


The Power of Word Processing for the Student Writer

Written for Renaissance Learning
by Steve Graham, Vanderbilt University

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RENAISSANCE LEARNING
P.O. Box 8036
Wisconsin Rapids, WI 54495-8036
(800) 338-4204
www.renlearn.com
answers@renlearn.com

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Introduction

Jamie's story

Jamie's smile is dazzling. You cannot resist it. It flashes onto her face, and other smiles pop up all around it. When Jamie started school, her smile began to lose its luster—just a little at first, but over several years it steadily faded so that its brilliance became a small and infrequent whisper. The glory of her smile was not fully lost—it often emerged on the playground. It was sometimes seen when she was reading. It occasionally appeared when she was working with others. It just never occurred when she had to write something.

Starting in kindergarten, Jamie watched as others around her learned to write letters neatly and quickly. She did not understand why her handwriting was so slow or her letters crowded one into the other, changing sizes and refusing to stay in between the lines.

Spelling was no better. She could spell some words just fine, but others seemed permanently beyond her reach. This made her writing even slower, as she was constantly stopping to try to figure out how to spell a word or replace it with an easier one.

During first and second grade, it took Jamie twice as long as her classmates to write a paper. Her handwriting was so slow and her spelling difficulties so disruptive that she was constantly forgetting her ideas as she tried to get them down on paper.

These difficulties had a corrosive impact on Jamie's writing. It took a lot of effort to figure out what she was saying, as many words were illegible or so badly spelled that they could not be deciphered. The constant starting and stopping around how to spell a word also took its toll, as most of the ideas she committed to paper were fragmented and disjointed. To a casual observer, it looked as if Jamie took her writing ideas, shook them up, and threw them on the page. In the process, some ideas lost one or more vital parts, other ideas were lost altogether, and the glue that connected ideas evaporated in some places but not in others. This bright child was also reduced to using simple words that she had some chance of spelling correctly.

Jamie was very aware of her difficulties, and took great pains to make sure that others did not see what she wrote if she could help it. Over time, she took to avoiding writing whenever possible and putting minimal effort into what she did write. This made the problem worse, so that by the end of second grade Jamie had developed an intense dislike for writing and rarely produced anything longer than a few sentences.

Her teachers were not insensitive to the difficulties that Jamie was facing. In first grade, her teacher decided to address Jamie's problems with handwriting and spelling by making the following modification. Whenever possible (about one-third of the time), she acted as a scribe while Jamie dictated her composition. Jamie liked this much better than having to write a paper herself. It also had a positive impact on her writing, as her papers doubled to tripled in length. Unfortunately, this was not a feasible long-term solution and produced some negative side effects. Jamie became more resistant to writing by hand, frequently insisting that her teacher or parents act as her scribe.

In second grade, Jamie's teacher took a different approach. She decided to provide Jamie with extra instruction in both handwriting and spelling. This did have some positive effects, as Jamie's spelling improved and her handwriting became slightly faster. It was not enough however. It was still hard to read her papers. It took her much longer to complete them, and spelling difficulties continued to disrupt the writing process.

Fortunately, Jamie's third-grade teacher really turned this situation around. Like the second-grade teacher, she provided Jamie with extra instruction, but focused her added efforts solely on spelling. This accelerated Jamie's spelling progress. More importantly, the third-grade teacher changed the way Jamie wrote. Instead of

writing by hand, Jamie began composing all of her papers on a portable computer in the classroom. She was also asked to do all of her writing at home on the family's computer.

At the beginning of third grade, Jamie's handwriting was faster than her typing. Her teacher rectified this situation by providing typing instruction four times a week through a typing software program. As Jamie's typing speed increased and she became more comfortable with the computer's spell checker, she slowly began to produce more text and became less negative about writing.

By the time Jamie reached middle school, her hands flew across the keyboard. She typed letters and words much faster than other students her age could write them by hand. While she was never destined to be the best speller among her peers, she did all right. The spell checker on her computer automatically corrected some of her spelling miscues and highlighted others so she could deal with them later. Her papers were no longer plagued with illegible letters and words or messy smudges and mark-outs. She became a master at adding text, moving it, typing over it, and deleting it when needed, taking full advantage of this feature of word processing.

