that impacted improved performance, not the amount of time or methods. This concept was also supported in the works of Schneck, Shasby, Myers, and DePoy-Smith (2012).

According to Dynamic Systems theory, “practice and experience alter the formation of movement patterns through interaction with the environment and the demands of the task”

(Zwicker & Harris, 2009, p. 30). It is this interaction between the person, a prescribed task, and the environment that plays a key role in either promoting or inhibiting movement and learning. Kaplan (2010) further expanded this premise by explaining that a change in any one of the component interactions could create change in the others. New movement patterns are created with changes in the task, person, or environment. The occupational therapist designed remediation intervention must consider practice session parameters, modification of the dynamic systems involved in the task, and the level of difficulty of the task to create learning opportunities that meet the requirements for sustained knowledge.

Skill Acquisition theory expands on the relationship and interaction between the environment and the child's behavior as it relates to learning new skills. Acquisition theory is based on the principles of learning and behavioral theory. Therapist interventions influence the teaching-learning process. This occurs through activity analysis, behavioral shaping, and reinforcements for the acquisition of new skills that could improve or optimize performance in each environment (Luebeen & Royeen, 2010). The therapist builds on student strengths and modes of intelligence to adapt the environment or instructional methods that promote child-centered learning. Handwriting programs enable students to learn necessary skills required to function optimally in their school environment. By analyzing the component problems and remediating specific skills, the student's behavior and learning can be positively influenced and reinforced until letter formation mastery is obtained.

Significance of the Study

The use of home programs is a common practice in occupational therapy, yet there was a void of research that indicated the effectiveness of this practice as it relates to improving handwriting skills. Through the identification of struggling writers, development of parent and

teacher training modules, and evaluation of the effectiveness of an occupational therapist guided handwriting remediation program, alternative service delivery models of practice for elementary school students were explored and quantified for the use of home programs as a potential intervention measure. The collaboration additionally promoted family centered care, explored occupational therapy supportive roles, supported state and local education goals, and helped advocate for school curriculum policy changes.

Parental influence is at the heart of child development and learning. Therefore, it is important to create a community of shared stakeholders who are agreeable to explore options that meet the needs of the students and their parents, even if the options include non-traditional approaches. The outcome effectiveness measure of home instruction programs will add to the body of knowledge for school-based practitioners to reach an unserved population of students through parent and teacher collaboration and shared capacity building.

The research supported state and local education goals that reflect a commitment to excellence in student and school performance standards. The selected school district developed a five-year strategic plan in 2015 that included six primary system-wide goals. Goal number one, objective two reads, “Teachers will utilize and implement effective instructional practices, by consistently using non-negotiable practices, fully implementing data teams on each campus, provide training in best practices for data analysis, and by highlighting innovative teaching practices” (Whitfield County Schools, 2015, p. 4). The scope and intent of the research study supported and facilitated improved instructional practices, parent involvement, data collection, evidence based decision making, training, and supports future innovative teaching practices.

The focus on researching effective handwriting instruction methods for students who struggle to form legible alphabet letters played a significant role in advancing student

achievement toward kindergarten grade level standards of performance. According the Georgia Kindergarten Inventory of Developing Skills (GKIDS) assessment, handwriting is evaluated in the English-Language Arts standards ELACCKL 1a, 2c, 2d, and ELACCKW 1, 2, and 3 (Georgia Department of Education, 2016a). The students who received ratings of “not yet demonstrated”, “emerging”, or “progressing” at the year-end assessment were identified as potential participants of the research. These students failed to meet grade-level English-Language Arts standards of performance and would require remediation to succeed with future writing endeavors, through repetition of the kindergarten school year or supportive instruction in first grade.

The research also supported school district performance standards, directly addressing the Georgia Department of Education School Performance Assessment standard 4, Instruction standard 4, Professional Learning standard 2, Leadership standards 4 - 6, and Family and Community Engagement standards 1-5. The research and remediation program sought to improve collaboration, support leadership, enhance collective performance, impact student learning through research based instructional practices, improve collaborative screening, improve shared decision making, promote leadership capacity, improve data driven decision making, provide an opportunity for family engagement in school activities that impact student performance, open communication lines between the school and family, and most importantly, “develop the capacity of families to use support strategies at home that will enhance academic achievement,” each of which were all identified tenets of the cited standards (Georgia Department of Education, 2016b, p. 49).

As occupational therapists, we have the responsibility to advocate for change to systems and policies by improving student access to therapy services through exploration of alternative

methods of service delivery. The Centennial Vision of Occupational Therapy challenged therapists to “generate high quality evidence documenting its effectiveness and impact with children and youth” (American Occupational Therapy Association, 2007, p. 613) and supported the need for “research to inform occupational practice with children and youth, in the roles and participation of parents, siblings, and other family members within family centered services” (AOTA, 2006, p. 8).

Summary

With the scope of poor handwriting impacting 22.4% of students in the designated school district, there existed the potential for almost 3,000 students to fail to write with sufficient legibility, which could potentially impact their overall academic performance. There is extensive research on the evolution of handwriting instruction, the programs that support handwriting acquisition, the neuromotor components required for mastery, the complexity of performance, and the long-term effects of both adequate and inferior skills that impact occupational performance. What had not been explored, or researched with any diligence was the effect or role home programs could potentially play in improving skill mastery, with parents as the primary supplemental educators. The use of home programs is a common practice in occupational therapy, and yet there was minimal research that indicated the effectiveness of this practice as it related to improving handwriting skills. Research supports occupational therapy as an effective intervention for the remediation of poor handwriting. Due to the nature of the referral process, and related service delivery of occupational therapy in school systems, there is a potentially large segment of unserved students who fail to meet the criteria that would afford them the opportunity to benefit from developmentally based instruction methods and occupational therapist guided intervention services. Guided Motor Learning, Dynamic Systems,

and Skill Acquisition theories, a parent instructed home handwriting program was evaluated for outcome effectiveness as a viable remediation strategy to improve student performance with alphabet letter formation mastery. This research was designed to glean practical implications for the use of parent collaborative home programs to improve student performance, and to add to the body of knowledge for school-based occupational therapy intervention alternatives.

Knowledge of the impact and benefits of proper handwriting on student outcomes serves to strengthen the base of support for effective evidence based programs. Curriculum design and education standards teachers use for instruction are regulated by state and local policies. Improved policies occur through better identification of students who need support, increased awareness of needed change, education on research-based best practices, increased availability and implementation of evidence based remediation resources, and the collaboration between schools and parents. As occupational therapists who support the educational progress of our students, we must be knowledgeable of state education standards of performance, school system goals, occupational therapy standards of practice, and the value of research to support these objectives.

This research was a significant first step to improving student handwriting performance through the exploration of innovative service delivery models and improved educational outcomes. Academic achievement begins with students being able to write legible alphabet letters. Handwriting proficiency “is really about whether or not we want our children to succeed in life. Handwriting is a fundamental cornerstone for an educated, literate nation” (Berninger, James, Peeverly, Santangelo, & Case-Smith, 2012).

Section 2: Review of the Literature

Introduction

To quantify the research questions of whether there was a significant improvement in alphabet letter formation accuracy upon completion of a home handwriting remediation program or the parent perceptions of student difficulty, the collaborative training effectiveness, their instructional experiences, and their child's response to intervention with home program remediation, a comprehensive review of the literature review was necessary. Effective handwriting instructional practices and contributing factor research was examined prior to the design of the parent training and remediation intervention programs to ensure that each element was evidence based and met the needs of the parents, teachers, therapists, and struggling students.

Due to the complexity and interplay of the physical, environmental, and social determinants of legible handwriting in kindergarten students, research was conducted to determine the incidence of poor handwriting among school-age children, the correlation between handwriting and occupational performance, the curricular influences on student achievement, the occupational therapist's role in handwriting instruction, the effects of collaboration and parent coaching, the most effective elements of handwriting instruction programs, and how to design parent training programs that foster capacity building partnerships with adult stake holders.

The Incidence of Poor Handwriting

The estimates of the number of students affected by poor handwriting varies greatly from study to study, depending on the criteria for inclusion. In statistical analysis of children age five through seventeen, Pastor, Rueben, and Loeb (2009) equated functional difficulties in handwriting with participation restrictions for many American children. The authors estimate

between 5%-20% of students display a disability in function because of handwriting problems (p. 9). According to Parikh (2015) up to 30% of kindergarten students have handwriting difficulties of sufficient quality to impact self-expression, self-esteem, socialization, and academic performance.

Donica, Larson, and Zinn (2012), Graham, et al. (2008), and Hammerschmidt and Sudsawad, (2004) cite the prevalence of struggling writers as much as 23% of the school-age population, and the access to occupational therapy services to evaluate for underlying difficulties is limited by the design of the qualification process to receive services (Graham, et al., 2008). The national incidence statistics were supported by teacher survey data from the designated research school district. According to Poole (2016), the definition of a struggling writer for teacher survey prevalence data was “a student who demonstrates enough performance errors in letter form, size, spacing, memory of correct form, correct case, and baseline placement to affect written legibility”. Based on class size data, teacher reported perceptions of the numbers of students who struggle to write, and the provided definition, 25.6% of kindergarten and first grade students in the designated three elementary schools were identified as struggling writers, and 23.8% of students demonstrated handwriting skills of such poor quality that it also affected their overall writing (compositional) abilities and school performance. Only 3.2 percent of identified struggling students qualified for occupational therapy services during the same time frame. With 22.4% of students demonstrating poor writing performance in the school system, and a student population of over 13,000 students, the prevalence of the problem was potentially significant. The early identification and remediation of functional difficulties improves developmental outcomes (Pastor, Reuben, & Loeb, 2009). As a profession, we are called to look for ways to

ameliorate the problem of occupational access and advocacy to reduce negative functional performance outcomes.

The Correlation Between Handwriting and Occupational Performance

According to Graham and Weintraub (1996), handwriting is one of the most important skills that children acquire and use throughout their school years as part of their occupation as students. Much has been written about the educational ebb and flow of formal handwriting instruction over time. No one has been more vocal or critical about the cyclical approach to education than Virginia Berninger as she admonished “education’s tendency to focus on what is stylish at the moment, rather than incorporating a more global approach to training teachers and teaching students” (Sheffield, 1996).

There are at least three reasons handwriting must be carefully taught to all children. First, handwriting allows access to kinesthetic memory, our earliest, strongest and most reliable memory channel. Second, serviceable handwriting needs to be at the spontaneous level so that a student is free to concentrate on spelling, and to focus on higher level thought and written expression. Third, teachers judge and grade students based on the appearance of their work, and the world judge’s adults on the quality of their handwriting (Sheffield, 1996, p. 22).

Students with better handwriting do better in school (Fink, 2014). Children with poor handwriting face obstacles in academic pursuits but also with social interactions, which further limits their activity participation (Preminger, Weiss, & Weintraub, 2004). Good handwriting has not only a predictive effect on school performance but also has a predictive correlation to adult occupational performance. Good, legible handwriting can be a determinant of success for adults’ due to the judgement of personal intelligence and the perceived education level of individuals based on their exhibited personal writing samples (Sheffield, 1996).

Once the child’s perception of difficulty and poor habits become established, the impact on future academic success is further compounded. Early instruction is vital, and yet our

educational system has not placed an emphasis on proper handwriting in over 40 years. The predisposing factors to poor performance can be tied to a gradual decline in society's view of the importance of written text, especially in our advancing digital world. Despite a gradual decline in formal handwriting instruction over the last few decades, there has been a noted resurgence in handwriting interest for children with learning disabilities and attention deficit hyperactivity disorder. In 2012, Berninger, James, Peverly, Santangelo, and Case-Smith presented research at an educational summit to support the necessity of handwriting in today's schools. During a YouTube video summation of the findings, the authors cited a Florida International University research study of 1,000 Miami-Dade students, which linked fine motor and writing skill mastery in pre-kindergarten to comparatively higher reading and math skills in later years, as opposed to those children who initially exhibited poor handwriting in the earlier years. This study supported the necessity of handwriting instruction, as a predictor of future academic success.

Multiple research studies indicate that there is a direct link between the mechanics of letter formation and reading, memory, impulse control, attention span, composition skills, and ultimately academic success (Fink, 2014; Berninger, et al., 2012). In a policy update for the National Association of State Boards of Education, author David Kysilko (2012) linked research data for the "educational benefit[s] of handwriting to cognitive and motor skills development, literacy, brain development, memory, improved written expression abilities, and improved academic outcomes for students with learning disabilities" (p. 2). Further support for unified, research based, direct handwriting instruction lies in the premise that the effort expended to physically write detracts from the use of cognition to learn academic content (Sheffield, 1996). Spear-Swearling (2006) asserts that without sufficient writing skills, students are ineffective

learners because they are expending all their cognitive resources on writing. Essentially, a child's attention is diverted from learning to recall alphabet letter formation.

Fink (2014) cited the works of Indiana University researcher Karin James to link MRI findings associated with handwriting and brain activity to prove that the “motor sections of the brain are engaged when literate adults look at printed text, whereas keyboarding didn't light up the literacy sections of the brain in the same way handwriting did” (p. 1), and the repeated physical motor action of repetitive letter formation imprinted a visual image and motor sequence pattern on the brain.

Curricular Influences on Student Achievement

Multiple researchers cite inadequate teacher knowledge and a lack of formal training to teach handwriting effectively to today's students (Asher, 2006; Donica, Larson, & Zinn, 2012; Frances, 2008; Graham, Harris, Mason, Fink-Chorzempa, Moran, & Sadler, 2008; Kemmis & Dunn, 1996; Sheffield, 1996). Seventy-two point two percent of surveyed teachers from the research setting indicated that they were not adequately prepared to teach handwriting from their college education programs, and yet 81.8% of these teachers reported at least moderate confidence in their ability to effectively teach handwriting from a developmental and evidence based framework.

Just as teachers use an eclectic array or blend of handwriting instruction methods, occupational therapists do as well. There have been conflicting research studies indicating that the Handwriting Without Tears program is (Donica, 2015) and is not (Schneck, Shasby, Myers, & DePoy Smith, 2012) the most effective approach for handwriting instruction across ability levels. Teachers indicated formal training knowledge in the D'Nealian (18.2%), Zaner-Bloser (9.1%), and Handwriting Without Tears (9.1%) curricula, with experience levels ranging from

one to twenty years. However, 70% of teachers in the target school district prefer to use a blend of handwriting approaches and curriculum elements, with 45.5% reporting actual use of blended curriculums for current instruction. The identified school system did not have a system-wide preferred curriculum at the time of the teacher survey. They subsequently adopted the Zaner-Bloser approach to handwriting instruction and recommended the use of the Handwriting Without Tears curriculum as an alternative or remediation intervention.

This blend of approaches along with inconsistent curriculum methods inhibits the continuity of handwriting instruction from grade to grade. Early poor or inconsistent instructional practices promotes the automaticity of illegible handwriting. Teachers cite the most common problems that contributed to poor or illegible handwriting were due to alphabet letter baseline placement, reversals, spacing, incorrect capitalization, and incorrect letter size (Poole, 2016). These identified handwriting legibility problems are related to inadequate letter formation memory, incorrect letter stroke start-position, incorrect stroke sequence, and inadequate repetitive guided practice opportunities. With a system wide, evidence based approach to consistent and unified handwriting instruction, these formation errors could potentially be eliminated.

About perceived curricular problems, teachers identified a lack of a unified system-wide curriculum focus, a varied teacher preference for curriculum methods, and inadequate instruction time as contributing factors to why students struggle or perform poorly (Poole, 2016). The specific inability to devote dedicated instructional time was cited by 44% of teachers in North Carolina (Donica, Larson, & Zinn, 2012) and up to 68.3% of locally surveyed teachers (Poole, 2016).

Occupational Therapist's Role in Handwriting Instruction

School system occupational therapists are frequently called upon to remediate handwriting difficulties in children. Research has shown that occupational therapy intervention improves handwriting legibility and school functional performance, even when compared to control groups without occupational therapy and adjusted for maturation (Case-Smith, 2002; Graham, Harris, & Fink, 2000; Hammerschmidt & Sudsawad, 2004; Schneck, Shasby, Myers, & DePoy Smith, 2012). Teachers are more likely to modify instruction and student supports prior to consideration of referral for occupational therapy services, despite confidence that therapy is a viable and beneficial modality. Graham, et al. (2008) states only 2% of struggling writers receive occupational therapy services. Local survey data indicated that 36% of teachers had students in their classrooms who received occupational therapy services, with only one to two per classroom, for a system average of 3.2% (Poole, 2016). Due to the nature of the referral process and service delivery of occupational therapy in the school system, there is a potentially large segment of unserved students who struggle with handwriting in the classroom but fail to meet the criteria that would afford them the opportunity to benefit from developmentally based instruction methods and occupational therapist guided intervention services. A commonly cited reason for inconsistent occupational therapy referrals was linked to a lack of teacher understanding of the scope of occupational therapy practice and the benefits of collaborative intervention (Donica, Larson, & Zinn, 2012; Hammerschmidt & Sudsawad, 2004; Kemmis & Dunn, 1996).

