Using Multimedia Graphic Organizer Software in the Prewriting Activities of Primary School Students: What Are the Benefits?

BARBARA LORENZ
John S. Malcom Elementary School, Laguna Niguel, CA, USA

TIM GREEN
California State University, Fullerton, La Habra, CA, USA

ABBIE BROWN
East Carolina University, Greenville, NC, USA

The use of multimedia graphic organizer software and how it influenced the prewriting process for primary school children were evaluated. An analysis of writing samples generated by second-grade students with diverse writing abilities was carried out. Students were given two opportunities to participate in prewriting activities—one without and one with the use of multimedia graphic organizer software. The results indicated that the use of multimedia graphic organizer software can provide some benefits to writing for elementary school children.

KEYWORDS multimedia, writing process, elementary students, graphic organizer software

At an elementary school in southern California—where one of the authors teaches—students have been using computers and digital cameras to support the writing process for about five years. Teachers, parents, and administrators were early adopters of the idea of technology integration into the curriculum. For many, the expectations were that test scores would increase and student writing would improve with the integration of new technology tools. As such, a large portion of the district and school budget was funneled into technology hardware, software, and technical support. Parent organizations helped offset the costs by raising thousands of dollars to provide
a computer lab and laptops for teachers to integrate technology into the curriculum.

Over the past five years, the ongoing cost of maintaining and replacing hardware, as well as updating software, has continued to absorb a significant portion of the total school budget. As costs mount, the administrators, parents, and teachers question whether the value of the computers in the school is worth the cost. To justify continued funding of the technology program, it was determined that ongoing evaluation of the use of computers in the classroom was necessary to provide evidence that either supported or rejected the idea that technology is improving student learning—especially student writing. Although this article describes the context of one school, we believe there are similar situations at other schools, and teachers can benefit from reading what was discovered.

PURPOSE AND CONTEXT

The specific purpose of this evaluation was to determine whether the use of a tool that provided second-grade students with the ability to organize their thoughts and ideas using various media would increase their written output and logical organization in the prewriting process. Traditionally, the prewriting process is conducted using paper and pencil. As the authors investigated the use of Kidspiration® software in the prewriting process, they were interested in determining whether certain groups of students would benefit more than others.

The students involved in this evaluation were second-grade students at the same elementary school, and were therefore part of a relatively stable population in terms of homogeneous background skills, knowledge, and exposure to computing tools. All students within the subject group had been exposed to approximately one year of computer instruction in a laboratory environment, and were familiar with the hardware and software used.

The school is located in a high socioeconomic area, and the parents and students are very interested in and experienced with technology. As the students had computers available in their homes and classrooms, it was assumed that they were not unduly motivated by the use of technology itself. It was further assumed that all students were taught writing skills based on the California State Standards for first grade. Further, it was assumed that the students had experience in first grade using the computer for writing stories.

LITERATURE REVIEW

The following literature review examines research focusing on the writing process, the use of graphic organizers in the literacy process (for both writing
and reading), and the use of computers in writing. The literature reviewed provides an overview of the benefits of using computing tools to create graphic organizers that facilitate student writing development in the self-contained elementary classroom.

The Writing Process

The view of writing instruction has changed over the course of the last 40 years. According to Smith (2000), the emphasis has shifted from creating a product to the current view of writing as a process. As beginning writers, students must learn the process and work on improving the content simultaneously. In the elementary school environment, the six-trait writing model is generally accepted and has a widely used assessment rubric that evaluates improvement of content. The six-traits program focuses on teaching and evaluating idea development, organization, voice, sentence fluency, word choice, and conventions. The six-traits rubric is referred to in the Great Source® writing handbook (2000) as well as many others. According to the handbook, the actual process of writing can be broken down into four essential steps: prewriting, drafting, revising, and publishing. These steps are taught to even the youngest writers, increasing in complexity as student writers mature and develop. The writing steps and traits are taught concurrently to develop skillful writers in the elementary environment.

It is during the first step of prewriting that the young author chooses a topic and develops the details to support the topic. This “thinking and planning step” is often taught in the classroom using graphic organizers. Generally it is felt that the organizer helps students sequence ideas and keep them in order. It also supports the writer in staying on task by keeping the ideas in front of the student during the subsequent step of writing the first draft. This belief is supported by cognitive learning theories.

