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The Role of Self-Regulation and Transcription Skills in Writing and Writing Development

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It is proposed that the development of writing competence depends on high levels of self-regulation and the mastery of low-level transcription skills. Predictions consistent with each of these claims are identified and evaluated. Although the available data are incomplete and many key findings require further replication, the accumulated evidence generally supports both of these propositions.

During the last 2 decades, considerable progress has been made in understanding the processes involved in writing. Despite these advances, current models of writing and descriptions of its development are incomplete. Although many parts of the writing puzzle are fairly well developed, other aspects remain sketchy (Hayes, 1996). This article examines the role of two processes, self-regulation and transcription, that are included as essential components in many recent descriptions of writing (Berninger, Fuller, & Whitaker, 1996; Kellogg, 1987; McCutchen, 1995; Scardamalia & Bereiter, 1986; Zimmerman & Riesemberg, 1997). It is proposed that the development of writing competence depends on high levels of self-regulation and the mastery of low-level transcription skills, such as handwriting and spelling.

Presently, there is much more data on the role of self-regulation in writing than there is on the impact of basic transcription skills. This is probably due to the heavy emphasis placed on the cognitive and self-regulatory aspects of composing in the two models of writing (Hayes & Flower, 1980; Scardamalia & Bereiter, 1986) that were most influential during the 1980s and 1990s, as well as a general de-emphasis on instruction in transcription skills, such as handwriting and spelling, during this same period (Graham & Weintraub, 1996). Even with the greater emphasis on the self-regulatory aspects of writing, the available evidence in both of these areas is incomplete. As a result, our analysis of more traditional empirical data is complemented by anecdotal reports from professional writers to provide a broader

evidentiary base for examining the role of self-regulation and transcription skills in writing development.

WRITING AND SELF-REGULATION

High levels of self-regulation are thought to be important to skilled writing because composing is an intentional activity that is quite often self-planned and self-sustained (Zimmerman & Riesemberg, 1997). In addition, skilled writing is commonly viewed as a difficult and demanding task, requiring extensive self-regulation and attentional control to manage the writing environment, the constraints imposed by the writing topic, and the processes involved in composing (Kellogg, 1987; Ransdell & Levy, 1996; Scardamalia & Bereiter, 1986; Zimmerman & Riesemberg, 1997). These assumptions are reflected in the prominent position that self-regulation is assigned in influential models of the writing process. Flower and Hayes (1980), for example, noted that “a great part of the skill in writing is the ability to monitor and direct one’s own composing process” (p. 39). They contended that skilled writing is a goal-directed activity and that writing processes such as planning, sentence generation, and revising must be orchestrated so that the writer can switch attention between these functions and a host of mechanical, substantive, and environmental concerns. According to their model, this is accomplished by a control structure, the *monitor*, which activates and coordinates the interplay among the various elements involved in writing. Somewhat similarly, Scardamalia and Bereiter (1986) employed the construct of *executive control* to account for the self-regulation and volitional processes that occur during writing.

Self-regulation is thought to enhance writing performance in two ways. First, self-regulatory mechanisms, such as plan-

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ning, monitoring, evaluating, and revising, provide building blocks or subroutines that can be assembled along with other subroutines, such as procedures for producing text, to form a program for effectively accomplishing the writing task (Scardamalia & Bereiter, 1985). Second, the use of these mechanisms may act as change-inducing agents, leading to strategic adjustments in writing behavior (Scardamalia & Bereiter, 1985; Zimmerman & Riesemberg, 1997). When self-regulatory mechanisms, such as planning and evaluating, are incorporated into writing, for example, they generate information that may influence not only their subsequent use, but other cognitive or affective processes as well. To illustrate, the successful use of a planning strategy should increase the likelihood that it will be used in the future. Moreover, continued success in using the strategy is thought to enhance self-efficacy for writing. It is hypothesized, in turn, that a heightened sense of efficacy influences intrinsic motivation, willingness to seek a strategic solution, and eventual literary attainment (Alexander, Graham, & Harris, 1998; Zimmerman & Riesemberg, 1997).

