Using Hypermedia and Multimedia to Promote Project-Based Learning of At-Risk High School Students

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The term *at-risk* in this article refers to those students who are in danger of dropping out of school (Rodriguez, 1997). Often, these students have low self-esteem resulting from persistently low academic achievement. One possible reason for academic failure is a mismatch between the student's needs and the curricular expectations. Consequently, it is important to plan to meet individual student needs appropriately and minimize the rate of dropouts. Planning more appropriately requires individualization of goals and curricula.

One approach to individualized planning includes project-based learning, which is the integration of community service with academic skills and structured reflection (Cairn & Kielsmeier, 1991). When real-world situations provide authentic learning opportunities, student learning is enhanced as the curriculum is made meaningful. Project-based learning, or service learning, in which students volunteer their time, effort, and skills to a social cause can be an effective method of learning for a variety of students, including students with disabilities (McPherson & Nebgen, 1991). For many students, service learning may lead to a heightened awareness of others' needs and provide the opportunity to actively contribute in a positive manner. For at-risk students, in particular, it is an opportunity to give, which can help them get out of the victim stance. Awareness of social issues within the school and the larger community may motivate students to contribute their time and knowledge. Also, when students give to others and are valued at a project-based learning site, they gain confidence in their abilities. Consequently, it increases their motiva-
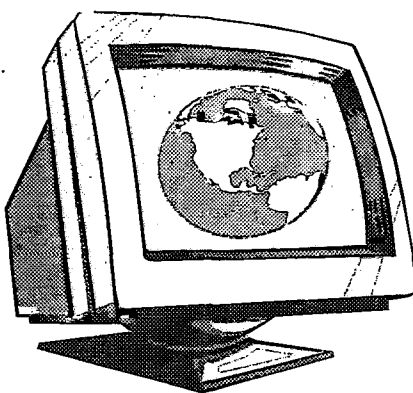
tion and likelihood of staying in school and seeking postsecondary training (Correa & Repetto, 1996; Mann, 1987).

Hypermedia and multimedia are technological applications that can provide an engaging environment for learners to construct knowledge through the association of relevant and meaningful information prompted by project-based learning (Mendrinos, 1997). Hypermedia (e.g., the Internet) is a nonsequential computer-based technique that may be seen as an application manager (Woodhead, 1991) that allows for the arranging and rearranging of chunks or nodes of information based on a learner's needs and background knowledge (Borsook & Higginbotham-Wheat, 1992). The learner can search for information and make associations between and among topic areas as he or she explores links and nodes. Hypermedia presents information that is accessible to all types of learners (Anglin, 1995; Nielsen, 1995). For example, the combination of text, sound, graphics, and motion video arranged in non-linear, linked nodes in hypermedia allows learners to efficiently deal with large and disparate sources of knowledge. The extent to which a student can make interconnections of the material presented via hypermedia depends on several factors. The student's age and maturity, for example, may influence his or her ability to perform higher-order thinking skills (e.g., synthesizing, generalizing, analyzing). Multimedia (e.g., video, CD ROM, laser discs, audio tapes), on the other hand, provides linear stimulation that is not controlled by the learner.

Learning through hypermedia or multimedia and using authentic tasks requires learners to see the "rele-

vance of the knowledge and skill to their lives, and the leverage it provides in problems they see as important" (Cunningham, 1991, p. 13). Problem-based tasks in service learning may allow the learner to get immersed "in a situation which requires the learner to acquire the knowledge and skills relevant to solving the problem" (Jonassen, Mayes, & McAleese, cited in Boyle, 1997, p. 71). In the following section, we describe a project-based program in which at-risk students used hypermedia and multimedia to self-direct their learning.

Project-Based Program Description

In our project-based program, we used various aspects of the *8 Ws* approach described by Lamb, Smith, and Johnson (1997) to help students investigate social issues and enhance project-based learning. The Ws are as follows: (a) *Watching* requires that students observe their project-based environment; (b) *Wondering* focuses on brainstorming and reflecting on initial information; (c) *Webbing* refers to the visual organization of relevant data; (d) *Wiggling* involves the twisting and turning of data to investigate underlying inferences; (e) *Weaving* is the integration of information and inferences; (f) *Wrapping* is the packaging of data and inferences (e.g., a slide show); (g) *Waving* refers to displaying the published product for the purposes of sharing and feedback; and (h) *Wishing* is the reflective process of the project and experience (e.g., "In what ways could we have done this project differently?" "In what ways do you wish this situation was different?").

Participants

Nine 10th-grade students from a suburban public school special education classroom participated in this program. Students were identified as having significant learning and emotional problems and were considered to be at risk for dropping out of school. The seven males and two females ranged in age from 15 to 19. Two of the students were Caucasian and seven were African-American. All were from lower- to middle-class socioeconomic backgrounds. In terms of their school status, two students were on probation at the time of the program, and three exceeded the legal number of absences and were close to losing credits for all classes. Participants' reading levels ranged from the third- to the ninth-grade.

