Letter-Perfect Handwriting Instruction Workbook Compendium

Jamie Rosenberg Friedman

New York University

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Objective

This competency project began with the simple aim of developing a handwriting workbook that would harness appropriate theories and optimize handwriting instruction for beginning writers. What evolved was an instructional handwriting initiative that is evidence-based and theory driven. Letter-Perfect Handwriting Instruction (L-Phi) uniquely emphasizes the production of letter formation through the use of graphic rules and organization principles. These rules and principles are based on the sequence and directions that are used to produce geometrical shapes and are applied to forming letters. L-Phi uses graphic rules and organization principles to analyze letter formation and systematize the progression of handwriting instruction. L-Phi further builds on handwriting instruction research and incorporates methodology with proven efficacy. As an innovative handwriting enterprise, L-Phi will need to be examined for real-world use. This competency project is the first step in the long journey of developing a valuable and practical addition to handwriting instruction.

Handwriting and Occupational Therapy

Handwriting is an important skill for young students to develop and master. It provides students with the earliest method for turning language into external written characters in order to share knowledge (Connelly et al., 2007; Rogers & Case-Smith, 2002). Handwriting is written language and involves both legibility and speed. Legibility refers to the neatness or precision of the text. It includes proper letter formation, directionality, size, and alignment, which relates to the spacing between letters and words as well as their placement on the line (Feder & Majnemer, 2007; Lifshitz & Har-Zvi, 2014). Speed is the temporal aspect of handwriting and is measured by the amount of text that is produced in a specific time period (Prunty et al., 2013). Three factors establish speed: first, the duration of the task or the time from initiation of the writing task to its

completion; second, the speed of execution or the pace at which the pencil is moving when in contact with the paper; and third, the duration of time spent paused which is measured as the percentage of time during the task when the pencil is either not in contact with the paper or not moving on the paper (Prunty et al., 2013).

As an essential occupation, that requires both motor and processing skills, handwriting interventions naturally fall within the parameters of occupational therapy's domain (AOTA, 2020). According to the Occupational Therapy Practice Framework: Domain and Process Fourth Edition, motor skills refers to one's ability to move and sustain body positioning, as well as the ability to interact and manipulate objects (AOTA, 2020). Processing skills refers to one's ability to organize space, time, and objects; it includes sustaining performance, applying knowledge, and adapting performance (AOTA, 2020). Specifically, writing letters requires the ability to recognize letter shapes (or have a complete visual representation of each letter) and recognize the individual line segments that form the letter; it requires the ability to reproduce line strokes in the sequence and direction that form the letter, which requires fine motor coordination (in-hand manipulation of a writing utensil and bilateral integration), visual-motor integration, kinesthetic and tactile sensitivities (to recognize the correct amount of pressure necessary to place on the writing utensil).

Occupational therapist possess a uniquely mixed awareness of child development, social and psychological behavior, and motor learning theory (Donica, 2010). With this foundational understanding along with an aptitude for identifying underlying performance skills that impact handwriting acquisition, and knowledge of evidence-based interventions and adaptations, occupational therapists are well suited to provide optimal handwriting instruction and interventions.

Traditionally in the United States, elementary school teachers have been responsible for initial handwriting instruction and occupational therapists have provided remedial services for students with identified handwriting impairments (Cahill, 2009). More recently, however, there has been momentum, aided by research, for greater occupational therapy involvement for whole classrooms at the initial stages of handwriting acquisition (Cahill, 2009; Case-Smith, Weaver, & Holland, 2014, Randall, 2018). According to a recently completed unpublished systematic review, handwriting outcomes improve when occupational therapists contribute to handwriting acquisition for children with and without identified handwriting difficulties (Friedman, 2021).

The Current State of Handwriting Instruction

Currently, there is no one universally used curricula to teach handwriting in the United States. Educators report using a variety of self-developed methods and commercially available writing programs to teach handwriting (Asher, 2006; Donica et al., 2012). According to a survey that was published in 2008, 61% of teachers reported using a commercial program to teach handwriting (Graham, et al., 2008). The commercial programs most often used were the Zaner-Bloser Handwriting program and D'Nealian Handwriting program (Graham et al., 2008). Another survey, published in 2012, found similar responses. In this survey, of the teachers who reported using commercial programs, Zaner-Bloser and D'Nealian were the most common with about 9% of respondents reporting to use Handwriting Without Tears (Donica et al., 2012).

Similarly, occupational therapists also implement a variety of handwriting interventions. Two of the most frequently researched occupational therapy developed handwriting curricula that are also available commercially, are Handwriting Without Tears (HWT; Olson, 2003; Olsen, et al., 2008), and Size Matters Handwriting Program (SMHP; Moskowitz, 2009). It is important

to take a closer look at these handwriting curricula to understand why they are popular and what they are lacking.

Zaner-Bloser

The Zaner-Bloser handwriting program was originally developed in 1888 by Charles Zaner and Elmer Bloser (https://www.zaner-bloser.com/company/history.php#navAnchor). The handwriting program teaches students to form manuscript (print) letters with straight lines and circle-like curves, often referred to as "ball and stick" (Shimel et al., 2009). In workbooks designed for children in prekindergarten, capital letters and numbers are taught. Letters are grouped based on the strokes used to form the letters: the first group is based on vertical and horizontal strokes; the second group follows forward and backward circle strokes; and the last grouping is based on diagonal strokes. This organizational sequence follows child development of line production (www.Zaner-Bloser.com). In the workbooks designed for kindergarteners, capital and lowercase letters are taught in tandem and are grouped based on the strokes used to form the lowercase letters (www.Zaner-Bloser.com).

Zaner-Blasor workbooks are presented in a landscape layout. A model of the letter is presented at the top on the page with numbered arrows designating stroke sequence and direction. The lined paper has a red bottom line, a dashed blue middle line, and a blue top line. There are no vertical starting or terminal lines on the page. A green dot is used to indicate the starting position of the letter. Colorful cartoon pictures are included on the page, but they are not for coloring.

Along with separate handwriting workbooks designated for students in prekindergarten through sixth grade, the Zaner-Blasor handwriting program also markets multi-sensory materials including handwriting kits, paper, journals, and songs that are commercially available through a

website (zaner-bloser.com). Currently, handwriting is only one element of Zaner-Bloser's expansive elementary teaching program that also tackles reading, writing and grammar, spelling, and vocabulary (www.zaner-bloser.com)

D'Nealian

D'Nealian Handwriting, developed by Donald Thurber in the 1970s, was created in response to the "ball" and "stick" method of handwriting instruction (Thurber, 1983). According to Thurber, using "circle-stick writing…requires continued pen/pencil lifts hindering rhythm or flow in the writing process. There is also little carryover value into cursive writing as the two scripts are totally different in make-up" (Thurber, 1995, p. 3). Thurber's instruction method emphasizes a "gestalt of forming letters," slanted print for transition to cursive writing, and "allowances…for individuality as no two people can write alike" (Thurber, 1995, p. 3).

D'Nealian Handwriting workbooks for kindergarteners start with printing numbers, lower case letters and then capital letters (classroomresourcecenter.com). Letters are not grouped but taught individually. The letter sequence organization is based on letter construction similarities (Thurber, 1995) and not developmental progression. Students are instructed to finger-trace sample letters first and then copy the letter.

D'Nealian workbooks have a portrait layout with colorful pictures or drawings to color. Writing lines have a red bottom line, blue top line and a dashed blue middle line. A grey dot is used to indicate the starting point of the letter. The workbooks do not use vertical starting or terminal lines.

Handwriting Without Tears

Handwriting Without Tears (HWT) was developed by an occupational therapist, Jan Olsen, in 1977. Today, the company, Learning Without Tears, has grown to include a prewriting

program, cursive handwriting instruction, keyboarding instruction, and a phonics reading program. The handwriting curriculum promotes a multisensory approach that includes manipulatives and digital online instruction. Handwriting instruction begins with an "Emergent Writing" program in prekindergarten that focuses on "readiness skills" including grip, fine motor skills, and letter and number recognition (Learning Without Tears, 2022). The curriculum for kindergarteners begins with instruction for printing capital letters and then moves on to lowercase letters and numbers (Learning Without Tears, 2022). The sequence for letter instruction is based on the type of strokes needed for letter formation. Letters that have vertical or horizontal lines are taught first, then curved letters, and finally letters with diagonals (Learning Without Tears, 2022).