Despite its assumed importance, many of the details and implications of self-regulation are not adequately specified in current models of writing, including description of key processes, the source of motivation to self-regulate, and the factors that nurture or inhibit the development of self-regulated writing (Graham & Harris, 1997b). A notable exception is a model developed by Zimmerman and Riesemberg (1997), as it provides the most fully developed account to date. They defined self-regulation of writing as the “self-initiated thoughts, feelings, and actions that writers use to attain various literacy goals” (p. 76). They proposed that three general categories of processes are used to exert control when writing. These included environmental (i.e., regulation of the physical or social context of writing), behavioral (i.e., regulation of the overt motoric aspects of writing), and personal processes (i.e., regulation of cognitive beliefs and affective states associated with writing). These processes interact reciprocally via an enactive feedback loop, involving a cyclic process in which writers monitor the success of the strategies employed and continue, modify, or abandon what they are doing based on the resulting feedback. The use of these processes is closely linked to one’s perceived capabilities (i.e., self-efficacy) to plan and implement the actions necessary to complete successfully the writing task. Furthermore, the importance and use of each form of self-regulation is assumed to vary according to environmental conditions, personal effort, and writing outcomes.

Theorists have identified a variety of self-regulation strategies that writers use to control environmental, behavioral, and personal processes (Graham & Harris, 1994b; Zimmerman & Riesemberg, 1997). These include goal setting and planning (e.g., establishing rhetorical goals and tactics to achieve them), seeking information (e.g., gathering information pertinent to the writing topic), record keeping (e.g., making notes), organizing (e.g., ordering notes), trans-

forming (e.g., visualizing a character to facilitate written description), self-monitoring (e.g., checking to see if writing goals are met), reviewing records (e.g., reviewing notes or the text produced so far), self-evaluating (e.g., assessing the quality of text or proposed plans), revising (e.g., modifying text or plans for writing), self-verbalizing (e.g., saying dialogue aloud while writing or personal articulations about what needs to be done), rehearsing (e.g., trying out a scene before writing it), environmental structuring (e.g., finding a quiet place to write), time planning (e.g., estimating and budgeting time for writing), self-consequating (e.g., eating ice cream as a reward for completing a writing task), seeking social assistance (e.g., asking another person to edit the paper), and self-selecting models (e.g., emulating the tactics or style of writing of a more gifted author).

If the use of such self-regulation strategies is an important element in the development of skilled writing, it is reasonable to expect that (a) skilled writers are more self-regulated than less skilled writers, (b) developing writers become increasingly self-regulated with age and schooling, (c) individual differences in self-regulation predict individual differences in writing, and (d) teaching such strategies improves the writing performance of developing and struggling writers. We examine each of these predictions next.

Prediction 1: Skilled Writers Are More Self-Regulated Than Less Skilled Writers

Skilled writers. For the most part, high levels of self-regulation are evident in professional writers’ descriptions of how they compose (see, e.g., Burnham, 1994; Lamb, 1997; Plimpton, 1989; Zimmerman & Riesemberg, 1997). In interviews published in the *Paris Review* (Plimpton, 1989), for example, self-initiated strategies for controlling environmental, behavioral, and personal processes were quite common among prominent 20th-century authors. Examples of strategies used to control the physical or social context of writing ranged from Ernest Hemingway’s daily routine of composing first thing in the morning because it was quiet and cool to Jack Kerouac’s ritual of lighting a candle, writing by its light, and blowing it out once he was done. Behavioral strategies included the generation of voluminous notes and character descriptions by Scott Fitzgerald as well as a general program of multiple revisions by Truman Capote, starting with the revision of his initial handwritten draft, followed by a second revision after typing the composition on yellow paper, and a third revision once it had set for a week or more. Strategies for regulating cognitive beliefs and affective states varied from Thornton Wilder taking a long walk as a motivation to start writing each day to Georges Simenon checking in with a doctor to assure himself that he was up to the demanding task of starting a new book.

Such anecdotal reports by professional writers are supported by more scientific observations of adults who are skilled writers. This can be illustrated by considering the self-regulatory skill of planning. In a study of adult writers who were asked to think aloud while composing, Hayes and Flower (1980) found that almost 80% of content statements produced early in the process of composing focused on planning. Gould (1980) reported that business executives spent about two thirds of their composition time planning. Kellogg (1987) found that college students spent about one fourth of their writing time planning. Although these figures vary considerably and are limited to a single process, they show that self-regulation accounts for a significant amount of the activity in skilled writing. The role of self-regulation in skilled writing is even more prominent when other self-regulatory strategies are included in this tally. For instance, in the study by Kellogg, another 20% of writing time was spent reviewing written ideas, and Hayes and Flower reported that 10% to 15% of content statements involved the process of revision.