Today Jamie is a college student. Word processing and the portable computer that followed her everywhere made this a possibility. I should know, as this vignette is based largely on my daughter's experiences.

Is Word Processing a Good Idea for Developing and Struggling Writers?

Just because word processing helped my daughter realize her potential as a writer does not guarantee this will be the case for all other developing writers. A single testimony, like the one presented above, does not validate the use of word processing as a writing tool for school-aged youngsters. It is better to draw upon scientific studies where the use of word processing is compared against writing by hand.

In 2007, my colleague Dolores Perin and I conducted a meta-analysis of studies that compared the writing performance of students who were assigned to either a word processing treatment or to a handwriting treatment (Graham & Perin, 2007a, 2007b). In a meta-analysis, the findings from each investigation are transformed into a common metric that shows both the direction and strength of the target treatment (in this case word processing). This metric is commonly referred to as an effect size. It is computed by subtracting the average performance of students in the control condition (i.e., handwriting) from the average performance of students in the treatment condition (word processing). This difference is then divided by a measure of the variability (i.e., standard deviation) of all of the participating students. The resulting effect size can be either positive or negative, with a positive effect favoring the effects of treatment and a negative effect favoring the control condition.

If an effect size of .80 is obtained, the treatment had a strong impact on students' performance. An effect size of .50 represents a moderate impact, whereas an effect size of .25 suggests a small impact. I think of these effect sizes in terms of dancing. If a study has an effect size of .80 or higher, the treatment is very effective and you are dancing on the moon. With an effect size of .50, the treatment is effective and you are dancing on top of the Empire State Building. An effect size of .25 indicates that the treatment had a small but significant impact and you are dancing on the street.

We located 18 studies that compared students assigned to word processing versus writing by hand. The length of time that students were assigned to each condition ranged from 1 week to 1 year. The outcome measure in each of these studies was quality of students' writing.

When all 18 studies were considered together, word processing had an average effect size of .55. This is dancing on the Empire State Building material. When we looked just at the impact of word processing on

struggling writers the effect size rose to .70 (Graham & Perin, 2007a), getting us close to dancing on the moon. For regular and higher achieving students, the effect size still had a moderate impact of .51.

The findings from the scientific studies are consistent with the anecdotal description of Jamie's turnaround. The use of word processing has a positive effect on students' writing development, and this impact is even more pronounced for struggling writers.

Why Is Word Processing an Effective Writing Medium?

The meta-analysis that Dolores Perin and I conducted did not tell us why word processing was effective. It only told us that it was. There are at least seven ways that word processing helps developing writers (Graham, Harris, & MacArthur, 2004).

One advantage of word processing is that each keystroke results in a legible letter. For a child like Jamie, there is no confusion about the letter she intended to write. This stands in stark contrast to her handwritten text, as even she was unable to figure out what she wrote at times.

A second advantage is that a word processor allows students to produce neat, printed work in a wide variety of professional-looking formats. This includes newsletters, illustrated books, business letters, and signs and posters. Jamie found it especially motivating to produce a finished product that looked like a professional publication. Gone were papers full of smudges and indecipherable handwritten words. They were replaced by compositions that contained a fancy title page, pictures and graphs that highlighted important points or concepts, attractive borders placed at the bottom or top of pages, and the judicious use of font or size of print to emphasize certain features of text.

Seven Ways Word Processing Helps Develop Writers

1. Legibility of text
2. Potential for publishing in variety of formats
3. Ease of revision
4. Fluent production of text (while composing, note taking, etc.)
5. Likelihood of supporting applications (for spelling, grammar, semantic mapping)
6. Portable, easy-to-replicate electronic text (easy to share and provide feedback; hard to lose)
7. Potential for links to electronic source material

Another advantage is that word processors make it easy to revise text. Words and ideas can easily be added, modified, deleted, and moved with a word processor. This is not the case when writing by hand. Jamie found it especially irritating to have to write a paper by hand and then have to rewrite it as she worked to polish the first draft. She was also very reluctant to make any changes while writing the first draft by hand, as she figured those changes could be made later when she had to rewrite the paper. Unfortunately, she did not always remember the needed changes at that time. Word processing set Jamie free, as she could more easily revise text at any point and did not have to recopy the whole paper again and again.