As occupational therapists, we are challenged through the American Occupational Therapy Association's Centennial Vision (2007) to expand collaboration between educators and therapists to "create a well-prepared, diverse, work force" through evidence based decisions regarding the types of programs and interventions selected. It is vital that we "demonstrate our

value to individuals, organizations, and the community to link education, research, and evidence based practices” (p. 614). If knowledge of handwriting research informs practice, we owe it to the students we do not serve to advocate for handwriting instructional practices that are unified, collaborative, research based, and effective.

Component skill remediation, or a bottom-up approach to remediation, is not as effective as a collaborative approach that includes practice sessions in a multitude of contexts (Cramm & Egan, 2015). Best practice remediation evidence supports teacher-therapist collaboration within all available and natural contexts, extensive practice experiences, and an intentional, holistic, and structured instructional method based on developmental growth and motor learning theory (Cramm & Egan, 2015; Graham, Harris, & Fink, 2000; Kemmis & Dunn, 1996, Schneck, Shasby, Myers, & DePoy Smith, 2012). The specific individualization of handwriting instruction that targets only individual and specific skills has not been shown to be as effective as consistent and repetitive practice, which supports a consultative or integrative approach to occupational therapy services in the school environment (Hoy, Egan, & Feder, 2011).

Collaboration and Parent Coaching

With an increased focus on the collaborative efforts to improve effective initial handwriting instruction for all students, occupational therapy intervention could be reserved for those children who have identified component deficits (Asher, 2006). Research supports collaborative consultation between teachers and therapists to improve student success for compensatory or remedial interventions (Kemmis & Dunn, 1996). This collaboration also needs to include parents. As a child’s first teacher, parents play a pivotal role in learning and development. Unfortunately, parents are not always aware of learning theory or evidence-supported interventions that can improve writing development (Beck, 2002). Parents rely on the

outreach and communication from teachers to be able to meet their child's needs. Without consistent or effective communication regarding the techniques and models used in formal education, parents are limited in their abilities to assist their children with improved performance at home. Parent beliefs about their roles in their children's education also has a direct effect on their level of involvement. Students whose teachers reach out to their parents see positive results from the combined efforts (Bartel, 2010). The triad effect of parent, teacher, and therapist collaboration supports student achievement. Collaborative support equips parents with the knowledge and confidence to work with their children at home, and sends a message of mutual respect and the value of education to the student (Beck, 2002).

Hoover-Dempsey, Walker, Sandler, Whetsel, Green, Wilkins, and Clossen (2005) correlated parent involvement with student achievement on such measures as grades and test scores, but also with teacher ratings of student competence. According to an extensive review of the literature on parent involvement, Cotton and Wiklund (1989) cite a positive relational correlation between student achievement and early intervention. The most significant effects are related to direct parent-child collaboration or tutoring models. The intensity of the parent-child instruction time has also been shown to positively correlate to student results. It should be noted that while parent training is a key component to success with a child's skill mastery, the scope and focus of the parent training should be specific and succinct, rather than extensive or time consuming, for the best outcomes (Bazyk, 1989; Hinojosa & Anderson, 1991; Novak & Berry, 2014). In the school system, parent involvement is a key component of local, state, and federal guidelines for school performance measures, and all Title I initiatives. All elementary schools in the designated district are identified as Title I schools by the State of Georgia.

Because the achievement gap is really a gap in learning opportunities, it is imperative that cities, schools, and school districts work to provide sufficient opportunities for all parents

to know what they need to help their children learn at home and in school, and to give higher priority to making sure they have the resources to do so (Bartel, 2010, p. 220).

Research supports the importance of parent to teacher, teacher to therapist, and therapist to parent collaboration as essential factors for student success. In an examination of parent perceptions of occupational therapy services, McCall and Schneck (2000) and Benson, Elkins, Wechsler, and Byrd (2015) confirmed parental desires for better communication, inclusion with decision making, support, educational training, and increased involvement with therapeutic interventions.

Occupational Performance Coaching has been identified as an effective intervention for improving academic and life skills. “Occupational Performance Coaching (OPC) is an enablement focused, parent-directed intervention designed for use by occupational therapists working with parents of children with performance difficulties” (Graham, Rodger, & Ziviani, 2010, p. 4). The intent of this approach is to improve a child’s occupational performance by providing parents the support, knowledge, and skill-specific training they need to be successful with current and future parenting needs. The difference between traditional home programs and Occupational Performance Coaching lies in the training and empowerment of parents to be able to problem solve solutions from the knowledge they have acquired from the collaboration. Coaching is a proven intervention to facilitate two-way communication, capacity building, and reciprocal growth (Dunn, Cox, Foster, Mische-Lawson, & Tanquary, 2012).

The research and remediation program attempted to incorporate the triad effect of parent-teacher-therapist coaching, collaboration, and improved communication to improve alphabet letter formation in kindergarten students and promote compositional skills. It is the improved awareness of student need and a strengthened alliance of support between parents, teachers, administrators, and therapists that has the power to affect changes in student skill acquisition.

Research supported knowledge of the impact and benefits of proper handwriting on student writing outcomes serves to strengthen the base of support for effective evidence based programs for all children in the classroom and in homes across the country.

The Centennial Vision of Occupational Therapy challenged therapists to “generate high quality evidence documenting its effectiveness and impact with children and youth” (AOTA, 2007, p. 613) and recognized the need for “research to inform occupational practice with children and youth, in the roles and participation of parents, siblings, and other family members within family centered services” (AOTA, 2006, p. 8).

Key Elements of Handwriting Instruction Interventions

Creek (2003, as cited in Kielhofner, 2006) states that it is “not uncommon that experienced occupational therapists use a wide range of techniques that appear to work, rather than appraising the research evidence” (p. 643). If we are to base therapy decisions and educational programs on sound principles we must perform, or be able to cite, research that supports the process. While there is a multitude of research citing the prevalence of poor handwriting, the importance of direct instruction, the lack of teacher training, the predictive correlation of poor handwriting to adult occupational performance, and the global effect of poor handwriting on school performance, there are few research studies that attempt to understand either the effects or role that a home program can play in skill mastery, or the parent perceptions of needed instructional support to be able to improve alphabet letter formation in their children.

Graham and Harris (2000) found that students who were at risk for writing problems and randomly assigned to a control group for extra alphabet letter instruction in addition to the regular classroom experience, exceeded their control group peers in handwriting and in overall writing skills. In the target school district, the provision of extra handwriting lessons or

instruction was only identified as a remediation strategy by 36.4% of surveyed teachers (Poole, 2016). The evidence supports remediation programs in general, but in order to design or recommend a home program, one must consider the complexity of the task. A remediation program must be based on relevant motor skill components, theoretical frameworks, and research support for key design elements. Best practices of a home handwriting program incorporate a top-down instructional approach with distributed, short periods of daily practice, explicit teaching, multi-modal presentations, self-evaluation, feedback, and opportunities to write from memory to promote automaticity (Cramm & Egan, 2015; Edwards, 2003; Fitzpatrick, Vander Hart, & Cortesa, 2013; Graham, & Harris, 2000; Graham, et al, 2008; Jones, & Christensen, 1999; Zwicker & Harris, 2009).

Practice is the most significant determinant to success in writing (Hoy, Egan, & Feder, 2011; Kaplan, 2010; Mackay, McCluskey, & Mayes, 2010; Poole, 1991; Zwicker & Harris, 2009; Zylstra & Pfeiffer, 2016). According to Zwicker and Harris (2009) and Hoy, Egan, and Feder (2011) the frequency of task-specific practice sessions varied from ten, to at least twenty for optimal learning and generalization to occur. In contrast, Feder, Racine, and Majnemer (2008, as cited in Hoy, et al., 2011) concluded that it is the handwriting practice alone that impacted improved performance, not the amount of time or methods. This concept was also supported by Schneck, Shasby, Myers, and DePoy-Smith (2012). The interaction between the person, a prescribed task, and environment played a key role in either promoting or inhibiting movement and learning, according to the Dynamic Systems theory. With extensive practice, instructor feedback, self-evaluation, and reinforcement, a home handwriting instruction program does support the theoretical framework of Motor Learning theory.

A moderate pace of instruction with complete coverage of all 52 alphabet letters was found to be more effective than a slower pace, or with a limited instructional exposure to only uppercase letters. The research group, which participated in the moderate paced curriculum, performed better with legibility, speed, and the development of handwriting automaticity than a group of students who received a slower pace of instruction (Fitzpatrick, Vander Hart & Cortesa, 2013). Through systematic review, best practices for handwriting instruction included teacher modeling, visual cues for sequential stroke formation, subsequent removal of visual cues when writing from memory, copying from a model, and verbal letter naming while writing. Each of these strategies targeted various sensory systems to promote memory retention. While not commonly used in school classrooms, students who were provided with visual cues, memory aids, or visual associations demonstrated significant improvement with letter formation. Each handwriting lesson gradually advances the skills of the learner by providing tracing and copying activities before beginning to write letters from memory. Child self-evaluation of individual letter accuracy was found to be effective for memory retention and skill refinement (Edwards, 2003; Hoy, Egan, & Feder, 2011).

Marr and Dimeo (2006) cited multiple benefits to summer handwriting instruction based on the results of their own occupational therapist-led remediation program. In the summer, parents and children have fewer time constraints and more time to collaborate for more focused and intensive instruction sessions along with greater practice opportunities. Based on literature reviews, expert opinion, historical perspectives, and an extensive review of both quantitative and qualitative studies related to the best instructional methods for home program design, a program plan of parent led handwriting instruction was formulated to meet the needs of students, parents, teachers, and therapists.

Parent Training Programs that Foster Capacity Building

Once weekly therapy does not meet the intensity dose requirement to promote neuroplasticity. However, authors Myrhang, et al, (2014) and Sakzewski, et al., (2013, as cited in Novak & Berry, 2014) conducted a meta-analysis which “conclude[d] that home programs [do] provide a pragmatic solution to achieving high dose therapy, thus overcoming the existing systemic implementation barriers” (p. 384). In contrast, without careful planning and thoughtful consideration of the parent needs in collaboration, home programs [were] not found to be “an effective method of augmenting the treatment provided by therapists” (Hinojosa & Anderson, 1991, p. 278).

With adults, the therapist’s role is that of a facilitator rather than content transmitter. A content transmitter relies on presenter skills, whereas a facilitator is a relationship builder. A facilitator can assess participant needs, encourage independent exploration, and link learners to available resources. For successful parent collaboration, a therapist mindset shift needed to occur whereby the parents were given decision power and control, as opposed to perpetuating their role as trained therapist extensions. This moved the relationship dynamic from therapist-centered to family-centered care. Family-centered care dictates an emphasis on the needs of the entire family, not just the child. Collaboration and parent participation were key components to realize this coaching mindset shift.

There was very little research evidence on parent views, the effectiveness of home programs, or parent training guidelines for academic endeavors that were grounded in research (Knowles, Holton, & Swanson, 1998; Novak, 2011). Most parent involvement literature was based on caring for children with physical disabilities or navigation of behavioral interventions associated with diagnosed behavior disorders or Autism Spectrum Disorders. To design a parent

training program that met the needs of parents and children, Knowles, Holton, and Swanson (1998) suggested that the emphasis should be “on experiential techniques that tap into experiences, and the ability to process, or apply the content” (p. 229).

An extensive literature review was conducted to incorporate cited training delivery elements into the parent coaching and training session. The works of Bazyk (1989), Berger (1994), Hinojosa and Anderson (1991), Kaiser and Hancock (2003), Knowles, Holton, and Swanson (1998), Lawrence-Lightfoot (2004), Novak (2011), Novak and Berry (2014), and Sassoon (2003) were instrumental in identifying the needs of parents in an educational setting, the delivery of content with an emphasis on participant exploration and personal application, the exploration of parent views about home program implementation, the recommended training formats, the handwriting teaching sequence, the duration and frequency guidelines, the need for supportive resources, incorporating parents as partners in education, and exploring educator roles at school and home for evidence-based critical decision making and program planning. Coaching and adult training research supported the use of both Acquisition and Motor Learning theoretical frameworks for adult and child concept mastery (Van der Merwe, Smith, & Vlok, 2011; Mackay, McCluskey, & Mayes, 2010)

Inclusion checklists were created from the literature review to assimilate the inclusion recommendations and research supported element considerations for effective parent training programs, home programs, and handwriting instructional programs (Appendix C). Each worksheet checklist represented the culmination of individual topic research that was used to design the parent training and handwriting home remediation programs.

Summary

Recent and historical literature, along with current survey research from the target school district, confirmed that 25-30% of students in kindergarten and first grade classrooms have poor handwriting. Despite evidentiary support for occupational therapist expertise, and successful outcomes with handwriting interventions, only 3% of students have access to therapy services. Limited access to therapy is driven in part by service delivery models in school systems, yet all school occupations are affected in some way by a child's handwriting abilities. Based on available data, there is a large unserved population of students who struggle with legible letter formation but do not qualify for direct occupational therapy services.

The education profession itself has demonstrated a fluctuating emphasis on the importance of this cornerstone skill. A multitude of studies cite the effects of poor handwriting skills on social, emotional, cognitive, educational, and behavioral performance abilities. Students with poor handwriting have overarching achievement limitations. The cognitive and attention requirements to remember how to form alphabet letters interferes with cognitive processing functions for academic tasks. Through the development of automatic handwriting, cognitive processes are available for information processing, composition, and problem solving. Automatic handwriting has a global impact on future academic success. Fluctuating emphasis on the importance of handwriting has contributed to poor student performance, in part due to teachers' limited experience with handwriting instruction methods and the dedicated time required to teach the content. Teachers use a blend of instructional approaches. The lack of a unified curriculum has the capacity to perpetuate poor letter formation, which can result in the automaticity of illegible handwriting from teacher to teacher and grade to grade. With greater

teacher support, training, and knowledge of effective instructional strategies, the problem of poor performance could be significantly improved.

Occupational therapists have a unique ability and responsibility to facilitate handwriting curriculum policy analysis and offer opportunities for instructional alternatives, stakeholder outreach, and collaborative problem-solving ideas for remediation. Despite direct service limitations for individual children, therapists often serve as a collaborative team member in many classrooms. With advanced knowledge in the complexity of the developmental progression of handwriting development, occupational therapists can design, instruct, and recommend instructional experiences that are evaluated to be effective, and which support the collaborative efforts between schools and parents.

Parents have needs related to training, confidence, and communication in the education of their children. Coaching is a recognized and effective intervention to meet student, parent, and teacher needs for improved academic skill mastery. The principles of occupational performance coaching were particularly relevant for this research due to the emphasis on therapist and parent collaboration and parent empowerment to affect change in their children's handwriting skills. Despite an extensive literature review, there were no current research studies that evaluated the effectiveness of parent coaching or home programs to improve kindergarten student's alphabet letter formation.

There were some clear, research-supported guidelines for the handwriting and home program designs, and inclusion criteria for the parent training experience. The most important contributing factors to improved handwriting skills are distributed, intentional, repetitious, and short daily practice sessions. A handwriting program should incorporate a top-down approach, consistent terminology with specific skill instructions, multi-modal presentations, constructive

feedback, opportunity for self-evaluation, opportunities to write from a model and then from memory at a moderate pace, succinct but comprehensive alphabet letter instructions, a sequence of 10-20 sessions, teacher modeling, visual and memory cues, verbal letter naming when writing, and a gradual system of skill advancement. Lessons with an emphasis on correct start position and stroke sequence that follow a similar movement pattern are beneficial to reinforce the motor skills required for groups of taught letters.

Home programs provide an opportunity to expand the instructional intensity of an intervention but are ineffective without consideration of parent and family needs. They must not alter the parent-child relationship, but rather be enjoyable, straightforward, short and concise, and repetitious. In addition, they should have imbedded collaborative goals, use evidence based interventions, and incorporate evaluative processes with supporting resources.

Parent training programs require a therapist mindset shift from content deliverer with expertise power to that of a co-participant or coach that facilitates the learner's capacity building for self-learning, exploration, and application. This occurs when parents make a conscious choice to participate, see value in the time expended, and view the training as collaborative in nature. Parents value opportunities within the training context to observe, model, and practice new skills with the students, with a recognized content expert using real life examples and illustrations. The parents desire specific details regarding the format of the training itself and the materials they will use with their children. A follow-up plan, resources, and a process to gauge child learning are important considerations for parent confidence building.

The literature review supported local data on the prevalence of poor handwriting skills among kindergarten students. Current research identified common contributing factors to poor performance, the correlation between handwriting skills and occupational performance, the role

of occupational therapy to remediate the problem, the value of parental empowerment to effect change in student achievement, and the best practice components of both parent training and home remediation programs to improve student handwriting. Without existing evidentiary literature support for the use of an occupational therapist guided, home handwriting program as an effective remediation intervention, further research was needed to determine the parental benefit and viability of this alternative intervention solution to reach the unserved population of students who struggle with alphabet letter formation in kindergarten.

Section 3: Methods

Project Design

This quasi-experimental research was designed to measure two preselected groups pretest-posttest outcome measures of the effectiveness of an occupational therapist guided, home handwriting instruction program on alphabet letter formation. The research study used pretest and posttest Test of Handwriting Skills-Revised (THS-R) data and parent surveys to explore the practical implications of using a home program as an effective intervention for improving handwriting skills for parent capacity building as the agents of change.