It is important to note that some professional writers provide descriptions of the composing process that are at odds with the aforementioned anecdotes and findings. Harriet Beecher Stowe, for instance, had so little idea what was going to happen next when writing *Uncle Tom's Cabin* that she thought that the book was written through her by another hand (Burnham, 1994). Similarly, the novelist Hervey Allen, author of *Anthony Adverse*, believed that he received help from his ancestors and an angel-like creature that danced along his pen while he wrote (Plimpton, 1989). Unlike Stowe and Allen, who relied on a metaphysical recorder to explain how they wrote, other professional writers have claimed that writing occurs through the unconscious mind (see Safire & Safire, 1992, for examples) or have described an approach to writing where planning, revising, and other self-regulatory strategies are not prominent or are notably absent (see Kazin, 1967, for examples). Harold Pinter, the playwright, for instance, noted that he often wrote in a high state of excitement and frustration, with a dim view of a possible overall idea, following what he saw on the paper, one sentence after another (Plimpton, 1989). As Ransdell and Levy (1996) noted, there are times when writing is "fluent, fluid, and seemingly effortless" (p. 93), requiring little in the way of self-regulatory activity.

It is difficult to evaluate scientifically the assertion that a metaphysical recorder guides the writing process or that writing occurs through the unconscious mind. Such assertions, however, have been challenged by other authors, who have either made light of them or offered alternative explanations. For example, in response to Hervey Allen's claim of metaphysical help, James Thurber sarcastically commented that the novelist had all the luck (most of these descriptions are limited to novelists or poets), as humorists such as himself never got any help from their ancestors (Plimpton, 1989). We suspect that some professional writers are able to minimize self-regulatory processes during writing, because these processes have become so routine that they require little con-

scious attention. To illustrate, Lillian Hellman, the playwright, indicated that she was able to write without a clear conception of what would happen because she had become so practiced and skilled that the use of self-regulatory strategies, such as advanced planning, were no longer needed (Kazin, 1967).

Developing writers. Developing writers typically show little high-level, goal-directed behavior when composing (McCutchen, 1988; Scardamalia & Bereiter, 1986). They commonly approach writing by converting the assignment into a task of writing as remembering or writing by pattern (McCutchen, 1995). Any information that is somewhat appropriate is retrieved from memory and written down, with each preceding sentence or phrase acting as a stimulus for the next idea. Little attention is directed to rhetorical goals, the constraints imposed by the assignment, the needs of the reader, or the organization of the text. The role of self-regulation strategies, such as planning and revising, are minimized, as this retrieve-and-write process typically functions like an automated and encapsulated program, operating largely without metacognitive control (McCutchen, 1988). This is not to say that this knowledge-telling approach to writing is thoughtless; rather it is primarily forward moving, with little of the recursive interplay among composing processes commonly observed among more skilled writers (Hayes & Flower, 1980).

Although there are few actual comparisons between the self-regulatory processes employed by developing and skilled writers, an investigation by Bereiter and Scardamalia (1987) revealed markedly different levels and patterns between these groups, at least in the area of planning. They found that undergraduate students (i.e., skilled writers) planned their entire composition during a scheduled preplanning period, generating multiple and abbreviated lists of ideas that were connected by lines or arrows. Conceptual planning notes, evaluative statements, and structural markers were also quite common. In contrast, the planning notes developed in advance by children in Grades 4, 6, and 8 showed that younger students simply generated complete sentences that were edited into a final draft when writing, whereas older students listed content ideas that were later worked into their compositions.

As they wrote, the participants in the Bereiter and Scardamalia (1987) study were asked to think aloud. Analysis of the resulting protocols revealed that one third of the planning statements made by the undergraduate students focused on conceptual issues and their content statements were typically concerned with goals, structuring their writing, and overcoming difficulties. Developing writers rarely made such comments. Not surprising, self-regulatory differences between skilled and developing writers are not limited just to planning, as the revising behavior of these two groups differ as well. For instance, skilled writers revise more for meaning

and make more sentence- and theme-related changes than their developing counterparts (Fitzgerald, 1987).

