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The Multimedia Challenge

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Multimedia projects can transform a classroom, but teachers need a network of support to integrate these complex technologies effectively.

Since its founding, the town of Belmont, California, has undergone many transformations in its landscape and identity. It has changed from a small residential community known for its parks and sanitariums, to a postwar shipping and horticultural center, to a suburban community with sprawling high-tech companies just outside its borders. The *Belmont Then and Now* project, completed in 2000 by three 3rd grade classes from Central Elementary, helps put Belmont's changes over the past 150 years in perspective.

Central Elementary students spent a year working with a local museum curator, their classroom teachers, and a teacher-leader to conduct research on the history of Belmont. Students collected old photographs of the town and its people from the Belmont Historical Society, took original digital photos of people and places today, videotaped interviews with longtime Belmont residents, and developed a time line of important events in Belmont's history with narrative accounts in the students' own words.

What helped bring structure and closure to the research was the development of a student multimedia presentation to be housed at the Belmont Historical Society after it was exhibited at a local multimedia fair. Using HyperStudio, a multimedia authoring tool developed especially for classroom use, students at Central Elementary designed electronic stacks of linked cards with scanned photos, videoclips, and text. Then students created animations from historical photos to represent the movement of trains and horses and added their own voice-overs to parts of the presentation. Their teachers helped them with the overall architecture for the site, but the students were responsible for content and coherence. They ensured that all links worked and that the linked cards formed a coherent historical presentation that would be useful to community residents who visited the museum. The multimedia tools helped students organize and synthesize their research and develop an eye-catching presentation that made visible what they had learned.

Both participants and outsiders considered the project a success. Students had learned not only about the history of their community, but also about using multimedia tools to develop a presentation for an audience outside the classroom. The project was recognized for the quality of its content and multimedia at the 34th Annual California Student Media and Multimedia Festival in spring 2000, where *Belmont Then and Now* won the history and social science category for elementary schools.

The Multimedia Project

As multimedia technologies have become increasingly accessible for students in classrooms, more individual teachers have conducted projects like the one at Central Elementary. These projects show the promise of advanced technologies in schools to support learning in many ways: as an aid to organizing and synthesizing content, as a tool to help students learn presentation skills, and as a motivator for students to actively participate. But most teachers work alone and are reluctant to undertake a project as complex as *Belmont Then and Now*. Such projects require a tremendous amount of time and effort from teachers and students. Many teachers lack confidence in using multimedia technology. Often, they have trouble gaining access to enough computers and other equipment for their students. Or they lack the technical support to troubleshoot computer problems or to learn the multimedia tools that their students will use. They lack time within the school day to collaborate with other teachers, much less with outside experts like museum curators and local residents.

The teachers who implemented *Belmont Then and Now* had help meeting these challenges through a five-year federally funded Technology Innovation Challenge Grant called the Challenge 2000 Multimedia Project. Sponsored by Joint Venture: Silicon Valley Network—a nonprofit school-business partnership—and the San Mateo County Office of Education, the initiative is a good example of how technology can transform classroom teaching and learning. It is a model for organizing the supports that teachers need to implement complex projects in their classrooms.

The goal of the Challenge 2000 Multimedia Project is to infuse the classrooms of Silicon Valley with an exemplary model of project-based learning supported by multimedia. The project is designed to spark the kind of transformation in teacher and student roles that enables students to acquire the skills needed for the workplaces of the 21st century. It provides opportunities to learn not just technology skills, but also content knowledge, problem-solving acumen, communication skills, teamwork, and self-assessment skills.

Project-based learning requires students to focus over an extended period of time on the resolution of a real-world problem (Blumenfeld et al., 1991). Typically, in the course of completing a project, learners use multiple information sources, collaborate with others, and apply a range of tools to support planning, implementation, and evaluation of the project. In this way, students develop a deep understanding of the subject matter as they acquire new information and concepts and apply this new knowledge to a design and production task.