The curriculum utilizes a workbook that has a landscape layout and uses gray rectangles with a black dot to designate starting position for students to practice printing. Letter formation is instructed using a model with numbered arrows designating sequence and direction of the strokes. Letters are traced four times and then copied four times. There are cartoon pictures that are available for students to color. Lined paper is not included until lower case letters are taught. Once utilized, the paper, also with a landscape layout, consists of a bottom line and a middle line only. There are no vertical lines to designate starting or ending of the writing space.

Size Matters Handwriting Program

The Size Matters Handwriting Program (SMHP) evolved from research Beverly Moskowitz completed in 2009, for requirements of a Doctorate in Occupational Therapy (realotsolutions.com). Moskowitz examined the effectiveness of occupational therapy handwriting interventions that "traditionally focused on the underlying processes associated with handwriting" compared with a task-oriented approach that "stresses direct teaching and skill

generalization with the accompanying list of specifically designed instructions like verbal prompts, fading and modeling" (Moskowitz, 2008, p. 3). She found that handwriting proficiency requires "intricate parts to be taught in isolation, practiced repetitively, gradually modified and individually critiqued. No amount of Heavy Work, Connect-The-Dots or tactile play seems to be able to replace that step" (Moskowitz, 2008, p. 14).

Moskowitz (2020) advocates "emphasizing 3 main contours," or letter size, over "shape, slant, directionality of stroke and even spacing. (p. 5)" Moskowitz suggest that this focus "accelerates the learning curve exponentially" (Moskowitz, 2020, p. 5). The first 21 pages of the SMHP workbook are devoted to defining eight key concepts including, naming letter strokes (Standing Up Tall Lines, Lying Down Lines, Slant Lines, Super C's, Smiles, Frowns, and Clocks), forming letters (starting points, initial lines, and touch points), defining letter size (1, 2, and 3), naming lines (bottom line, dotted line, and top line) describing proper letter placement on the line, and proper spacing between letters and words (Moskowitz, 2020).

SMHP teaches capital letters first, then numbers, and finally lowercase letters. Letters are not taught in alphabetical order, but the rationale for sequencing is not defined in the workbook. Letters are grouped in sets of two, three, four, or five letters for individual practice and then practiced again, as a group at the end of the section. The student workbook is oriented with a landscape layout and written using numerous colors on each page with a small picture for students to color at the bottom of the practice page. A bold bottom line, dashed middle line, and top line are clearly marked as are vertical starting lines and ending lines. Each practice page asks the student to name the letter size and then count and label the various line strokes needed to form the letter. Starting points for each letter are highlighted with a green dot. Students are asked to trace the letter and then "make" the letter, interposing each trial five times on a single line.

Students are asked to circle their "best" printed letter and then "roll the dice" to establish how many more practice trials should be completed for "Star-Worthy" letters. It is suggested that The Dice Game be "played on every letter that needs more practice…because it is the wrong size, made the wrong way or just funny-looking" (Moskowitz, 2020, p. 23).

Developing a New Handwriting Instruction Workbook

Although there are multiple handwriting instruction workbooks that are commercially available, none have proven superiority over the others. A systematic review published in 2018, examined the efficacy of various handwriting programs for improving handwriting outcomes (Engel, et al., 2018). The authors found that although generally, handwriting instruction improves handwriting legibility, not all programs improved speed and automaticity. Furthermore, the authors established that "no one handwriting program appeared to outperform the other programs across all domains" (Engel, et. al., 2018, p. 3). They suggested that "in an ideal situation, the needs of the children in the classroom would dictate which curriculum is used" (Engel, et al., 2018, p. 3). However, it seems unlikely to find a monolithic classroom of students all exhibiting the same "needs." Instead, it seems more reasonable to extract the proven characteristics employed in previously published workbooks, jettison aspects that have been found lacking, and develop a new workbook that is based on sound theories and the latest research.

Letter-Perfect Handwriting Instruction

Letter-Perfect Handwriting Instruction (L-Phi) is an English language, cognitive-based workbook that is a product of both theory and research. It was developed by an occupational therapist as part of a doctoral requirement. L-Phi evolved from a frame of reference for learning sequential strokes for printing letters and is guided by a model of practice that stresses the

importance of context. The workbook can be implemented by classroom teachers, occupational therapy practitioners, and parents independently, or used collaboratively. The first workbook to be developed focuses on capital letters. Future editions or workbooks in this series will address lower case letters and numbers.

At its heart, L-Phi promotes correct letter formation. Letter formation reflects the process which a letter is written and the final product. It requires that the letter segments' length and connections are accurate and represent the actual shape of the letter (Lifshiz & Har-Zvi, 2015). The important aspects of proper letter formation are the starting position of the letter, the sequence of strokes, and the direction of the strokes used to complete the letter (Asher, 2006). The sequence of strokes is the ordering of the component line segments (Meulenbroke, et al., 1996). The direction of the strokes is defined by the trajectory taken once the letter is initiated. As the number of letter segments increase, the number of sequencing strategies also increase (Meulenbroke, et al., 1996).

Letter-Perfect Handwriting Instruction is developmentally appropriate, but it is not based on child developmental stages. Other handwriting curricula group letter instruction by the types of strokes needed to complete the letter shape based on child development (vertical, horizontal, circular, and oblique). However, by the time children enter kindergarten at age 5, students should be developmentally ready to form these basic strokes (Beery & Beery, 2010). Instead, L-Phi follows a unique approach based on graphic behaviors that reflect the organization and arrangement of drawing geographic patterns including the starting position and the direction and sequence of strokes.

Theoretical Base

Graphic Behavior: Graphic Rules and Graphic Organization Principles

Researchers have found that when children copy simple geometric patterns, they tend to follow similar graphic behaviors, or common patterns of organization and arrangement (Ellenblum, 2019; Ivancevic et al., 2020; Khalid et al., 2010; Nihei, 1983; Ninio & Liebich, 1976). Notably, the specific start positions and sequence of strokes follow a set of graphic rules that represent predictable starting points, or starting rule, and sequence progression, or progression rule (Mulenbroek, et al., 1996). The rules for starting a geometrical shape reflect the inclination for children to begin copying the first segment stroke at the top or at the left of the pattern. The rules for progression reflect preferences in children to draw vertical lines downward and horizontal lines rightward (Meulenbroek et al., 1996). Developing graphic behavior that conforms to graphic rules tends to evolve organically in children from tendencies to use analytic strategies when copying geometric patterns (Kalid et al., 2010, Meulenbroek et al., 1996). According to Fischer (2017), typically developing children have a natural inclination or bias for top to bottom due to the influence of gravity. For a detailed discussion of graphic behavior, please see, A Frame of Reference for Learning Sequential Stroke for Printing Letters English Letters (Friedman, 2022).

In addition to the starting point, there are three main graphic organization principles for drawing line segments. These include:

1. The *fixed principle* which states that the second stroke is drawn from the starting point of the first line (e.g., ’N’)
2. The *fluid principle* which states that the second stroke is drawn from the endpoint of the first line (e.g., ‘L’).

3. The *flexible principle* which states that the second stroke starts at a point in space and is drawn to the first line (e.g., ‘K’)

As children learn to draw, the graphic rules and organization principles are gradually accommodated and become automatic procedural knowledge, sometimes referred to as automaticity (Meulenbroek et al., 1996).