A fourth advantage is that a typed letter can be produced more quickly than a handwritten one. This is especially the case for students who learn to touch-type. They can produce text much quicker on a keyboard than they can by hand. Once Jamie became fluent with a keyboard, she lost fewer ideas while writing and was able to devote more attention to other aspects of writing such as planning, monitoring, evaluating, and revising. She also became a more efficient note taker during her classes, as she was able to record notes much more quickly.

A fifth advantage of word processing is that it is typically packaged together with other software or hardware that provides additional support for writers. This includes supports that help writers with the mechanical demands of writing, such as spelling, capitalization, punctuation, and usage. Computers tools, such as

spelling and grammar checkers, speech recognition (writer can hear written text), and speech synthesis (writer's speech is converted to typed text), all have the potential to compensate for problems in these areas. Because of her difficulties with spelling, spell checking was particularly helpful for Jamie. When she was younger, she also loved to hear the computer read back what she had written. This helped her catch grammatical errors in her papers.

Supports can further involve computer applications that help writers think as they compose, including software that helps the writer set goals, generate writing content, organize ideas, and revise text. For example, many word processors have outlining capabilities, and software is now available for creating semantic maps that tie a writer's ideas together around central and related themes. Jamie loved these kinds of programs because the plans she created could easily be modified through the editing features of the word processor.

A sixth advantage of word processing is that it creates electronic text. Such text is easily portable. Students can send what they have written to others via the Web or on disc. The Internet provides an extremely efficient means for sharing text, as a file can be sent almost instantaneously to anywhere around the world. For Jamie and many youngsters today, this provides the capability to share what they have written broadly and quickly. Instead of having to wait weeks to hear back from a pen pal in another country, Jamie sometimes received a response to a letter in a matter of minutes. This was highly motivating to her, and increased the amount of writing she did.

It is also easy to provide feedback on electronic text. Many word processing programs have features that allow a reviewer to insert notes and make changes that are easily visible to the author. As a result, students can send a paper created on a word processor to a peer, several peers, or the teacher, who can make comments and changes directly on the electronic paper. Once they send their suggestions and edits back to the author, it is a simple matter for the writer to accept or reject these changes. For example, some word-processing programs allow writers to accept all suggested edits via a single click of the mouse or to choose suggested edits selectively. Although Jamie is now in college, she still occasionally sends me a paper electronically, seeking my advice and suggestions as an editor.

When Jamie was young, I cannot tell you the exact number of times that she lost a handwritten paper. It was frequent and every time it occurred, she treated it as a crisis of earth-shattering magnitude. Once she started writing on the computer, she got into the habit of saving her electronic text in multiple places (typically on the computer and a back-up disc). This is not to say that electronic texts were never lost, but it occurred less often than it did for her handwritten papers.

My seventh and final advantage of word processing is that it can be connected to other electronic sources where students can locate needed information for writing a paper, such as libraries (through their electronic portals), software programs such as electronic encyclopedias, and the Internet. This allows students to search for ideas (both verbal and visual) without having to leave the comfort of the classroom or home. For Jamie, this typically involved locating information from an electronic source, copying it, and bringing it back into her own word processing writing environment. Of course, this presents some extra challenges when information is obtained from the Web, as there is no guarantee that such information is valid. In our household, this provided an excellent opportunity to examine how to evaluate the trustworthiness of ideas taken from different sources.

Maximizing the Advantages of Word Processing

I would love to say that all it takes to help students become better writers is to give them a word processor. This would be pretty much like giving a child a tuba and expecting that she or he will become a good musician by playing around with it. The potential advantages of word processing for writing are minimized and even lost if we do not carefully set the stage for its use.