The intervention and control groups were comprised of teacher-referred students who were identified as having poor letter formation legibility based on screening and kindergarten grade level assessments (Referral Form-Appendix D). Following parental consent, both groups were administered the THS-R to obtain baseline standard and scaled scores for letters, words, and sentences. The quantitative data measured memory and copying skills. The control group participated in both pre-test and posttest evaluations but did not participate in the occupational therapist guided remediation program, per parent request. The intervention group of students completed both the pre-test and posttest THS-R evaluations and completed the seven-week remediation program with their parents as the supplemental educators. Intervention group parents also completed a post-program survey and agreed to complete a three-hour training session prior to program implementation.

Using parent survey research and participation/instruction time logs, the study examined parent perceptions of the child's initial abilities and letter formation progress, the ease of the program, the time commitment involved, the instructional needs of the parents, and parent confidence in their role as a supplemental educator. The design of the intervention plan

(therapist), participant selection (teacher), and parent agreement for research participation improved the collaborative efforts between teachers, parents, and therapists to support and encourage growth of handwriting performance for those students who did not receive OT services, and yet received a rating of “not yet demonstrated” or “emerging” in the performance standard of alphabet letter formation legibility on state designated kindergarten performance measures (Georgia Department of Education, 2016a).

Setting

The setting included three public school kindergarten classes, from three different rural elementary schools that the participant students attend, and included their homes in northwest Georgia. The rationale for the selection of these classes and elementary schools was based on investigator knowledge of the subject’s prior handwriting instructional exposure. In each of the classrooms, the occupational therapist led the initial weekly handwriting instruction sessions based on the Handwriting Without Tears curriculum design. Each week the teacher replicated the daily lessons and provided opportunities for classroom review with practice sessions. By alleviating variables in the teachers’ handwriting instruction methods, letter sequence instruction, knowledge, materials, instructional language, and consistency using the Handwriting Without Tears program, these classrooms were purposefully selected to address fidelity and to alleviate any potential Type 1 errors. With parents as the primary supplemental educators of the program, the student’s homes served as the primary setting of the research study.

Participants

A convenience sample of kindergarten students was selected from three specific rural elementary schools in northwest Georgia; selected students also met the inclusion criteria of attending a school classroom where:

- a) knowledge of alphabet letter formation was guided by the Handwriting Without Tears (HWT) program and delivered at least in part by an occupational therapist,
- b) the primary teacher followed the principles of HWT in daily handwriting practice,
- c) the child was referred by his or her home room teacher based on poor handwriting skills evaluation data,
- d) the child's parent(s) agreed to participate in the supplemental remediation program,
- e) the parent(s) agreed to participate with survey research and participation logs, and
- f) the parent(s) agreed for his or her child to participate in two standardized handwriting evaluations.

Participant referrals (Appendix D) were generated by teachers as a result of poor student alphabet letter formation based on poor classroom work samples, and included those students who have “not yet demonstrated” or demonstrated “emerging” writing scores on year-end handwriting standards of the Georgia Kindergarten Inventory of Developing Skills (GKIDS) assessment or those students who scored below a 70% on the Screener of Handwriting Proficiency at the end of the year collection data point (Handwriting Without Tears, 2015). GKIDS mastery domains were based on Georgia Department of Education English-Language Arts standards ELACCKL 1a, 2c, 2d, and ELACCKW 1, 2, and 3 (Georgia Department of Education, 2016a). Teacher identified and referred students who met the criteria for inclusion and whose parents agreed to allow child participation in the two handwriting evaluations, but declined to participate in the remediation program, became designated as control group participants. The intervention group was comprised of those students whose parents consented for both pretest and post-test handwriting evaluations, participation in the 7-week remediation program, and parent participation for survey data collection of their perceptions and experiences.

Exclusion criteria for both groups included those students who have had physical motor impairments, educational, or medical diagnoses that inhibited motor control of utensils, or those children who received more than two-hours per day of special education services. Participant selection grouping is outlined in Figure 1.

Methods

Students in the three target classrooms received consistent weekly handwriting instruction using the Handwriting without Tears curriculum from the occupational therapist. The teachers were trained in and used the Screener for Handwriting Proficiency to collect three points of performance data in September or October, January, and April. The screener results identified the students who struggled with alphabet memory, orientation, and baseline placement. The teachers also administered the GKIDS assessment (Georgia Department of Education, 2016a) in the same three time frames. Based on the combination of these two types of assessments and observed classroom performance, teachers generated a list of students who would benefit from remedial instruction.

The child's homeroom teacher made the initial contact to inform parents of their child's difficulty with handwriting and poor alphabet letter formation. During an end of school year conference, the teacher and therapist offered parents the opportunity to participate in the summer remediation program and provided consent documents to consider research participation. Written information regarding the remediation program design, research study, purpose, objectives and implementation plan was provided and translated in Spanish, as required for thorough understanding. The conference provided an opportunity to discuss the child's handwriting difficulties, testing results, purpose and methods of the proposed program, and the parent's participation role in the research. "The Parental Consent Agreement for Minor's

Participation in a Research Project” was included in the handout materials (Appendix E). The consent agreement outlined specific requirements for both the parent and child regarding time commitment, purpose of the research, program specifics, potential benefits and associated risks, timelines, and expectations. Parents were given the information to consider and asked to return the consent agreement, Survey One (Appendix F), and a preferred contact card for future correspondence. All parents were given Survey One to collect demographic data, determine the child’s previous handwriting exposure and experiences, and to further identify the parent perceived difficulties of children who struggle with alphabet letter formation, despite dedicated and consistent evidence based instruction practices. The parent contact form included the student’s date of birth, parent first names, preferred contact methods, applicable phone or email addresses, and an opportunity to select the best days or times for remediation program training.

The teacher collected all documents and forwarded them to the researcher. To address confidentiality, following receipt of parent consent forms and the sealed initial parent survey, the researcher generated a list of student and parent first names with corresponding contact preferences to set up the training program. All other participant related documents, consent forms, surveys, referral forms, and pretest booklets for each child were delivered to the faculty advisor, Dr. Colleen Schneck, at Eastern Kentucky University for generation of the random identifier codes that would replace all identifying information to blind the researcher from participant identities for all outcome measure instruments. The faculty advisor maintained a record of the random codes assigned to student and parent participant identifiers in a password protected computer file and in a locked research file cabinet. One printed copy of the matched codes with identifier information was placed in a research file and locked with the participant

files. The parents were identifiable only by first name and phone number for all correspondence and contact with the researcher.

Prior to implementation of the home program, both groups of students were evaluated using the Test of Handwriting Skills-Revised to obtain baseline handwriting standard scores for all ten subtests. Each child was asked for assent to participate using a designated written script (Appendix G). Following the reading of the assent agreement, and child confirmed understanding along with agreement, the researcher wrote the word “Agreed” on the bottom of the child’s test booklet to document consent. After the handwriting evaluations were completed, they were bundled and sent to Eastern Kentucky University for confidentiality coding prior to scoring. The coded pretest booklets were scored as a group by the researcher and returned to a locked cabinet to await results tabulation and analysis.

Intervention group parents were contacted individually to determine the best location, time, and date for home program training. Three date and time options were initially selected, and two additional training opportunities were added to meet last minute parent scheduling conflicts. Upon completion of the training, parents completed a post-training survey to determine their confidence in parent coaching and perceptions of the training session, lesson materials, teaching resources, and training effectiveness (Appendix H). They were also instructed to keep a log of the amount of time spent in instruction for the corresponding daily lessons (Appendix I).

The first three weeks of the remediation program focused on review of uppercase letters. The fourth week coincided with the fourth of July holiday, so it was designed as a review or break week. Weeks five through seven concentrated on correct lowercase letter form. Parent phone contact occurred two weeks from the start of the program, and again at four weeks to

check for understanding, difficulties, needs, or additional resources. The final phone contact occurred between weeks six and seven of the program. The final contact was designed to remind parents to complete the post program Parent Survey Two (Appendix I) and the instruction time log. A self-addressed envelope was provided in the training manual and designated with kit number codes to ensure return of all sealed surveys and time logs without breach of confidentiality before participant code numbers could be affixed by the faculty mentor at Eastern Kentucky University.

The posttest evaluation (Test of Handwriting Skills-Revised) was performed for all student participants between August 14- 31, 2017 at the students' home schools. Following posttest evaluation completion and receipt of parent surveys and time logs, the documents were sent by return receipt mail to EKU for replacement of identifiable information with participant code numbers for each document. Upon return receipt of all coded participant documents the posttests were scored for comparative data analysis.

Comparative data analysis was performed to answer the primary research question of whether a home handwriting instruction program was effective to improve student performance with alphabet letter formation. Group data analysis from the survey measures also addressed the overarching research question of home program effectiveness and parent perceptions of student benefit. Based on the pre-test and posttest comparative standard scores, the statistical analysis determined whether both groups were homogeneous before the intervention despite a lack of randomization, evaluated the natural effect of maturation compared to intervention group change scores, and compared mean handwriting evaluation standard change scores between groups and subtests, to determine program effectiveness. Copy and memory subtests scores were individually calculated to evaluate skill specific improvements. The abbreviated THS-R score

was calculated for each participant to determine if there was a difference between letter formation mean change scores when memory abilities were eliminated.

Outcome Measures

All students were evaluated using The Test of Handwriting Skills-Revised (THS-R) to determine baseline, maturation, and post-program levels of performance with the formation of uppercase and lowercase letters, words, and sentences. Alphabet letter formation was assessed based on formation memory in alphabet sequence, out of alphabetical sequence, from a copied model, and from dictation for both cases. The THS-R also measured the speed of handwriting, spelling, and number formation, but for the purposes of this research project those subtests were not included for comparative data analysis. They were only included in the overall standard score for purposes of homogeneity analysis and total growth change scores.

“The THS is a test to measure how a child produces motorically with his or her hand, letters of the alphabet and numbers from memory and by copying. It is not a test to measure a child’s memory of language symbols. Since the purpose of the THS is to assess a child’s handwriting skills, both weaknesses and strengths. The purpose is also to plan, based on the area(s) of weakness, a remedial program. The goal of remediation is to improve a child’s legibility of letters and words and numbers (Gardner, 1998, p. 11).

The THS-R was designed to recognize the elements of D’Nealian, Palmer, and Zaner-Bloser as the most common instructional curricula used in today’s classrooms. This was significant due to the recent transition of the curriculum model in the research setting from D’Nealian to the Zaner-Bloser method this past school year. The THS-R measures ten subtests of handwriting, for children from 6 to 18 years of age. It provides normative data, standard scores, scaled scores, and percentile rank. In manuscript subtests, the reliability coefficients ranged from .61 to .85 across

all ages, and the “test-retest coefficients provide evidence that the use of the THS-R is sufficiently stable over time” (Milone, 2007, p. 59-60).

To define, identify the scope and common characteristics of those struggling hand writers at the end of kindergarten, two parent surveys were used to assign quantitative values for subjective or perceptive responses. Both parent surveys used numerical response selections and Likert scales for comparative numerical analysis. The first parent survey (Appendix F) addressed the identification of common characteristics in students who struggle with legible alphabet letter formation for both control and intervention groups of children. The survey was designed to establish demographic data, the child’s prior writing experiences, influences, and each parent’s perception of his or her child’s handwriting problem areas. The survey was completed at the time of parent consent and before the start of the remediation program for the intervention group.

The second survey (Appendix J) was provided to the parents of the intervention group students. Survey Two questions explored parent experiences in using the home program, perceived program effectiveness, child performance, time commitment, component evaluation of the instructional materials, and the parent’s confidence as the supplemental educator. Parent survey research complemented the quantitative pretest-posttest outcome measures to obtain a comprehensive view of the home program components, effectiveness of the instructional methods and the parent training program. Based on the remaining research objectives, Survey Two was also used to explore the effects of collaborative remedial interventions, parent coaching, and it attempted to determine if an occupational therapist designed home program was a beneficial and effective intervention strategy to improve student handwriting performance.

Data Analysis

Comparative data analysis was performed to answer the primary research question of whether a home handwriting instruction program was effective to improve student performance with alphabet letter formation. Group data analysis from the survey measures also addressed the overarching research question of home program effectiveness and parent perceptions of student benefit. Based on the pre-test and posttest comparative standard scores, the statistical analysis determined whether both groups were homogeneous before the intervention despite a lack of randomization, evaluated the natural effect of maturation compared to intervention group change scores, and compared mean handwriting evaluation standard change scores between groups and subtests, to determine program effectiveness. Copy and memory subtests scores were individually calculated to evaluate skill specific improvements. The abbreviated THS-R score was calculated for each participant to determine if there was a difference between letter formation mean change scores when memory abilities were eliminated.

Independent-samples *t*-tests, paired samples *t*-tests, mean change with standard deviation, and Cohen *d* statistical data were analyzed with IBM SPSS Statistics (Version 24; IBM Corporation, Armonk, NY) to answer the research question;

1. Is there a significant improvement in alphabet letter formation accuracy upon completion of a home handwriting remediation program for struggling kindergarten students who do not receive occupational therapy services?

To answer the research question of the effectiveness of the intervention, the mean change (posttest minus pre-test values) in participant standard scores were compared between the two groups using paired sample *t*-tests. Independent sample *t* tests were performed to ensure homogeneity of the two groups. The full scale THS-R standard score and individual subtest

scores were calculated for both tests for each participant to determine the mean gain of the group, the standard deviation, and *t* test results. According to Cohen (1988, as cited in Marr & Dimeo, 2006, p. 12), an effect size of .50 or greater indicated an improvement [in performance] that is clinically valuable.”

To analyze the parent survey data responses, each answer was converted to a numerical value. The numerical values of the initial parent survey responses provided the mean results for student demographic, instructional exposure, and common characteristics of the entire child-participant population. Parent Survey Two answers were also converted to numerical values. These Likert scale and limited numerical response questions/answers were used to generate group mean scores for each survey question. Standard deviation results were calculated with age and group mean scores. Survey Two results revealed how the parent participants perceived program effectiveness, ease of use of the home program, beneficial elements, instructional material satisfaction, and student progress.

Ethical Considerations

The importance of a collaborative approach with the teacher and parents served to build trust and instill a level of confidence in the therapist’s ability to identify the child’s difficulties and create a remediation plan to meet those needs. Through informational materials and collaborative conference, parents were introduced to the concept and availability of supplemental instructional resources, and provided with the ability to participate in the research study to advance knowledge for future remediation options. The introduction letter included information regarding the purpose, process, and procedures of the study along with the consent agreement. Potential issues of ethics were minimized with the inclusion of an informed consent agreement document, specific education regarding the purpose of the interventions, and research study

objectives (Creswell, 2014). Since the consent form was included in the informational packet and discussed at the conference, parents had an opportunity to ask specific questions of the researcher and had no time limit for home consideration for participation. There was no external pressure to participate, which is an important ethical consideration for obtaining research participants.

In selection of the research participants it is “critical that the persons who make up the sample in an experiment are representative of the population from which they are drawn” (Nelson, 206, p. 66). Students were selected from three different schools and classrooms where school children are randomly assigned to individual kindergarten classrooms. The individual schools should have been representative of the demographic population as regular education students in this school district are served at home designated geographic locations. In addition to parental consent signature documents, the students were asked to assent to participation. The scripted assent document was read and marked for agreement prior to any active research participation or evaluative data collection. Both parent and child consent agreements indicated that participation was entirely voluntary, and the consent could have been withdrawn at any time. Four parents did change participant preference and opted to move from the intervention group to the control group for convenience. Intention to treat analysis was performed.

The pre-test and posttest was administered to all participants. The participant inclusion criteria were very specific, which limited numbers but designed to target a specific population of students who did not respond to traditional educational methods, did not receive occupational therapy services, but had all been instructed in the same manner by the same instructor with the same program and under the same conditions to reduce the effect of confounding variables. While the students were not randomly selected from classroom attendance rolls, the placement in

designated groupings was variable and dependent on parent preference for their level of engagement, up until the week of implementation.

The research plan and home program participation demonstrated no greater risk of harm than would be experienced during an ordinary school day for the students, and no more harmful than a typical day parenting a kindergarten child for the adult participants. While unlikely, the child could have been identified as having difficulty with handwriting among his/her peers; however, performance of the remedial activities at home and over the summer minimized this exposure. To minimize or protect against the potential risk of parental feelings of instructional inadequacy, parents were specifically trained by the researcher on how to instruct the handwriting lessons. Parents were provided a three-hour training class with the child in attendance to practice the delivery of individual lessons. Additionally, they were provided with very specific lessons, examples, resources, and visual aids for each lesson. The child's remedial instruction took place outside the school environment, and confidentiality measures were put in place to protect child and parent identities. For further protection against potential harm, each child was evaluated using a standardized norm-referenced evaluation instrument. The home program is a recognized evidence based handwriting instruction method. The researcher was blind to all participant and parent identifiable data or responses due to faculty mentor coding replacement for all researcher viewed documents. The doctoral mentors and a statistical adviser were consulted for validity of the reported data.

