
Handwriting Instruction in Elementary Schools

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OBJECTIVE. Classroom teachers teach handwriting, but when problems arise, students are referred to occupational therapy for remediation. This study, conducted by occupational therapists, reviews handwriting instruction by classroom teachers in one school district.

METHOD. Teachers from kindergarten through grade 6 were asked to complete an open-ended questionnaire regarding handwriting instruction.

RESULTS. Teachers differed in their methods of instruction, including in the programs and paper used, and practice provided. Teachers of grades 5 and 6 had to continue to review handwriting instruction, because all students could not fluently use handwriting as a tool of expression.

CONCLUSION. Elementary students need structured instruction to develop the motor skill of writing. School-based occupational therapists can support effective handwriting instruction by interpreting information from motor learning theory pertaining to instruction and practice, which supports acquisition, transfer, and retention of handwriting skills. They also need to be cognizant of prior handwriting instruction when addressing handwriting difficulties.

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Initial handwriting instruction in elementary school is the responsibility of teachers. Generally teachers teach manuscript writing in grades 1 and 2, and cursive writing in grade 3 (Graham & Miller, 1980). Classroom instruction may involve teaching in a natural context, such as when a student needs to use the letters for a language arts activity (Graham, 1992). Alternatively, letter formations may be taught directly during whole class instruction, typically between 20 to 60 min per week (Rubin & Henderson, 1982; Zaner-Bloser, 1993). Teaching may involve the use of commercial programs or teacher-developed programs.

Although handwriting was studied extensively from the 1970s through the early 1990s (Dobbie & Askov, 1995; Graham & Weintraub, 1996), research has not established the superiority of a particular method of instruction, or specific tools that facilitate handwriting production. Some of the research pertaining to instructional programs, tools, and paper used for handwriting is presented here. Aspects of motor learning theory relevant to handwriting instruction, and a description of the *optimal challenge framework* are also included.

Programs Used for Handwriting Instruction

Although many occupational therapists recommend specific programs to teach handwriting—such as Handwriting Without Tears® (Olsen, 1994; Jan Olsen, OTR, 8001 MacArthur Boulevard, Cabin John, Maryland 20818) or *Loops and Other Groups* (Benbow, 1999)—little evidence exists to clarify the advantage of one program over another (Scheerer, Reed, & Skiver, 2004; Sheffield, 1996). Stirlacci (2004) found that Benbow's *Loops and Other Groups*, a kinesthetic approach to teaching cursive, produced better speed and legibility than the D'Nealian® handwriting program (Scott Foresman-Addison Wesley, 1 Jacob Way, Reading, Massachusetts 01867). Scheerer et al. (2004) compared the effectiveness of Handwriting Without Tears and the traditional ball-and-stick method to teach handwriting to kindergarten students, and found that both methods were equally

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effective. Other studies evaluated programs using slanted manuscript and single continuous-stroke letter formations, which were used to facilitate learning of cursive writing. However, these studies did not establish the superiority of any one method (Farris, 1982; Ourada, 1993; Trapp-Porter, Cooper, Hill, Swisher, & LaNunziata, 1984).

Tools for Handwriting and Grasp Patterns Used

Yakimishyn and Magill-Evans (2002) found that students used a more mature pencil grasp for writing when provided with a short writing tool and a vertical writing surface. However, studies by Burton and Dancisak (2000) and by Dennis and Swinth (2001) found that the types of grasp patterns did not significantly affect the accuracy of graphomotor control. Other studies found that the shape or the diameter of the pencils shafts used did not affect pencil control of students in elementary grades (Carlson & Cunningham, 1990; Lamme & Ayris, 1983; Oehler, DeKrey, Eadrey et al., 2000; Ziviani, 1981). Carlson and Cunningham (1990) found that some children did better with the beginner's pencil, whereas others did better with a regular pencil. Graham and Weintraub (1996) therefore concluded that children should be allowed to use a variety of writing instruments when learning to write.