Cameron, Hunt, and Linton (1996) raised a challenge to the predicted differences between skilled and developing writers, suggesting that young writers differ little from skilled writers in their text-production capabilities. They indicated that qualitative and anecdotal evidence collected in classrooms that support students' self-regulatory abilities, namely process writing and whole-language classrooms, provide evidence that even young children show high levels of self-regulation and problem solving when composing under favorable conditions. Although we agree that classroom or environmental supports can boost self-regulatory competence, there is little reason to believe that children's self-regulatory skills, even those in process or whole-language classrooms, are a match for those of skilled writers (see Smagorinsky, 1987, for a critical review of ethnographic and anecdotal evidence concerning process writing; and Graham & Harris, 1994a, 1997c, for reviews of research on whole-language and process writing).

Struggling writers. Consistent with the evidence reviewed so far—that skilled writers are more self-regulated than developing writers—better writers are more self-regulated than their poorer writing peers, at least if data on planning and revising are representative of general levels of self-regulation in writing. Good writers spend more time planning and focus more of their attention on text-level concerns than struggling writers (Humes, 1983), better writers make more revisions than their less competent counterparts (Fitzgerald, 1987), and good writers are more knowledgeable than poor writers about the self-regulatory processes involved in composing (Englert, Raphael, Fear, & Anderson, 1988).

These findings are further supported by several studies conducted by Graham and his colleagues (Graham, 1997; De La Paz, Swanson, & Graham, 1998) that show that the performance of struggling writers may be hobbled by difficulties managing and coordinating the elements underlying the process of revising. In one study (Graham, 1997), fifth- and sixth-grade students who scored 1 *SD* below the mean on a standardized writing test received help directing the revising process by using a routine that insured that the evaluative and tactical decisions involved in revising occurred in a regular way. The routine primarily focused students' attention on sentence-level concerns. In a second study, eighth-grade students with writing scores 1 *SD* below the mean used a similar routine, involving two revising cycles: one focusing on text-level concerns and the other on more local difficulties. In both studies, participants reported that the self-regulatory support provided via the revising routine made the task of revising easier. There was also an increase in the number of revisions that were rated as improving text in both studies, and the overall quality of students' revised text improved as a con-

sequence of using the routine in the second study. Although additional replication is needed with other self-regulatory processes, these investigations provide support that such processes contribute to the difficulties experienced by struggling writers.

Prediction 2: Developing Writers Become Increasingly Self-Regulated With Age and Schooling

Notably scarce in the study of writing are longitudinal investigations tracing the development of self-regulatory processes (Graham & Harris, 1997b). Most current research employs cross-sectional methodology and typically focus on a single self-regulatory strategy or process. Although a great deal remains to be learned about the breadth, depth, and course of self-regulation in writing, the available data generally support the prediction that writing becomes increasingly self-regulated with experience and maturity. For example, in the Bereiter and Scardamalia (1987) study reviewed earlier, the amount of planning notes produced between fourth and sixth grade doubled, whereas conceptual planning increased slightly across the fourth- to eighth-grade range. Similarly, Boscolo (1990) found that most of the planning notes produced by children in Grades 2 and 4 were sentences that were repeated with minor changes when writing, but about 35% of notes in Grades 6 and 8 were either reminders to recall a certain item when writing or superordinate titles that summarized or synthesized information. Although there is considerable individual variation, revising behavior also tends to change with age or experience, with older writers revising more often, revising larger units of text, and making more meaning-based revisions (Fitzgerald, 1987). Finally, students' conceptualization of writing appears to become more self-regulatory with age, at least during early adolescence, as older students were more likely to emphasize the self-regulatory aspects of composing than younger students in two interview studies where participants responded to questions about the process of writing (Graham, MacArthur, & Schwartz, 1993; Wong, Wong, & Blenkinsop, 1989).