L-Phi utilizes principles of graphic behavior to categorize letters into similar groups to aide instruction. The order of instruction is taught according to the complexity involved when producing the letter’s segments. As every letter has a designated starting point at or near its apex, it is important to master starting point position first before moving on to progressively more complex organization principles. Specifically, the *Starting Point Letters* have only one segment stroke and are taught first. Letters in this group include C, O, U, and S. The addition of a second stroke increases the task complexity further. The fluid principle is the least complex of the three graphic principles because the first stroke fluently leads to the second stroke without lifting the pencil. This principle builds on the knowledge already learned with the starting point rule, but slightly increases the difficulty by adding a second stroke where the first stroke ends. *Fluid Letters* include L, V, W, and Z. Next, the fixed principle increases the task difficulty further because the second stroke starts back at the starting position of the first stroke. Therefore, students are required to lift the pencil from the paper and restart to continue the letter. Letters that follow the fixed principle, *Fixed Letters*, include A, B, D, E, F, M, N, P, and R. Because the second stroke of the fixed principle uses the same starting point as the first stroke, it is not as complex as the letters that follow the flexible principle. Flexible Letters have the greatest task difficulty because the starting point for the second stroke starts away from the first stroke. Students not only have to lift the pencil up to start the second stroke, but they must also judge the

placement of the second stroke in relation to the first. Letters that follow the flexible principle include G, H, I, J, K, Q, T, X, Y.

The Challenge Point Framework

As handwriting requires motor learning, L-Phi incorporates a motor learning theory to guide the process of handwriting instruction. Guadagnoli and Lee (2004) developed a theory that uses the concept of the challenge point to describe effects of practice conditions on motor learning. According to their theory, if all other factors are held constant, skill improvement is positively related to the amount of practice completed. Importantly, learning is considered a problem-solving process and is dependent on the information that is available. Too much or too little information can impair learning. However, when there is an optimal amount of information available (which is dependent on the skill level of the individual and the difficulty of the task to be learned) learning will occur (Guadagnoli & Lee, 2004). Furthermore, learning is the product of the relationship between the potential available information, or information that is accessible and interpretable, and the understanding that arises from the performance (Guadagnoli & Lee, 2004). Performance depends on the difficulty of the task and the skill level of the performer. The optimal challenge point aligns all three factors: difficulty of the task, potential available information, and individual skill level. Accordingly, it is possible to increase learning by increasing the functional difficulty of a task up to this optimal challenge point. Offering information beyond this point, exceeds the capability of the individual and reduces learning. L-Phi capitalizes on the challenge point framework by grading the difficulty of the task (by the complexity of the graphic rule) and altering the available information provided (fading the number of cues provided to construct each letter).

The challenge point framework also addresses optimal practice conditions. The two practice variables described are blocked practice and random practice. Blocked practice occurs when one distinct motor skill is repeatedly practiced before progressing to another distinct motor skill. Random practice occurs when there is no specific order to the practice and/or when multiple motor skills are practiced at a performance instance. According to the challenge point framework, blocked practice will increase performance during the acquisition trials. However, random practice will produce greater retention performance than blocked. By providing the learner with optimal challenge conditions while movement representation is acquired, the facilitation of complex skill learning can occur (Guadagnoli & Lee, 2004).

L-Phi incorporates these practice conditions through the presentation of single letters for blocked practice, then grouped letters (by graphic rule) and finally mixed group letters, for random practice. By implementing the fundamental components of the challenge point framework to practice the graphic rules for handwriting, L-Phi optimizes the learning process for the improved skill acquisition of handwriting.

Evidence Base

In order to provide optimal handwriting instruction, L-Phi applies evidence-based research. To begin, explicitly and systematically teaching letter formation has been cited in the literature as an important component in handwriting instruction (Graham, 1992; Graham, 2018; Satangelo & Graham, 2016). Although the legibility of print is impacted by elements such as letter size, spacing, and alignment, “poor letter formation reduces legibility of print more than any other element” (Graham & Madan, 1981, p. 391). Letter formation is a fundamental component of L-Phi. Each letter trial stresses a consistent starting point, stroke segment sequence, size, and direction. L-Phi uses numbered arrow cues to indicate order and direction of

each letter stroke. Research validates that this type of instructional modeling encourages students to generate accurate representations of letter formation in memory (Berninger et.al., 1997, Graham, 2018). By incorporating such consistency in letter production, L-Phi supports efficient habit patterns that reduce cognitive load and improves handwriting automaticity.

Another common thread in the literature is an emphasis on repeated practice that provides various exercise opportunities, including tracing, copying, and writing letters from memory (Graham, 2018, Howe, Roston, Sheu, and Hinojosa, 2013). L-Phi provides the structure for students to practice writing each letter in multiple ways: drawing inside guided lines, connecting dashed lines, tracing, copying, and writing from memory. With L-Phi, letter trials start with multiple support cues that are gradually faded out leading to writing each letter from memory.

Finally, while research indicates that beginner handwriting instruction should promote practice opportunities to develop automaticity, curriculum should not overemphasize the neatness of the writing product (Medwell and Wray, 2008). In fact, research shows that conscious attention to neatness negatively impacts the production of automated handwriting movements (Tucha and Lange, 2005). Although with its name it might be misleading, L-Phi does not aim to have beginning writers produce perfect letters. L-Phi understands that handwriting inherently involves the "development of personal style" and therefore, should not reach iconic perfection (Graham, et al., 2007, p. 67).

Ecological Model of Occupation

The Ecology of Human Performance provides a framework that examines how performance is impacted by context (Dunn, Brown, McGuigan, 1994). Context, or the "interrelated conditions that surround the person," can be natural or contrived (Dunn, 2017, p. 212). According to Dunn (2017), "performance may be inhibited in contrived settings because

the environment is unfamiliar, or naturally occurring supports are unavailable" (p. 218). Dunn emphasizes the superiority of interventions that utilize natural contexts (2017). L-Phi uses this model in two distinctive ways: 1) use of paper, and 2) occupational therapy inclusion. First, the lines and orientation of the L-Phi paper were developed to provide the best approximation to lined notebook paper that is commonly used in classrooms. As such, to resemble standard notebook paper, L-Phi's paper is laid out with a portrait orientation and utilizes blue horizontal lines and red vertical lines for guiding starting and terminal writing points. Second, L-Phi also encourages a collaborative approach to handwriting instruction. This push-in approach not only allows students to practice handwriting naturally in the classroom, it also provides direct access of the occupational therapists to all students from the onset of handwriting instruction. Collaboration between the occupational therapist and classroom teacher ensures consistency with handwriting instruction that the classroom teacher can carry over throughout the school day. It also allows all students to benefit from the combination of the distinct skillsets provided by both the occupational therapists and the classroom teachers. Finally, having occupational therapists present in the classroom permits immediate recognition of emerging handwriting difficulties that can be addressed expeditiously.

Strengths-Based Approach

Many handwriting curricula employ a deficits-based approach with a focus on any errant strokes that fall outside the lines. L-Phi applies principles of strength-based practice to handwriting instruction that recognizes the best effort. Students are encouraged to practice writing without the stress of creating a "perfect" letter that is the exact right size, touching the exact right lines. The lines on the page are there as cues, for support, and not as obligatory targets.

Sample of Letter Introduction page -Letter M

Upper and lower case models

Instructions with simple and consistent language.

Starting point highlited with a star.

Stroke segment direction indicated with numbered arrows.