Prior to implementation, approval to conduct research was obtained from the identified school district, the involved elementary school administrators, and participating teachers.

Handwriting Without Tears developer Jan Olsen granted permission for the use of the program

and provided its components as the basis for the home instruction program. Institutional Review Board approval was obtained through Eastern Kentucky University.

Fidelity

With the use of a parent instructed home program of handwriting intervention, there could be potential issues that cause the program to not be administered as planned or designed. According to Nelson (2006) this creates a “problem of fidelity, where all participants are receiving the exact same experience” (p. 67). There existed a potential problem of delivery, where there could be variance in the amount of time parents spent on the instruction, a problem of receipt where the child did not fully engage with the parent as an instructor, and the potential problem of enactment, where both the parent and child did not follow the instructions for the proper use of the materials. Ultimately, when the variable being measured is not standardized and monitored, such as with a home program, every problem of fidelity has a potential to exist. The threats to validity and fidelity were addressed through a) standardized parent training, b) standard instructional materials, c) specific lesson instructions, d) a provided visual and written outline sequence of the daily prescribed lessons, e) the use of an evidence based curriculum, f) the use of a parent time log to monitor instructional time, and f) a test- retest reliable evaluation instrument, which had been used for a similar research study involving kindergarten students, and a handwriting remediation program (Marr & Dimeo, 2006).

Timeline

Month	Activities
September October 2016	<ol style="list-style-type: none"> 1. Began weekly alphabet letter formation lessons to 3 kindergarten classes using the Handwriting Without Tears (HWT) curriculum and teaching methods. 2. Taught kindergarten teachers how to administer the Proficiency screener from Handwriting Without Tears (HWT) and assisted in screening students for the first data collection period.

November	<ol style="list-style-type: none"> 3. Completed school system request to conduct research 4. Developed letters of informed consent for parents. 5. Developed parent Survey One to address objective one- exploration of the common characteristics of struggling hand writer. 6. Developed post-program parent Survey Two to assess the perceived benefit of the program for the parents, based on objective two. <p>Completed IRB Proposal Draft</p>
December	<ol style="list-style-type: none"> 1. Contacted Jan Olsen of HWT to discuss the use of their methods and materials for the research plan, and determine if they would provide the materials for each summer kit. 2. Completed Research proposal 3. Began development of parent tracking logs of student participation. 4. Began development the parent information brochure
January 2017	<p>Assisted teachers to perform mid-year screening using the HWT screener</p> <p>Jan Olsen provided agreement for full support of the research with provision of all required materials to create the home program kits for the intervention group of students.</p>
February	<p>2/6//17 IRB application submitted for expedited review Revisions completed for final IRB submission 2/22/17</p>
March	<p>3/9/17 IRB approval received to conduct research through Eastern Kentucky University</p>
April	<ol style="list-style-type: none"> 1. Obtained end of year screening results from the teachers. 2. 18 prospective students were identified who failed to meet kindergarten standard for legible letter formation based on the HWT screener and/or the GKIDS assessment. 3. Began development of the parent training course.
May	<ol style="list-style-type: none"> 1. Met with parents and teachers to describe the research plan and available summer instructional program to determine group participants. 2. Obtained informed consent signatures for 16 parent and child participants. 3. Parent permission received to evaluate 16 students with the Test of Handwriting Skills-Revised (THS-R). 4. 16 students assented to participate in the program and/or evaluation. 5. Evaluated 16 student participants with THS-R between 5/15-5/22/17. 6. Created student instructional materials (individual home program kits). 7. Developed parent instruction manual. 8. Three parent training courses completed 5/22-5/30/17.
June	<ol style="list-style-type: none"> 1. Eight parents and their students completed the home program training session. 2. Eight parents chose to decline training in favor of control group designation. 3. Eight parents completed surveys on training program effectiveness.

	<ol style="list-style-type: none"> 4. Pre-tests, surveys, referral forms, consent documents, and all participant identifying information delivered to ECU faculty advisor for confidential coding and creation of participant research files. 5. Parent training survey data tabulated. 6. The 7-week remediation program began on June 5, 2017, extending to at least July 21, 2017 or until completion based on vacation breaks. 7. Parent contact 6/21/17 to check on progress/ concerns/ problems.
July	<ol style="list-style-type: none"> 1. Parent contact 7/5/17 to discuss mid-program needs. 2. Final parent contact 7/27/17 to remind completion of post program parent survey, time logs, and address any questions or concerns. 3. Pretest THS-R evaluations scored in bulk and locked.
August	<ol style="list-style-type: none"> 1. Survey One results tabulated. 2. Students returned to school August 8, 2017. 3. Collected survey and time log sealed envelopes through multiple parent contacts 8/8-9/14/17. 4. Posttest THS-R Handwriting evaluation for both groups completed between 8/14-8/30/17 for each student.
September	<ol style="list-style-type: none"> 1. Posttest and survey results sent to ECU for confidential coding and returned 9/9/17 for scoring. 2. Posttest evaluations scored as a group and locked. 3. Compilation of research data.
October	<ol style="list-style-type: none"> 1. Finalize the capstone document.

Summary

Taylor, Suarez-Balcazar, Forsyth, and Kielhofner (2006) identified principles for implementing research in Occupational Therapy. The research evaluated the effectiveness of home programs, parent coaching, and the viability of an occupational therapist guided home program as a potential means to improve access to occupational therapy through non-traditional service delivery models. The study explored the notion that an occupational therapist designed home handwriting remediation program could improve student achievement, empower parents, support teachers, and provide long term occupational benefits for those students who struggled to write legibly by the end of the kindergarten year despite intentional, dedicated, and evidence based instructional practices. The goal of the plan was to explore alternative methods for students and parents to learn how to learn, in non-traditional ways. The research combined with handwriting program implementation was designed to improve teaching and learning skills for all participants. Occupational therapists use research to inform practice, while simultaneously using evidence based practices to stimulate further research. This quasi-experimental two group pretest posttest research blended the principles of education and occupational therapy research to explore commonly used home program practices as the basis for evidential validation and to inform future therapy interventions.

The selection of a quasi-experimental design was dictated by the inability to randomize the subject participant groups. The sample size was significantly limited by the selection criteria to minimize as many confounding variables as possible. Comparative group research, whether true experimental or a quasi-experimental, attempts to evaluate causality of an intervention. As a pilot effectiveness study, this plan met the criteria for quasi-experimental research due to the administration of one planned independent variable (the home program), the confounding

variables being minimized by the inclusion criteria, the dependent variable (handwriting evaluation test scores) as standardized and given to all child participants, and the “experimental hypothesis tested [was] the probability of a causal effect,” (Nelson, 2006, p. 65). The control group added valuable information regarding the characteristics of struggling kindergarten students regardless of parent ability to participate in the remediation program, and established homogeneity of the two groups at pre-test.

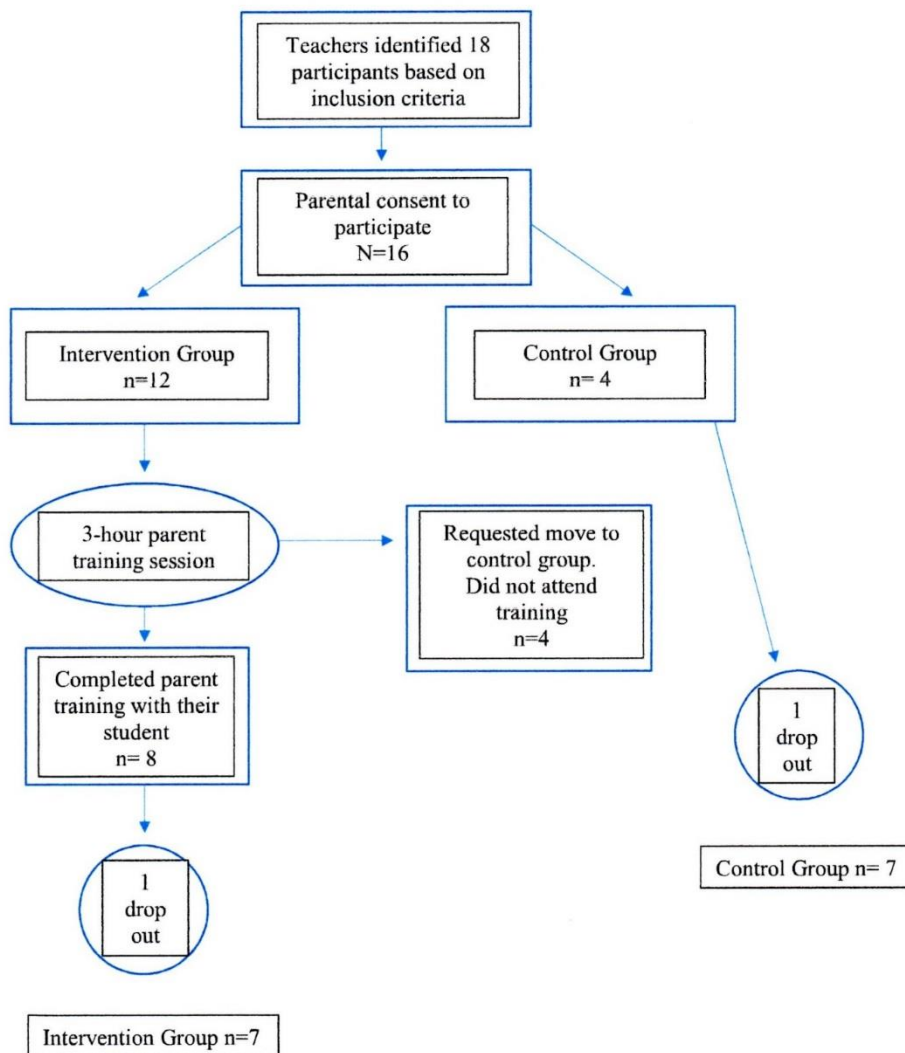
The Test of Handwriting Skills-Revised was standardized, valid, and reliable for the population sample, and administered by the same experienced evaluator. Confidentiality was protected due to researcher blinding. Fidelity of the intervention was addressed through an implementation manual, parent training session, and schedule of daily lessons. Parents were instructed in the program implementation with the student present, and were provided with coached opportunities to deliver individual lessons from each letter formation group. Standard statistical methods were utilized to determine mean change of standard and subtest scaled scores and standard deviation. An IBM SPSS version 24 statistical program was utilized to determine significance values. Parent perception survey responses that explored the effectiveness of the training, and student responses to the intervention were converted to numerical values for mean and standard deviation calculations. Intention to treat analysis was completed and result values reflect the population served regardless of the level of program completion.

Section 4: Results and Discussion

Student Characteristics

From eighteen identified and teacher-referred students, sixteen children and their parents consented for participation (89%). Fourteen (78%) (N = 14) completed the respective duties for inclusion in the intervention (n = 7) and control groups (n = 7). The flow of participant inclusion and group selection is illustrated in Figure 1.

Figure 1. Flow of Subject Group Selection



From the original eighteen referrals, two parents initially declined interest in participation (N=16). Intention to treat (ITT) analysis was performed. By the end of the intervention stage, one family moved out of state and one parent did not adhere to the treatment protocol. Specific child characteristic survey results were based on the full inclusion group (N=16). Post program test results and parent survey responses for both intervention and control group were based on group designation and program protocol adherence (n=7) (Table 1).

Based on parent survey results, the characteristics of students who failed to meet kindergarten standards for handwriting but who did not qualify for occupational therapy services had a mean age of 6 years, 3 months by May of their kindergarten year. Fifty-six percent were right handed (n=9), 38% were left handed (n=5), and 6% continued to use both hands (n= 1). Participant ethnicity, socioeconomic status, and independent living status did not have a direct bearing on the intended research questions and was not included in the survey questions. Preschool attendance was reported for 88% of children (n=14), with 44% of children receiving handwriting instruction prior to kindergarten (n= 7). Eighty-one percent of students were attending kindergarten for the first time (n= 13). Parents reported that 81% of children received additional handwriting instruction outside school settings with the parents and family members as the most common provider (n= 13). Parent perceptions of alphabet letter mastery for both upper and lowercase letters was varied, but they reported 88% of children wrote at least some letters backward (n= 14), and 13% wrote letters upside down (n= 2).

There is a common perception that the mastery of geometric shape drawings is an indicator of the ability to form alphabet letters (Daly, Kelley, & Krauss, 2003; Goyen & Duff, 2005). Between 93% and 100% of the subjects could draw a closed circle, square with four exact corners, and a triangle with three identifiable angles and yet intervention group THS-R mean

scores placed their handwriting performance between the 25th and 27th percentile for letter form accuracy.

The most difficult letters to form were those capital letters with diagonal line segments or those with curved components. Lowercase letter formation difficulties were described as more individualized, with 25% of parents reporting that “all” lowercase letters were difficult for their children to write (n=14). Parents reported that 44% of their children had poor knowledge of what the alphabet letters look like from memory (n= 7), and another 38% of children had handwriting difficulties due to inadequate attention, or task haste for proper letter formation (n= 6).

Regarding reported inattention, 19% of children were identified as having a medical or physical problem that could have contributed to poor performance. In those identified cases, the provided diagnosis was Attention Deficit Disorder or hyperactivity. However, 81% of parents denied any medical or physical cause for handwriting difficulties. On a Likert scale of one to five, with one indicating unreadability, and a score of five indicating legible, proper letter form, the mean score for parent perception of child proficiency with alphabet letter formation was 3.46 (SD .72) at pretest.

Parent Perceptions

Intervention group parents were overwhelmingly supportive of the use of the home remediation program as a potentially effective way to improve children’s handwriting (n= 7). Eighty-six percent of parents felt the seven-week duration of lessons was adequate to complete the program without being rushed for completion (n= 6). All parents reported improved alphabet letter formation and readability of written text, and 86% of parents reported improvements with a reduction in the formation of upside down and backward letters (n= 6). Improved name writing

was reported for 57% of children (n= 4). All parents supported the availability of the handwriting program as a provided check-out resource in school parent resource centers.

The parents spent an average of 25 (SD 9.8) minutes per day in instruction but individual reported times ranged from nine to forty-three minutes per day, over the course of seven weeks. Despite provision of extensive video tutorials and digital teaching resources, only one parent utilized the additional digital teaching supports. Even with reported progress and perceived effectiveness of the remediation, 57% of children still had difficulty with the formation of some letters at program completion (n=4). The most reported letters of difficulty at program completion fell into the uppercase teaching groups of curved letters such as C, O, Q, D, G, P, B, R, U, S, and J, (n= 3) and those uppercase letters with diagonal line segments such as A, K, M, N, W, X, Y, and Z (n= 2). Persistent lowercase letter formation difficulties were reported in letters which start like a “c” such as a, o, d, g, q, and s for 57% of children (n= 4). These difficult formation groupings remained consistent from pretest to posttest parent surveys.

By program completion, six of seven parents reported a moderate level (rating of 3 on a 4-point scale) of improvement, indicative of a need for more practice and specific letter review to achieve full alphabet formation mastery. All parents felt the amount and format of the training session had been adequate to meet their needs as the supplemental educator. With universal parent agreement (n=7), the provided manual and kit of instructional materials was easy to understand and provided the support they needed to teach each lesson. With the provision of a progressive four-point rating scale, whereby a score of three indicated the parent was somewhat confident, and a rating of four indicating complete confidence in instructional abilities, the parents reported a confidence level of 3.71 (SD .45).

Table 1. Parent Reported Student Characteristics

Parameter	Whole Group N = 16	Intervention Group n =7	Control Group n =7	Parameter	Whole Group	Intervention Group	Control Group
Mean Age (months)	75	74	74.6	Uppercase letter formation accuracy			
Gender Male	n= 9	n= 4	n= 4	1-5 letters	21%		43%
Female	n= 7	n= 3	n= 3	6-10 letters	14%	29%	
Hand Dominance				11-16 letters	21%	29%	14%
Left	38%	21%	43%	17-21 letters	7%		14%
Right	62%	71%	43%	22-26 letters	36%	43%	29%
Mixed	6%		14%	Lowercase letter formation accuracy			
Attend Pre-K	88%	86%	86%	1-5 letters	7%		17%
First K yr.	81%	71%	100%	6-10 letters	15%	14%	17%
HW instruction before K				11-16 letters	15%	29%	
Yes	43%	57%	29%	17-21 letters	38%	14%	66%
No	38%	29%	57%	22-26 letters	23%	43%	
Unsure	19%	14%	14%	Most difficult letters to form -Uppercase			
Supplemental Instruction				Straight line letters	14%	29%	33%
Yes	86%	71%	100%	Those with Curves	21%	29%	33%
No	14%	29%		Those with diagonal lines	21%	43%	33%
Supplemental Instruction Provider 100%				All of them	7%		
Parents/Family	99%		100%	No report	36%		*only 3
Tutors	1%	86%	+tutor	Most Difficult letters to form- Lowercase			
Writes first name correctly	89%	100%	100%	Those that start with "c"	14%	20%	25%
Draws closed circle	94%	100%	86%	Below baseline			
Draws a square	100%	100%	10%	Tall letters	7%		25%
Draws a triangle	100%	100%	100%	Diagonal line segments	7%	20%	
Writes letters backward	88%	100%	71%	Connected humps			
Letters upside down	13%	0%	29%	No specific group	14%	20%	25%
Med/Physical problems that cause HW difficulties				All of them	21%	40%	25%
Yes	19%	14%	14%	Causes for poor handwriting			
No	86%	86%	86%	Poor pencil grasp	21%	25%	10%
				Poor memory	36%	38%	20%
				Baseline placement	21%	12%	10%
				Upside down/backward	21%		30%
				Writes too fast/inattentive	36%	25%	30%
				Pretest Likert rating of handwriting legibility			
					3.5		3.7
					SD	3.3	SD
					(.75)	(.45)	(.94)

Note: 5-point Likert Scale 1= Unable to read, 5=Able to read & letters formed properly

Program Effectiveness

By design of the participant selection process through teacher referral and the need to have parents agree to be co-participants, group designation was not randomized except to the extent that child group placement was randomly designated by parent participation preference and consent. For statistical purposes, homogeneity of the two-group pre-test THS-R scores was determined through an independent-samples t-test. There was not a statistically significant difference in the two groups with intervention (M = 89.57, SD =12.12) and control (M = 92.00, SD = 8.44; $t(-0.43)$, $p = .67$, two-tailed) group mean standard scores at pre-test. There were also no significant differences between the groups at posttest. Comparative mean change standard and scaled scores, t test, and Cohen d values between groups are outlined in Table 2.

