Students as Multimedia Designers

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Although our most fortunate schools are steadily increasing their access to computers and multimedia technologies, most students are simply passive recipients of such technology. For example, one of the most common applications of multimedia instruction for students is in the area of mathematics (Druin & Solomon, 1996). Students can engage in drill-and-practice programs to develop new skills or play games that require the application of newly learned math skills.

As multimedia technologies and applications have become more accessible to larger numbers of teachers and students, many students have experienced the opportunity to present information gathered through traditional investigative processes and then displayed through multimedia programs and devices. Although both applications of technology have enhanced the learning of all students, and in many instances have been particularly helpful to students with a variety of disabilities, engaging students as developers of multimedia is an important application of multimedia technologies.

Definitions vary in the field, but we have chosen to define *multimedia* as the presentation of information through two or more media, including sound, video, graphics, text, and hands-on experiences. Computers are increasingly the most common interface for multimedia, but they are not an essential component.

Multimedia is an ideal vehicle to encourage students to become active builders of knowledge, rather than just receivers of information or proficient presenters. Using multimedia in instruction provides learners with new adventures; however, when students are designers of multimedia they are empowered to create and reveal the adventure themselves. Jonassen (1996) said, "Some of the best thinking results when students try to represent what they know" (p. 4). This article highlights the skills that students develop through multimedia design and describes examples of classrooms where students act as multimedia designers.

STUDENTS AS MULTIMEDIA DESIGNERS

The student designer of multimedia has an advantage over the multimedia user. Designing and creating multimedia enhances and expands critical, creative, and complex thinking skills by requiring the learner to organize, analyze, and creatively structure new information, thus building what Jonassen (1996) called *mindtools*. He stated, "When students work *with* [emphasis added] computer technology, instead of being controlled by it, they enhance the capabilities of the computer, and the computer enhances their thinking and learning. The result of this partnership is that the whole of learning becomes greater than the sum of its parts" (p. 4). Using computer applications to build multimedia programs requires students to think about the content they are learning because they must gather, select, organize, link, and display information. Additionally, students need certain skills in order to be effective multimedia designers, and authoring programs can be used in the designing process.

Skills for Multimedia

Jonassen (1996) identified three stages of multimedia development that encompass key critical thinking skills:

- Researching information,
- Organizing information, and
- Managing the project.

Research skills include assessing information, prioritizing, analyzing, inferring, and comparing. Organizing and designing multimedia requires creative thinking; linking of information; and structuring of resources, media, and navigation. Managing the project requires learners to define the program goals, evaluate, revise plans, create time lines, prioritize tasks, and make choices to complete the program. These are key skills for learners of any age; such skills last a lifetime and serve them in any setting.

Multimedia development in the classroom should allow students the opportunity to work and progress through the three stages of multimedia development with guidance and feedback from the teacher at each stage. This type of student learning requires comprehensive initial organization from the classroom teacher. It also requires the teacher to function more as a facilitator and resource person than as the single dispenser of knowledge. The teacher must coach the students through the steps of the process.

Multimedia Authoring

Multimedia authoring programs are applications that allow computer users to create their own multimedia programs that link sound, video, graphics, and text. Several quality multimedia authoring programs are available (e.g., HyperStudio, HyperCard, SuperCard, LinkWay). HyperStudio is one of the easiest to learn to use for both teachers and students of all ages. It is flexible and powerful enough for most classroom program designs. As students progress both in age and skill, they may want to use authoring programs that allow them more control and creativity.

It is important to remember that multimedia development is not limited to computer authoring. It includes projects that combine video development, print materials, audiotapes, graphics, art projects, and hands-on simulations. Students can create quality multimedia projects without computers. However, computers are usually the most efficient interface for multimedia learning.

CLASSROOM APPLICATIONS

The multimedia design process is a natural framework that supports, and in some instances even negates, the variety of organizational, processing, writing, and presentation difficulties encountered by students with a variety of learning problems. The following examples provide a portrait of potential uses of multimedia as a learning strategy. These examples combine the authors' experiences in a variety of classrooms, along with published examples in current professional literature.

Young Designers

Even preschoolers can become active designers of multimedia! A teacher at a reservation school for at-risk and special needs students in New Mexico works with her preschool class to create a multimedia program to reinforce basic vocabulary in both Navajo and English (see Figure 1). First, she and her students brainstorm words they want to practice and decide on animals and numbers from 1 to 10. Next, they agree on a list of 10 animals. The teacher brings in a large variety of printed clip art. The class selects the pictures for each animal and pictures to represent each number. Next, the students record their voices saying the words in both Navajo and English; the voices are saved as digitized recordings in the computer. The teacher takes all the pieces and creates a simple HyperStudio program to be used with a touchscreen. When the teacher brings the finished HyperStudio program to class, the students touch a picture, which leads them to a screen with one of the target words in both Navajo and English. When they touch the words, they hear their own voices reading the words. They can use this program for several weeks for group and individual practice. Although the teacher could create the program on his or her own and then bring it into the classroom, the students' learning experience and motivation are greatly enhanced if they are the primary program designers.