First, word processing and computer programs are complex devices. If a child does not know how to operate them, these tools are unlikely to provide much of an advantage. Consequently, it is important that students learn basic operating moves for using the computer, the associated word-processing program, and any software or hardware they might apply (including learning how to navigate the Web). These skills should be taught directly, and students should be encouraged to ask questions when

they are experiencing difficulty (it is very exasperating to lose text because you are unsure of how to save it). For instance, before Jamie began using word processing to write school papers, we taught her how to open a new file, type text into it, save the file, as well as add, delete, change, and move text. This involved modeling how to carry out each of these processes, followed by her doing them with help if needed, and ending with her showing us how to do them on her own. As she began to use the word processor for school assignments, we further encouraged her to ask for help whenever she needed it.

These same principles apply to students' use of other supporting software and hardware such as publication programs, spell checkers, speech recognition, outlining and webbing programs, library portals, the Internet, and so forth. However, some of these are very complex and will involve more extensive teaching and preparation to ensure that children learn to use them in an effective and facile manner.

When teaching youngsters how to use a software program that facilitates advanced planning in writing, for example, it is important to first provide an overview of the software. This includes discussing the purpose of the software, how it works, and why using it will help them write better. Next, students need to see how another person uses the software effectively. Students do not need to be passive during such modeling, as they can help generate and organize ideas for the plan. In some cases it may be necessary to model how to use a strategy more than once. As they start to apply the software, many youngsters will need additional help to use it effectively. One often-overlooked source of support is other students, as they can work together to apply the software in their own writing. It is also useful to hold periodic class-wide discussions about the impact of using the software, problems that are encountered, and how to solve them.

Second, if students do not learn to type fluently, one of the primary advantages of word processing—speed of producing text—is lost. If a child has to hunt consciously for letters on the keyboard, this interferes with other writing processes (just as slow handwriting does). When this is the case, students have less cognitive resources to devote to other writing processes such as planning, monitoring, evaluating, and revising. It takes them longer to complete writing tasks, and they are likely to view the computer as a frustrating writing instrument. At the end of second grade, we used a typing software program to help Jamie learn to be a touch-typist (see Christensen, 2004, for evidence that typing instruction has a positive impact on youngsters who write with a word processor). I wish that I had been taught the same way. I type by using two or three fingers on each hand, and I am forced to look constantly at the keyboard when typing. While I have become reasonably fluent over the years, I envy those writers whose fingers fly across the keyboard, while they look directly at the screen and the text they are producing.

Third, one of the most powerful aspects of word processing is its editing capabilities. Text can be easily changed, added, deleted, or moved. This makes it easier to execute small mechanical changes in text

Set the Stage for Success With Word Processing

Make sure students are proficient with the tool:

- Teach students how to use the word processor and supporting applications.
- Teach students to keyboard.

Make sure teachers do not confuse knowing how to word process with knowing how to write:

- Teach students how to review and revise.
- Teach students the strategies, skills, and knowledge they need to be skilled writers and to use technology effectively.

(which students do readily) as well as larger substantive changes. Unfortunately, many students do not take full advantage of this feature when revising, as most of their changes focus on substituting one word for another, adding a phrase here and there, and correcting mechanical errors (Graham et al., 2004). The editing features of word processing are much more likely to be used if students are taught how to revise. This can be done by teaching strategies for revising that will encourage them to take full advantage of the editing capabilities of word processing.

My colleagues and I (see MacArthur, Schwartz, & Graham, 1991) have examined the effectiveness of such an approach. We taught students peer revising strategies like the one presented in the box below. With this approach, the writer shares his paper with a peer, who then tells the writer at least three things she likes about the composition. The peer then takes the paper, rereads it, and makes specific comments directly on the paper. In the boxed example, the peer is asked to consider and comment on any part of the text that is unclear, places where ideas could be profitably added or deleted, and concerns about how the text is ordered. The writer then decides which of this feedback is useful and makes changes accordingly. Teaching students how to use such a strategy changes how students revise papers written on a word processor. They make more substantive changes in their papers, expanding how they use the editing capabilities of the word processor. Most importantly, the quality of what they write is improved.