Table 2. Mean Change THS-R Scores Between Groups

Group	Parameter	Test of Handwriting Skills- Revised							
		Full Scale Scores THS-R					Abbreviated Copy THS-R		
		Pretest	Posttest	Mean change	<i>t</i>	<i>d</i>	Pretest	Posttest	Mean change
Intervention Group	Standard Score (SD)	89.6 (11.2)	101.4 (9.6)	11.8	6.175 (p < .05)	1.049	96.4 (15.8)	110 (13.9)	13.6
	Scaled Score (SD)	8 (2.4)	10.3 (2.0)	2.3			9.6 (3.1)	12.4 (2.7)	2.8
	Percentile Rank	25 th	53 rd				39 th	75 th	
Control Group	Standard Score (SD)	92.0 (7.8)	100.7 (12.2)	8.7	2.276 (p > .05)	.785	101.6 (13.0)	111.3 (16.5)	9.7
	Scaled Score (SD)	8.4 (1.5)	10.1 (2.4)	1.7			10.4 (2.6)	12.4 (3.2)	2.0
	Percentile Rank	30 th	53 rd				53 rd	77 th	

Cohen d calculations from <https://www.uccs.edu/lbecker/index.html#meansandstandarddeviations>

To determine if the remediation intervention was effective to improve student THS-R mean standard handwriting scores, paired samples t-tests were conducted (Table 3). The hypothesis that the intervention group mean change standard scores would exceed the control group was supported and were statistically significant ($p < .05$). The control group demonstrated improved mean change scores from pretest to posttest ($M = 8.71$, $SD = 10.12$) but the results were not statistically significant ($p > .05$). Students in the intervention group demonstrated a statistically significant increase in full scale THS-R scores from pre-test ($M = 89.57$, $SD = 12.12$) to posttest ($M = 101.4$, $SD = 10.39$), $t = 6.175$, $df (6)$, $p = .001$ (two-tailed).

Table 3. Group Mean Change Paired Samples Test

Group	Mean Change	SD	Std. Error Mean	95% Confidence Interval of the difference		t	df	Sig. (2 tailed)
				Lower	Upper			
Intervention Pretest- Posttest	-11.857	5.0803	1.9201	-16.5556	-7.1586	-6.175	6	.001
Control Pretest- Posttest	-8.714	10.1277	3.8279	-18.0809	.6523	-2.276	6	.063

The intervention group mean increase in THS-R scores was 11.85 (SD 5.08) with a standard error mean of 1.92, and within the 95% confidence interval of the difference. At posttest, control group mean change standard scores were slightly less (8.7) than the intervention group (11.8) and the value change was statistically significant. This improvement was also supported in scaled score mean changes. For the intervention group, the gain in standard scores correlated to percentile ranking improvement from the 25th to the 53rd percentile.

Scaled scores “are typically used to compare subtest scores across age groups or tests” (Milone, 2007, p. 39). To accurately evaluate the effectiveness of an occupational therapist guided and parent taught handwriting remediation program, the only reliable comparative scores must focus on THS-R copying subtests six through nine, or the scaled scores from the abbreviated version of the evaluation which are taken from subtests six and seven. Specific details of individual subtest scaled scores is outlined in Table 4. The intervention group mean change (2.3) exceeded the control group (1.7) scaled scores from pretest to posttest. The greatest mean change of scaled scores for all subtests and groups was produced in sentence copy for the intervention group (4) followed closely in lowercase copy scores for the same children (3.8). The greatest variance in control group mean change scores was produced in the uppercase sequential memory (3.1) subtest. It should be noted that the control group copy subtest scores were already at or above the 50th percentile in the pretest evaluation, but their memory scaled scores were lower than those of the intervention group in every subtest.

The full scale THS-R evaluation also assessed memory of the alphabet in and out of sequence, number form, and the spelling memory of dictated words which were all outside the scope of the remediation program. The occupational therapist guided remediation program specifically targeted the accurate formation of uppercase and lowercase letters which could only be measured through copying subtest mean change scores. It was hypothesized that memory scores would naturally improve as a side benefit of dedicated practice, repetition, and teaching of alphabet letter formation through visual memory cues, and that the number and spelling subtest scores would remain constant to not affect the mean change scores for either group. Given these hypothesized conditions, both the subtest and full scale THS-R mean scores of the intervention group would show significant improvements, despite the lack of concentrated effort for

improvement of alphabet memory. The intervention group did show improvements in both memory and copying subtests but memory subtest gains were minimal and not significant.

Table 4. THS-R Subtest Scaled Scores

		THS-R Subtest Scaled Scores									
		Intervention					Control				
Subtest		Pretest mean	(SD)	Posttest mean	(SD)	Mean change	Pretest Mean	(SD)	Posttest Mean	(SD)	Mean change
Memory Subtests	Uppercase sequential memory	8	(4.4)	9.6	(2.6)	1.6	5.9	(1.4)	10	(2.7)	3.1
	Lowercase sequential memory	7	(1.4)	9.9	(2.1)	2.9	6.4	(1.4)	8.9	(2.4)	2.5
	Uppercase random dictation	7.1	(2.3)	8.7	(2.1)	1.6	6.7	(1.6)	8.6	(2.8)	1.9
	Lowercase random dictation	7.7	(2.4)	9	(1.3)	1.3	7	(3.4)	9.1	(2.7)	2.1
Copy Subtests	Uppercase copy	10.3	(4)	12.2	(3.9)	1.9	11.3	(3.7)	12.1	(4.3)	0.6
	Lowercase Copy	8.1	(4.1)	11.9	(3.4)	3.8	9.3	(2.7)	12.3	(4)	3
	Word Copy	11	(2.7)	13.7	(2.3)	2.7	10.9	(1.8)	13	(2.1)	2.1
	Sentence Copy	10.6	(4.4)	14.6	(1.8)	4	12.6	(4)	14.1	(3)	1.5

Interpretation of Results

Twenty-two point four percent of children failed to meet kindergarten handwriting performance testing benchmarks in a rural northwest Georgia school district due to poor alphabet letter formation, poor memory of what letters look like, and inattention to formation details, even with consistent and dedicated instruction using evidence-based handwriting programs. These children have typically attended preschool and received additional support at home to improve letter formation skills, but up to 86% of them still write at least some letters backward or upside

down (14%) with no reported medical diagnoses or contributing physical factors except Attention Deficit Disorder in a small number of children. The students could form accurate geometric shapes but still struggled with the formation of uppercase letters with curves, diagonal line segments, and most lowercase letters. This finding supported the work of Goven and Duff (2005) which cited no correlation between VMI scores and letter formation abilities. The reported difficulty in formation of alphabet letters that have curved or diagonal line segments correlated to the developmental program plan of lessons and progressive teaching sequence prescribed by Olsen and Knapton (2013) in the Handwriting Without Tears teaching guide. The students had not received occupational therapy services or remediation interventions by the end of the kindergarten year. Based on teacher assessment, they will require writing remediation in first grade or be retained in kindergarten.

Participation in an occupational therapist guided, parent-taught home handwriting remediation summer program was effective to improve the accurate formation of alphabet letters, words, and sentences for children who completed the pilot pre-test posttest effectiveness research study. The seven-week summer intervention program was evidence-based with a multi-modal lesson format based on the Handwriting Without Tears level one program. The instructional materials, teaching resources, lesson manual, and parent training session met the needs of the children and all parents. Parents could complete the prescribed lessons with an average time commitment of 25 minutes per day (SD 9.8) in the designated time frame. Parent confidence in their ability to serve as the supplemental educator following parent training was rated 3.71 (SD .45) on a four-point scale, with a score of three indicating somewhat confident and a score of four as completely confident. Post-program, the parents overwhelmingly supported the use of an occupational therapist guided remediation program with parent training as a potentially effective

way to improve child handwriting skills. All parents reported moderate improvement with alphabet letter formation and the readability of written text. The greatest gain of all groups and subtests was evident in intervention group copying of lowercase letters and sentences. The copying subtests most accurately assess student progress with the home remediation program due to the emphasis on correct alphabet letter formation to improve automaticity. The abbreviated THS-R assessment results were also utilized to specifically alleviate memory or alphabet letter recall and oral dictation variables from analysis of the accurate effect of the remediation program. With removal of all other variables and focusing only on the child's ability to form alphabet letters with accurate form, the intervention group demonstrated significant improvement between pre-test and posttest scaled scores.

Progress was also noted in control group mean change scaled scores in copying, but their pretest values were already at, or exceeded the scaled score mean of 10 (50th percentile). With the control group copying skills already demonstrating the age related standard mean at pretest, little change was expected. Despite noted progress in letter formation accuracy, children still had difficulty with memory of what alphabet letters look like, and 57% continued to struggle with the accurate formation of uppercase letters with curved and diagonal line segment components, or those lowercase letters that begin with an initial "c" stroke. Based on parent surveys, these areas of difficulty at program completion were also the same areas of concern at the start of the program.

The posttest comparative evaluation of both groups indicated resolution of intervention group copying deficits which were lower at pretest, and improved uppercase sequential memory scores for the control group which were the lowest of all subtest scaled scores at pretest. Each group demonstrated unique comparative handwriting difficulties, but by the end of the summer

both groups demonstrated handwriting skill improvements in their respective deficit areas. Intervention group percentile ranking improved from the 25th to 53rd percentile. The two groups were homogeneous at pretest despite non-randomization of the sample. Although not statistically different at pretest, the intervention group scaled score of 8 was equivalent to a percentile ranking of 25, and the control group demonstrated handwriting skills in the 30th percentile. At posttest, intervention group mean change standard scores were slightly larger than the control group, but the difference between the posttest values was not statistically significant. At posttest, the two groups were not statistically different.

Strengths and Limitations

The small non-randomized sample of child participants disqualified it from a true experimental design. The confounding variable that could potentially have an impact on the results was related to parent variations in the delivery of the home program from the way it was designed. This could occur despite uniformity in the training, lesson presentation, modeling, and individual coached assistance with the child.

The design of this study included elements of the previously cited works of Marr and Dimeo (2006) and attempted to further reduce as many confounding variables as possible. The authors evaluated the outcomes of a summer handwriting course with pre-test posttest outcome measures but with occupational therapist provided instruction, as opposed to occupational therapist guided, but parent-taught instruction. They also used the Handwriting Without Tears curriculum and parent survey data to assess outcomes. In citing recommendations for future research, Marr and Dimeo (2006) recommended an alternative assessment measure from the use of the Evaluation Tool of Children's Handwriting (ETCH), more instructional time, and adding a control group, all of which this study incorporated to improve validity. The selection of the Test

of Handwriting Skills-Revised was chosen as an alternative to the ETCH, to specifically address its design compliment for the Zaner-Bloser and Handwriting Without Tears teaching curriculums. The original Test of Handwriting Skills authored by Gardner (1998), was normed for children as young as five years old which contributed to its recommendation by Marr and Dimeo (2006) and its selection as the preferred instrument for the kindergarten subjects in this pilot study. With kindergarten children typically entering kindergarten at age five, the use of an evaluation measure that began at age six would unfairly disadvantage all children with age related norms. The revision of the THS-R (Milone, 2007) changed the norm sample from age five to six, which left no standardized handwriting evaluation normed from age five.

The design of the research which attempted to eliminate all potential and cited confounding variables was the direct cause of the small sample size. Through careful planning, every potential research subject across three different schools and classrooms was provided initial handwriting instruction by the occupational therapist, with daily classroom practice of the initial lessons, and supplemental teacher instruction. Children were screened for potential difficulties throughout the year so that the teachers could target specific handwriting problems as they occurred. Many children initially identified as demonstrating handwriting problems in the fall and winter demonstrated mastery of the kindergarten standards by April. The teacher identified research participants only qualified for remediation participation based on their inability to meet kindergarten writing standards from the Georgia Department of Education (2016a) Kindergarten Inventory of Developing Skills (GKIDS) assessment, or consecutive HWT screening tests which indicated alphabet letter formation scores below 70%. Inclusion criteria in the intervention group was further limited based on parent agreement to participate in the seven-week instructional program and completion of the 3-hour training class. While group designation

was not researcher designed randomization, eventual group placement became random due to parent preferences or inability to complete the responsibilities required for intervention group inclusion.

Implications for School-Based Practice

This study sought to determine if we have a role in facilitating skill mastery for those children we do not serve through the development of collaborative partnerships with teachers and families. The research supported student improvement with alphabet letter formation as a direct result of offering teacher support in the modeling of handwriting lessons, training teachers on how to use an evidence based curriculum for daily lessons, and offering screening resources to help identify those children who need additional support. As therapists, we need to advocate for handwriting instruction policy implementation within our own spheres of influence. Teachers are eager to learn how to teach handwriting lessons because they didn't typically get exposure in their education preparation curriculum. Parents unanimously supported the use of training, provision of resources, and a home program as a beneficial way to improve student handwriting performance.

The effort expended to prevent handwriting performance difficulties in classrooms due to improper experiences is rewarded with more appropriate occupational therapy referrals and caseload time dedicated to those children who truly have foundation deficits. The process started through advocacy and volunteering. Occupational therapists can volunteer to teach a handwriting lesson or train grade level staff on a preferred handwriting curriculum at a staff meeting. Instructional kits of the resources needed to teach alphabet letters for parent and teacher use can be assembled and procured through education of Title I coordinators or school system curriculum personnel. Advocacy efforts for school libraries or parent resource centers to

purchase evidence-based handwriting instruction materials paves the way for improved accessibility for teachers, parents, and students. Therapists can engage families in improving handwriting skills at home by offering to demonstrate a lesson at a school open house event. Most importantly, therapists can begin the process of facilitating family-centered care, as opposed to the direct, and selective service of individual children.

The guiding principle of the remediation program was based on Occupational Performance Coaching. Our role in facilitating a grass-roots change in school curriculum policy and child handwriting performance is to facilitate the experiential learning of families and school personnel so that they can process and apply the content to their own circumstances and needs. Our role as a collaborative team partner requires that we discard the medical model of practice whereby expert information is relayed to foster parent-therapist extensions, and move toward facilitative efforts that help others assess their own needs, procure available resources, and foster independent problem solving. Each team member has a role in student handwriting achievement. Therapists have curriculum and resource knowledge. Teachers have instructional and pedagogical knowledge, and parents have innate knowledge of child motivation, abilities, and limitations.

Future Research

Occupational therapist designed, teacher supported, and parent instructed home handwriting programs can improve the legibility of kindergarten children's handwriting. Parents kept time logs during the summer program to help determine how much intervention was necessary to see statistically significant changes in performance. Unfortunately, with such a small sample size and huge variances in the amount of time parents reported working on individual lessons, the procured data was not included in the results of this study due to large

standard deviation values. Future replication of this pilot study or examination of student performance gains would be strengthened by correlating the changes as a factor of home instructional time.

As in the Marr and Dimeo (2006) research, the inclusion of teacher perception of student performance change in a classroom setting would prove beneficial to accurately assess application and generalization of the test score improvements. However, unless the student were retained in the same kindergarten class, this information would be difficult to quantify due to interrater reliability bias. In a school system and classrooms with dedicated and intentional handwriting instruction time, with an evidence based instructional program, and collaborative therapist and teacher support, the study could be easily replicated to include many more children and true randomization of the subject groups. The final recommendation would be to undertake a longitudinal study to determine what percentage of identified struggling writers in kindergarten eventually require occupational therapy or special education services due to undiagnosed dysgraphia or other foundation problems. A longitudinal study of the effects of early identified handwriting deficits on future standardized testing benchmark performance, or graduation rates could prove beneficial as a predictor of academic success.

Summary

With appropriate training, team collaboration, evidence-based methods, and consistent intentional instructional opportunities, all children can improve alphabet letter formation and legibility with an occupational therapist guided, parent-taught remediation home program. The success of the home remediation program was a direct result of an occupational therapy-educator partnership that included family outreach to solve a historically cited generational problem.