Additional research is clearly needed to replicate and expand on these findings. This includes more ambitious, descriptive, and developmental writing studies designed to track the emergence and trajectory of multiple self-regulatory strategies. As writers gain more competence, we anticipate both quantitative and qualitative shifts in their levels of self-regulatory behavior (see Alexander et al., 1998). For instance, self-regulatory strategies that were initially inefficient and inelegant will be upgraded and refined to make them more effective. In addition, the use of some self-regulatory strategies will undoubtedly decline with increased competence no longer being necessary, whereas the frequency and importance of others will increase, as the complexity and difficulty of writing tasks and personal writing goals become

more challenging. Without more extensive and longitudinal investigation, however, it will be difficult to develop a comprehensive and integrated theory of writing or to design developmentally appropriate writing practices involving self-regulation.

Prediction 3: Individual Differences in Self-Regulation Predict Individual Differences in Writing

Data from studies examining the relation between writing and self-regulation generally support the prediction that individual differences in self-regulatory behavior predict individual differences in writing performance. These findings must be interpreted cautiously, though, as they are either based on indirect measures (i.e., self-reports) or may be confounded by other intervening variables (see the following discussion).

In a frequently cited study by Englert et al. (1988), students in fourth and fifth grade were asked a series of questions that assessed, among other things, their knowledge of self-regulatory strategies in writing. The task was made more concrete by tying the questions to three vignettes of children who were experiencing difficulty on a particular writing task and asking the participants to give these children advice. Correlations between performance on expository writing tasks and knowledge of 10 different self-regulatory processes ranged from .25 to .70. All but two of the self-regulatory variables, sources of information and revising, were significantly related to writing achievement. Somewhat similar results were found by Bonk, Middleton, Reynolds, and Stead (1990) who reported that a composite measure of knowledge of self-regulatory strategies was significantly related to the overall quality of three papers written by children in Grades 6 through 8 (correlations ranged from .35–.45).

Studies examining the relation between a single self-regulatory strategy and writing performance have focused mostly on revising and planning. Until high school or later, revising behavior is generally unrelated to overall writing performance, probably because younger children do not revise very much and tend to limit their revisions to proof-reading and minor word changes (Fitzgerald, 1987). In terms of planning, both quantity and quality of plans are typically related to writing performance. In their review of literature, Hayes and Nash (1996) reported that the correlations between writing quality and amount of planning ranged from .11 to .66 for adults, whereas correlations between quality of writing and quality of plans ranged from .23 to .87 for students in Grade 6 through college. In interpreting these findings, Hayes and Nash cautioned that correlation does not imply causation and that a correlation can be caused by any of a multitude of third factors, or namely a confounding variable. This can create the appearance of a special relation between two variables when none actually exists. In several of the studies they reviewed, for instance, a previously significant correlation between writing quality and planning became nonsignificant

once time-on-task was held constant via the technique of partial correlation.

The issue of time-on-task raised by Hayes and Nash (1996) can also be controlled by holding planning and writing time constant. This was done in a study by Berninger, Whitaker, Feng, Swanson, and Abbott (1996) in which students in Grades 7 through 9 were each provided a constant amount of time to plan and write (10 min for each process). Under these conditions, there was a small but significant correlation (.21) between level of planning and the organization of students' text.

Prediction 4: Teaching Self-Regulatory Strategies Improves Writing

Unlike correlational studies, causation can be implied in experimental studies in which writing performance improves following instruction in self-regulation. Such improvements have been observed for both developing and struggling writers (see reviews by Graham & Harris, 1994b; Harris & Graham, 1996; Zimmerman & Riesemberg, 1997). In some instances, improvement occurred as a result of instruction in the use of a single self-regulatory strategy, such as goal setting (Graham, MacArthur, & Schwartz, 1995; Page-Voth & Graham, 1999) or self-monitoring (e.g., Harris, Graham, Reid, McElroy, & Hamby, 1994). In other cases, improvements were associated with learning to use a heuristic that contained multiple self-regulatory procedures (Sawyer, Graham, & Harris, 1992; Troia, Graham, & Harris, 1999). Although not all of the self-regulation strategies described at the beginning of this article have been the subject of experimental training studies, the array of strategies that have been taught and tested are broad enough to support a general conclusion that increased self-regulation enhances writing performance. Self-regulation strategies that have been used to improve the writing performance of both developing and struggling writers include goal setting and planning, seeking information, organizing, transforming, self-monitoring, self-evaluating, revising, self-verbalizing, and self-selecting models (see Graham & Harris, 1994b; for reviews of individual studies, see Zimmerman & Riesemberg, 1997).

