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ABSTRACT

The reopening of a middle school in San Diego, California, provided a testing ground for a unique collaborative effort between the school faculty, a university department, and Apple Computer Corporation. The desire to infuse technology and cultural awareness across the curriculum led to the development of an interactive "microworld" game template for student projects. The 12-week interdisciplinary project provided teachers the opportunity to learn more about the potential of educational technology, enhanced their collaborative teaching efforts, and motivated their students toward excelling in the learning process. In addition, the project provided students the opportunity to develop computer-based simulations which fostered team work, improved their subject matter skills across the curriculum, and increased their knowledge of the role culture plays in society. Topics highlighted in the report include: integrating technology throughout the curriculum; teacher training; the interdisciplinary approach; cooperative learning; cultural scenarios; the microworld template; and the findings of a summative evaluation of the project. Two figures illustrate the user and developer modes of the template. (Author/ALF)

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Title

Integrating technology usage across the curriculum through educational adventure games.

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Abstract

The reopening of a middle school in San Diego, California provided a testing ground for a unique collaborative effort between the school faculty, a university department, and Apple Computer Corporation. With the desire to infuse technology and cultural awareness across the curriculum, an interactive "microworld" game template was developed for student projects. The twelve-week, interdisciplinary project provided teachers the opportunity to learn more about the potential of educational technology, enhanced their collaborative teaching efforts, and motivated their students toward excelling in the learning process. In addition, the project provided students the opportunity to develop computer-based simulations which fostered team work, improved their subject matter skills across the curriculum, and increased their knowledge of the role culture plays in society.

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Introduction

In a section of inner-city San Diego, where the student dropout rate is over 25%, an educational technology experiment with culturally diverse students is beginning to show signs of transforming the way students participate in school. The adopted technology system includes more than just hardware and software. It also includes a unique combination of interactions between students, teachers, parents, university faculty, and business leaders.

O'Farrell Community School, located in southeast San Diego, reopened its doors in the Fall of 1990 with no principals, vice-principals, or counselors, and a 7th grade class of 420 students (35% Afro-Americans, 30% Hispanic, 25% Filipinos, 5% Indo Chinese, and 5% Anglo). Rather than implementing the traditional top-down management system of most schools, O'Farrell opted for a site-based management program in which teachers determine the curriculum, counsel the children, and handle all student related problems. Due to this unique combination of teachers, students, and administrative procedures, Apple Computer selected O'Farrell Community School and the Department of Educational Technology at San Diego State University to participate in a program entitled the Christopher Columbus Consortium. Apple's goal for this program was to form partnerships between university and public school entities to apply microcomputer solutions and educational technology strategies to help solve classroom problems. Thirty-two similar partnerships were established throughout the United States. The focus of the San Diego contingent was to provide a tool which would allow students the ability to easily develop computerized instructional programs. To be successful, the developers hypothesized that this program would need to 1) appeal to teachers to insure that its use would be integrated throughout the curriculum, 2) empower each student with the ability to become the creator, designer, and developer of relevant academic materials, and 3) be easy to use and have a strong motivational appeal to the students to sustain their interest. It was determined that the best method to achieve these goals would be to create a HyperCard template which would allow the students to create an interdisciplinary, interactive "microworld" adventure game.

The initial group of school and university faculty who developed the idea of incorporating microworld programs recognized that structuring an entire

school's curriculum around a series of games would probably be met with resistance from the faculty, administration, and students. To increase the probability of acceptance, two objectives were established by this group led by Dr. Bernard Dodge, a university instructor and advocate on the development of educational computer games and simulations. First, the faculty at O'Farrell Community School would need to become closely involved in coordinating and guiding the games to insure its pedagogical success. Second, the students would require a simple method by which graphics, text, sound, and movement through a game environment existed.

Integrating technology throughout the curriculum

In 1988, the O'Farrell School of Performing Arts closed its doors and relocated to a new facility. This left a vacant building in San Diego's inner city which soon became the target of vandalism and other undesirable behavior. Due to its desire to improve upon traditional educational, the San Diego Unified School District decided to reopen O'Farrell in the Fall of 1990 as a restructured school employing a variety of innovative approaches to education. In staffing the facility, the CEO (Chief Educational Officer) and teachers were all chosen for their subject matter knowledge, enthusiasm, dedication, willingness to examine and incorporate innovative ideas, and commitment to excellence by themselves and their students. Top-down administrative policies were abandoned in favor of decisions made by either the individual teacher, one of three "families" of teachers, or the community council, composed of representatives from teachers, staff, parents, and students. All faculty member and students were assigned to one of three school families. Families were further divided into smaller groups of approximately 22 students (the average classroom size). This model not only provided the teachers a stronger voice in how the school would implement the educational process, but provided a collegial atmosphere of working with school families to achieve educational and social goals. The use of technology to enhance education was provided for with the establishment of computer labs, a media center with mass storage and retrieval devices, and a networked computer system for the faculty. Few teachers, however, had taken the time or had the knowledge to implement the theories or techniques of educational technology in their classrooms.