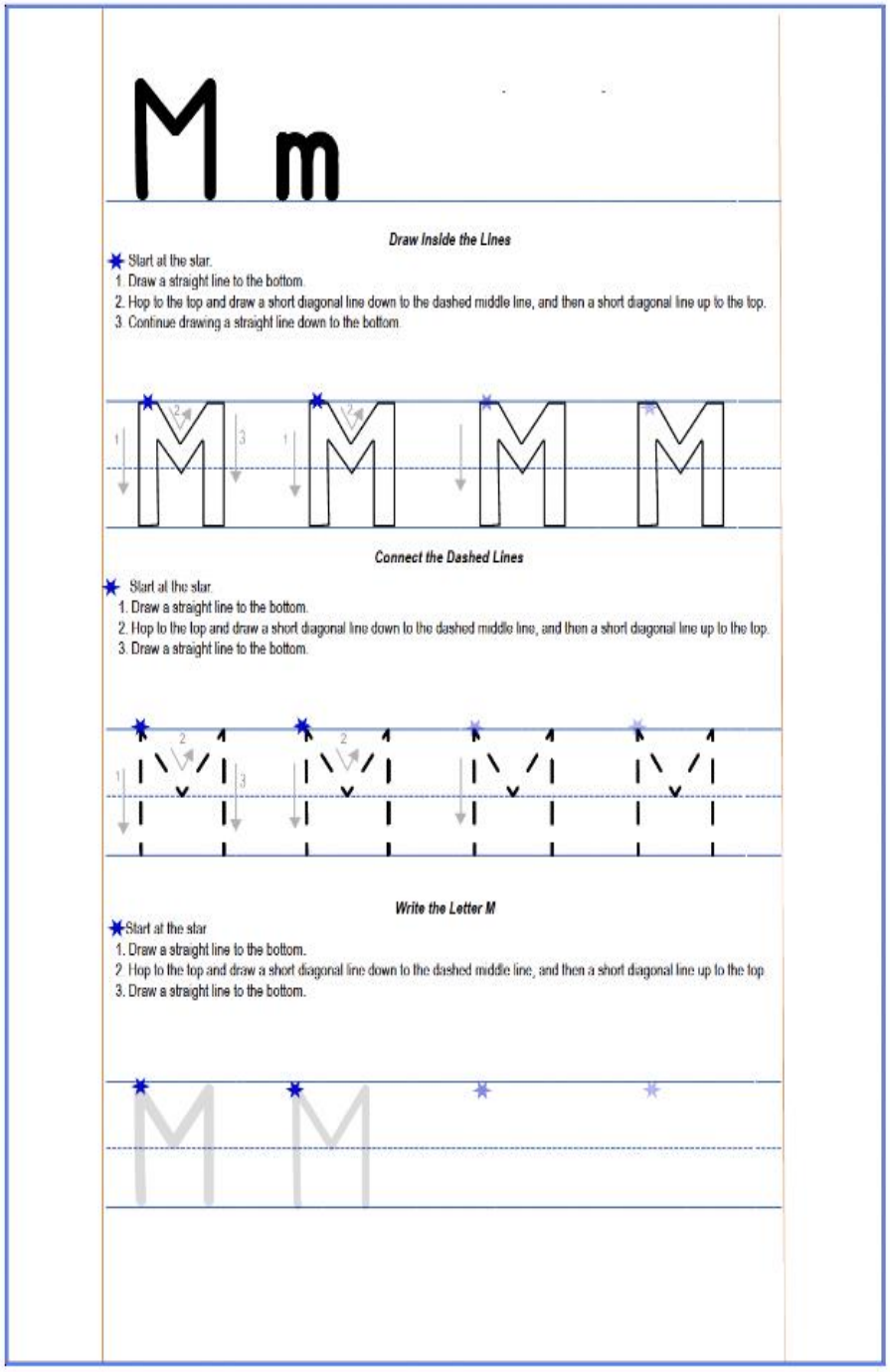
Fading cues with each practice.

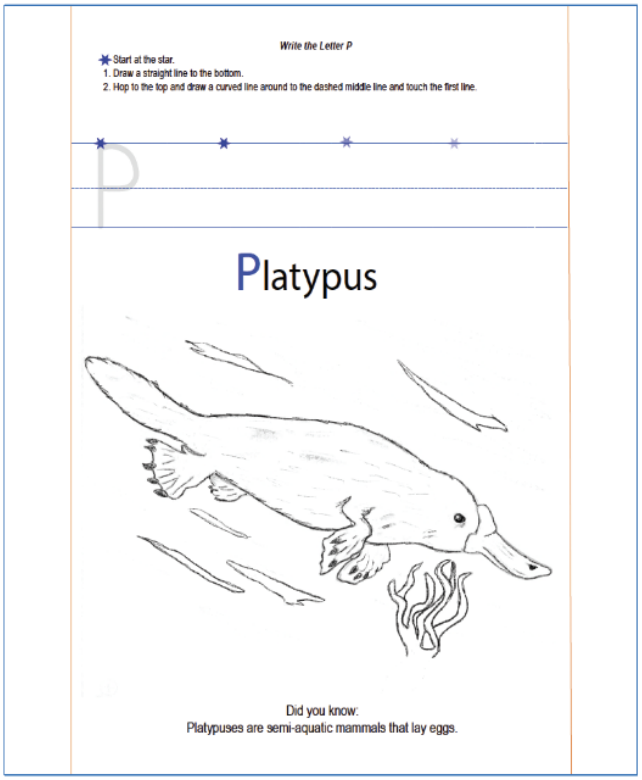
Varied practice opportunities.

Paper orientation and colors resemble standard notebook paper.

Lines provide support cues for starting position and stroke length.

Minimal distractions:
- limited colors
- no pictures





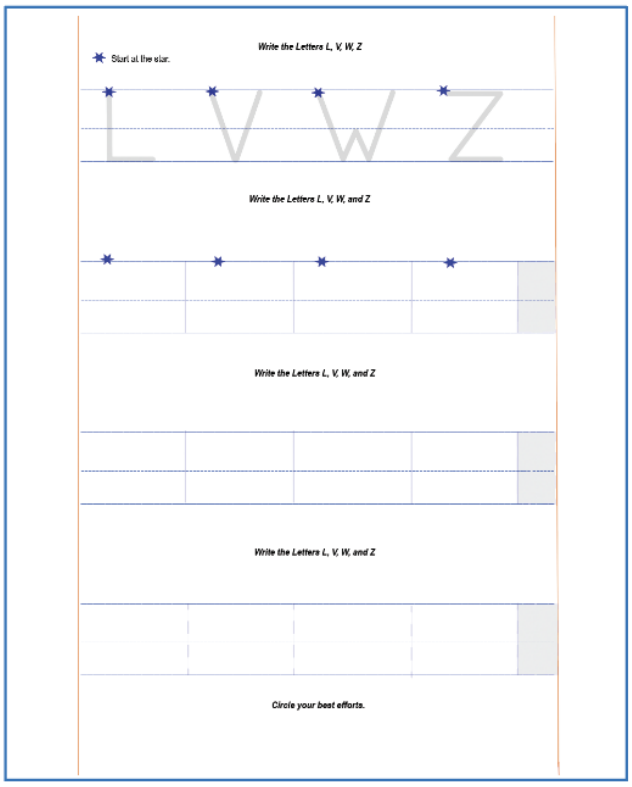
Continued practice opportunities with faded cues.

Educational drawing for coloring and fun fact for discussion.