Paper Used for Handwriting

Children in elementary grades are provided large-spaced paper for writing to allow for greater freedom of hand movement and to decrease eye strain (Waggoner, LaNunziata, Hill, & Cooper, 1981). Several studies found that use of large-spaced paper improved the letter strokes of some groups of elementary school students but not others (Hill, Gladden, Porter, & Cooper, 1982; Trapp-Porter, Gladden, Hill, & Cooper, 1983). Based on this research, Graham (1992) recommended that schoolchildren be provided large-spaced paper for initial practice and different kinds of paper for further writing. Daly, Kelley, and Krauss (2003) found no relationship between the use of lined or unlined paper and the handwriting legibility of kindergarten students. They recommend that kindergarten-age students be allowed to experiment with various types of writing paper, to individually determine the right options.

Motor Learning and Handwriting Instruction

A brief reference is made here to motor learning and its relationship to handwriting instruction and handwriting practice. Readers are referred to the original research for

detailed discussion of the concepts (Guadagnoli & Lee, 2004; Poole, 1991).

Motor learning conceptualizes that the behavior of a system at any one point results from a confluence of all the functionally related components. The organism, the task, and the context self-organize behavior to a preferred form (Kamm, Thelen, & Jensen, 1990). As the number of variables to be coordinated increases, skilled behavior takes longer to establish. The following authors discuss the application of motor learning principles in therapeutic settings. Poole (1991) recommends that in initial learning, constant and blocked practice may be indicated to increase performance. In blocked practice, the order of tasks practiced remains the same. In constant practice, the conditions of the task remain the same across trials. Once motor patterns are developed, random and variable practice is appropriate. Variable practice involves changing the conditions under which the skill is practiced. In random practice, the order of the practiced tasks differs, thus increasing the adaptability of learning and ease of transfer of skills, according to the Motor Learning Theory (Poole, 1991; Shumway-Cook & Woolacott, 1995). Referring to delivery of school-based services, Baker (1999) agreed that blocked practice may be beneficial to children in the early stages of learning motor skills, accelerating the learning curve, whereas random practice may be effective for learners in the stage of refining an already learned skill.

Guadagnoli and Lee (2004) presented the *challenge point framework* to conceptualize the effects of various practice conditions in motor learning. They explained that if all other factors are held constant, improvement in motor skill is positively related to the amount of practice. Motor learning is related to the information available and interpretable in each performance of that task, which, in turn, depends on the functional difficulty of the task. Increasing the functional difficulty of a task increases learning by providing more information up to an *optimal challenge point*. Beyond this point the amount of information would exceed the capacity of the individual to process the information efficiently, because of which the learner cannot use the information to improve skill. The challenge point framework proposes that in comparison with blocked practice, random practice will increase the functional difficulty of the task. With a simple task, an action plan may be developed within a few practice trials. Further refinement of the skill is dependent on the extent to which the learner is challenged by practice conditions, and random practice would enhance learning by increasing the difficulty level of the task. The development of a movement representation of a complex skill involving a series of relatively independent subcomponents (e.g., a dance routine with intricate hand, neck, and

leg movements) would take longer to learn, and would require more effort and information-processing activities by the learner. Providing the learner with practice conditions that facilitate performance until a relatively stable movement representation is acquired, as provided in blocked practice, will enhance complex skill learning (Guadagnoli & Lee, 2004). Drawing an analogy to handwriting instruction, it can be surmised that beginning writers would perform better when given blocked practice with a few letters. As the students gain experience, random practice with those letters would enhance retention. With further development of expertise, the students would benefit from an increased challenge as obtained by increasing the number of letters presented in a random fashion.

Ste-Marie, Clark, Findlay, and Latimer (2004) researched the motor aspects of handwriting skill acquisition in a series of experiments, each examining the effects of blocked practice or of random acquisition practice schedules on the retention and transfer of handwriting performance. The authors described *blocked practice* as that in which all trials of a task are practiced before another task is introduced, and *random practice* as that in which all of the tasks are practiced together in an unsystematic sequence of trials. The participants, between 5.5 and 7.0 years of age, were given symbols or letters of the alphabet to copy. The researchers found that performance of the blocked practice group was better in the acquisition phase, whereas that of the random group was better in the transfer and the 20-min retention phase. Statistically significant differences in performance did *not* persist after a 24-hr interval, but participants who followed the random practice schedule wrote faster than did those following a blocked practice schedule, while maintaining accuracy (Ste-Marie et al., 2004).