There is preliminary support for team collaboration and parent coaching with home programs as an alternative service delivery model for the improvement of handwriting in students who fail to meet kindergarten handwriting performance standards.

References

- American Occupational Therapy Association. (2006). Children and Youth Ad Hoc Committee-Recommendations for education and practice. Bethesda, MD.
- American Occupational Therapy Association. (2007). AOTA's centennial vision and executive summary. *American Journal of Occupational Therapy*, 61(6), 613-614.
- Asher, A. (2006). Handwriting instruction in elementary schools. *American Journal of Occupational Therapy*, 60(4), 461-471.
- Bartel, V. (2010). Home and school factors impacting parental involvement in a Title 1 elementary school. *Journal of Research in Childhood Education*, 24, 209-228.
- Bazyk, S. (1989). Changes in attitudes and beliefs regarding parent participation and home programs: An update. *American Journal of Occupational Therapy*, 43(11), 723-728.
- Beck, A. (2002). Parental involvement in the development of young writers. *Childhood Education*, 79(1), 48-49.
- Benson, J. D., Elkin, K., Wechsler, J., & Byrd, L. (2015). Parent perceptions of school-based occupational therapy services. *Journal of Occupational Therapy, Schools, & Early Intervention*, 8(2), 126-135.
- Berger, E. H. (1994). *Parents as partners in education: Families and schools working together*. Englewood Cliffs, NJ: Prentice Hall.
- Berninger, V., James, K., Peverly, S., Santangelo, T., & Case-Smith, J. (2012, August 24). *Can you imagine a world without handwriting?* [Video file]. Retrieved from <https://www.hw21summit.com>
- Case-Smith, J. (2002). Effectiveness of school-based occupational therapy intervention on handwriting. *American Journal of Occupational Therapy*, 56(1), 17-25.

- Cotton, K., & Wikelund, K. R. (1989). Parent involvement in education. *School Improvement Research Series*, 6(3), 1-17. Retrieved from <http://multiculturaleducole.pbworks.com/w/file/55317746/ParentInvolvementinEducation.pdf>
- Cramm, H. & Egan, M. (2015). Practice patterns of school based occupational therapists targeting handwriting: A knowledge to practice gap. *Journal of Occupational Therapy, Schools, & Early Intervention*, 82, 170-179. doi: 10.1080/19411243.2015.1040942
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks: Sage.
- Daly, C. J., Kelley, G. T., & Krauss, A. (2003). Relationship between visual-motor integration and handwriting skills of children in kindergarten: A modified replication study. *American Journal of Occupational Therapy*, 57(4), 459-462.
- Donica, D. K. (2015). Handwriting Without Tears: General education effectiveness through a consultative approach. *American Journal of Occupational Therapy*, 69(6), 1-8.
- Donica, D. K., Larson, M. H., & Zinn, A. A. (2012). Survey of handwriting instruction practices of elementary teachers and educational programs: Implications for occupational therapy. *Occupational Therapy in Healthcare*, 26(2-3), 120-137. doi: 10.3109/07380577.2012.693244
- Dunn, W., Cox, J., Foster, L., Mische-Lawson, L., & Tanquary, J. (2012). Impact of contextual intervention on child participation and parent competence among children with autism spectrum disorders: A pretest-posttest repeated measures design. *American Journal of Occupational Therapy*, 66(5), 520-528.

Edwards, L. (2003). Writing instruction in kindergarten: Examining an emerging area of research for children with writing and reading difficulties. *Journal of Learning Disabilities*, 36(2), 136-148.

Fink, J. L. W. (2014). *The case for handwriting: Why handwriting instruction may be your secret weapon to academic success*. Retrieved from <https://www.scholastic.com/teachers/articles/teaching-content/case-handwriting/>

Fitzpatrick, P., Vander Hart, N., & Cortesa, C. (2013). The influence of instructional variables and task constraints on handwriting performance. *The Journal of Educational Research*, 106, 216-234.

Frances, R. (2008). *Have computers forced handwriting out of the picture?* Education World. Retrieved from http://www.educationworld.com/a_currcurr241.shtml

Gardner, M. F. (1998). *THS, Test of handwriting skills: manual*. Hydesville, CA: Psychological and Educational Publications

Georgia Department of Education. (2016a). Georgia kindergarten inventory of developing skills: Administration manual 2016-2017. Retrieved from https://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Documents/GKIDS/Resources_16-17/GKIDS_Administration_Manual_2016-17.pdf

Georgia Department of Education. (2016b). Georgia school performance standards. Retrieved from: <http://www.gadoe.org/School-Improvement/School-Improvement-Services/Documents/School%20and%20District%20Effectiveness/GA%20School%20Performance%20Standards.pdf>

- Goyen, T.-A. and Duff, S. (2005), Discriminant validity of the Developmental Test of Visual–Motor Integration in relation to children with handwriting dysfunction. *Australian Occupational Therapy Journal*, 52, 109–115. doi:10.1111/j.1440-1630.2005.00488.x
- Graham, S., & Harris, K. R. (2000). The role of self-regulation and transcription skills in writing and writing development. *Educational Psychologist*, 35(1), 3-12.
- Graham, S., Harris, K., & Fink, B. (2000). Extra handwriting instruction: Prevent writing difficulties right from the start. *Teaching Exceptional Children*, 33(2), 88-91.
- Graham, S., Harris, K., Mason, L., Fink-Chorzempa, B., Moran, S., & Sadler, B. (2008). How do primary grade teachers teach handwriting? A national survey. *Reading and Writing*, 21(1), 49-69.
- Graham, F., Rodger, S., & Ziviani, J. (2010) Enabling occupational performance of children through coaching parents: Three case reports. *Physical & Occupational Therapy in Pediatrics*, 30(1), 4-15.
- Graham, S. & Weintraub, N. (1996). A review of handwriting research: Progress and prospects from 1980 to 1994. *Educational Psychology Review*, 8(1), 7-87.
Doi:10.1007/BF01761831.
- Handwriting Without Tears. (2015). Retrieved from <http://www.hwtears.com/hwt/online-tools/screener/about>
- Hammerschmidt, S. L., & Sudsawad, P. (2004). Teachers’ survey on problems with handwriting: Referral, evaluation, and outcomes. *American Journal of Occupational Therapy*, 58(2), 185-192.

- Hinojosa, J., & Anderson, J. (1991). Mother's perceptions of home treatment programs for their preschool children with cerebral palsy. *American Journal of Occupational Therapy*, 45(3), 273-269.
- Hoover-Dempsey, K., Walker, J., Sandler, H., Whetsel, D., Green, C., Wilkins, A., & Clossen, K. (2005). Why do parents become involved? Research findings and implications. *Elementary School Journal*, 106(2), 105-130.
- Hoy, M. M. P., Egan, M. Y., & Feder, K. P. (2011). A systematic review of interventions to improve handwriting. *Canadian Journal of Occupational Therapy*, 78(1), 13-25.
- Jones, D., & Christensen, C. (1999). Relationship between automaticity in handwriting and students' ability to generate written text. *Journal of Educational Psychology*, 91(1), 44-49.
- Kaiser, A. P., & Hancock, T. B. (2003). Teaching parents new skills to support their young children's development. *Infants & Young Children*, 16(1), 9-21.
- Kaplan, M. (2010). A frame of reference for motor skill acquisition. In P. Kramer & J. Hinojosa (Eds.), *Frames of reference for pediatric occupational therapy* (pp. 390-424). Baltimore, Maryland: Lippincott Williams & Wilkins.
- Kemmis, B. & Dunn, W. (1996). Collaborative consultation: The efficacy of remedial and compensatory interventions in school contexts. *American Journal of Occupational Therapy*, 50(9), 709-717.
- Kielhofner, G. (2006). *Research in occupational therapy: Methods of inquiry for enhancing practice*. Philadelphia: F. A. Davis.
- Knowles, M. S., Holton, E. F., Swanson, R. A. (1998). *The adult learner* (5th ed.). Woburn, MA: Butterworth-Heinemann.

- Kramer, P. & Hinojosa, J. (2010). *Frames of reference for pediatric occupational therapy*. Baltimore, Maryland: Lippincott Williams & Wilkins.
- Kysilko, D. (2012). *Policy update: The handwriting debate*. National Association of State Boards of Education. 19(7). Retrieved from https://www.hw21sumit.com/media/zb/hw21/H2989_NASBE_PolicyUpdate_TheHandwritingDebate.pdf
- Lawrence-Lightfoot, S. (2004). *The essential conversation: What parents and teachers can learn from each other*. New York: Ballantine books.
- Luebben, A. J., & Royeen, C. B. (2010). An acquisitional frame of reference. In P. Kramer & J. Hinojosa (Eds.), *Frames of reference for pediatric occupational therapy* (pp. 461-488). Baltimore, Maryland: Lippincott Williams & Wilkins.
- Marr, D., & Dimeo, S. B. (2006). Outcomes associated with a summer handwriting course for elementary students. *American Journal of Occupational Therapy*, 60(1), 10-15.
- Mackay, N., McCluskey, A., & Mayes, R. (2010). The log handwriting program improved children's writing legibility: A pretest-posttest study. *American Journal of Occupational Therapy*, 64(1), 30-36.
- McCall, S. A., & Schneck, C. M. (2000). Parents' perceptions of occupational therapy services for their children with developmental disabilities. *Developmental Disabilities Special Interest Section Quarterly*, 23, 1-4.
- Milone, M. (2007). *Test of handwriting skills revised manual*. Novato, CA: Academic Therapy Publications.

- Nelson, D. L. (2006). Group comparison studies: Quantitative research designs. In G. Kielhofner (Ed.), *Research in occupational therapy: Methods of inquiry for enhancing practice* (pp. 65-76). Philadelphia: F. A. Davis.
- Novak, I. (2011). Parent experience of implementing effective home programs. *Physical & Occupational Therapy in Pediatrics*, 31(2), 198-213.
- Novak, I., & Berry, J. (2014). Home program intervention effectiveness evidence. *Physical & Occupational Therapy in Pediatrics*, 34(4), 384-389.
- Olsen, J. Z., & Knapton, E. F. (2013). *Handwriting Without Tears kindergarten teacher's guide* (11th ed.). Cabin John, MD: Handwriting Without Tears.
- Parikh, S. (2015). *Handwriting as an intervention: An evidence based approach provides necessary skills for children*. Advance healthcare network. Retrieved from <http://occupational-therapy.advanceweb.com/Editorial/Content/PrintFriendly.aspx?CC=282376>
- Pastor, P. N., Reuben, C. A., & Loeb, M. (2009). *Functional difficulties among school-aged children: United States, 2001-2007*. National Health Statistics Reports. U.S. Department of Health and Human Services. 19. Pub No. (PHS) 2010-1250, 1-24.
- Poole, C. W. (2016, August 7). Capstone needs assessment. [Unpublished survey data]. Copy in possession of author.
- Poole, J. L. (1991). Application of motor learning principles in occupational therapy. *American Journal of Occupational Therapy*, 45(6), 531-537.
- Preminger, F., Weiss, P.L., & Weintraub, N. (2004). Predicting occupational performance: Handwriting versus keyboarding. *American Journal of Occupational Therapy*, 58, 193-201.

Sassoon, R. (2003). *Handwriting: The way to teach it* (2nd ed.). Thousand Oaks, NJ: Sage.

Schneck, C., Shasby, S., Myers, C., & DePoy-Smith, M. L. (2012). Handwriting Without Tears versus teacher-designed handwriting instruction in first grade classrooms. *Journal of Occupational Therapy, Schools & Early Intervention*, 5, 31-42. doi: 10.1080/19411243.2012.675759

Sheffield, B. (1996). Handwriting: A neglected cornerstone of literacy. *Annals of Dyslexia*, 46(1), 21-35. doi: 10.1007/BF02648169

Spear-Swearling, L. (2006). *The importance of teaching handwriting*. Retrieved from <http://www.readingrockets.org/article/importance-teaching-handwriting>

Taylor, R. R., Suarez-Balcazar, Y., Forsyth, K., & Kielhofner, G. (2006). Participatory research in occupational therapy. In G. Kielhofner (Ed.), *Research in occupational therapy: Methods of inquiry for enhancing practice* (pp. 620-631). Philadelphia: F. A. Davis.

Van der Merwe, J. V., & Smit, N., & Vlok, B. (2011). A survey to investigate how South African occupational therapists in private practice are assessing and treating poor handwriting in foundation phase learners: Part II treatment and evaluation practices. *South African Journal of Occupational Therapy*, 41(3), 11-17.

Whitfield County Schools. (2015). Five-year strategic plan. Retrieved from <http://files.whitfield.k12.ga.us/comm/strategic-plan/wcs-strategic-plan-en.pdf>

Zwicker, J. G. & Harris, S. R. (2009). A reflection on motor learning theory in pediatric occupational therapy practice. *Canadian Journal of Occupational Therapy*, 76(1), 29-37.

Zylstra, S. E. & Pfeiffer, B. (2016). Effectiveness of a handwriting intervention with at-risk kindergarteners. *American Journal of Occupational Therapy*, 70(3), 7003220020.

Appendix A: IRB Approval



Graduate Education and Research
Division of Sponsored Programs

EASTERN KENTUCKY UNIVERSITY

NOTICE OF IRB APPROVAL

Protocol Number: 000631

Institutional Review Board IRB00002836, DHHS FWA00003332

Review Type: Full Expedited

Approval Type: New Extension of Time Revision Continuing Review

Principal Investigator: **Cindy Poole** Faculty Advisor: **Dr. Colleen Schneck**

Project Title: **The Effectiveness of Occupational Therapist Guided Remediation through Handwriting Home Programs**

Approval Date: **3/8/17** Expiration Date: **12/31/17**

Approved by: **Dr. Sandy Hunter, IRB Member**

This document confirms that the Institutional Review Board (IRB) has approved the above referenced research project as outlined in the application submitted for IRB review with an immediate effective date.

Principal Investigator Responsibilities: It is the responsibility of the principal investigator to ensure that all investigators and staff associated with this study meet the training requirements for conducting research involving human subjects, follow the approved protocol, use only the approved forms, keep appropriate research records, and comply with applicable University policies and state and federal regulations.

Consent Forms: All subjects must receive a copy of the consent form as approved with the ECU IRB approval stamp. You may access your stamped consent forms by logging into your [InfoReady Review](#) account and selecting your approved application. Copies of the signed consent forms must be kept on file unless a waiver has been granted by the IRB.

Adverse Events: Any adverse or unexpected events that occur in conjunction with this study must be reported to the IRB within ten calendar days of the occurrence.

Research Records: Accurate and detailed research records must be maintained for a minimum of three years following the completion of the research and are subject to audit.

Changes to Approved Research Protocol: If changes to the approved research protocol become necessary, a description of those changes must be submitted for IRB review and approval prior to implementation. Some changes may be approved by expedited review while others may require full IRB review. Changes include, but are not limited to, those involving study personnel, consent forms, subjects, and procedures.

Annual IRB Continuing Review: This approval is valid through the expiration date noted above and is subject to continuing IRB review on an annual basis for as long as the study is active. It is the responsibility of the principal investigator to submit the annual continuing review request and receive approval prior to the anniversary date of the approval. Continuing reviews may be used to continue a project for up to three years from the original approval date, after which time a new application must be filed for IRB review and approval.

Final Report: Within 30 days from the expiration of the project, a final report must be filed with the IRB. A copy of the research results or an abstract from a resulting publication or presentation must be attached. If copies of significant new findings are provided to the research subjects, a copy must be also be provided to the IRB with the final report. Please log in to your [InfoReady Review](#) account, access your approved application, and click the option to submit a final report.

Other Provisions of Approval, if applicable: None

Please contact Sponsored Programs at 859-622-3636 or send email to lisa.royalty@ecu.edu with questions about this approval or reporting requirements.

Appendix B: Whitfield County Schools Permission for Research



TO: Cindy W. Poole, Eastern Kentucky University Doctoral Student

FROM: Audrey M. Williams, Ed.D., Assistant Superintendent of Assessment & Accountability

RE: Parents as Teachers: The Effectiveness of Occupational Therapist Guided Home Handwriting Instruction

DATE: November 14, 2016

Whitfield County Schools is granting Cindy W. Poole, Occupational Therapist, this letter of support for off-campus research involving human subjects. I understand the purpose of this research is to investigate the effectiveness of parent taught, home handwriting instruction programs for kindergarten alphabet letter formation performance, in those children who struggle to meet kindergarten performance standards.

Permission is granted for this project to involve students who want to participate and have met the inclusion criteria, from three elementary schools identified in the application to conduct research. The researcher has determined these individuals to be appropriate subjects for this research. The participants will be asked to participate in two standardized handwriting evaluations, and participate in an occupational therapist designed home instruction program of alphabet letter formation, over the course of 7 weeks during the summer of 2017. The children's parents will be trained on the remedial program and be provided with all materials, lessons, and instruction manual, free of charge. They will receive support throughout the process of the remedial instruction program. The parents will be provided with an informed consent agreement and the children will also be asked for their assent to participate.