Grouped random practice for the fluid principle

Practice opportunities with fading cues

Self-evaluation/feedback

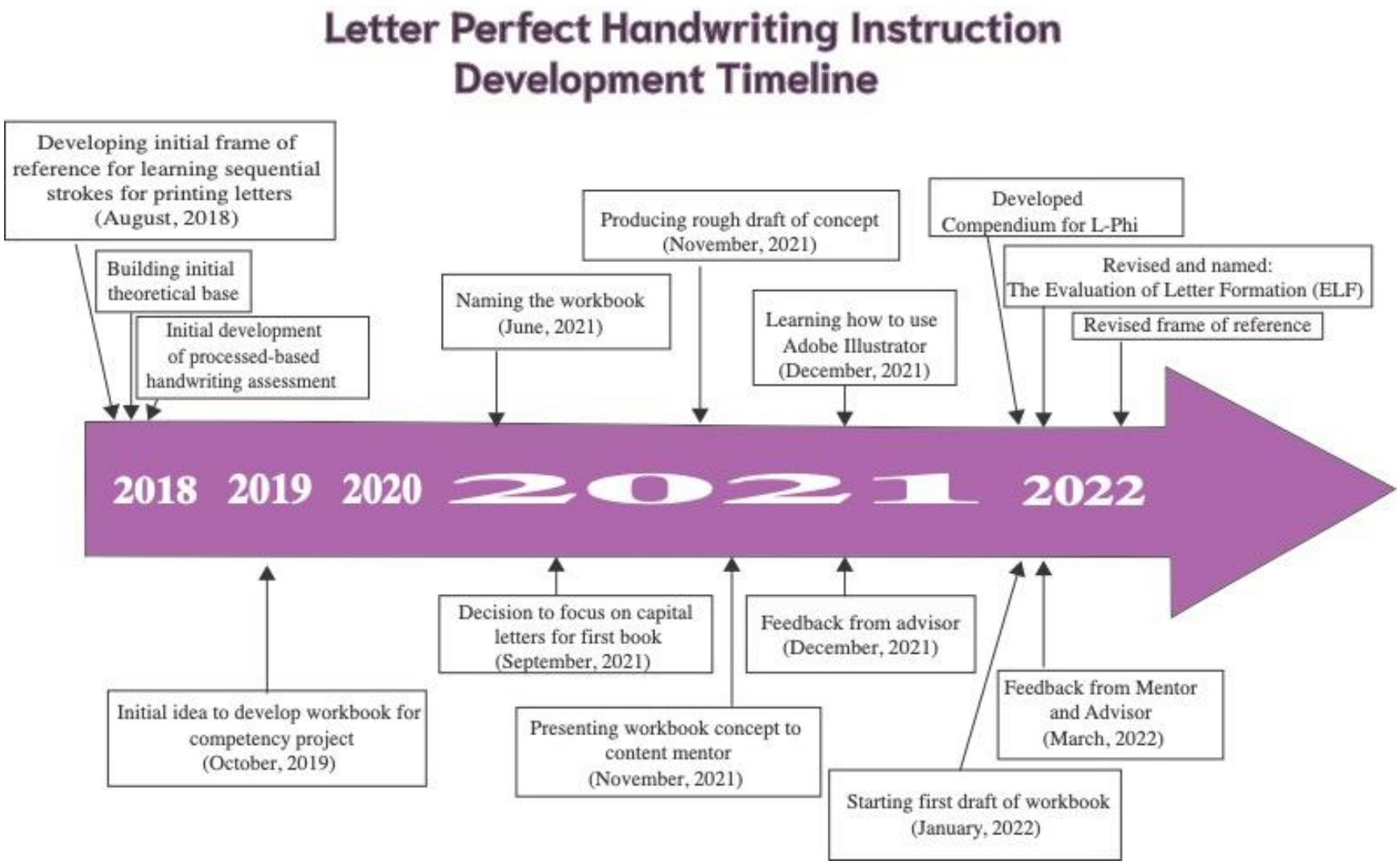


What Makes Letter-Perfect Handwriting Instruction Different?

Handwriting Program	**L-Phi**	**Zaner-Bloser**	**D'Nealian**	**HWT**	**SMHP**
Theory Base	Challenge Point Framework	N/A	N/A	N/A	Motor Learning Theory
Sequence organization	Based graphic organization principles	Based on type of segment stroke (vertical and horizontal lines, circle, and diagonal)	Numbers, lower case, then uppercase	Based on type of segment stroke (vertical and horizontal, curved, diagonal)	?
Instructions	Simple language, stroke size, sequence and direction repeated for each trial. Geared for use with teachers, occupational therapists, and/or parents with or without prior knowledge of handwriting instruction.	Simple language, concise (not fully descriptive) directions – stroke sequence and direction are included but *not* size of stroke.	Simple language, stroke size, direction and sequence included.	Stroke size, direction and sequence are indicated with simple language, minimal wording, and numbered arrows.	Lengthy new names for line segments prior to writing letters. Stroke sequence and direction *not* included.
Model of Practice	Ecological Model of Occupation	N/A	N/A	N/A	N/A

	L-Phi	Zaner-Bloser	D'Nealian	HWT	SMHP
Evidence-based	Systematic instruction of letter formation Cognitive and task-oriented approach Varied practice opportunities Recognizes individualization in handwriting Suitable for collaborative instruction	Not defined in Teacher's Handbook (Research has been completed post development)	N/A (Research has been completed post development)	N/A (Research has been completed post development)	Task-oriented approach (Research has been completed post development)
Workbook paper	Resembles standard notebook paper: Portrait landscape Blue horizontal lines, red vertical lines Only three colors to reduce distractions One large educational picture for students to color after letter practice	Landscape Multi-colored Colorful cartoon pictures	Portrait Multi-colored pictures	Landscape Gray scale – rectangle boxes for capital letters Available cartoon pictures to color	Landscape Multi-colored Model of entire alphabet on each page Small cartoon picture to color

	L-Phi	**Zaner-Bloser**	**D'Nealian**	**HWT**	**SMHP**
Feedback	Strength based: "Circle your best effort"	"Circle your best"	?	?	Deficit-based: "what is wrong, circle the mistakes" Strength - based: "Circle the best" printed letter
Fading cues	Intra-letter and inter-letter practices	N/A	N/A	N/A	N/A


Letter Perfect Handwriting Instruction
Development Timeline
Developing initial frame of reference for learning sequential strokes for printing letters (August, 2018)
Building initial theoretical base
Initial development of processed-based handwriting assessment
Naming the workbook (June, 2021)
Producing rough draft of concept (November, 2021)
Learning how to use Adobe Illustrator (December, 2021)
Developed Compendium for L-Phi
Revised and named: The Evaluation of Letter Formation (ELF)
Revised frame of reference
2018 2019 2020 2021 2022
Initial idea to develop workbook for competency project (October, 2019)
Decision to focus on capital letters for first book (September, 2021)
Presenting workbook concept to content mentor (November, 2021)
Feedback from advisor (December, 2021)
Starting first draft of workbook (January, 2022)
Feedback from Mentor and Advisor (March, 2022)

Reflections

The concept for the Letter-Perfect Handwriting Instruction workbook sprouted as an idea to fulfill the requirements for an occupational therapy doctorate at New York University. After developing a frame of reference that provided guidelines for intervention for students learning to print, the next step was to produce a workbook that utilizes the principles within the frame of reference. Although, the L-Phi workbook evolved out of a frame of reference, it is a product of the absorption of all aspects of NYU's doctoral program. L-Phi is grounded on theory and evidence-based research, it incorporates the values of a model of practice, and it aims to be strength-based.

Advantages and Limitations

As L-Phi is an academic endeavor, there are both inherent advantages and limitations. Notably, with a goal of completing a doctoral degree, time becomes a factor. While the author has broader goals for L-Phi (see below), it would be impractical to attempt completing all aspects prior to graduation.

Another limitation involves the author's novice proficiency using Adobe Illustrator (Adobe Illustrator, 2022), Procreate (Procreate, 2021), and Adobe Acrobat Pro DC (Adobe Acrobat, 2022). These constraints are limited and can be overcome with time and practice.

There are also inherent valuable advantages for developing L-Phi as a doctoral student. First, the immeasurable guidance and education provided by knowledgeable professors and mentors; and second, easily available access to a university library with scientific and peer-reviewed literature. These advantages have been vital for the development of L-Phi.

Future Directions and Ideas for Improvement

L-Phi is a workbook in progress. It is a product of trial and error, thinking and rethinking, writing and editing, drawing and redrawing. There is a famous Chinese proverb ascribed to Lao Tzu, that suggests that a journey of a thousand miles begins with a single step (https://literarydevices.net/a-journey-of-a-thousand-miles-begins-with-a-single-step/). This competence project is part of a journey that will need to continue after graduation. The following discussion outlines the future steps on a continuing journey.

Capital Letters

Notably, to be useful in practice, L-Phi will need to become more comprehensive and include lowercase letters and numbers. A conscious decision was made to develop this first edition with a sole focus on capital letters. There is evidence (albeit, limited and outdated) that suggests that capital letters are easier to print for beginning writers (Stennett et al., 1972; Worden & Boettcher, 1990). More significantly though, in regard to instruction, capital letters are less complex than lowercase letters because they are uniform in size with similarly located starting points.

Preliminary Feedback

To understand real-world practicality and viability, it will be critical to gather and analyze feedback from teachers, occupational therapy practitioners, parents, and students. A sample survey has been constructed to be used in the future to gather information about L-Phi's instructions, sequence of letter instruction within the graphic rule grouping, usefulness of the practice options, and other suggestions that the author may have not originally considered (see Appendix A).