Learning Theory Supporting the Use of Graphic Organizers

Graphic organizers are considered visual displays that enable the learner to understand information more easily (Dye, 2000). According to a review of the research on graphic organizers produced by the Institute for the Advancement of Research in Education (IARE) in 2003, three cognitive learning theories support the use of graphic organizers in the learning process: the dual coding theory, schema theory, and cognitive load theory. Each provides support for the use of the graphic organizer in the classroom environment. According to IARE:

- Dual coding theory maintains that individuals code information both in verbal and nonverbal formats. By attending to both formats (which is
relatively easy to do through the use of graphic organizers), information is easier to retain and recall.

- Schema theory explains that within our memory exists schemas, or networks of information. The use of graphic organizers can help students link the existing knowledge organized in schemas to new knowledge.
- Cognitive load theory suggests that working memory has a maximum capacity of information it can process. If that load is exceeded, learning does not take place. Graphic organizers, if used appropriately, can help reduce the cognitive load and, consequently, allow more resources (working memory) to be devoted to learning new material.

(p. 5)

Graphic Organizers in the Classroom

For at least the past decade, educators have been using graphic organizers as a tool in their quest to develop more competent writers and readers across all grade levels. The graphic organizer is used to help students keep to the topic by having their ideas in a spatial form as they write. Graphic organizers, also called structural overviews, have been proven to help students keep to the topic, organize information, and keep their writing in the correct sequential order (Meyer, 1995). They may also support students as they link their writing to prior knowledge (Moore & Readence, 1984). Griffin, Malone, and Kameenui (2001) discovered in their research with fifth-grade students that explicit instruction using graphic organizers supports recall of information, while the mere presence of the graphic organizer does not. In the process of writing, using a graphic organizer during the prewriting phase in a writers' workshop environment causes significant improvement for all students (Meyer, 1995), and low-achieving students seem to derive the most significant benefit (James, Abbott, & Greenwood, 2001).

Combining Technology with the Prewriting Process

Roberts (2002) found that “both the quality and quantity of poetry writing may be improved by integrating technology with the prewriting stage” (p. 684). The type of software used may also influence students' learning on the computer. Inspiration.com (2007), the Web site for the graphic organizer software, Kidspiration®, states, “Created for K–5 learners, Kidspiration® provides an easy way to apply the proven principles of visual learning. Students build graphic organizers by combining pictures, text, and spoken words to represent thoughts and information” (Inspiration, 2007). Kristin Knight (1998), in her review of the software, comments that this program and its version for older students, Inspiration®, encourages the beginning level writer and provides a platform for success. These students, according to Knight, are the
least likely to organize the information first, before writing. In her review of the software she notes that Schwartz, Graham, and MacArthur (1993), in their study on integrating word-processing and strategy instruction into the writing process, found that “novice writers in general and learning-disabled writers in particular spend little time on planning, take a conversational approach to writing, and do very little editing, [suggesting] that the use of a tool like Inspiration might be helpful in working with students who have trouble with organizing what they read and write” (p. 242).

Given the popularity and ubiquity of computing tools, it is likely that computers will continue to be used to support the writing process (Goldberg, Russell, & Cook, 2003; Roberts, 2002; Smith, 2000). The literature further suggests that the use of computers may promote motivation and enhance the prewriting process for primary school students.

THE EVALUATION

As mentioned, the evaluation was conducted to assess the value of using the computer for the prewriting stage for second-grade students. A two-step process was developed and implemented by four second-grade teachers. The evaluation was completed in the teachers’ self-contained classrooms and the school’s computer lab. Students were introduced to the five-step writing process prior to the beginning of the evaluation.

To begin the activity, each teacher provided the same prompt and modeled the wheel and spoke graphic organizer as a prewriting strategy. Students then created their own wheel-and-spoke graphic organizer as a prewriting assignment. When complete, students wrote their personal narratives from the organizer. On a subsequent day in the school’s computer lab, each teacher modeled a similar prompt, and students created a graphic organizer using Kidspiration®. Taking the printed results, students returned to their classrooms and wrote their stories. The resulting writing samples and graphic organizers were reviewed by the researcher and an expert writing teacher unfamiliar with the school or students. The data were compiled taking into account each student’s gender, reading achievement, and teacher. The results were intriguing.