This information from the motor learning theory is now considered with reference to handwriting instruction in the classroom. When students are taught letter formations in a natural context—that is, when they are needed to complete a language arts activity—the functional difficulty of the task is increased. The child now has to attend to the cognitive components of content and language in addition to the motor task of actual letter formation. For a novice writer, these requirements may exceed the optimal challenge point (Guadagnoli & Lee, 2004), and the information would exceed the capacity of the individual to process the information and use it to improve skill. Research by Ste-Marie et al. (2004) suggests that rote practice of letters over several repetitions—for example, filling in several worksheets of one letter—may not be beneficial; however, blocked practice in the acquisition phase was shown to be beneficial. As students gain mastery of a few letters, the letters could be practiced further in differing combinations

(i.e., under random conditions) to reach the optimal challenge conditions for better performance.

Occupational Therapy and Handwriting

Students who have difficulties with handwriting are typically referred to occupational therapy, and are a major source of referrals for occupational therapists in the school system (Chandler, 1994; Clark-Wentz, 1997; Vreeland, 1999). Occupational therapists typically address the performance components that support handwriting, for example, kinaesthesia, motor planning, eye–hand coordination, visuomotor integration, and in-hand manipulation skills (Cornhill & Case-Smith, 1996). Benbow (1995) further describes the musculo-skeletal components, open web space, isolated finger movements, thumb opposition, distal finger prehension, and adequate palmar arches, as needed for in-hand manipulation and therefore for handwriting. Levine (1987) describes poor motor memory (i.e., a deficit in the ability to recall distinct motor patterns) as an additional cause of handwriting difficulties. Levine attributes this condition to many factors, including weak or inconsistent ability to recall movement sequences, and lack of practice involving consistent repetition of the pattern. One possible conclusion that can be drawn from Levine's study is that for students with poor motor memory, lack of consistent practice during the initial instruction may exacerbate handwriting difficulties.

In schools, occupational therapists are often inundated with large numbers of referrals, reducing their ability to work effectively. In a survey of 500 school-based occupational therapists, Holtzinger and Hight (2005) found that excessively high caseloads affected about 1 in 3 therapists. On an average the occupational therapists had completed 4.8 initial assessments ($SD = 3.9$) over 1 month. They had spent an average time of 4.1 hr ($SD = 2.0$) to complete and report the assessment.

With my 28 years' experience providing school-based occupational therapy, I have at times questioned the handwriting instruction received by students. After using valuable resources in assessing a child referred for difficulties, I sometimes found that the student did not have any underlying dysfunction, but only needed structured handwriting instruction. Other educators have suggested that insufficient attention is given to teaching handwriting in schools (Graham, 1992; Sheffield, 1996).

In summary, review of literature pertaining to handwriting does not indicate the superiority of particular handwriting programs, writing tools, or paper in facilitating handwriting instruction. Motor learning theory suggests that blocked practice in the initial phase of handwriting

instruction may be effective. With development of skill, further practice under random conditions would provide an optimal challenge point, facilitating further acquisition, transfer, and retention of the skill of handwriting. However, educators may not be giving sufficient direct instruction or using effective strategies in teaching handwriting.

Occupational therapists, intervention teachers, and special educators—who work with students from many different classrooms in one mid-western school district—found variations in handwriting instruction, including in the use of programs, paper, and the directionality of formations. This article describes the process undertaken by that district to review current practice in teaching handwriting in the school district. The goal of this project was to describe the handwriting instruction strategies used across kindergarten through grade 6 in the district.

Method

A survey of the process by which handwriting was taught to students from kindergarten through grade 6 was carried out by the two occupational therapists working in the district. I constructed an open-ended questionnaire, which was a format that was chosen to capture the full extent of the teachers' opinions. The suburban school district had approximately 2,900 students from kindergarten through grade 6 when the project was undertaken.

