

Despite the diminished place of handwriting in the curriculum and the broad availability of word-processing programs, fluent and legible writing remains a necessary practical skill. In the academic world alone, it is needed for adequate note taking, state proficiency tests, and standardized tests requiring handwritten essays. And poor handwriting influences judgments about the quality of written work (Briggs, 1980) and even about the education, intelligence, or professional competence of writers. Students' perceptions of their own handwriting also affect their judgments about themselves as writers (Graham, 1992; Graham & Weintraub, 1996).

Recently, Graham, Harris, and Hebert (2011) combined the results of available studies of *presentation effects* on writing scores. Their analysis demonstrated the negative impact of noncontent factors (poor spelling, handwriting, grammar, or the use of word-processed text) on judgments of writing quality. Deficiencies in any of these factors led to harsher judgments on the writing of both school-age and college-age students. Although poor usage in any factor lowered the perceived quality of the writing, poor handwriting among school-age students had the largest negative impact.

Poorly developed handwriting, however, can affect more than judgments about written content and writing ability. In combination with poor spelling and by itself, it can contribute to disability in written expression (Graham, Harris, & Fink, 2000). Just as a failure to develop accurate and automatic decoding can impair comprehension in readers, failure to develop legible and automatic letter and word formation may interfere with content in writing (Jones & Christensen, 1999). Students who struggle to retrieve letters from memory, to reproduce them on the page, and to scale them to other letters have less attention available to spend on spelling, planning, and effectively expressing intended meanings (Hayes & Chenowith, 2006).

In contrast, when the component skills of writing are automatic, writers are free to devote their energy to the composition itself, although attention alone is not enough to guarantee improved content. Because of the excessive labor and unattractive results involved in such writing, students are more likely to avoid or minimize the process when possible (Graham & Weintraub, 1996).

Further, recent findings indicate that students across the elementary years write quicker and longer essays when using a pen as opposed to a keyboard (Berninger, Abbott, Augsburger, & Garcia, 2009), and that they contain more ideas (Hayes & Berninger, 2009). This finding contradicts the assumption that children will write more and faster if trained to keyboards. Indeed, as stated above, scorers of word-processed texts have also been shown to grade these products more severely than handwritten texts (Graham et al., 2011). More fundamental still, evidence suggests that learning letters and spellings by hand is superior to learning them with a keyboard (Longcamp et al., 2008). That is, the tactile feedback from forming letters