The idea of incorporating a microworld format across the curriculum originated one month after the beginning of the 1990-1991 school year at meetings with the computer teachers at O'Farrell and faculty members from the Department of Educational Technology. After initial details and overall framework of the process were established, the ideas was presented to the school staff. Although few doubted the pedagogical potential of the proposal, concern was expressed by some on their lack of knowledge of the computer hardware and software to be used in developing the microworlds and how they could insure that the time spend by the students would be meaningful. A conditional acceptance of the proposal was agreed upon when it was decided that all teachers would be trained on the hardware and software involved with the project, and that the microworlds would: a) be developed with an interdisciplinary approach to learning, b) incorporate cooperative learning in teams composed of students from various cultural backgrounds, and c) reflect game scenarios which were historically accurate and cultural relevant to the student population.

Teacher training

To insure the integration of the technology across the curriculum, it was imperative that the teachers gain both a conceptual understanding of how technology assists the learning process and the basic skills for using the required hardware and software. Two venues were established to reach these objectives. First, Apple Computer provided the school with a set of computers, a videodisc player and monitor, and accompanying software. Included in the software was the interactive videodisc and CD-ROM program "Macintosh Fundamentals". This self-paced program provides users a variety of activities to become familiar with the computer and peripheral devices, as well as the HyperCard software program.

In addition, six workshops were conducted to 1) help teachers conceptualize how the learning process can be accentuated with technology, 2) provide them the knowledge required to help initiate and develop the microworld adventure games, and 3) become more familiar with the equipment the students would be using in building their microworlds. These workshops were conducted by the school's computer teachers, media center director, and university faculty.

Interdisciplinary approach

From the beginning of the school year, the faculty at O'Farrell had adopted an interdisciplinary approach to learning. Teachers within families meet daily to coordinate their instructional plans and the school's community council identifies and develops six-week thematic units for the entire school population. Both activities help insure coordination of educational topics. The microworld concept presented an additional avenue for this cooperation. It was decided that all subject domains would contribute either to the building of the microworlds or incorporating the findings into their curriculum. Individual subject domain activities included:

- **Language Arts:** Story boards and creative writing lessons for the development of the story lines;
- **Social Studies:** Historical research on the cultures, artifacts, geography, and societies which became the basis of factual information for the games;
- **Science:** Game obstacles dependent on the science of the time (ie. climate, astronomy, biology);
- **Mathematics:** Game obstacles dependent on the mathematical concepts relevant to the time and culture (ie. number systems, calendar, measures);
- **Computer:** Instruction on template use and entering material into word processors, graphic programs, and HyperCard template;
- **Art:** Development of computerized graphics and scanned images;
- **Music:** Incorporation of sound effects and traditional music into the games; and
- **Physical Ed.** Incorporation of games and sports played from the different time periods.

Cooperative learning

Cooperative learning arrangement were developed by dividing each class of approximately 22 students into 4 teams, each team responsible for developing one quadrant of their microworld. Because each team had approximately 6 students, specific roles were assigned to help reduce redundancy. These roles became

game master, map master, graphic master, word master, sound master, and research master.

In addition to their assigned role, each student was also required to develop at least one completed card for the game. This not only helped insure that each student was competent in all skills required to build a HyperCard stack, but also provided a sense of ownership of the finished product. This dual role of reliance on the team as well as the ability to reach individual goals fit into the school's thematic units of dependence and independence.

Because the final product was to reflect the contributions of the entire team, students within each team collaborated and cooperated much more freely than in pre-microworld activities. This cooperative learning occurred not only as material was being entered into the computer, but in all classes as the research, story line, obstacles, and game enhancements were being developed.