The factors incorporated in the survey evolved from the literature on handwriting, including kinds of paper

used, letter formations and programs, and practice time. The survey differentiated between the ages when students were expected to write letters and when the students were taught how to form the letters using a specific directionality, because some teachers expected students to write letters before formal instruction in letter formation. Based on progression of visual-motor control (Beery, 1997), occupational therapists often recommend that letters with straight lines are taught first, followed by those with curves, and finally letters with oblique lines. However, some teachers use a different order to introduce letters; hence, a question was included about the order in which letters were introduced to the students. The questionnaire was pilot-tested with two teachers, and three different versions of the questionnaire were used on their advice. The first version pertained to teaching of manuscript letters and was distributed to teachers of kindergarten through grade 2 (see Table 1). The second version referred to the teaching of cursive script (see Table 2), and it was distributed to teachers of third and fourth grades. The third version was prepared for teachers of fifth and sixth grades and queried the need to review handwriting (see Table 3). Each classroom teacher and the teachers providing special education and intervention services, from kindergarten through grade 6, were asked to complete the appropriate version of the survey. The number of years of teaching experience of the respondents was between 2 and 30 years. The survey was distributed during the month of October and responses were retrieved 1 week later.

Table 1. Questionnaire: Kindergarten–Grade 2 (Manuscript)

Grade Level	Room Number (Optional)
1. At what age do you introduce (manuscript/printing) writing, and what paper do you use? Please include samples.	
2. At what age do you teach correct letter formation, and what paper do you use?	
3. Describe the different kinds of paper your students are required to write on in a regular week (e.g., triple lined, single lined):	
4. Please describe the writing program you use to teach manuscript: <ul style="list-style-type: none"> a. Does it introduce upper and lower case letters simultaneously ("Aa") or first all upper/lower case letters and then the other? b. In what order are the alphabets introduced? <ul style="list-style-type: none"> The regular alphabet sequence a, b, c, Letter shapes (e.g., first straight line letters such as L, T, then obliques such as K, N, M, followed by curves B, O). Sounds Any other particular order Random 	
5. What practice schedule do you use? How many minutes per session, how many sessions per week?	
6. Do you wait for mastery of each letter or letter group before proceeding, or do you follow a set schedule (e.g., each week so many new letters)?	
Please share any other thoughts about teaching handwriting. Thank you.	

Table 2. Questionnaire: Grades 3–4 (Cursive)

Grade Level

Room Number (Optional)

<p>1. Please describe the writing program you use to teach cursive writing, and what paper do you use? Please include samples.</p> <p>a. Does it introduce upper and lower case letters simultaneously (“Aa”) or first all upper/lower case letters and then the other?</p> <p>b. In what order are the alphabets introduced?</p> <p>The regular alphabet sequence a, b, c,</p> <p>Letter shapes (e.g., first straight line letters such as L, T, then obliques such as K, N, M, followed by curves B, O).</p> <p>Sounds</p> <p>Any other particular order</p> <p>Random</p>
<p>2. What practice schedule do you use? How many minutes per session, how many sessions per week?</p>
<p>3. Do you wait for mastery of each letter or letter group before proceeding, or do you follow a set schedule (e.g., each week so many new letters)?</p>
<p>4. Describe the different kinds of paper your students are required to write on in a regular week (e.g., triple lined, single lined).</p>
<p>Please share any other thoughts about teaching handwriting. Thank you.</p>

Table 3. Questionnaire: Grades 5–6

<p>1. Do you find that students from all the four elementary schools enter intermediate school with the same quality of preparation with respect to handwriting? Yes/ No If no, please comment on the difference.</p>
<p>2. Do you teach/review cursive writing in class? Yes/No Do you teach/review manuscript in class? Yes/No Please describe, if you use a specific writing program:</p>
<p>3. Do you include handwriting practice in your class routine? If yes, how many minutes per session? How many sessions per week?</p>
<p>4. What different kinds of paper are the students required to use during a regular school week? (e.g., wide ruled, college ruled)</p>
<p>5. Do you enforce a particular script (cursive/manuscript)? If so, which one and for what percentage of the work?</p>
<p>6. Are the students required to read cursive even if they cannot write it (e.g., writing on the board)?</p>
<p>7. What percentage of the written assignments are the students allowed to do using a computer (e.g., rough drafts, final presentations)?</p>
<p>8. Is there a particular program you would recommend teachers in elementary school use to teach Manuscript: Cursive:</p>
<p>9. Please share any other thoughts about the teaching of handwriting. Thank you.</p>

Results

Twenty-five surveys were handed out at the grade 5 and grade 6 levels, of which 23 were returned, for a return rate of 92%. This high rate of return may reflect the importance of handwriting to the teachers, because handwriting is now a tool used to demonstrate mastery of content in other subject areas.