To support this research, the researcher has the permission to collaborate with classroom teachers to identify prospective students who would benefit from a remedial education program of alphabet letter formation, to improve their kindergarten writing performance standards. This research proposal supports state and local goals for teaching and learning. It supports initiatives to improve parent involvement, student achievement, innovative teaching practices, and has the opportunity to inform future educational practices for remediation strategies.

Please remember the Family Educational Rights and Privacy (FERPA) and the Protection of Pupil Rights Amendment (PPRA) agreements previously signed as you continue investigate the effectiveness of parent taught, home handwriting instruction programs, for children who struggle to meet kindergarten performance standards. Ensure safeguards are in place to confirm the confidentiality and privacy of all participants, schools, and district.

If I can be of any further assistance let me know. I can be reached at 706.217.6732 or email at audrey.williams@wcsqa.net.

Audrey M. Williams, Ed.D.
Assistant Superintendent of Assessment and Accountability

Appendix C: Checklist of Training and Design Components

Checklist of parent training and home program design components required for an effective home handwriting program based on literature review

Included in program design/ method	PARENT TRAINING COURSE
Consent form	Parents must choose to participate and make the commitment to complete the program (Bazyk, 1989, Kaiser & Hancock, 2003)
✓	Observation of therapist techniques was most beneficial for parents; illustrate and model techniques and provide examples (Bazyk, 1989, Hinojosa & Anderson, 1991; Kaiser & Hancock, 2003)
✓	Include specific details regarding time commitment, how and when the home program should be implemented (Hinojosa & Anderson, 1991; Kaiser & Hancock, 2003)
Training pretest	Parents must see the value in participation related to the child's developmental need (Bazyk, 1989, Kaiser & Hancock, 2003)
✓	Training must educate parents on child development (Kaiser & Hancock, 2003)
✓	Parents and educators are co-participants (Bazyk, 1989, Kaiser & Hancock, 2003)
✓	Educator must have content expertise (Kaiser & Hancock, 2003)

- ✓ Educators uses personal examples, stories, and relatable real-life situations (Kaiser & Hancock, 2003)
- ✓ Include parent practice session opportunities (Kaiser & Hancock, 2003)
- ✓ -adjusted after first session
Be conscientious of training time (length, promised schedule) (Kaiser & Hancock, 2003)
- Not included
Consider videotaping parents providing the lessons for affirmation and supplemental support (Kaiser & Hancock, 2003)
- ✓ First session, explain timelines, expectations, roles, and format of the presentation (Kaiser & Hancock, 2003)
- ✓ Provide real time feedback on parent performance (Kaiser & Hancock, 2003)
- ✓ Have parents keep a log of activities, reflections, questions (Kaiser & Hancock, 2003)
- ✓ Coach parents as a background observer to promote confidence and eliminate over intrusion (Bazyk, 1989, Kaiser & Hancock, 2003: Novak & Berry, 2014)
- Pre-posttest
Provide parents a way to gauge child learning or skill mastery (Kaiser & Hancock, 2003)
- ✓ Include parent evaluation of the training (Kaiser & Hancock, 2003)
- ✓ Schedule follow-up consultation methods and times at training (Kaiser & Hancock, 2003)

✓ Provide handouts, resources, materials, and activities to explicitly teach the content (Kaiser & Hancock, 2003; Novak & Berry, 2014)

✓ Include a description of why parents are completing the daily log sheets- to see if there is a correlation between progress and time spent on the lessons as opposed to an enforced compliance log as cited in Novak (2011).

HOME PROGRAM DESIGN COMPONENTS

Some inclusion Home program (HP) should include collaborative goal setting and treatment planning (Bazyk, 1989, Hinojosa & Anderson, 1991; Novak & Berry, 2014)

✓ Home programs have the potential to alter the parent child relationship in a negative way unless they are designed with parent needs and considerations in mind (Bazyk, 1989, Hinojosa & Anderson, 1991)

30 minutes/day as recommended Home programs must not be too time consuming to interfere with daily activities- short and concise (Bazyk, 1989, Hinojosa & Anderson, 1991; Novak & Berry)

Fun activities each lesson group Home programs must be enjoyable for the parent, and not stressful for the child (Hinojosa & Anderson, 1991)

Scripted design Must be straightforward and not complex (Hinojosa & Anderson, 1991)

✓ Repetitious practice of known effective interventions have the best chance for success (Novak & Berry, 2014).

✓ Must utilize evidence based interventions (Novak & Berry, 2014)

Bi-weekly coaching calls	Provide regular support to the families (Bazyk, 1989, Novak & Berry, 2014)
Pre-posttest	Both parents and therapist evaluate the outcomes of the program (Novak & Berry, 2014)
Eval results	With intensive home programs, handwriting skills can improve without direct teaching (task approach) when the therapist targets the underlying processes of contributed difficulties (process approach) and develops activities to advance those skills (Erhardt, & Meade, 2005).
✓	Consistent terminology should be used for all lessons (Sassoon, 2003).
✓	The instruction of correct start point and sequence are important to prevent reversals (Sassoon, 2003).
✓	Letters are best taught in “stroke related groups” (Sassoon, 2003, p. 47).
✓	Capitalization, spacing, and letter height need to be explicitly taught (Sassoon, 2003).
✓	HW is a motor skill, so instructional methods must include some kinesthetic components, even with visual and auditory presentations (Sassoon, 2003).
✓	Teaching letters in groups or families reinforces the movement associated with the strokes (Sassoon, 2003).
✓	Repetition of the movements promotes automaticity (Sassoon, 2003).
✓	Child self-appraisal is important to support mastery (Sassoon, 2003).
✓	Lowercase letter teaching sequence begins with easy letters (Sassoon, 2003).

- ✓ Letters with an over-curve pattern and those which start like a “c” are taught in groups (Sassoon, 2003).
- ✓ The last group of instructed letters are those with diagonal line segments or those which change directions such as s and f, or k (Sassoon, 2003).
- ✓ Children should only have 4-5 repetitions of letter practice per page (Sassoon, 2003).
- ✓ - in parent training Assess a child’s developmental stage of writing by looking at where problems begin in the formation families (Sassoon, 2003).
- ✓ Tracing is valuable tool to determine the child’s developmental stage and readiness for writing (Sassoon, 2003).

References

- Bazyk, S. (1989). Changes in attitudes and beliefs regarding parent participation and home programs: An update. *American Journal of Occupational Therapy*, 43(11), 723-728.
- Berger, E. H. (1994). *Parents as partners in education: Families and schools working together*. Englewood Cliffs, NJ: Prentice Hall.
- Erhardt, R. P., & Meade, V. (2005). Improving handwriting without teaching handwriting: The consultative clinical reasoning process. *Australian Occupational Therapy Journal*, 52, 199-210.
- Hinojosa, J., & Anderson, J. (1991). Mother’s perceptions of home treatment programs for their preschool children with cerebral palsy. *American Journal of Occupational Therapy*, 45(3), 273-269.

- Kaiser, A. P., & Hancock, T. B. (2003). Teaching parents new skills to support their young children's development. *Infants & Young Children, 16*(1), 9-21.
- Lawrence-Lightfoot, S. (2004). *The essential conversation: What parents and teachers can learn from each other*. New York: Ballantine books.
- Novak, I. (2011). Parent experience of implementing effective home programs. *Physical & Occupational Therapy in Pediatrics, 31*(2), 198-213.
- Novak, I., & Berry, J. (2014). Home program intervention effectiveness evidence. *Physical & Occupational Therapy in Pediatrics, 34*(4), 384-389.
- Sassoon, R. (2003). *Handwriting: The way to teach it* (2nd ed.). Thousand Oaks, NJ: Sage.

Appendix D: Student Referral Form

Teacher: _____ Number of students in classroom _____

Summer Home Handwriting Program Referral Form

Child's name _____ DOB: _____

Parent's First Name(s) _____ Phone number _____

Email address: _____

Preferred time for contact: Day/ Evening or specific time _____

Conference scheduled date: _____ Consent docs provided: _____ (Parent Initial)

Therapist attendance: Y/ N Consent return date: _____

Date sent to therapist _____

Chosen Program plan: Summer program _____ Evaluation only _____ No intervention _____

Criteria checklist: Date of Handwriting Evaluation: _____ (to determine chronological age)

GKIDS ELAGSEKL1 PRINT UC/LC	ND	EM	PR
GKIDS ELAGSEKL2 SENTENCE SKILLS	ND	EM	PR
HWT SCREENER	Memory Score		
(Year end results)	Orientation score		
	Placement score		
	Sentence score		

Special Education services? Y / N Direct OT services? Y / N Repeat Kindergarten? Y / N

FOR FACULTY ADVISOR USE:

Random access code assigned to student _____

Code affixed to evaluation 1 # _____ (add additional value for pre/post designation)

Code affixed to evaluation 2 # _____

Code affixed to Parent survey 1 # _____

Code affixed to parent survey 2 (only experimental group) # _____

Appendix E: Cover Letter and Parental Consent Agreement

Cover Letter for parent introduction to the home program and research opportunity

Greetings!

Your child's teacher has identified him/her as having difficulty with alphabet letter formation or legible handwriting. As an occupational therapist, I often work with children who have handwriting difficulties. According to guidelines set by the State of Georgia, I am only able to directly work with children who receive special education services. In order to try to find new ways to help children who cannot receive occupational therapy directly, I have developed a home handwriting instruction program for parents. This program takes about 15 to 30 minutes a day to complete, and is designed to be performed 5 days a week, for 7 weeks during the summer. You will be trained on how to teach each lesson, and all materials will be provided free of charge.

In order to see if this kind of program works well for students, I will also be collecting some data to see if your child makes progress with the lessons. This will involve your consent to allow me to evaluate their handwriting abilities before and after the summer program. I will also need to get some information from you about what you thought about the program, and what you see are your child's handwriting problems. You will be asked to do two short multiple choice question surveys, keep a log of how much time you spent teaching your child, and teach the handwriting lessons.

At Whitfield County Schools, we value the role you play in your child's education and would like to work as a team to try to find some solutions for children who struggle to write. I am in a doctorate program at Eastern Kentucky University. This summer program and research is closely monitored for child protection measures. Confidentiality is very important to me, so your

identities will be protected through the whole process. Approvals have been obtained by the Whitfield County School district, and through the Institutional Review Board from Eastern Kentucky University. Participation in the program and research is totally voluntary. I have enclosed a parental consent agreement for your consideration. This document outlines the specific details of the responsibilities for each of us, including your child.

The purpose of collecting this information and research, is to determine the effectiveness of a parent taught, occupational therapist guided, remedial handwriting home program, for kindergarten children's alphabet letter formation. I thank you in advance for considering participating in the home instruction program, and for the valuable information you can provide us on ways to help all children with handwriting difficulties.

For further questions or concerns please feel free to contact me at 706-673-2295 at New Hope Middle School. Please return the enclosed parent consent agreement to let me know your decision regarding participation preference for yourself, and for your child. I look forward to hearing from you!

Sincerely,

Cindy W. Poole, OTR
Occupational Therapist
Whitfield County Schools



Parental Consent for Minor's Participation in a Research Project, and Adult Participant Informed Consent Agreement

PARTICIPATION IN EDUCATION RESEARCH IS ENTIRELY VOLUNTARY

Title of Project:

The Effectiveness of Occupational Therapist Guided Remediation
through Handwriting Home Programs

Why is my child being invited to take part in this research?

We would like to invite your child to take part in a research study about the effectiveness of using a summer home program to improve alphabet letter formation for handwriting legibility. We would like to invite your child to participate because he/she has been identified by the teacher as having difficulty with writing, due to poor alphabet letter formation or problems with writing legibility. The decision to offer your child the opportunity to participate in a summer remediation program, and further evaluation of specific problem areas that affect their handwriting performance, was based on their results of the GKIDS kindergarten assessment, classroom work samples, and yearlong screening data from their handwriting samples. If your child takes part in this study, he or she will be one of up to 15 children to participate.

Who is doing the study?

The person in charge of this study is Cindy Poole, an occupational therapist that works for Whitfield County Schools, and is also a doctoral graduate student at Eastern Kentucky University. As a graduate student, she is being guided in this research by Dr. Colleen Schneck. There may be other people on the research team assisting at different times during the study, to serve as advisors and to assist with maintaining the confidentiality of your child.

What is the purpose of the study?

We recognize that parents are the primary educators of children, and yet many parents need assistance and guidance to be able to help their children with school work. A parent training session and home program has been designed by the occupational therapist to help improve your child's alphabet letter formation, and writing skills.

By doing this study, we hope to determine if parent coaching and home instruction programs are an effective way to improve children's handwriting.

Where is the study going to take place and how long will it last?

1. The research/evaluation procedures will be conducted at the elementary school during the last few weeks of the school year and at the beginning of next school year.
2. The evaluation of your child's handwriting will take approximately 20-30 minutes, both before and at the completion of the summer program.
3. The parent training session will be scheduled with your convenience in mind, at the end of May.
4. The parent training session will take approximately one hour.
5. The summer program will run during the months of June and July 2017.

6. You will be given 5 assignments for each week, to work on a specific letter form, lasting 15-20 minutes each day.

The total amount of time your child will be asked to volunteer for this study is (2) 30 minute evaluations, and 35 alphabet letter instruction sessions of 15-30 minutes each, led by you as the parent for a total time commitment of approximately 10-18 hours over 3 months.

Your time commitment for participation in this study would also be 10-18 hours over 3 months, due to the hour of training as substituted for the evaluations the child will complete. You will also be asked to complete two short surveys which are designed to take no more than 15 minutes each.

What will my child be asked to do?

1. Your child will be asked whether they agree to participate in both evaluations and the home instruction program to improve their alphabet letter formation, after you provide consent.
2. In May and August, they will be asked to write uppercase and lowercase letters, words, and sentences as a part of a standardized handwriting evaluation.
3. They will complete five alphabet letter formation lessons each week, for seven weeks, beginning June, 2017.
4. They will be asked to participate with you for at least 15-20 minutes per session to improve their writing skills.
5. They will spend three weeks reviewing uppercase letters, have one week of review, and then complete three weeks of lowercase letter instruction.

What will I be asked to do?

1. You will be asked to consider participation in both the research study, and to be trained in a summer instructional program to help your child improve their alphabet letter formation and handwriting.
2. You will be asked to sign a consent form for your child's participation in this research study.
3. You will be asked to sign a consent form to agree to act as your child's instructional coach through this research process.
4. You will be asked to sign a consent for your child to be evaluated using a standardized handwriting evaluation, before the program begins, and at the end of the program, to determine his/her progress with the extra instruction.
5. You will be asked to participate in a training program of the handwriting instruction program.
6. You will be asked to commit to working with your child on the lessons for 15-20 minutes per day, 5 days a week, for 7 weeks.
7. You will be asked to keep a log of how many minutes per day your child worked on each lesson.
8. You will be asked to complete a short survey of questions that help to determine what you perceive the problems with handwriting are, how much instruction they have had previously, and to help identify the common characteristics of children who have difficulty with handwriting (such as reversing letters).
9. At the end of the program you will be asked to complete a short survey of your perceptions of your child's progress in letter formation, continued difficulties, recommendations for program improvement, and evaluation of the parts of the program that were/were not beneficial.

Are there reasons why my child should not take part in this study?

Your child should not participate in the remediation program if you (or someone else) do(es) not have the time or ability to spend 15-20 minutes a day working on their handwriting.

What are the possible risks and discomforts?

To the best of our knowledge, the things your child will be doing have no more risk of harm than he or she would experience in everyday life.

Will my child benefit from taking part in this study?

There is no guarantee that your child will get any benefit from taking part in this study. However, children have experienced improved handwriting skills when they get extra instruction that is specifically designed to teach alphabet letter formation, from a developmental model. We cannot and do not guarantee your child will receive any benefits from this study.

Does my child have to take part in the study?

If you decide to allow your child to take part in the study, it should be because your child wants to volunteer. Your child will not lose any rights he or she would normally have if you choose not to allow him or her to volunteer. If your child participates and either of you change your mind later, your child can stop at any time during the study and still keep the benefits and rights he or she had before volunteering.

If I don't want my child to take part in the summer program, are there other choices?

You may still choose to have your child evaluated in May and August, to determine their handwriting difficulties, but decline to participate in the home instruction program component.

The evaluations would help to identify what your child's specific difficulties are, for the future classroom teacher.

Evaluation (only) participation also helps the researcher identify a standard for how a child would normally progress with their skills, even without specifically working on them. He/she would be identified as the *control group*.

If you decline research participation, there are no other formal remediation options at this time.

What will it cost for my child to participate?

There are no costs associated with taking part in this study.

Will my child receive any payment or reward for taking part in the study?

Your child will not receive any payment or reward for taking part in this study.

Who will see the information my child gives?

Your child's information will be combined with information from other people taking part in the study. When we write up the study to share it with other researchers, we will write about this combined information. Your child will not be identified in these written materials.

We will make every effort to prevent anyone who is not on the research team from knowing that your child gave us information, or what that information is. For example, your child's name will be kept separate from the information he or she gives, and these two things will be stored in different places under lock and key.