Elementary Designers

Multimedia designing is a natural complement to the development of written language skills in elementary school. Mary McAuliffe, computer specialist at Mission Viejo School in Aurora, Colorado, wrote, "The writing process has always been linear. Now with HyperStudio, kids can make it multidimensional, with the same kind of branching that would occur in their minds. Kids are using software to do sophisticated constructions that makes their writing come to life" (Greenfield, 1991, p. 12). McAuliffe believes that creating multimedia programs develops higher-level thinking skills in the students as kids start thinking about thinking.

Elementary students can design multimedia programs based on their creative or informational writing. Effective pairing of multimedia and writing includes time for students to create detailed plans about how to link information and ideas through multimedia, time to gather or create media representations of information, and time to put it together and share with peers and adults.

Rather than provide simply a linear presentation of a story, students now have the ability to incorporate links (accessed by buttons or hotspots) that branch to let the reader hear sounds, read supplemental information, access definitions, view illustrations, watch video demonstrations, or even change the course of the story. Branching is the process used to link information allowing students to access information in the order that is most meaningful to them. For example, the learner may stop a presentation to receive de-

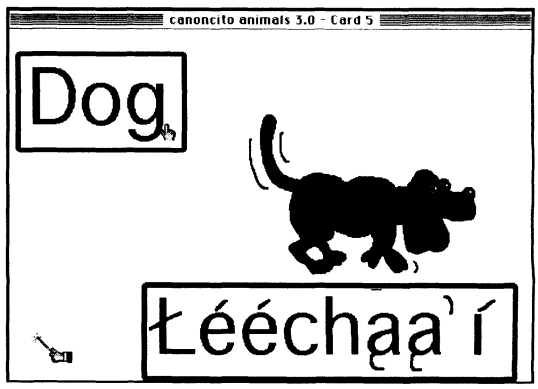

Figure 1. *Sample screen from Navaho/English vocabulary programs.*

tailed information about a particular term or process and then resume the program. However, the student designer of the program must plan for this need by gathering and organizing the additional information. By participating in the technical steps required to develop the branching sequence, the learner engages with the content as both knowledge seeker and knowledge giver. For a multimedia user, branching allows control of the learning so that new information can be mentally linked to similar information. For the learner-designer, creating branches builds mindtools to organize information.

Middle School Designers

Consider a classroom with 15 students, including general education students, students with learning disabilities, students with behavior disorders, and a student with a severe physical impairment. The focus of this literature class for one 9-week session is story components: plot, setting, conflict, character development, and style. Students begin by reading *The Wizard of Oz* and then watching the classic movie *The Wizard of Oz* on laserdisc. The teacher spends several class sessions discussing the book and the movie with the class. Students access the laserdisc to find specific scenes in the movie for comparison with passages in the book and then relate information from both sources to their list of story components.

Next, the students work in small groups to design multimedia programs based on one of the story components, such as character development. Students spend several class sessions designing and flowcharting their programs. They identify the text to be included, the video clips for illustration, and the places for links to supplemental information. Groups that work on character development write descriptions of the characters at key points in the plot. They select quotes from the text and they find video clips that illustrate the character changes.

Students spend several class sessions using their plans and flowcharts to create multimedia programs with HyperCard. When the program is complete, the students are "experts" on *The Wizard of Oz.* They are surprisingly articulate about the character development of Dorothy and the Cowardly Lion, plot progression, Dorothy's external conflict with the witch, and Dorothy's internal self-conflict.

As groups share their programs, they have inspired discussions about both story components and multimedia design. They comment on ideas and provide suggestions on program design and media selection. This lesson sequence encourages students to interact with information and ideas through a variety of media; practice the skills of research, organization, and project management; and build personal knowledge by manipulating information to create a multimedia representation of their learning.

High School Designers

Holzberg (1994) described how high school students in Oregon created a multimedia display about the Columbus River Gorge Scenic Area for the U.S. Forestry Department. They began by gathering information from many sources: notes from their personal river explorations, their own photos, textbooks, CD-ROMs, and videodiscs. Then they designed a multimedia presentation combining all their information and authored it using LinkWay software. Their project was installed with a touchscreen for public use at an Oregon conference center.

This example of multimedia design by students includes all three stages of multimedia design: research, organization, and management. Students not only participated in every stage of the process, they were an integral part of all the work, including gathering firsthand information and original media for the project. In addition, the students' work was shared in a meaningful way, which further validates the entire learning process.

Conclusion

Student designers of multimedia have the opportunity to practice the three stages of multimedia developments: researching information, organizing ideas, and managing projects. In addition, they have the opportunity to develop technical skills and to learn to manipulate information in a variety of media. As society transitions from the Industrial Age to the Information Age, students need technological skills for a lifetime of learning. Powerful technological tools and media are available to students and can make them skilled builders of knowledge; the challenge for educators is to integrate these tools into classroom instruction.

Persons interested in submitting material for Technology Tips should contact Diane Pedrotty Bryant, University of Texas at Austin, Special Education Dept., SZB 306, Austin, TX 78712.

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