A recent study by De La Paz (1999) illustrated the impact of self-regulation instruction on writing performance. Over a 4-week period, middle-school teachers taught seventh- and eighth-grade students to use a self-regulation heuristic to guide the process of writing essays. The heuristic contained strategies for advanced and online planning, including goal setting, seeking information, and organizing, as well as strategies for monitoring these processes. Instruction in the use of this heuristic had a positive effect on writing performance of good, average, and struggling writers. Their papers became longer, more complete, and qualitatively better.

In summary, the evidence reviewed here supports the claim that the development of writing competence depends on high levels of self-regulation. Although the current re-

search base is incomplete and further replication is needed, the data are generally consistent with our predictions that skilled writers are more self-regulated than less skilled writers, developing writers become increasingly self-regulated with maturity and experience, individual differences in self-regulation predict writing achievement, and teaching self-regulation strategies to developing and struggling writers improves writing performance. This is further supported by recent findings showing that a writer's self-efficacy can be enhanced by the judicious use of a combination of self-regulatory procedures (e.g., Schunk & Swartz, 1993; Zimmerman & Kitsantas, 1999).

TRANSCRIPTION SKILLS

Transcription involves transforming the words that the writer wants to say into written symbols on the printed page (Berninger, Fuller, & Whitaker, 1996). It primarily entails the processes of spelling and handwriting (or typing). Mastery of transcription skills are thought to be important to writing development because the execution of these skills can consume considerable attentional resources, especially if they cannot be carried out fluently and efficiently. For those who have not yet mastered the mechanics of writing, having to consciously attend to the lower level skills of getting language onto paper may tax the writer's processing memory, interfering with higher order skills such as planning and content generation (Graham, 1990). Consistent with this view, McCutchen (1996) proposed that the act of spelling and handwriting are so demanding for young writers that they minimize the use of other writing processes, such as planning and revising, because they exert considerable processing demands as well. Berninger, Mizokawa, and Bragg (1991) further proposed that difficulties mastering transcription skills can lead children to avoid writing and develop a mind-set that they cannot write, leading to arrested writing development.

If transcription skills are an important element in the development of skilled writing, it is reasonable to expect that (a) more skilled writers evidence greater mastery of transcription processes than less skilled writers, (b) the transcription skills of developing writers improve with age and schooling, (c) individual differences in transcription skills predict writing achievement, (d) ignoring or eliminating transcription skills enhances writing performance, and (e) teaching these skills results in improvements in writing. Each of these predictions are examined next.

Prediction 1: Transcription Processes of Skilled Writers Surpass Those of Less Skilled Writers

Handwriting and spelling difficulties have bedeviled a number of professional writers, including such notables as James Joyce and Victor Hugo (Henderickson, 1994). Joyce's handwriting was so bad, for example, that one section of *Ulysses*

was mistaken for scrap paper and tossed in the fire. Nevertheless, it is generally assumed that skilled writers enjoy the advantages of having handwriting and spelling largely automated so that they require little conscious attention during composing (Scardamalia & Bereiter, 1986). This is not to say that transcription skills have no influence on the writing of skilled writers. Popular writers, such as Steve Allen and Sidney Shelton, have indicated that they dictate rather than write, as this allows them to compose at a rate closer to their speed of thought (De La Paz & Graham, 1995). As research by Bourdin and Fayol (1993, 1994) demonstrated, however, the transcription processes of skilled writers (i.e., adults) impose little cost on limited writing resources in comparison to the transcription skills of developing writers (i.e., children). They found that adults were equally adept at recalling information and generating sentences when asked to respond orally or in writing, but children's performance was significantly poorer when writing.

For the most part, the handwriting and spelling skills of children who experience writing difficulties are less well developed than the transcription skills of their normally achieving classmates (see, e.g., Deno, Marston, & Mirkin, 1982; Farr, Hughes, Robbins, & Greene, 1990; Graham & Weintraub, 1996). This was illustrated in a longitudinal study by Juel (1988) in which 14 of 21 children in fourth grade who were classified as poor writers scored 1 *SD* below the mean on a standardized test of spelling. Although these data generally support the prediction that the transcription processes of more skilled writers are better developed than those of less skilled writers, additional research is needed to determine more precisely the frequency of transcription difficulties for children who are good, average, and struggling writers.