As a first step however, sample pages from L-Phi were distributed to a small group of school-based occupational therapists (3), teachers (3), parents (3), and children (2) (see Appendix B). All participants have a personal or professional relationship with the author and responses were not anonymous. Informal discussions and feedback focused mostly on current practice; ideas about handwriting instruction; practicality, ease of use, design elements, level of engagement or appeal of L-phi; and pacing of instructions. A common theme involved the instructions and the sequence in which the letters are taught. One teacher wrote, "I love how you categorize the letters. That really makes a lot of sense to me." Additionally pointing out, "The intro sequencing seems like it would be a helpful way to introduce new letters to young writers (S. Goldberg, personal communication, May 31, 2022). Also, regarding instructions, one parent noted, "I think [they] are easy to follow" (L. Friedman, personal communication, September 9, 2022). An occupational therapists commented on the practicality of using L-Phi in a classroom, she wrote, "I think it is very easy to use and not overly full of vocabulary" (L. Barros, June 2, 2022). Another occupational therapist noted: "I really liked that you explained the meaning behind blocked/random practice for non-OTs to understand the fundamentals of handwriting practice/learning. The background information you provided is simple to understand for someone who is not an OT. Also, directions for practicing each letter are adequate and simple to follow" (S. Carr, June 27, 2022).

Another common thread amongst the feedback centered around practice opportunities. An occupational therapist commented on the fading of cues for each practice trial: "I like that each practice trial… starts with maximum visual cues and decreases as the number of times the student writes the letter increases" (S. Carr, June 27, 2022). Another commented: " I like how there is more practice than HWT but not as much as the other sheets I have seen" (L. Barros,

personal communication, June 2, 2022). Regarding the quality of practice opportunities, a teacher noted: “I also like how you weave in random practice with visuals and practicing from memory. Parodic review is so important. I notice within my class, writers (at all levels) are creating some letters in a very inefficient way even though we have practiced. It seems retention is mediocre” (S. Goldberg, personal communication, May 22, 2022). There was also agreement about the importance of “circling your best effort” Both teachers and occupational therapists felt that this instruction encourages “self-reflection” and “ownership” (S. Carr, personal communication, June 27, 2022; D. Walker, personal communication, June 3, 2022). Research similarly suggest that students tend to also perceive value in self-monitoring (Lee & Lape, 2020)

The majority of respondents additionally enjoyed the educational pictures. One teacher reported: “I know my class would love to read about each animal and learn a new fact with each letter” (S. Goldberg, personal communication, May 22, 2022). Another teacher wrote: “the educational pictures with the facts were really engaging and fun” (D. Walker, personal communication, June 3, 2022). One parent commented: “I love the animal pictures and facts – I think they will motivate and engage kids” (L. Friedman, personal communication, September 9, 2022).

There were also suggestions for improvements. One teacher suggested that an example of the letter should be included on all practice pages. This however does not allow students to practice writing the letters from memory. Instead, it will be important (for future editions) to clarify the importance of practicing from memory and why some pages will not include sample letters.

An occupational therapist suggested that the introduction should also include a “recommendation list” that will “provide strategies to teachers/parents for environment

placement (desk height, chair, positioning of paper, etc.) and student positioning (posture)" (s. Carr, personal communication, June 27, 2022)

Finally, a common suggestion was to include recommendations for pacing instruction and intervention (i.e. how many letters should be taught in a week, how many minutes a day should be dedicated to handwriting intervention or instruction and practice). Not providing this information was clearly an oversite by the author and will be rectified in future editions. A section will be added that will include separate pacing recommendations for initial instruction and remedial intervention.

A systematic review, published in 2011, examined the effectiveness of interventions that occupational therapists may use for students with handwriting difficulties (Hoy et. al.). The authors found that effective interventions must allow for handwriting practice at a minimum of two times a week for at least a total of 20 sessions (Hoy et.al., 2011). This provides a baseline that, when combined with the challenge point framework, can be used to guide individualized interventions for handwriting remediation. The challenge point framework, which provides much of the fibers in the fabric of L-Phi, emphasizes the importance of aligning the individual's skill level, task difficulty, and potential available information for learning to occur. Occupational therapists should base pacing on these three factors. As such, learning to print some letters will require more time, practice, and supportive cues for some students. The pacing of interventions may be dynamic and should move at the rate which is based the individual's optimal challenge point.

Classrooms have an inherently heterogeneous mix of students which heightens the challenge for teachers to provide appropriate pacing. Researchers note that formal guidelines regarding the amount of practice per week have not been established (Asher, 2006) and

surprisingly, “research into what constitutes the best pace of letter instruction is scarce” (Sunde et al., 2019, p. 142). According to Sunde et. al., (2020), the most common approach in many countries is to introduce one new letter a week. Although more research is needed to identify an optimal pace for teachers to introduce new letters, this author would suggest that teachers monitor student’s proficiency and progress at a pace that fits the class as a whole. As with all other class subjects, there may be students that require extra time and practice to gain proficiency. The L-Phi workbook provides extra lined paper so students can easily continue practicing to print more challenging letters.

Assessing Graphic Behavior

Close observation is critical for determining compliance with conventional graphic behavior. Handwriting performance can be further assessed by determining the readability of the text and the speed of writing. While there are many standardized tests available to assess the end product of handwriting quality (Evaluation of Children’s Handwriting, Amundson, 1995; Minnesota Handwriting Test, Reisman, 1993), no published measures could be located to assess the confluence of writing speed, legibility, and process of complying with conventional graphic behavior (see Appendix C). Therefore, to assess compliance with conventional graphic behavior, *The Evaluation of Letter Formation* (ELF) is being developed (see Appendix D). The first edition of ELF can be considered a prototype. It contains the fundamental components to assess compliance of graphic behavior, but it will need to be modified as well as assessed for validity and reliability prior to practical application. Namely, the current iteration is low tech and can be improved by utilizing new technology that can collect copious accurate data regarding graphic behavior. This author does not currently have the skill set to develop a high-tech version and will need to collaborate on this future endeavor.

Next Steps

1. Develop a second edition of L-Phi that includes lowercase letters, numbers, whole words, and short sentences.
2. Ensure second edition uses sufficiently contrasting colors to be inclusive for individuals with low vision.
3. Acquire feedback from educators, occupational therapy practitioners, parents, and students on the completed second edition of L-Phi.
4. Conduct scientific research to assess L-Phi for efficacy.
5. Develop high-tech version of ELF.
6. Research the validity and reliability of ELF.
7. Learn more about publication options.
8. Develop a website for marketing
9. Develop a web-based compatible instruction program and/or app for L-Phi.

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Appendix A

Letter-Perfect Handwriting Instruction: Questions for Experts

1. I am a: Teacher _____ Occupational therapist_____ Parent_____
2. Have you used other handwriting instruction workbooks before? Yes_____ No____

   If yes, which one(s)? _____
3. How important do you think it is to teach proper letter formation?

   Very important _____ Important but not critical _____ Not important _____
4. Do you think it is useful to group letters by the principals of graphic production?

   Very useful_____ Useful _____ Not very useful _____ Detrimental _____
5. Do you think that the sequence of letter instruction within each grouping was effective?

   Very effective _____ Effective _____ Not very effective _____ Ineffective _____
6. Does L-Phi offer enough practice opportunities? Yes _____ No_____
7. How effective are the variety of practice opportunities?

   Very effective _____ Effective _____ Not very effective _____ Ineffective _____
8. Are the instructions descriptive enough?

   Yes, just right ____ Too wordy _____ Not descriptive enough_____
9. What did you like about L-Phi?