Planning for and Implementing
Project-Based Learning

The context of the project was a local homeless shelter for preschool-age children and their mothers. The objective for visiting the homeless shelter was to have students spend sufficient time volunteering and mentoring in a setting that would allow them to relate to inner-city children from homeless shelters as they searched for information. We determined that the experience of being involved with the shelter would help our students' awareness of social issues. At the same time, we believed that the students' informal knowledge about solutions to social issues (e.g., poverty, welfare) might be challenged as they began to research facts and information on their topic. In addition, students could learn to apply critical thinking and problem-solving skills as they navigated through links in the Internet, searching for solutions. Because students could incorporate hypermedia and multimedia technology in their quest for information, they could use multimedia to present their findings.

We chose project-based learning because it allows integration of traditional subject-matter goals and objectives with authentic learning. The first author (learning support teacher) collaborated with other staff in the school as the first step in the planning process. First, teachers from the previous year lent insights into individual student's characteristics and prior learning experiences. Meeting with the service learning coordinator at the school helped to create a curricular focus (e.g., a pilot program about homelessness using hypermedia and multimedia). Likewise, the technology specialist was integral in identifying hypermedia and multimedia applications that enabled students to effectively engage in research, design, analysis, composition, and communication of their project. Once a curricular focus was established and hypermedia and multimedia supports were in place, we designed personal objectives for each student.

One of our primary goals was to motivate the students to become active learners. Therefore, we used student motivators such as providing choices, having them collaborate with others, and challenging them to engage in higher-level goal applications (e.g., evaluation). The project was implemented with the students brainstorming key words that they associated with homelessness. For example, students generated key words that included *poor, depressed, dirty, lonely, hungry,* and *dying*. Through teacher facilitation, students then categorized the words under topics such as poverty, welfare, housing, education, child development, substance abuse, mental illness, nutrition, and social skills. As part of the project-based objective, each student chose a topic (e.g., poverty) to research.

Our class implemented aspects of the 8 Ws approach described earlier to explore information related to the project-based learning at the homeless shelter. The preschool teacher at the shelter and the students' high school teacher determined that each student would be responsible for facilitating activities for two pre-

schoolers during play, snack, art, and reading time. Students visited the shelter biweekly and spent about 2 1/2 hours for a total of 26 hours of service. During this time, students met with the preschool teacher for an orientation on their arrival, interacted with the preschoolers, and shared their experiences and concerns with the two teachers at the end of the visit. All students engaged in *watching* as they observed and interacted with preschoolers at the homeless shelter. Upon their return to the high school, students were encouraged to write about their experiences and concerns in a weekly reflections journal (i.e., *wondering*).

In addition, students used the Internet to identify several resources related to homelessness such as articles, video listings, toll-free phone numbers, e-mail addresses, books, and addresses of homeless organizations. Newspaper and magazine articles were also scanned, and all relevant information was organized (webbing) as students prepared their presentations on the topic. At the same time, students learned to *evaluate* the quality of the information. Students were instructed to note the bias in the articles, distinguish fact from opinion, and evaluate the relevancy of the topic. For example, student questions on the topic of poverty included the following: "Who is affected by poverty?" "Why are people affected by poverty?" "What does poverty look like?" To evaluate bias in their resources, students first worked together to question the article's information as follows: "What is the author's purpose for compiling these data?" "Who is the author?" "Which agency is the author from?" To distinguish fact from opinion, students looked for evidence, such as documented facts and credibility of the source, by questioning as follows: "Are these studies recent?" "Is this a well-known organization?" Lastly, to evaluate the relevance of new information to a given topic, students again used questioning: "What does mental health have to do with poverty?" "Does this new information help to explain my topic more clearly?"

Students were responsible for their own learning and had to use the higher-order thinking skills of planning, problem solving, and reflecting on daily experiences at the shelter. Application of problem-solving skills became evident as students evaluated conflicting information (wiggling). First, they had to look at the sources and determine the credibility of each based on the date of the article, the author's organization, and other information. Then students had to determine a possible motive on the part of each author. For example, was one of the authors trying to blame and the other trying to defend?

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Finally, students had to decide which position they would take and defend it with factual information from various sources. That is, students took a position and defended it with facts as they engaged in problem-solving processes that required the application and integration of higher-order information (Ennis, 1994). Next, the information was organized into a meaningful multimedia presentation using the Claris Works slide show application on a Macintosh computer, which integrates pictures, text, music, and graphics. In addition, students photographed each other's interactions with the children and mothers at the homeless shelter. After scanning photos or downloading them onto the computer, students selected six images for their slide show presentation (wrapping). Students worked diligently to gather information from the Internet, the library's CD-ROM database, and other sources for the slide show to be presented to an audience of their peers and school personnel (waving). In addition, students continually reflected on their project experience as they wrote in their journals (wishing).