What is different about the Multimedia Project is the way that students and teachers use a wide range of technologies to design, plan, research, and complete their projects. Although students certainly learn how to use specific multimedia technologies, the emphasis is on developing students as authors of multimedia content. In the creative process of designing multimedia products to meet given specifications, students learn not only academic content but also critical-thinking, problem-solving, and teamwork skills. In the Multimedia Project, students are not simply consumers of advanced technologies; they learn how to use and adapt the particular tools to meet the challenges posed by a complex communication task.

Carver, Lehrer, Connell, and Erickson (1992) have developed a cognitive framework that outlines design skills that students typically develop in the course of multimedia project work. Teachers have observed students learning many of these skills in the Multimedia Project: how to allocate resources and time for different task segments, how to search for information, how to analyze and interpret information, how to organize a presentation, how to catch and maintain audience interest, and how to revise a presentation on the basis of feedback and self-reflection.

Evidence of Effectiveness

Since the Challenge 2000 Multimedia Project began in 1995, researchers at SRI International's Center for Technology in Learning have been evaluating the Challenge 2000 Multimedia Project. Beginning in the second year, the evaluators tracked differences in classroom teaching practices between Multimedia Project classrooms and other classrooms in the same schools. In the fourth year, SRI researchers administered a performance assessment task to measure whether students involved in multimedia projects were in fact learning the kinds of design skills outlined by Carver and her coauthors (1992). Both the observation results and the performance-task findings suggest that the Multimedia Project has made a significant difference in teaching and learning.

Observations conducted in a sample of 12 Multimedia Project classrooms and eight matched-comparison classrooms revealed that students involved in multimedia-supported, project-based learning were likely to be doing the challenging cognitive activities required in a process of design (Penuel & Means, 1999). For example, during the spring observation period, students in Multimedia Project classrooms spent nearly half their time (46 percent) engaged in activities that included thinking about the audience for a presentation, compared with no time thinking about an audience in comparison classrooms. Multimedia Project students spent nearly one-third of their time developing arguments or explanations of phenomena that they were researching, compared with 9 percent in comparison classrooms. They spent significantly more time than their peers in comparison classrooms revising and reviewing their work. Clearly, teachers in the Multimedia Project were teaching differently and providing more opportunities for students to acquire information-age skills.

The results of the performance assessment task were similar. The task was administered to groups of four or five students in all 12 Multimedia Project classrooms that were part of the observation study and in six of eight comparison classrooms. The performance assessment measured student communication and design skills in the context of constructing a multimedia product for a specific purpose and audience (Penuel & Means, 2000).

The task required students in both samples to design a brochure for principals and teachers to identify ways that they could help homeless students succeed in school. Students were given a range of documents about problems that homeless students face, existing homeless programs, and evaluation data. Students had to read, interpret, and synthesize this information as a basis for creating content for their brochures. As a fair test, students were asked to produce pencil-and-paper drafts, rather than use technologies that might not have been available in the comparison classrooms. Condition-blind raters then scored the brochures with a researcher-developed rubric that had three dimensions: content, sensitivity to audience, and design.

Overall mean scores showed that the Multimedia Project students significantly outscored their peers on all three dimensions of the rubric (see below). Moreover, when the products of students of veteran Multimedia Project teachers were compared to those of students with teachers new to the project, the former tended to have higher ratings.

Keys to Success

What makes the Challenge 2000 Multimedia Project unusual is not the use of multimedia per se, but the network of supports for teachers implementing the project. Instead of assuming that a one-time course in how to use multimedia software would prepare and motivate teachers to implement high-quality classroom activities, the Multimedia Project supplied an ongoing structure of social, organizational, and financial supports. The most significant program features include equipment funding, professional development opportunities, and the project's focus on assessment for continuous improvement.

Teachers new to the Multimedia Project have a number of incentives that help overcome initial resistance to implementing complex projects with their students. Among these incentives are

minigrants that support individual teacher's requests for equipment, software, or special training activities. Teachers also receive a stipend for successfully completing a project with their students and displaying examples of student multimedia products at regional multimedia fairs. The teachers who led *Belmont Then and Now* used minigrant funds to buy scanners, a digital camera, and multimedia software, as well as extra memory and storage media—two items that districts and schools often do not include as line items in their technology budgets.