To ensure all participants confidentiality, the faculty advisor will generate and label your consent and contact forms with a random identifier code. The code will then be used in place of all names-for evaluations of all children, parent survey responses, and parent logs of the time spent in instruction. All documents with identifying information and a master random code list will be kept in a locked file cabinet, under the supervision of the faculty advisor.

The researcher will be blind to everyone's identifying information, survey responses, and individual test scores.

The parents will be identifiable to the researcher by a first name and phone number or email address only.

All correspondence and contact with the researcher, for questions or guidance throughout program implementation, will be made by the parents or therapist using first names.

However, there are some circumstances in which we may have to show your child's information to other people. We may be required to show information that identifies your child to people who need to be sure we have done the research correctly; these would be people from such organizations as Eastern Kentucky University, but the information will not be reported in the results.

Can my child's participation in the study end early?

If your child decides to take part in the study, he or she still has the right to decide at any time that he or she no longer wants to participate. Your child will not be treated differently if he or she decides to stop taking part in the study.

The individuals conducting the study may need to end your child's participation in the study. They may do this if your child is not able to complete the instructional program or complete the evaluations of performance.

What happens if my child gets hurt or sick during the study?

It is important for you to understand that Eastern Kentucky University will not pay for the cost of any care or treatment that might be necessary because your child gets hurt or sick while taking part in this study. That cost will be your responsibility. Also, Eastern Kentucky University will not pay for any wages that might be lost as a result of this study.

Usually, medical costs that result from research-related harm cannot be included as regular medical costs. Therefore, the costs related to your child's care and treatment because of something that is done during the study will be your responsibility. You should ask your insurer if you have any questions about your insurer's willingness to pay under these circumstances.

What if I have questions?

Before you decide whether to accept this invitation for your child to take part in the study, please ask any questions that might come to mind now. Later, if you or your child have questions about the study, you can contact the investigator, Cindy Poole at 706-673-2295 (Office at New Hope Middle School). If you have any questions about your child's rights as a research volunteer, contact the staff in the Division of Sponsored Programs at Eastern Kentucky University at 859-622-3636. We will give you a copy of this form to take with you.

What else do I need to know?

The standardized handwriting evaluation selected will be **The Test of Handwriting Skills-Revised**. The home instruction summer program will use components of the **Handwriting Without Tears** curriculum. There are many available parent resources on their website at hwtears.com. In the event that supplies or materials are provided for the instructional program from the Handwriting Without Tears company, there is no financial benefit, influence, or intended conflict of interest by the researcher, in using this program.

This research program is fully funded by the researcher, with the cooperation and approval of Whitfield County Schools. The intent of the research is to improve parent involvement, student achievement, innovative teaching practices, and research that has the opportunity to inform future educational practices.

You will be told if any new information is learned which may affect your child’s condition or influence your willingness to continue allowing your child to take part in this study.

*I have thoroughly read this document, understand its contents, have been given an opportunity to have my questions answered, and give permission for my child to **participate in the complete research project** which includes two evaluations, and a summer home program of handwriting instruction, if he/she chooses to participate.*

_____	_____	_____	_____
Parent/Guardian’s Name	Date	Child’s Name	Date
_____	_____	_____	_____
Parent/Guardian’s Signature	Date	Witness Signature	Date

*I have thoroughly read this document, understand its contents, have been given an opportunity to have my questions answered, and give permission for my **child to participate in only the handwriting evaluations** if he/she chooses to participate.*

_____	_____	_____	_____
Parent/Guardian’s Name	Date	Child’s Name	Date
_____	_____	_____	_____
Parent/Guardian’s Signature	Date	Witness Signature	Date

I do not want my child to participate in a handwriting instruction program, evaluations, or research program.

_____	_____	_____	_____
Parent/Guardian’s Name	Date	Child’s Name	Date
_____	_____		
Parent/Guardian’s Signature	Date		

PARENT PARTICIPATION INFORMED CONSENT AGREEMENT

*I have thoroughly read this document, understand its contents, have been given an opportunity to have my questions answered. I fully acknowledge my responsibilities as the **parent coach** for my child's handwriting instruction program. I consent to participate in this research program by performing the instructional lessons, attending a handwriting instruction training program, completing a log of my time/ participation, and completing two short surveys.*

Parent/Guardian's Name Date

Child's Name Date

Parent/Guardian's Signature Date

Witness Signature Date

*I have thoroughly read this document, understand its contents, have been given an opportunity to have my questions answered. I do not wish to participate in the summer remediation program, but I will consent to assist with the research by **agreeing to complete a short survey** of my child's experiences with previous handwriting instruction and my perceptions of the types of difficulties he/she is currently having with handwriting.*

Parent/Guardian's Name Date

Child's Name Date

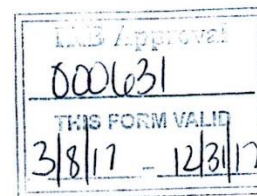
Parent/Guardian's Signature Date

Witness Signature Date

To Be Completed by the Faculty Advisor

Random Access Code assigned for this parent participant _____.

Random Access Code assigned for this child participant _____.



Appendix F: Parent Survey One

Handwriting Research Parent Survey-One

This survey is designed to gather information about the characteristics of your child, the amount and type of handwriting experiences they have had, and to try to identify some common causes of their writing difficulties.

Child Characteristics

1. What is the exact age of your child in number of months? (Ex. 5 years=60 months, 5 1/2=66 mos., 6 years=72 months, etc.)

_____ Months

2. What hand does your child write with?

Left

Right

3. Did your child attend a preschool program before kindergarten?

Yes

No

4. Is this the first time your child is in kindergarten?

Yes

No

Previous experiences

5. Did your child receive handwriting instruction before kindergarten?

Yes

No

Unsure

6. Has anyone else attempted to teach the child how to write alphabet letters in addition to classroom instruction?
- Yes
 - No, skip to question 8
7. Please indicate who has tried to provide extra help with handwriting (Please select the best answer-the person(s) who performed the most help).
- Parents
 - Tutors
 - Brothers/Sisters
 - Other family member

Parent perceptions of current handwriting skills

8. Does your child know how to write his/her first name with the correct letters?
- Yes
 - No
 - Some letters are correct
9. How many uppercase (capital) alphabet letters do you think your child can write well?
- 1-5 letters
 - 6-10 letters
 - 11-16 letters
 - 17-21 letters
 - 22-26 letters
10. How many lowercase letters do you think your child can write legibly?
- 1-5 letters
 - 6-10 letters
 - 11-16 letters
 - 17-21 letters
 - 22-26 letters

11. Does your child write any letters backward?

Yes

No

12. Does your child write any letters upside down?

Yes

No

13. Which letters are typically formed the wrong way?

Please list them _____

14. Can your child draw a closed circle?

Yes

No

15. Can your child draw a square with four exact corners?

Yes

No

16. Can your child draw a triangle with three identifiable angles?

Yes

No

17. Which type of capital letters are the most difficult for your child to write properly?

Straight line letters such as F, E, T, L, H

Those with curves such as C, O, Q, D, G, P, R, B, U, S, J

Those with diagonal line segments such as W, Y, A, K, Z, X, V, M, N

All of them

18. Which group of lowercase letters are the most difficult for your child to write properly?

- The letters that start like a “c” such as c, a, o, d, g, q, s
- Those which extend beyond the baseline such as j, p, y, q
- Those that are taller than the others such as b, d, h, k, l, t
- Those that diagonal line segments such as z, x, v, k, w, y
- Those that have connected “humps” such as n, m, r, h, f
- Specific letters that do not fit into any of these groupings
- All of them

19. What do you think are some of the causes for your child to have handwriting difficulties?
(Check all that apply)

- Poor pencil grasp
- Poor knowledge of what the letters look like from memory
- Poor placement of the letters on the baseline
- Letters upside down or backward
- He/she writes too fast or doesn't take the time to write properly

20. How would you rate your child's handwriting? **(On a scale of 1-5, please bubble in the best corresponding number answer)**

Unable to read it 1 2 3 4 5 **Able to read, letters formed properly**

21. Does your child have any medical or physical problems that would cause handwriting difficulties?

- Yes, please list your responses in the question below
- No

22. List any medical problems you think may cause handwriting difficulties:

Thank you for your participation in this research survey to determine the common characteristics of those children who demonstrate difficulty with handwriting.

Appendix G: Child Assent Script

IRB Application Attachment

Assent Script for children under the age of seven

“I am doing some research to try to figure out if children can improve their handwriting if they work on handwriting lessons at home. You know how I teach you the alphabet letter lessons in school? I have asked your family if they would be willing to work with you at home, on your handwriting this summer. I am not sure if children who practice the lessons at home get better at handwriting. I would like your help to figure that out. If you agree to help me with this project, you will be asked to take a handwriting test which will give me a number score of how you write alphabet letters, words, and sentences. You will be asked to write down the letters I call out, or copy them from a book. Then I will ask you to work on a handwriting lesson for 15 to 30 minutes a day, from Monday to Friday during the summer. I will train your family on how to teach you the lessons, just like we have done all year. At the end of the summer, I will ask you to take the handwriting test again, to see how much progress you made with the extra lessons.

“Your parents know that I am asking you if you want to participate, but it is up to you to decide if you want to do this. I do not want you to feel like you have to participate, and no one will be upset if you say no. Even if you say yes now, but decide you want to stop later, no one will be upset with you. All you have to do is tell me that you want to stop”.

“Since some kids have trouble with handwriting, I want to see if you can make better letters with your parent teaching you, and with the extra practice. If the summer program works well, we will know that it could be a way to help other children write better”.

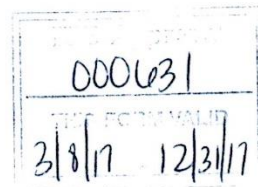
“Do you have any questions for me”?

“Would you agree to taking the two tests, and working on your handwriting this summer from my lessons”?

“If you agree, make a mark on this paper and I will write the word “Agreed” on your test form”.

“If you do not want to participate, it is okay. Thank you”!

Consent mark of agreement _____ Declined _____ Date _____.



Appendix H: Parent Training Survey

Date of Training _____

1. Did the day and time of the training meet your schedule needs? Y / N
2. Were you given several options of training times to choose from? Y / N

On a scale of 1 to 5, answer the following questions:

3. The therapist considered my needs as a parent, and designed the program to fit my learning style.

Not at all = 1 2 3 4 5 = Great

4. The therapist used several different methods such as demonstration, modeling, video, provided notes, and practice opportunities so that I could learn the program different ways.

Not at all = 1 2 3 4 5 = Definitely

5. After completing the program, how confident are you in being able to teach the lessons?

Not at all = 1 2 3 4 5 = Definitely

6. After completing the program, how would you rate its overall effectiveness at teaching you what you need to know to work with your child this summer?

Not effective = 1 2 3 4 5 = Very effective

7. After completing the program, how would you describe your need for continued training or support to be confident in teaching the lessons?

I will need lots more support = 1 2 3 4 5 = I should not need much more help.

8. What part(s) of the training was most helpful in understanding how to teach your child?

9. What was least effective for your learning?

10. Do you have any recommendations to improve your experience?

Thank you so much for helping me design parent programs that meet your needs!

Cindy Poole, OTR

Appendix I: Parent Time Log Form

Daily Lessons and Time Log Form

	Monday	Tuesday	Wednesday	Thursday	Friday	Total Time/week
Week 1	F, E	D, P, B & words	R	N & words	M	
Minutes spent on instruction						
Week 2 Diagonals	H, K & words	U, V & words	X, Y & words	W & words	Z & words	
Minutes spent on instruction						
Week 3 Curves and Center Start	C, O, Q & words	G & words	S & words	A, I & words	T, J & words	
Minutes spent on instruction						
Week 4 Review	K	N, M	X, Y	S	Z	
Minutes spent on instruction						
Week 5 Magic C	c, o, g & sentences	a, d & words	q & words	s & words	e & words	
Minutes spent on instruction						
Week 6 Animal Letters	Fishers j, y & words	Swimmers p, r & words	n, m & words	Sharks v, x & words	v, w & words	
Minutes spent on instruction						
Week 7 Tall Letters	h, b, t & words	l, k & words	f & words	z, i	Review Magic c, draw mat man, write alphabet	
Minutes spent on instruction						

TOTAL MINUTES

Appendix J: Parent Survey Two

Handwriting Research Parent Survey-Two

This parent survey is designed to gather information about your perceptions and experiences while participating in the research program, how your child progressed with the lessons, and to get feedback about the handwriting instruction/ program elements. This information, along with your child's handwriting test scores will help us determine if home programs are a useful way to improve a child's alphabet letter formation.

Parent perceptions of the training program

1. How would you rate the **training** you received before you began the handwriting lessons? Consider whether you had a good understanding of how to teach the handwriting lessons.
 - The training did not meet any of my needs to be able to teach the lessons
 - The training met a few of my needs to be able to teach the lessons
 - The training met some of my needs to be able to teach the lessons
 - The training met most of my needs to be able to teach the lessons
 - The training met all of my needs to be able to teach the lessons
2. Was the format or style of the training session helpful?
 - Yes
 - No
3. Was the amount of time provided for the training program adequate to meet your needs?
 - Yes
 - No
4. Was the parent instruction manual easy to understand and provided the information you needed to be able to teach the lessons?
 - Yes
 - No

5. Did the kit provide the type of materials you needed to be able to teach your child the handwriting lessons?
- Yes
 - No
6. Following the training program and review of the instructional materials, how would you **describe your confidence** in being able to instruct your child in the handwriting lessons?
- I was unsure of how to teach the lessons.
 - I was somewhat unsure of my ability to teach the lessons.
 - I was somewhat confident in my abilities to teach the lessons.
 - I was confident in my abilities to teach the lessons.
 - I was very confident in my abilities to teach the lessons.

Parent experiences with the instructional program

7. How many **minutes per day did** your child work with you, and on his/her own to complete the daily lessons? (On an average day)
- 5-10 minutes
 - 11-15 minutes
 - 16-22 minutes
 - 23-30 minutes
 - More than 30 minutes per day
8. Do you think this type of program **could be** an effective way to improve a child's handwriting ability?
- Yes
 - No
9. Did you ever look up the videos, instructions, or available support materials from the Handwriting Without Tears website (www.hwtears.com)?
- Yes
 - No

10. If this kit were available to check out from the school parent resource center, do you think parents would use it?
- Yes
 - No
11. Did you feel rushed to get all of the lessons completed each day/week?
- Yes
 - No
12. Do you think 7 weeks of instruction was an adequate amount of time to complete the program?
- It was enough time (the lessons were neither too short or too long for each day)
 - The program was too short to get the material covered- (need more time per letter lesson)
 - The program was too long- (need more lessons each day to finish faster)

Parent perception of the child's response to the handwriting home program

13. Can your child write his/her name correctly now?
- Yes
 - Some improvement
 - No, no change
14. Did your child demonstrate improvement with writing letters upside down or backward?
- Yes
 - No
 - They didn't have a problem with this before the program
15. Are there still letters that your child has difficulty writing correctly?
- Yes
 - No, skip to question 18

16. Which type of capital letters does your child still have difficulty writing properly?
- Straight line letters such as F, E, T, L, H
 - Those with curves such as C, O, Q, D, G, P, R, B, U, S, J
 - Those with diagonal line segments such as W, Y, A, K, Z, X, V, M, N
 - Please list specific letters if they do not follow a group category _____
17. Which group of lowercase letters does your child still have difficulty writing properly?
- The letters that start like a “c” such as c, a, o, d, g, q, s
 - Those which extend beyond the baseline such as j, p, y, q
 - Those that are taller than the others such as b, d, h, k, l, t
 - Those that diagonal line segments such as z, x, v, k, w, y
 - Those that have connected “humps” such as n, m, r, h, f
 - Please list specific letters that do not fit a group category _____
18. Did the home handwriting program improve your child’s alphabet letter formation, and your ability to read his/her written work?
- Yes
 - No
19. Now that the structured home program plan is complete, would you be interested in keeping the lessons and kit of materials for a longer time period?
- Yes
 - No
20. Now that the program is complete, how would you rate your child’s current handwriting abilities?
- No improvement, handwriting remains un-readable
 - Minimal improvement, still needs handwriting instruction, practice, and review
 - Moderate improvement, would benefit from some practice and review of specific letters.
 - He/she forms all letters correctly- demonstrates mastery of alphabet letter formation

21. In the training program, you were asked to complete a daily log of the **amount of time** you spent teaching the lessons in this program. Based on that daily log, please add up the number of minutes you spent teaching your child the handwriting lessons.
- I spent _____ minutes teaching my child.
 - Please add up the number of minutes for me from this log sheet.
22. Please list any recommendations, feedback, or suggestions that you feel would help in designing or improving this home handwriting instruction program.

Thank you so much for your participation in this research survey, and your commitment to help ALL children improve their handwriting. I sincerely hope that the parent training, resources, and home instruction program were helpful for you, and your child.

If you have further questions or concerns, please feel free to contact me at 706-673-2295 (Office at New Hope Middle School)

Cindy Poole, OTR, M. Ed.
Occupational Therapist
Whitfield County Schools

****Please attach your daily log sheet to this survey form, and return them in the enclosed stamped envelope.**