Forty surveys were handed to teachers at the kindergarten through grade 2 levels, with 17 returned, representing a return rate of 42.5%. Twenty-five surveys were handed out at the grade 3 and 4 level, of which 7 were returned (return rate of 28%). This low rate of return (less than 50%) may indicate the lack of importance given by teachers to handwriting instruction, or it may indicate an emphasis on other content areas. For example, grades 3 and

4 were required to include keyboarding instruction, lasting 35 min per day, 3 to 5 days per week, during the months of September and October. The aim of the survey was to study the variations in handwriting instruction, which was supported through the obtained responses. Therefore, the information was considered relevant and analyzed further. The results are grouped according to the factors questioned in the survey to facilitate analysis.

Age When Handwriting Is Taught

Some teachers expect students to copy the letters presented in class without addressing the directionality of the letter formation. Four of the 17 respondents at kindergarten through grade 2 did not teach writing because they were involved with intervention services. Of the remaining 13 respondents, 7 teachers taught or expected manuscript handwriting to be taught in the kindergarten year, while 6 teachers taught or expected it to be taught in the first grade. Cursive writing was taught consistently in third grade, although it was not formally prescribed in the district curriculum.

Age When Correct Letter Formation Is Taught

This question refers to the specific instruction of how each letter should be formed, including where to start and in which direction to proceed to complete it. Nine out of 13 teachers stressed specific manuscript letter formations from the beginning; that is, from 5 to 6 years of age in kindergarten, or 6 to 7 years of age in first grade. However, one teacher shared that the children had established a bottom-to-top direction by age 7 and could not change this pattern to form letters from the top of the line. Four teachers stated that they were still teaching correct letter formations in grades 5 and 6. With respect to cursive writing, correct letter formations were taught consistently in grade 3.

Different Kinds of Paper Used

Several different kinds of paper were used, including blank paper and paper with double lines 1/4 inch apart. Those kinds with a dotted center-line included yellow paper with two lines 1 inch apart, and green paper with lines 3/4 inch wide. Some teachers used different paper concurrently; for example, wide-ruled paper (with single lines) was used for daily journals, while spelling words were written on typical school paper with triple lines (pink and blue).

With cursive instruction, only 1 teacher (out of 7) reported using two different kinds of paper concurrently. However, there was variation in the paper used by the individual teachers. Three teachers used green paper with triple lines, 2 used single-lined notebook paper, and 1 teacher used red-and-blue triple-lined paper. Blank paper and paper with double lines were also used.

Programs Used for Writing Instruction

Nine respondents used 6 different commercial handwriting programs for manuscript instruction, including D'Nealian (Thurber, 1984), Daily Oral Language spelling (Byers, 2001), Handwriting Without Tears (Olsen, 1994), Land of the Letter People® (Abrams & Co. Publishers Inc., PO Box 10025, Waterbury, Connecticut 06725; Abrams & Co., 1996), and the Zaner-Bloser handwriting program (Zaner-Bloser Educational Publisher, 2200 West Fifth Avenue, Columbus, Ohio 43216-6764). Five teachers reported using informal programs, whereas 2 teachers did not report using any formal method of teaching handwriting. For cursive instruction, 5 of the 7 respondents used the Zaner-Bloser handwriting program (2003). Another teacher used the Orton-Gillingham program (Gillingham & Stillman, 1997), and the last respondent asked for help to set up a program.