Setting

Collected over a three-week period, the data for this evaluation came from one public elementary school located in an upper-middle-class socioeconomic area in southern Orange County, California. The school has a commitment to technology as demonstrated by the parents’ willingness to provide a computer lab with 32 computers, 4 video cameras, 6 projectors, and 6 digital
cameras. In addition, each primary classroom contains two computers and each upper grade classroom contains four computers for student use. All teachers are connected to an e-mail system, the Internet, and have access to limited technology training. The students in this evaluation were provided with one 40-minute computer lab training per week.

Evaluation Participants

The evaluation consisted of four second-grade classes comprised of 20 students each. Although all students participated in each activity, only 24 students were chosen for this in-depth evaluation. The students who were evaluated in-depth included 11 girls with an average age of 7 years, 8 months, and 13 boys with an average age of 8 years. One student was a designated English Language Learner. The students had varying degrees of computer literacy. Each student was familiar with the equipment and had weekly experience on the school computers, while several had extensive experience on personal computers at home.

The 24 students were chosen based on academic achievement as determined through the district-administered CORE Level Reading Test. The Northwest Evaluation Association (NWEA) created and customized this achievement-level test for districts across the nation. The scale used by this test is called the RIT (Rasch Unit) score and is tied directly to the curriculum, rather than being based on the performance of a specified group of students. Students’ progress is tracked year by year using this measurement. In the area of reading, nine children—three boys and six girls—achieved RIT scores in the top 10th percentile; seven children—four boys and three girls—achieved RIT scores in the 50th to 75th percentile; and eight children—three girls and five boys—achieved RIT scores below the 35th percentile.

Observation and Evaluation of Student Progress

The teachers involved observed students at work and took anecdotal notes. Although the anecdotal notes were meant to focus on students, the focus was on the teachers’ involvement in the evaluation (i.e., self-reflection on the process). It is useful to note that the data were not robust and therefore were not included in the results of the evaluation because the authors felt that the data did not provide any meaningful insights regarding computer use and student writing.

To ensure objectivity, the lead author worked with a teacher colleague, an expert in the area of children’s writing, and the two co-authors, both experts in educational technology, to review the notes and evaluate the
results. These three individuals were unfamiliar with the students. The four female teachers involved in this project were second-grade teachers at a single elementary school. These educators collaborated to improve writing and develop consistent writing assessment for the grade level. Each of the participating teachers used graphic organizers to support writing as a general teaching practice. Each of these teachers has more than 10 years of experience. All of the teachers felt they had an adequate knowledge of the equipment and application to teach, demonstrate, and support student use of Kidspiration® for the research project.

Procedure

The students created two similar personal narratives. They used pencil and paper to produce a graphic organizer “prewrite” for one assignment, and developed a second graphic organizer prewrite on the computer using Kidspiration®. The students ($n = 24$) completed the two drafting sessions at their desks using paper and pencil. The teachers completed the two writing assignments within a three-week period. The results were evaluated using a rubric, a spreadsheet, and anecdotal notes.

Before introducing the writing assignment to the students, the teachers spent an hour reviewing the Kidspiration® software, and the project parameters and expectations. As the modeled writing prompt is a common form of grade-level assessment, they felt comfortable with the guidelines.

The project began with the teacher demonstrating the wheel-and-spoke style of graphic organizer to the class. The student prompt was to “Describe one event that happened this summer.” The teacher modeled the prewriting step using the organizer on a personal narrative. Students were asked to create their own organizer including details and adding adjectives. They were encouraged to do their best. Students were given 30 minutes to complete the prewriting assignment. The teachers gave no individual guidance to students, and did not provide spelling help. The next day the students wrote their story using the graphic organizer as a guide. They were given approximately 45 minutes to complete the assignment. Once again, the teachers did not provide individual support. Students wrote a half-page to two-page narrative. Students were encouraged by their teacher to review the narrative and self-edit. Ultimately, the prewrite documents and the written narratives were collected for evaluation.