Prediction 2: The Transcription Skills of Developing Writers Improve With Age and Schooling

There is a considerable body of research showing that spelling improves with age and schooling (see, e.g., Farr et al., 1990; Gentry, 1982; Smith & Ingersoll, 1984). The developmental aspects of spelling are especially evident in young children (Gentry, 1982) as they move through the following stages from preschool to the early elementary years: precommunicative (symbols bear no relation to the sounds in a word), semiphonetic (letters represent some but not all of the sounds in a word), phonetic (complete phonological structure of a word is represented, but often with unconventional orthography), transitional (more conventional orthographic conventions are applied), and correct (grade-level words spelled correctly). Beyond the primary grades, spelling continues to improve, as the percentage of words spelled correctly in children's compositions increases from one grade to the next, at least through Grade 9 (Farr et al., 1990).

Children's fluency with handwriting also improves with schooling and age (for a review of normative data, see Graham & Weintraub, 1996), typically increasing 10 letters or more per minute with each succeeding grade level. Such increases, however, appear to level off by the start of high school, as the speeds of students in Grade 9 approximate those typically obtained by adults (Graham, Berninger, Weintraub, & Schafer, 1998). Although data charting the course of handwriting legibility is less consistent, the writing of young children becomes increasingly legible during the elementary-school years but may plateau or even regress in Grades 4 or later (Graham & Weintraub, 1996), probably because of increasing demands for fluency and personalization of handwriting style. Overall, however, the available data support the prediction that transcription skills improve with age and schooling.

Prediction 3: Individual Differences in Transcription Skills Predict Writing Achievement

Most of the available studies examining the concurrent relation between writing and transcription were summarized recently by Graham, Berninger, Abbott, Abbott, and Whitaker (1997). The most robust finding in their review of 13 studies was that spelling was moderately correlated with writing quality, whereas low to moderate correlations were generally found between spelling and writing output. Handwriting fluency was also moderately correlated with writing performance, but there were too few studies to separate out specific effects. In contrast, handwriting quality was not correlated with measures of composing.

We located three additional studies (not included in the review by Graham et al., 1997) that also yielded results that are generally consistent with the prediction that individual differences in transcription skills predict writing achievement. First, Jones and Christensen (1999) reported that handwriting skills accounted for 50% of the variance in the writing quality of second-grade children when reading scores were held constant. Second, Juel (1988) indicated that spelling performance accounted for 29% of the variance in the writing scores of first-grade children in her longitudinal study when oral production skills were held constant, but this dropped to 10% by fourth grade. One interpretation of this finding is that transcription skills become less important in the intermediate grades. However, the findings from a much larger and comprehensive study by Graham et al. (1997) suggest that this is not the case. Using structural equation modeling, they found that handwriting and spelling skills accounted for a sizable proportion of the variance in the writing skills of children in Grades 1 through 6 and that there was no significant drop in the amount of variance accounted for in the primary versus the intermediate grades. Transcription skills accounted for 25% and 42% of the variance in compositional quality at the primary and intermediate grades, and 66% and 41% of the

variance in compositional fluency (amount of text written in a specified period) at these same grade levels, respectively.

Prediction 4: Ignoring or Eliminating Transcription Skills Enhances Writing Performance

One way to experimentally examine the effects of transcription skills on writing is to reduce the demands of specific transcription skills during writing and observe if the planned alterations influence the composing process or resulting product. This was done in a study by Glynn, Britton, Muth, and Dogan (1982). College students were directed not to worry about mechanics (i.e., compliance with spelling and punctuation rules) when generating a first draft of a document. Reducing the demands to attend to transcription skills resulted in an increase in the number of arguments they included in their paper. Unfortunately, the mechanisms responsible for this improvement were unclear, as directions not to worry about mechanics did not influence the number of spelling or punctuation errors made by participants.