Order of Introducing the Letters

When teaching manuscript, 4 teachers reported that they introduced the letters in a developmental progression: first all of the letters using straight lines (e.g., *L, T, H*), then letters using curved lines (e.g., *C, O, U*), and finally those using oblique lines (e.g., *K, N, M*). Five teachers did not use a fixed sequence but introduced letters in conjunction with classroom themes—for example, the letters *G* and *g* were introduced during the “Green Week.” Three teachers reported that they introduced one new letter per week as part of the language arts curriculum. One teacher reported that she waited for mastery of that letter formation before moving on to teach other letters.

With cursive, 4 (out of 7) teachers taught all lower-case letters first, followed by all upper case. One teacher reversed the order, introducing all upper-case letters first, and then the lower-case letters. Another teacher preferred to teach both the upper-case and lower-case forms of each letter simultaneously. The order in which the letters were introduced also differed. One teacher taught them in the alphabet sequence, starting with the letter *A*. Others grouped letters with similar initial strokes, such as “cane stem” beginnings, curved letters, and so forth.

Practice Schedule Used

Only 3 teachers (out of 13 teachers teaching manuscript) reported having a daily practice schedule when teaching new manuscript letters. Two teachers scheduled practice about three times per week, 3 others scheduled practice about once a week, and 5 teachers had no scheduled practice times.

With cursive, 1 teacher (out of 7) scheduled formal practice once a week. The other teachers arranged for 15 to 20 min of practice at least 2 to 3 times per week.

Additional Information

In this school district, students from four elementary schools are combined in one intermediate school building, housing grades 5 and 6. Here the students are expected to apply the skills learned in the earlier grades to demonstrate mastery of content. Only 4 out of the 23 respondents found that all the students had the same quality of preparation with respect to handwriting. Some students were proficient in cursive. Others printed exclusively because, after instruction, their teachers did not enforce the use of cursive and, consequently, these students did not retain the skills that were taught. Eight out of 23 respondents reported that they had to review cursive writing in class, while 3 teachers additionally reviewed manuscript. Handwriting practice was scheduled anywhere from once a month, to daily for 10 min, by 7 out of the 23 respondents. The other teachers could not schedule practice because of time constraints.

Out of the 23 teachers, 10 commented that there should be a district-wide consistency in the teaching and use of cursive writing. The teachers expected that the students should have at least one legible mode of writing, either manuscript or cursive, and that the students should be able to read cursive.

Implications for Handwriting Instruction

The concerns raised by the variation in the methods of handwriting instruction used by the different teachers across the grade levels are discussed further.

Age When Handwriting and Correct Letter Formation Are Taught

Teachers differed in their beliefs regarding age for introducing handwriting instruction. Consider a child whose kindergarten teacher has the philosophy that writing should be taught in the first grade. If that child transitions to a first-grade teacher whose philosophy dictates that handwriting should be taught in kindergarten, the child will reach second grade having received no formal instruction on how to form individual letters. The child would then use his or her resources to form recognizable letters but may pick up inefficient letter formations.

In practice, I have found that many children referred for occupational therapy use very unusual letter formations—for example, when the letter *a* is made by two or more complete clockwise circles; or when a lower-case *r*, scripted from the baseline up, cannot be differentiated from an incomplete letter *c*—which reduces speed of writing as well as legibility. Sheffield (1996) states that many cases of apparent dysgraphia are the result of inadequate teaching.

She found that teaching students of grades 1, 2, and 3 the correct letter formations, and giving them adequate handwriting practice over 1 school year, resulted in a significant decrease in the number of students having difficulty with written language. Thus, it can be inferred that students need consistent instruction on how to form the individual letters, and the instruction should be coordinated with the higher grades.