Before completing the second activity, the students participated in a review of Kidspiration® during their regular computer lab period. Each student experimented, creating small projects on the application for two forty-minute sessions. The students had a basic level of prior knowledge of the program from first grade, but needed the review to be able to operate the software independently. During a subsequent forty-minute computer lab period
subjects created a graphic organizer using Kidspiration® as a prewriting activity in preparation for a narrative essay on one event that happened after school started. Once again, each instructor modeled the graphic organizer. This time the instructor used a projector and screen in front of the class to model the prewriting stage of the personal narrative using the computer. Students were given the same directions as the first assignment. They had 30 minutes to create and print out their prewriting graphic organizer. All the teachers stated in their field notes that the students appeared more actively engaged and less distracted in the computer lab. Students were told to work independently, and sound out words, but were supported for technical difficulties with the computer or application.

Writing Samples
Two writing instructors evaluated each writing sample separately. Using the holistic approach with a 1–4 rating, the two assignments were evaluated using the four basic categories of organization, language usage, use of a main topic, and how well the detail sentences supported the main topic. This information, along with the student reading level, the teacher, gender, quantity of writing per story, the number of ideas created in the organizers, and the number of pictures used in the computer prewrite were entered into a spreadsheet for further analysis by the lead researcher. Finally, the lead author interviewed the teachers and gathered field notes containing anecdotal observations about the students. This information was reviewed by the lead author to identify relationships between the creation of a computer graphic organizer in the prewriting stage of the writing process, and improved quantity or quality of writing for second-grade students.

DATA ANALYSIS
Comparisons were drawn among the two writing samples with regard to the quantity of writing produced in each personal narrative, the basic organization of the narrative, and the number of ideas generated in the graphic organizer created during the prewriting stage of the writing process. After reviewing the data overall, it was further examined from the perspective of gender, reading level, and teacher. Upon completing the evaluation, the authors concluded that, at the very least, it may be assumed that the use of graphic organizer software in the prewriting process is not detrimental to students. Furthermore, using computer technology to teach prewriting organization in a computer laboratory setting may be of particular value to certain groups of students.
The Impact of Graphic Organizer Software on Logical Organization and Written Output

In reviewing the results of all students, it was observed that the quantity of writing in the essays overall stayed the same for more than half (13) of the 24 students, regardless of the prewriting organizer method. The quantity of writing did increase for eight of the students when the prewrite stage was conducted on the computer. Only two students increased the quantity of writing after developing a pencil and paper graphic organizer.

When creating idea bubbles on the graphic organizers, the 24 students generated between 4–17 ideas (on average 7 ideas) using the computer graphic organizer, compared to between 3–14 ideas (on average 8 ideas) using the pencil and paper organizer. The students did not create pictures on the pencil and paper graphic organizers. Examination of the computer-generated pictures created in the prewrite process verified that seven students did not use pictures to enhance their computer graphic organizer either; however, four used five or more pictures. Overall, boys and girls were equally likely to add pictures, boys averaging 2.53 pictures, while girls produced an average of three pictures each. The data collected from the two activities were evaluated by gender and reading levels as well.

Gender

Overall, the boys slightly increased the quantity of their writing after creating a computer graphic organizer, with an average of 0.98 pages, compared to 0.77 pages. When examined by reading level, both high- and average-level male writers tended to write longer personal narratives after using the computer graphic organizer. Only one of the students in these categories increased his amount of writing after using a pencil-and-paper-created graphic organizer. This was not true of lower-level male readers. Students in this category appeared more likely to write the same amount.

The organization of the overall writing, as judged by a 1–4 rating scale, either stayed the same or improved after the use of the computer prewrite. Of the four boys deemed average readers, three improved the organization of their final paper using the computer for the prewrite. Of the high-level readers, three of the four students maintained the same rating and one improved when using the computer graphic organizer. For low-level male readers, four of the five received the same points for organization on both the papers.

The teachers encouraged their students to create as many ideas as possible in the creation of both graphic organizers. In general, the results were inconclusive. Four of the boys increased the number of ideas with the
computer, five of the boys increased the number of ideas using pencil and paper, and four of the boys produced the same number of ideas regardless of method. In the case of the high-level male readers, two of the four created more ideas using the computer. This ran counter to the entire population, where 7 of the 24 students created more ideas using the computer. In the middle-level male reader group, half of the students increased the number of ideas using the computer graphic organizer software, and half demonstrated increases using the pencil and paper. In the group of lower-level readers, two of five increased the number of ideas using the pencil and paper organizer, while none created more ideas using the computer. Most of the lowest group demonstrated no preference; three of the five created the same number of ideas regardless of method.