A second means for examining the effects of transcription is to simply eliminate the mechanical demands of writing altogether by having writers dictate their composition. In a recent review of studies comparing dictation and writing, De La Paz and Graham (1995) reported that one advantage of removing the mechanical demands of composing is that writers, old and young, usually produce more text. A second advantage that is often obtained with young children just learning to write and older elementary-age children with poorly developed transcription skills (i.e., students with learning disabilities) is that text quality improves as well.

Although these findings support the prediction that eliminating transcription skills enhances writing performance, the impact of transcription on writing may have been underestimated. Participants in many of the studies reviewed by De La Paz and Graham (1995) probably had little or no access to text as it was being dictated and may have viewed dictation as a request to speak extemporaneously. Reece and Cumming (1996) addressed these weaknesses in a series of studies with fifth- and sixth-grade children. Dictated text was made accessible by having it appear on a computer screen as it was generated, and it was emphasized that dictation was not telling a story, but composing it. Text dictated under these conditions were judged to be qualitatively better than those that were handwritten, suggesting that transcription skills can also influence the writing quality of older elementary-grade children as well.

Prediction 5: Teaching Transcription Skills Improves Writing

Although research on the teaching of transcription skills started at the beginning of the 20th century, we were only

able to locate three studies that examined the impact of either handwriting or spelling instruction on children's writing. In a study by Berninger et al. (1997), first-grade children at risk for handwriting difficulties were randomly assigned to five handwriting treatment groups or a phonological awareness treatment condition. Performance on a standardized writing test improved for students assigned to the most successful handwriting group. This group wrote each letter from memory after viewing a model of the letter containing directional arrows. A second investigation by Jones and Christensen (1999) found that instruction aimed at improving the letter formation and handwriting fluency skills of first-grade children with poor handwriting enhanced both handwriting and story-writing performance. Finally, Berninger et al. (1998) indicated that spelling instruction that emphasized the learning of common phoneme-spelling associations, practicing new spellings by saying each letter in the word plus the onset and the rime, and using spelling words when writing a short composition resulted in improvements in spelling as well as the number of words produced when writing for second-grade children who were poor spellers. Although these three studies support the prediction that transcription instruction improves writing performance, they provide a relatively meager validation, as they involved only primary-grade students who experienced transcription difficulties, and the investigations did not examine if the observed effects were maintained past the initial instructional period.

In summary, the evidence reviewed in this article not only supports the claim that writing competence depends on high levels of self-regulation, but indicates that writing development is dependent on the mastery of transcription skills as well. The accumulated data are generally consistent with our predictions that more skilled writers demonstrate greater mastery of transcription processes than less skilled writers, the transcription skills of developing writers improve with age and schooling, individual differences in transcription skills predict writing achievement, eliminating transcription skills enhances writing performance, and transcription instruction improves writing. All of these predictions require additional verification, especially the final one, namely, transcription instruction improves writing performance.

The data reviewed in this article are also consistent with the view that writing difficulties, at least in part, are a consequence of problems in acquiring or using self-regulatory processes and transcription skills (Graham, 1999; Graham & Harris, 1997a). The composing of poorer writers is less self-regulated than that of their better writing peers, and their transcription skills are not as well developed. Even more important, the performance of struggling writers can be improved by boosting their level of self-regulation when writing or improving their transcription skills. Thus, both of these processes need to be considered when designing instructional programs for these students.

POSTSCRIPT

In the book, *Steel Beach*, by John Varley (1992), journalists are able to activate an internal recorder and think their story into the external memory of a computer. Although such marvelous writing tools are as yet an invention of the imagination, a more modest revolution is currently underway that may make transcription skills as obsolete as the stone and chisel. This involves the development of speech recognition software that allows writers to speak instead of type or write their compositions. Assuming that the capabilities of this software continue to improve and it becomes commonplace, children of the future may learn to compose without ever, or only rarely, using a pen, pencil, or keyboard. It is doubtful, however, that such a state of affairs will significantly reduce the role of self-regulation in writing. Although future writers will undoubtedly have access to new tools that will assist the process of planning and revising, these and other self-regulatory processes will continue to be a critical cornerstone of skilled writing. This was illustrated on a small scale in a recent study by De La Paz and Graham (1997). They found that students with writing and learning difficulties did their best composing when planning instruction was combined with dictation. Although improved speech recognition software will be a great boon to children such as these, it will not eliminate the need to plan, monitor, evaluate, revise, and so forth.

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