To secure these funds, teachers must develop proposals that are reviewed by Multimedia Project staff and a team of experienced teacher-leaders. The proposals must identify specific objectives for the project and methods for assessing student work, and they must outline how the project will include each element of the multimedia-supported, project-based learning model (Simkins, 2000). In addition to using multimedia, the projects must

- be extended in time,
- be anchored in the core curriculum,
- involve extensive student decision making,
- require small-group collaboration,
- have a clear real-world connection, and
- include methods for assessment during the project.

One or more teacher-leaders or Technology Learning Coordinators (TLCs) help new teachers develop proposals. The TLCs are teachers skilled both in pedagogy and in instructional uses of technology. They are available for on-site assistance to their fellow teachers in developing project ideas, assisting with implementation, and coordinating the involvement of teachers and students in regional multimedia fairs held each spring. The TLCs have become a strong teacher network over the five years of the project; they meet monthly to share progress, to plan continuing professional development activities, and to discuss specific student projects.

The development and implementation of *Belmont Then and Now* illustrates how individual TLCs and the TLC network can support a particular project. Jeanine Woodell, TLC for one team, had the idea for the project a few years ago. In fall 1999, Woodell took her idea to three teachers at Central Elementary, and together they developed the proposal for *Belmont Then and Now.* Proposal reviewers saw the promise of the project and decided to include a discussion of the project on the agenda of the monthly TLC network meeting. At the meeting, all the TLCs from the Multimedia Project discussed *Belmont Then and Now*'s strengths and made specific suggestions on how to improve the project's design.

As the project progressed, Woodell used her position to help teachers with the overall coordination of the project. For example, she made telephone calls during school hours to the historical museum's curator. Woodell also helped facilitate student learning as students worked on their projects, taking a hands-on approach throughout the project.

Teachers implementing *Belmont Then and Now* also relied on one another's support, using a form of organization adopted in the fourth year of the Multimedia Project. This "partnership" model emerged as the project grew to include multiple teachers within a single school. Each partnership includes a lead teacher (often with more than a year of experience in implementing multimedia projects) and partner-teachers. Together, the partnership teachers submit proposals to Multimedia Project staff to secure necessary hardware, software, and network tools. While implementing their projects, partner-teachers discuss the projects within their school, and they have the opportunity to meet with teachers from partnerships in other schools at projectwide meetings throughout the year.

Another crucial component of the Multimedia Project's success is the extensive use of assessment to improve the quality of student products. It is too easy to get caught up in the activity of technology use and to neglect the quality of the content that students are learning. The Multimedia Project's emphasis on assessment ameliorates this tendency. All participating teachers evaluate the quality of students' multimedia products and measure changes in student knowledge and competence as a result of project work.

Classroom assessments are complemented by more formal assessments conducted each year across the Multimedia Project in conjunction with the regional multimedia fairs. Clusters of schools hold annual exhibitions of student work, and each cluster submits six of its best projects to be scored by a group of teachers and community members using a rubric developed by a team of teachers, evaluators, and project staff. Project scores on the rubric are used as one source of data for measuring progress of the Challenge 2000 Multimedia Project toward its stated goal of infusing the schools of Silicon Valley with an exemplary model of project-based learning supported by multimedia (Simkins, 2000).

Technology Integration for the 21st Century

One of the chief lessons of the Multimedia Project is the importance of developing a network of teacher supports for integrating technology into a model for innovative teaching and learning. As schools, districts, and government agencies allocate more funding for technology, we should not overlook the benefit of informal networks of instructional and technical support. Innovative districts, such as New York's District 2, and research-based educational reforms have highlighted the importance of integrating ongoing informal professional development into daily practice (Cognition and Technology Group at Vanderbilt, 1997).

Making available a teacher-leader to help novice teachers during class time as they try out new technologies and models of instruction allows novices to see someone handle the challenges of implementation. Making sure these teacher-leaders themselves have support is similarly crucial. As one TLC described, "This is our staff development. There's a lot of power in this room. It's very motivating, this group of people who meet together."

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