Girls

Overall, the girls slightly decreased the quantity of writing after creating a computer graphic organizer, with an average of 1.14 pages compared to 1.25 pages. When examined by reading level, both the highest group and the lowest group of readers wrote similar personal narratives, regardless of the graphic organizer. This was not true of the middle-level group. Students in this group tended to write more after using the computer.

The organization of the overall writing, as judged by a 1–4 rating scale, either stayed the same or improved after the use of the computer prewrite. Of the three girls deemed average readers, two improved the organization of their final paper using the computer for the prewrite. In the high-level group, three of the five students maintained the same rating regardless of prewrite method. One student improved one point after using the computer, one student improved after using a pencil and paper to create the graphic organizer. For low-level female readers, two improved with the computer, and one stayed at the same ranking.

By examining the data for the quality of the girls’ writing again, it is clear that almost half (5) of the 11 remained at the same point on the scale, 5 of the 11 improved organization using the computer, and 1 improved organization after using the pencil and paper method. The girls differed from the boys when it came to the number of ideas generated on the graphic organizers. Overall, on the computer girls generated an average of 6.8 ideas, as opposed to 8.5 using paper and pencil. For female readers in the high range, four of the five listed more ideas using paper and pencil than the computer method. The three average-level female readers all listed more ideas using the paper and pencil method, while in the lowest-level group, two-thirds increased the quantity of ideas using the computer. The third student increased the number of ideas generated using the paper and pencil method.
Reading Level

The data for the boys and girls were then combined and re-examined by looking at the three reading achievement levels. As might be expected, the high-level readers in general scored higher on writing organization, regardless of activity. All nine students were rated either 3 or 4 on the 1–4 scale used. Of these nine students, six maintained the same rating on both writing activities. Of the other three, two increased 1 rating point after the computer graphic organizer; one increased after using pencil and paper for organizing.

The middle achievement readers were the most likely of the three groups to improve organization of their final papers after using the computer graphic organizer in the prewriting process. In fact, five of the seven students showed an increase of 1 point on the rubric. The other two students’ ratings remained the same for both activities. The lower-achieving students demonstrated the same results as the high-achieving students. When rating the writing samples for organization, five of the eight lower reading students scored the same regardless of type of graphic organizer created. Of the other three, one gained a point after creating the pencil and paper organizer, and two gained a point after creating the graphic organizer on the computer.

All three groups created more ideas using pencil and paper than when using the computer. The average difference was insignificant, less than one idea bubble. As might be expected, when the number of pictures used on the computer graphic organizer was compared by reading level, the highest readers created, on average, one more picture than either the lowest or middle group.

Results by Teacher

The teaching style of individual educators did not appear to have much impact on the outcome of any one of the three student groups. The student results were consistent among the teachers with only a few minor student variations in one classroom. This may be because the group of teachers has been teaching, collaborating, and developing writing assessments together for five years. The prompts were straightforward, and the teachers felt they were very consistent in their delivery and the support provided. It was interesting to note that each teacher made similar statements about the two prewrite sessions: The students appeared to be more motivated, willing to work longer, and wanting to share their product, after working on the computer. Two of the teachers commented that they would start using the lab to prewrite more often, not just at computer time.
Results for High-Achieving Students

As a group, the high-achieving students demonstrated little notable benefit from using the computer for prewriting. All high-achieving readers had little trouble with the prewriting process, as this type of writing assignment had been modeled and used by the students since the beginning of school in September. When exposed to Kidspiration® in the computer lab, these children tended to get to work immediately. As expected, these students wrote in complete sentences for both assignments. As a group, they demonstrated consistently high organization skills, and confidence with the prewriting process. The data are ambiguous when examined for a whole group as to any clear benefit to creating the prewriting graphic organizer on the computer.