Different Kinds of Paper Used

Of the many different kinds of paper used in the school district, the commercial program used to teach handwriting dictated some choices. Letters are formed by flexion extension strokes of the thumb, index, and middle finger, with wrist movements for the rounded and horizontal strokes. This is a learned motor skill. The excursion made by the movement components has to change when letters have to fit between differently spaced lines, or when the placement of the letter on the line changes: that is, the letter *a* is written on top of the line when writing on a single line; is touching the top and bottom lines when writing between two lines; and is between the middle and the bottom lines when using triple-lined paper. If students are provided with all three types of paper when writing is introduced, they have to adjust to three differing sets of parameters, requiring more information-processing activities. For some students, this effort may exceed the optimal challenge point (Guadagnoli & Lee, 2004) and therefore skilled behavior might potentially take longer to establish. Thus in the initial phase of handwriting instruction, teachers should consider keeping task demands consistent by minimizing the variations of paper. Once motor patterns are developed, variable practice using different kinds of paper is appropriate. It will increase the challenge level of the task, facilitating retention of performance. Although some researchers have suggested the use of different kinds of paper, Graham (1992) recommended that students should be restricted to paper with wide lines during initial handwriting instruction. Information from motor learning supports Graham's recommendation because it essentially limits the number of variables provided until the student develops some control of letter formations.

Programs Used for Writing Instruction

The different programs reported in this survey used varying formations to form some of the letters. The letter *W*, for example, was formed with continuous strokes from the left to the right in a “down, up, down, up” sequence or by repeated downward strokes changing the direction of the oblique line; the letter *d* was formed by extending the bottom of the letter *c* with a continuous vertical stroke from the bottom,

up, and down again, or by starting from the top down, with a counter-clockwise loop to close the letter. A student may get differing instructions if receiving help from different teachers (e.g., special educators, intervention specialists) within the same grade level, and from parents at home, or when moving through different grades. For a child struggling with handwriting, conflicting instructions add to the motor planning challenges. Use of the different programs within one school is also frustrating to the staff, including special educators and occupational therapists who move between classes. One teacher reports, "As an intervention specialist, I try to reinforce what's done in the classroom—but the classrooms teach differently, so this is difficult."

Research supporting the superiority of a particular program over another is limited. However, using one consistent program within a school district would ensure that the staff uses uniform instructions, helping students master writing more easily. Consistency of instruction together with adequate practice during acquisition of handwriting would help to establish the motor skills used for communication.

Some commercial programs use the concepts suggested by motor learning theory. Using consistent paper, the programs require several repetitions of the introduced letter, providing verbal directions to guide the directionality (i.e., the program provides blocked practice in the acquisition phase). As each new letter is introduced, and mastered, it is practiced as part of a word using the previously mastered letters. This helps to retain the previously learned letter formations. It also provides an optimal challenge by ensuring random practice conditions and including language concepts. As the students increase their repertoire of letters, the challenge point is raised by the recall of a larger number of letters for more efficient retention of learning.

Order of Introducing the Letters

The order in which each teacher introduced letters was determined by his or her particular philosophy, whether visual-motor control or language development. Students should be developmentally ready to form the basic lines (vertical, horizontal, circular, and oblique) that constitute manuscript letters by the time they enter school at age 5 (Beery, 1997). It can be deduced that if students have had adequate experiences using paper and pencil and have developed age-appropriate visual-motor integration skills, then the order of introduction of letters should not have an impact on success with handwriting. Research confirms that kindergarten students who were able to copy the first 9 forms on the Beery-Buktenica test of Visual Motor Integration (VMI) performed better on a copying task than those kindergartners who did not copy them (Daly, Kelley, & Krauss, 2003).

Practice Schedule Used

Students need to practice the motor production of letters before they have this skill available at an automatic level to convey thought. Although formal guidelines regarding the amount of practice per week have not been established, it appears that some of the teachers in this district provide less than the typical handwriting instruction of 20 to 60 min per week (Rubin & Henderson, 1982; Zaner-Bloser, 1993).

Students whose handwriting difficulties stem from poor motor memory do not retain a kinesthetic pattern for forming letters. Their writing may appear legible, but observation reveals that one particular letter may be formed in different ways; for example, the letter *a* may be formed from the top in a clockwise direction, or anti-clockwise, or from the baseline up in either direction, or in a fragmentary fashion. These students then must compare visually to determine the correctness of the letter-forms, which slows down their writing. To address the difficulties resulting from poor motor memory, Levine (1987) advocated that adequate practice with consistent repetition of efficient letter formations be provided in the classroom within a structured handwriting program. Close adult supervision is needed to ensure that students are practicing correctly, because using a consistent letter formation helps to strengthen the kinesthetic memory of that letter formation. Practice may occur under blocked and constant conditions in the introductory phase of handwriting (Baker, 1999; Poole, 1991). When a relatively stable movement representation is developed, use of random and variable practice conditions will help retention of the motor skills. Mastery of the motor skills involved in writing can then be used for effective communication.