   Simple instructions _____ Limited colors and distractions on each page _____

   Educational picture for students to color _____ Lines on the paper _____

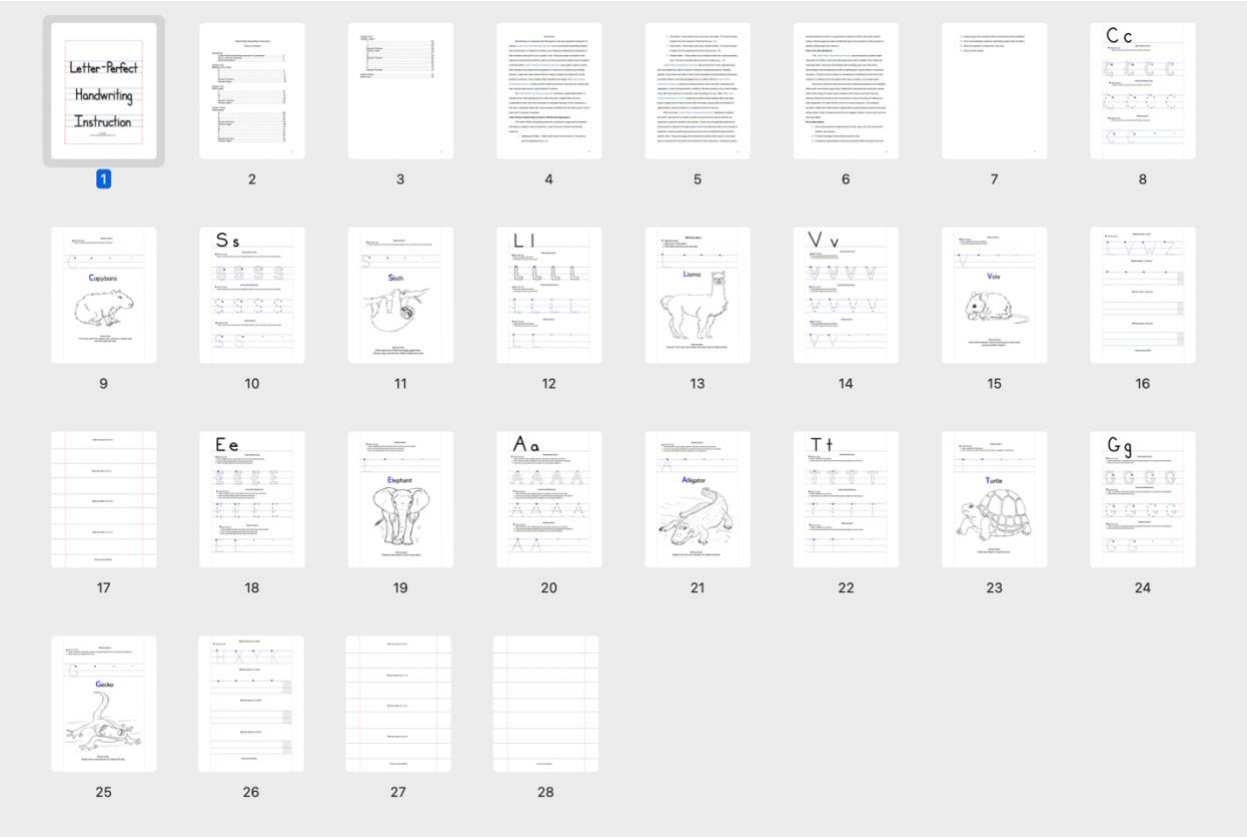
   Other _____
10. What would you like to see changed in the next edition?

    _____

    _____

Appendix B

Sample L-Phi Sent to Expert Reviewers



Pages 4, 5, 6, and 7:

"Handwriting is an essential skill that requires clear and organized instruction for mastery. Letter-Perfect Handwriting Instruction is an instructional handwriting initiative that is based both on research and theory and uniquely emphasizes the production of letter formation through the use of graphic rules. These principles are based on the sequences and directions that are used to produce geometrical shapes and are applied to forming letters. Letter-Perfect Handwriting Instruction uses graphic rules to analyze letter formation and organize the progression of instruction to optimize and simplify

learning. Letters with fewer strokes that are easier to master are taught first. As the workbook continues, more complex letter formations are taught. The Letter-Perfect Handwriting Instruction workbook offers simple and precise instructions for writing each letter and provides plenty of opportunities for practice.

The Letter-Perfect Handwriting Instruction workbook, capital letters edition, is intended as an initial starting point for letter instruction. Capital letters are less complicated to learn than their lowercase counterparts because of the consistency in their size. Lowercase letters also have a greater variability with the starting point of each letter which increases complexity.

Letter Perfect Handwriting Instruction Workbook Organization

The Letter-Perfect Handwriting Instruction workbook is organized for simplicity and based on graphic rules of production. Letter instruction follows the following sequence:

1. *Starting point letters* – these letters have only one stroke. The starting point is emphasized (e.g., C).
2. *Fluid letters* - these letters have more than one stroke. The second stroke is drawn from the endpoint of the first line (e.g., 'L').
3. *Fixed letters* - these letters also have multiple strokes. The second stroke is drawn from the starting point of the first line (e.g., 'N').
4. *Flexible letters* - These letters have multiple strokes and a second starting point. The second stroke starts at a point in space (e.g., 'K').

Letter-Perfect Handwriting Instruction also borrows from motor learning theory and incorporates two types of practice conditions, blocked and random. Blocked practice occurs when one distinct motor skill is repeatedly practiced before progressing

to another distinct motor skill (Guadagnoli & Lee, 2004). With the Letter-Perfect Handwriting Instruction workbook, students practice each new letter, separately and repeatedly to mimic blocked practice conditions. Random practice occurs when multiple motor skills are practiced in no specific order (Guadagnoli & Lee, 2004). The LetterPerfect Handwriting Instruction workbook provides random practice after each letter group is taught and at timely intervals within the larger groups (fixed and flexible) for opportunities to write the letters out of sequence and from memory.

With each letter, Letter-Perfect Handwriting Instruction highlights the starting point with a star and then provides numbered arrows that correspond with the line segments to guide the student's next strokes. These cues are gradually faded as the student gains competency through practice. Each new letter also has a second page for students to continue practicing as well as a picture of an animal that begins with the practice letter. This second page demonstrates the practice letter used in a word and has an educational fun fact about the animal for further discussion. Coloring the picture provides students another fun opportunity to practice the fine motor skills used for writing. Practice pages are also provided throughout the workbook to allow student to practice writing letters from memory.

How to Use this Workbook

The Letter-Perfect Handwriting Instruction was developed to provide simple instruction for children. Each new letter page opens with a sample of the capital and lowercase letter. Instructors should begin with modeling each new letter with a demonstration that emphasizes the letter's starting point, stroke direction, and stroke

sequence. This can be done simply on a whiteboard or blackboard at the front of the classroom or sitting next to the student with a piece of paper or dry erase board.

Instructions should be read aloud during the initial demonstrations and repeated before each new practice opportunity. Hearing the instructions and seeing the sample letters while writing the letters, gives students multi-sensory cues that improves learning. Instructors should monitor the students to ensure that they are drawing the letter segments in the right direction and in the correct sequence. The workbook provides multiple and varied practice opportunities to guide students and promote good writing habits. Finally, Students should be encouraged to reflect on their work and circle their best efforts.

Recommendations

1. Give students plenty of opportunities to write, draw, and color with pencils, markers, and crayons.
2. Provide lined paper when students need to write.
3. Incorporate opportunities to discuss the practice letters throughout the day.
4. Always support the students' efforts and provide positive feedback.
5. Don't overemphasize neatness. Emphasize proper letter formation.
6. Allow the students to critique their own work.
7. Have fun with writing! "

Appendix C

Commonly Referenced Handwriting Assessments

There are multiple standardized tests that are often referenced in the literature for assessing handwriting quality. Three that are commonly mentioned are the Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI; Beery & Beery, 2010), the Minnesota Handwriting Test (MHT; Reisman, 1991), and the Evaluation Tool of Children's Handwriting (ETCH; Amundson, 1995). While each of these assessments have proven value, each are lacking critical components necessary for evaluating the success of L-Phi

The Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI; Beery & Beery, 2010), is a norm-referenced assessment designed to measure of one's ability to integrate visual and motor skills (McCrimmon et al., 2012). The VMI may be a valuable initial screen for beginning writers, as students are not required to know how to write the alphabet prior to evaluation. Using a paper and pencil, examinees imitate and copy a developmentally sequential series of geometric forms (Howe, et al., 2013). The VMI was never intended to be used as a measure of handwriting ability (Pfeiffer et al., 2015) and although research indicates a significant correlations between handwriting and visual-motor coordination (Cornhill & Case-Smith; 1996; Parush et al., 2010; Weintraub & Graham; 2000), research also indicates that the VMI may not be an effective posttest measure for handwriting intervention (Howe et al., 2013; Pfeiffer et al., 2015). In fact, researchers have found that the VMI did not have enough sensitivity to measure changes in handwriting ability, noted in other handwriting assessments, after occupational therapy interventions (Howe et al., 2013; Pfeiffer et al., 2015). Pfeifer et al., (2015), point out that outcome measures should be "appropriate for, and sensitive to, the construct being measured, which in turn must be the construct that the intervention is addressing" (p. 5).