The cultural scenarios

With five major ethnic groups represented in the community, one of the major missions of the school has been to help students become more aware and appreciative of various heritages and cultures. The microworld format provided an ideal platform for this expansion. The community council determined that the microworlds should reflect these representative cultures at important points in their development. Students would then be required to research these cultures to insure that the games depicted historically accurate and cultural relevant information. Five scenarios were eventually chosen for development. All were stated in a manner to entice the students to delve into the culture. For instance, the scenario for the Philippines stated: "You are an advisor to the village chief Lapu-Lapu on Cebu Island. Spanish ships, lead my Magellan, have arrived for the first time in the Philippines. You are to be the negotiator with the Spaniards."

Using the media center's resources, students were able to carry out their initial research into the various cultures and time frame under study. Unfortunately, some areas of research had limited amounts of information available at the school. Trips to the public library, university library, inter-library loan, and modems were used to help provided additional material.

The Microworld template

The students had had some exposure to the Macintosh prior to the project, but no experience with programming. The challenge was to design an authoring system which would allow them to create adventure games without getting bogged down in programming. The tool that resulted is called Cabrillo, named after the explorer who was the first European to sight San Diego. Cabrillo is a tool for the creation of environments for exploration.

From the player's point of view, Cabrillo allows the development of games that are easy to move around in, and which are tied to curriculum by their being grounded in historical reality (Figure 1). Navigation is accomplished by clicking on a compass. Directions that are not open are grayed out, so players don't feel the frustration of trying to "Go North" and having the program tell them "You can't go that way". Maps and a reference manual are available at the click of an icon. Sounds can be attached to any graphic.

From a game designer's point of view, Cabrillo makes it possible to link screens together by clicking on a template (Figure 2). A designer can create an entire microworld with graphics, sounds, conversing characters, treasures, maps, and a reference guide without ever seeing a line of programming. This opens up the possibility of students creating their own adventures.

Conclusions

At the conclusion of the 12 week project, summative evaluations were conducted by graduate students in the Educational Technology Department. Observations and interviews with the school's faculty identified numerous areas where the incorporation of technology provided either direct or indirect improvements in the educational system. Teachers cited that cooperation both within and across families was improved, there was an expansion and integration of technology into the curriculum, and a higher level of cooperative learning, research skills, and

higher level thinking skills of the student population was reached. The teachers were also impressed with the students acquisition of facts and concepts of the cultures under study. One hesitancy expressed was the trade-off of time from the traditional curriculum in exchange for developing the microworlds.

Students also cited numerous positive influences from working with the microworld templates. Most notable in the interviews were their comments on increased motivation and excitement which the games provided as they worked with this new curriculum. Observations revealed enhanced team work as the students assigned roles for the production, discussed variables in setting up routes and obstacles as players moved through their world, and relied on each other to complete their quadrant within the allocated time. The exposure to the varied technology of computers, scanners, telecommunications, electronic databases, and audio equipment all contributed not only to the student's development of cognitive skills applicable for future employment, but also contributed to a profound impact on their attitudes of self-esteem and confidence.

The question of how exportable the microworlds approach is to other schools is not yet answered. Massive amounts of technology are not required. What is needed, however, is a staff willing to implement innovative ideas and work closely together. The faculty at O'Farrell voted to incorporate the microworld concept again during the 1991-1992 school year.

Acknowledgements

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Dr. Bernard Dodge developed Cabrillo. Instrumental to building the adventure games using Cabrillo were CEO Dr. Bob Stein, computer teachers Roland Garcia, George Muñic and Laura Parks-Sierra, and the faculty, staff, and students of O'Farrell Community School.

Figure 1. User mode

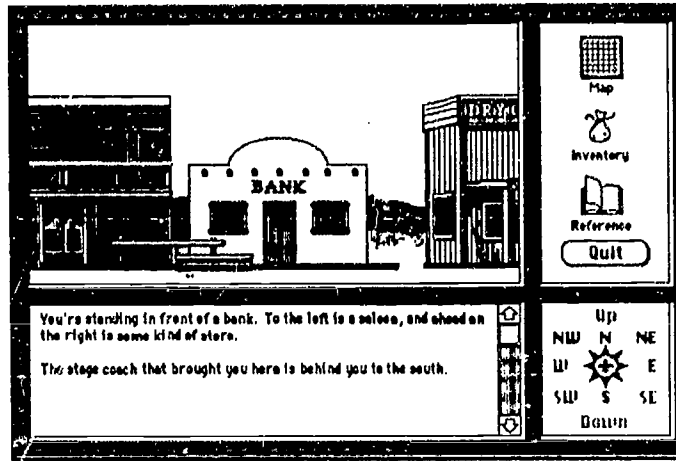


Figure 2. Developer mode