Limitations

The relatively low return rate of the surveys from teachers of grades 3 and 4 may have skewed the results. The return rate may have increased if the school administration had been involved in the study, because they could have assigned time to complete the survey during a staff meeting after informing the teachers to come prepared to discuss their handwriting instruction. This study was conducted across only one school district, with an untested questionnaire that I developed. Although conclusive findings cannot be derived, the results are thought-provoking and will stimulate occupational therapists to question initial handwriting instruction in students referred for therapeutic remediation. Extensive research has explored different aspects of teaching handwriting and written language; however, a broader picture encompassing motor skills and language development is still needed. Specifically, longitudinal research on models

of handwriting focusing on normal and atypical development of children is needed (Graham & Weintraub, 1996).

Conclusion

The study found that educators in this school district use a variety of methods and tools to teach manuscript, with no continuity of instruction between the grade levels. Although cursive was introduced uniformly in grade 3, with some agreement in the program used, there was variation in the order of introduction of letters, paper used, and practice time provided. These instructional methods could potentially limit the effectiveness of handwriting instruction, which was confirmed by the teachers of grades 5 and 6. They reported that all students had *not* developed fluent handwriting as a tool of expression, because of which instructional time was used to review handwriting again. These consequences suggest the need for structuring handwriting instruction, which should be aligned from kindergarten through the subsequent grade levels. The students would then augment the competencies developed in the earlier grades to refine the motor skill of writing. As teachers accommodate the required increases in content areas, they need clear guidelines on effective methods to teach handwriting as a tool of written expression. School-based therapists can interpret information from the motor learning theory identified in this article, pertaining to consistency of instruction and practice, to help educators develop these guidelines.

Teachers impart initial handwriting instruction, but students with problems in handwriting are referred to occupational therapy for remediation. As school-based occupational therapists struggle to manage the myriad referrals in school (Holtzinger & Hight, 2005), they need to reflect on the initial instruction of handwriting imparted by educators, in addition to therapeutic needs identified. By contributing to the effectiveness of the initial handwriting instruction, occupational therapists can ensure that all students receive proper instruction. Then, only those students who have genuine deficits best addressed by occupational therapy would be referred for remediation, allowing therapists to better manage their caseloads. Ensuring appropriate referrals would be ethically correct and reflect professional integrity. Occupational therapists addressing handwriting instruction should align their instructional programs to those used in the student's classroom and avoid adding variables to handwriting instruction.

The results of the survey spurred this school district to review its handwriting instruction and to use one consistent program with specific expectations from kindergarten to the sixth grade. The instructional decision was based on philo-

sophical beliefs and research-based evidence from the fields of both education and occupational therapy. The district team first outlined the philosophical beliefs regarding handwriting, after which they drew up a curriculum with specific objectives for each grade level as part of the language arts curriculum. Only then did they evaluate the commercial programs available to select one program that met their needs. Additional factors considered included cost of materials and availability of related programs, such as writing readiness and spelling programs. This program has been used for 5 years now. Occupational therapy referrals for students with only handwriting difficulties (i.e., students not served on Individual Education Programs) were not tracked in this district; therefore, data regarding change in the number of students served is not available. However, I have noted a shift in the quality of the referrals. Rather than the students seen previously who needed handwriting instruction, the current referrals predominantly concern students with deficits in motor or visual-perceptual function, which are appropriately remediated with occupational therapy.

In describing management of handwriting instruction, Benbow (1995) clarified that some children learn to write well regardless of the methods used to teach writing. Others are unable to learn the skill regardless of the interventions used. However, most children fall between these two extremes and readily benefit from good teaching strategies. Occupational therapists have valuable information to share that will assist educators in devising instructional strategies that help these in-between students develop an efficient mode of written communication. ▲

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