Benefits of Project-based Learning

Service learning helped students realize that they could help someone else. The most obvious outcomes of this project were the students' sense of accomplishment and pride along with increases in self-growth (e.g., confidence, self-esteem, responsibility), attendance rates, and empathy for others. The final activity involved the students making a formal presentation to a wide range of audience members that included their peers, the principal, the superintendent, and the faculty. Students' success was reflected in their confidence and enthusiasm as they made their presentations. Additionally, the audience seemed fascinated with the information, and all students confidently answered a myriad of questions related to possible solutions to homelessness. All of a sudden, nine students who were used to failing showed that they could succeed. Each student demonstrated expertise on a specific topic. Each student formed an opinion. Each student felt positive about school. The interest and motivation to engage in the project seemed to contribute to the students' success in this program.

This program also met each student's Individualized Education Plans for reading, writing, and speaking. As students were engaged in the project-based learning, they continued to practice prescribed curricular skills

(e.g., reading, writing) within authentic circumstances. For example, objectives for one of the nine students addressed improving adult and peer relations, writing five-paragraph essays with a point of view, and increasing reading rate, all of which were attained during project-based learning. In a classroom where homework and project completion were the exception rather than the rule, all nine students completed a five-paragraph essay on their project topic (see Figure 1 for sample). At the end of the project-based learning experience, the classroom was filled with artifacts of the students' collective efforts. From brainstorming sheets to articles to photo layouts to five-paragraph essays, the students' diligence to make learning meaningful was evident.

A variety of approaches was used to create the diverse presentations. Some students began with a random topic related to homelessness, and others chose pictures from the shelter to begin the story and get ideas for a topic. One student used his weekly journal reflections from our visits to the shelter to document his initial perceptions of homelessness, his experiences, and his new schema of the shelter. In summary, students positively benefited from this experience. Throughout this project, students felt important, unique, and deserving of praise, and for some, it was the first time in their lives that they had felt this way.

CONCLUSION

Focusing on student strengths and realistic post-graduation goals and skills may be the key to successful and meaningful educational programming. Student strengths became evident throughout this project-based learning experience, a notion supported in the literature. For example, Yoder, Retish, and Wade (1996) pointed out that as the student becomes an engaged learner of authentic tasks, strengths and basic skills in reading, writing, and speaking can be realized within the context of the project-based task. In this program, because the students were able to recognize that the role of the teacher moved from knowledge-giver to coseeker of knowledge, they became empowered. They realized that they were trusted and in control of their own projects.

Informal interviews and ongoing observations revealed that hypermedia, multimedia, and project-based learning allowed students to connect the new information with pre-existing cognitive structures as they explored, questioned, and sought answers. Hypermedia allowed students to independently seek answers, and project-based learning created an environment that supported diversified interests and led to the realization of individual goals. This finding lends itself to the notion that hypermedia increases the quality and ease of access to varied information (Woodhead, 1991). Finally, multi-

Service Learning

When you work in a shelter, you must act and care for others. Service learning is about helping others through devotion and respect. Service learning means honesty, caring, and giving.

You need honesty when you work at a shelter and to work with people, because people ask you questions. By being honest, you can go a long way. By showing children to be honest, you will teach kids that to get respect they must give respect.

Caring is also important when working in a homeless shelter. If you don't care for people, you will not get anything out of life when you give your heart to it. Most people don't care if they have an impact or who they touch with their actions. However, people who do care get something back in return. Whoever we touch through our caring will look up to us in their own way.

People who have a lot to give have all the love to share with people. Those who give will know that all people are not bad and they will spend some time to help the ones in need. Without people to care, the shelter would not be there for people who need someone in their life.

All the time you spend with the KIDS will help them to know that people outside the shelter care for their well-being. It is important to show the kids the qualities of honesty, sharing, and caring so that they will grow up knowing important values. If you give all you can you may find out that you have a lot of friends out there.

Figure 1. *Student sample of written essay on service learning.*

media was seen by students as not only a tool to learn from, but as a tool to communicate understanding of a topic.

In addition, hypermedia and multimedia were particularly useful to motivate at-risk students because, as McPherson and Nebgen (1991) noted, these applications tend to elicit "multiple senses and kinds of intelligence, making learning more accessible" (p. 328). The interactive nature of hypermedia and the ease of multimedia not only enhanced student engagement and productivity, but also increased their ability to perform complex tasks (i.e., writing essays). These findings seem to support the notion that technology increases the abil-

ity to successfully perform more and more complex tasks, enhances motivation, and leads to changes in classroom roles and organization (Baker, Gearhart, & Herman, 1994; Means & Olson, 1994; Mendrinos, 1997).

In summary, students in this program developed confidence and autonomy as a result of the project-based learning, making it well worth the time and effort involved. Project-based learning is seen as an emerging educational practice that is important for all students, particularly the at-risk learner (Ioele & Dolan, 1992; Siegel, 1996; Yoder et al., 1996). As schools provide project-based learning experiences, it may be necessary to consider establishing an appropriate match between technology-based instruction and effective educational practices (Salomon & Perkins, 1996; Toomey & Ketterer, 1995).

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