Of course, this peer revising strategy is not the only way that students can work collaboratively around word processing in the classroom. A computer network can be established, where a teacher can model how to carry out a specific skill or process, such as rewriting a paragraph to make it more concise or combining several smaller sentences to produce a more complex single sentence. Students can then be asked to work alone or in pairs to emulate the same processes or skills with similar text, with the teacher or even other peers providing feedback as they are doing this or once they are finished. In addition, word processing in conjunction with email or other means of electronic communication provides a powerful mechanism for expanding the audience for children's writing. Too often youngsters write just for their teacher or the other students in their class. Electronic text sent across the Web now makes it possible for students to share what they write with a much broader audience.

Peer Revising Strategy

1. LISTEN and READ along as the author reads the story.
2. TELL what it is about and what you liked best.
3. READ it to yourself and make NOTES about:
 - A. CLARITY? Is there anything you do not understand?
 - B. DETAILS? What information/details could be added?
 - C. FIT? Is there anything that should be removed?
 - D. ORDER? Is there anything that needs to be moved?
4. DISCUSS your suggestions with the author.
5. Author: Make changes on the computer.

Word processors and associated writing software must be embedded in a high-quality writing program if their impact is to be maximized. If students are not expected to write or most of their writing is limited to writing short answers, word processing is of little value. Likewise, word processing is not a substitute for teaching students the strategies, skills, and knowledge needed to be a skilled writer. It is like a magician's hat. You have to put something in to get something out. Even when the construction of the hat makes it easier to pull something out (as word processing does), there has to be something in there to begin with.

Finally, it is important to realize that word processing can be used in ineffective ways. For example, if a youngster is writing a composition, while simultaneously connected to email or an electronic chat room, they are likely to switch back and forth between writing and communicating with others. Such distractions may cause writers to forget ideas they were planning to use as well as disrupt their line of reasoning, resulting in text that is less coherent and well developed. An obvious solution to this is not to write when connected to the Web.

In a slightly different vein, youngsters can sometimes become overly involved with supporting software or electronic resources that can be used in conjunction with a word processing program. For instance, searching the Web for information to write about can be overwhelming for some youngsters. For some topics, there are so many available resources, it is difficult to know where to start. Developing writers may also not be able to separate the wheat from the chaff or tell what is valid or invalid. Like other cognitive processes, these skills need to be directly taught.

And, some software is inordinately seductive for developing writers. My daughter, Jamie, would sometimes spend as much time getting a paper ready for publication (picking font, trying out different borders, putting in pictures, and so forth) as she did actually writing the paper. In situations like this, it is important to set specific limits on how much time can be devoted to these activities.

Final Comment

Despite the power of word processing, its use in the teaching of writing is surprisingly limited in American classrooms. In national surveys of writing practices in elementary and secondary schools, computers and word processing were among the least used tools in writing instruction (see Graham, Harris, MacArthur, & Fink-Chorzempa, 2003; Kiuahara, Graham, & Hawkin, 2009). For children like Jamie, and all children in fact, this is unacceptable. Writing and word processing have become increasingly important in modern life, especially at work and in everyday interactions involving email and text messaging. Schools need to bring this twenty-first century tool more directly into the classroom.

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About the Author



Steve Graham is the Currey Ingram Professor of Special Education and Literacy in the Peabody College at Vanderbilt University. His research interests include learning disabilities, writing instruction and writing development, and the development of self-regulation. Graham is the editor of *Exceptional Children* and the former editor of *Contemporary Educational Psychology*. He is the co-author of *Handbook of Writing Research*, *Handbook of Learning Disabilities*, *Writing Better*, and *Making the Writing Process Work*. He received an Ed.D. in special education from the University of Kansas.

In 2001, Graham was elected a fellow of the International Academy for Research in Learning Disabilities. He is the recipient of career research awards from the Council for Exceptional Children and Special Education Research Interest Group in the American Educational Research Association.