When compared by gender, the boys were more likely to improve the quantity of ideas on the computer. While the boys demonstrated a tendency to improve after using the computer, with one exception, the high-level girls exhibited high-level, well-organized writing regardless of prewriting method. Although they enjoyed it, the girls did not demonstrate a strong benefit from using the computer. Conversely, with one exception, they wrote more ideas on their graphic organizer using the pencil than the computer. The girls, however, were more likely to use a greater number of pictures from the computer library in creating the organizer. This may have negatively influenced the number of ideas generated, as choosing pictures is a more time-consuming process than making text bubbles. In creating the graphic organizer with a pencil, none of the boys or girls interacted with any other student. Pencil and paper seemed to be viewed by the students as a less collaborative activity. For the high-achieving students in general, the quality of writing on the work samples for each assignment was similar.

Results for the Mid-Range Readers

Students rated in the mid-range of reading scores were viewed by their teachers as more developing writers. These seven students demonstrated the strongest benefit after using the computer for prewriting. The writing organization and quantity of writing either stayed the same or increased after using the computer, even though most of the students created more ideas in their prewrite using pencil and paper. It appears that, although the number of ideas increased using pencil and paper, this did not positively influence the organization of the writing sample.

When compared by gender, once again the group of boys was more likely to increase the number of ideas created with Kidspiration®. One-half created more ideas on the computer prewrite. Conversely, all the girls showed increases in the number of ideas after creating their graphic organizers using pencil and paper. The organization of the essay, for both boys
and girls overall improved one point after using the computer to prewrite. In addition, it was noted that as a group, both boys and girls either increased the quantity of the writing after using the computer, or maintained the same amount of writing. None of the students increased the quantity of writing after the pencil and paper prewrite. These students, as a group, demonstrated the strongest connection between the computer as a tool and their writing outcomes.

Results for Low-Level Readers

As a group, these students struggle with reading and writing in general. They demonstrated the least amount of change dependent on the prewrite method. Overall, for both boys and girls the organization of the papers, and the quantity written were rated lowest of the three groups, and similar regardless of the prewrite method. The low-level readers were the least likely to use the pictures on the computer for their prewrites.

The girls and boys did demonstrate some differences. The girls were more likely to increase the number of ideas they generated in the prewrite while using the computer. None of the boys did. Although none of the boys demonstrated higher organization in their papers with the computer, two of the girls did. The quantity of writing did not change for either boys or girls. This group had less skill with the computer, asking more questions, and needing more teacher help than the other two groups. This may have been a function of only having access to the computer for one 50-minute session each week. It appeared that three lab sessions, each a week apart, may not have been enough for this group to remember the steps needed to work independently on the Kidspiration® application.

DISCUSSION

In discussing the results of this evaluation, it is important to be cautious due to its limitations. The major limitation focuses on the students and the evaluation of what took place at one school. The number of students in the evaluation is relatively small (n = 24). Despite the limitations, there are important outcomes to report from this evaluation that can inform teacher use of technology in writing, and can inform future research on this topic.

The results from the observations and work samples data are mixed. At least one conclusion, however, can be suggested: Using computing tools to teach prewriting skills does no harm. The data further suggest that students seem to interact differently depending on skill level and reading ability. Overall, the students were very enthusiastic about using Kidspiration® on the computer for writing activities. In looking at the data, it was revealed that
all students demonstrated more verbal enthusiasm for the computer graphic organizer activity than completing this using the traditional paper and pencil method.

All the students in this evaluation were eager to create the computer-generated graphic organizer. They expressed their enthusiasm through word choice and focus during the work sessions. Even though the students are very familiar with computers, the teachers felt this was a strong benefit of conducting prewriting on the computers. The students were willing to work longer, collaborate, and focus. The literature strongly supports the value of the computer in keeping students interested and focused. Its ability to motivate students has been a strong selling point for computers in the schoolroom. This evaluation supported this idea.

A secondary aspect, but nonetheless important aspect of this evaluation, was to more clearly understand the value of using the computer to help develop organizational skills in the writing process for various sub-populations of young students (boys; girls; low-achieving; high-achieving). The results, while mixed, seem to indicate that using computer technology to teach organization in the prewriting stage of the writing process is beneficial to certain types of students. For the student sample in this evaluation, the data suggest that there were variations based on gender and reading ability. There were also similarities noted among all students working on the computer: Both boys and girls expressed more verbal enthusiasm for the computer organizer.

REFERENCES