The Minnesota Handwriting Test (MHT; Reisman, 1991), is a quantitative and norm-referenced assessment designed to be sensitive to small changes in printing ability (Feder & Majnemer, 2003; Reisman, 1993). It measures handwriting performance, specifically quality and speed, for children in first and second grades (Reisman, 1991). Children are presented with a test sheet containing a pangram, or sentence containing all letters of the alphabet ("the quick brown fox jumped over the lazy dogs"). The words in the sentence are arranged in a mixed sequence in order to reduce the speed advantage of more fluent readers. Children are given 2.5 minutes to copy the sample and asked to circle the last letter completed in the time allotted. Children are allowed to finish copying the entire sample, so it is available for scoring the quality (Reisman, 1993).

Although the MHT is a practical and popular handwriting assessment (Pfeiffer et al., 2015) its scope is ultimately too narrow to examine the effectiveness of L-Phi or a students compliance with graphic behavior. Importantly, the MHT is a near-point copying test that assesses the speed and quality of only lowercase letters. Although with general text writing, lowercase letters far exceed the quantity of capital letters, this does not mean that printing capital letters correctly and developing "automaticity in writing the letter is any less important" (Fears et al., 2020, p. 173). Also, L-Phi emphasizes the importance of writing letters from memory, without visual or verbal prompts. Copying text from a test sheet placed near the child does not assess one's ability to write letters from memory.

The Evaluation Tool of Children's Handwriting (ETCH; Amundson, 1995), is a comprehensive assessment of handwriting. It is comprised of six tasks that replicate classroom handwriting requirements: a) writing the alphabet in upper and lowercase from memory, b) writing numerals 1-12 from memory, c) near-point copying, which requires the child to copy a

short sentence from a pre-printed sample that is placed 3 inches from the top of the response booklet, d) far-point copying, which requires the child to copy a short sentence from a pre-printed sample on a wall chart that is placed 6 to 8 feet away from the child, e) dictation, in which the child is asked to print two nonsense words (five letters in each word) and a zip code (containing five numbers), and f) sentence composition, in which the child is asked to compose a sentence containing at least five words (Diekema, et al., 1998; Feder & Majnemer, 2003).

Although the ETCH explicitly assesses handwriting ability and more comprehensively replicates typical classroom handwriting requirements, it contains a fatal flaw (as do the VMI and MHT) which removes it as a contender for assessing the efficacy of L-Phi. The ETCH, the MHT, and the VMI all focus solely the quality of the completed writing product without regard for the handwriting or drawing process. Therefore, although each can identify and quantify poor design replication or handwriting, none considers the how a letter is formed. As the adherence to graphic rules is an essential component of L-Phi, it is critical to have an assessment that observes and examines the process of writing that includes the starting point, stroke direction, and stroke sequence. An evaluation with these characteristic measures could not be located, and therefore, an evaluation is being developed.

Appendix (D)

The Evaluation of Letter Formation (ELF)

The Evaluation of Letter Formation (ELF) is being developed to assess the confluence of writing speed, legibility, and compliance with graphic rules for children as young as 5. This first edition of the evaluation is geared for occupational therapists to deliver. In the future, it may be modified for classroom teachers to use as well. The ELF is comprehensive and includes the assessment of both upper and lowercase letters, and therefore it is assumed that pretest scores will be reflective of novice writers inexperience with explicit handwriting instruction.

There are four essential components to the assessment:

1. *Environment and materials*
2. *Content assessed*
3. *Instructions and testing*
4. *Scoring*

Environment and Materials

First, the environment should be a quiet room with a table and chair that is appropriate for the size of the student. Materials required for the assessment include paper, a sharpened pencil, a card with a hand printed sentence, and a stopwatch. The paper should have solid bottom and top lines and a dashed middle line for orientation. The writing utensil should be a simple standard sharpened No. 2 pencil. The card should have the handwritten sentence “the zany hare quickly jumps by and vexes a wild frog.” This pangram was developed to contain all letters of the alphabet. The print on the card should be neat and large enough to be easily read and printed. For the purposes of this evaluation, the height of a lowercase letter should range from .5 inches to one inch (e.g., the letter ‘a’ should measure .5 inches and the letters ‘b’ or ‘y’ should measure

one inch). The pangram should be written using the same line structure as the test page (solid bottom and top lines with a dashed middle line.

Content

It is important to keep in mind that a child's speed for producing letters can vary with context and instructions. Therefore, all phases should be assessed: copying from a prompt, freewriting from memory, and writing from dictation. Because kindergarteners are beginning to learn to read and spell as well as print, it is imported for the assessment to focus specifically on printing letters while minimizing the more complicated tasks of reading and spelling. Therefore, this assessment uses letters of the alphabet for both freewriting and dictation (reading and spelling skills are not required). However, it is appropriate to assess copying speed with a sentence encompassing all the letters of the alphabet because the child will be able to refer, as needed, to the card and will not be limited or aided by reading or spelling abilities.

Instructions and Testing

After the student is comfortably seated, the test paper should be placed on the table in front of the student, and the student should be informed simply and generally about the handwriting assessment. The occupational therapist might simply say: "Today I want to see how you write your letters. Here is a piece of paper and a pencil that I want you to use for this activity" [the paper can be placed on the table in front of the child, but the therapist should hold on to the pencil]. "Before each section, I will give you instructions on what you should write and when to begin. Use your best writing. Do you have any questions?" Once the instructions for the first assessment are given, a pencil should be provided to the student.

The first phase of the assessment will address printing the letters of the alphabet in the order they are dictated. The order will follow the graphic rules and organization principles: the

ELF begins with letters that contain only one stroke (C, O, S, U), then continue with letters that follow the fluid principle (L, V, W, Z), then progress to letters that follow the fixed principle (A, B, D, E, F, M, N, P, R), and finish with the letters that follow the flexible principle (G, H, I, J, K, Q, T, X, Y). The student will be instructed to write a letter after the occupational therapist verbalizes the letter. The therapist might say: "I would like you to print the letters that I read to you. Print the letters in uppercase." This phase, as with the next two phases, should be timed. With careful observation, the occupational therapist notes how often the student completes a letter following the graphic rules of production.

In the second phase, the student should be asked to write all letters of the alphabet from memory and in alphabetical order, in uppercase first and next in lowercase. The occupational therapist might say: "I would like you to write the alphabet in uppercase and then continue writing the alphabet again, this time in lowercase. Concentrate on each letter as you write it and remember to write as clearly as you can." During this phase, the occupational therapist should provide visual and/or verbal cues for following the graphic rules and organization priciples when necessary. Again, with careful observation, the occupational therapist should note how often the student requires verbal and/or visual cues for compliance with the graphic rules and organization principles.

In the third phase, the student should be asked to copy the pangram. A card with the sentence, "the zany hare quickly jumps by and vexes the wild frog" should be placed on the table in front of the student's paper. The student will be asked to copy the sentence as he or she is timed. The occupational therapist should show and read the card to the student and say: "I would like you to copy this sentence as you see it, on the paper you have in front of you. Please use

your best writing." For this phase, readability should be assessed on whether each letter can be identified out of context.

Scoring

The first phase of the assessment focuses on graphic rules and speed. When scoring this phase, the occupational therapist should tally how many letters the student prints that follow the graphic rules for production. The occupational therapist notes how often the student follows each graphic rule (i.e., x/26 for initiation of the letter at its apex, x/9 for the fixed principle, x/4 for the fluid principle, and x/9 for the flexible principle). The time required for the student to complete the phase will also be noted. This phase will have five total scores.

The second phase focuses on graphic behavior, speed and legibility. The occupational therapist will count how often cues are required for the student to follow the graphic rules and organization principles, with a possible score of 52 (both upper and lowercase will be considered). There will be a binary distinction regarding scoring compliance with graphic rules and organization principles. Each letter will be counted only once: either a verbal/visual cue was needed, or it was not. Again, the time required to complete this phase should be noted. This phase will have a third score which evaluates legibility. Each letter that is readable and recognizable will be considered legible. Upper and lowercase letters will be scored separately. This phase will have four scores.

The last phase focuses on speed and legibility. The therapist will time how long it takes to copy the pangram and will tally how many letters (out of 44) are recognizable and readable. This phase will have two scores.