An Elementary Approach to the 21st Century

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Technology as a subject may be discrete, or peripheral to other subjects or it can be fully integrated in the whole curriculum, as in this American elementary school

For us, technology is defined as the application of knowledge to solve problems. At Dranesville Elementary School, Fairfax County, Virginia (on the outskirts of Washington DC), the students (900 aged between five and twelve) and staff are encouraged to use a variety of equipment computers, laser disc and CD-ROM players, hand tools and manipulative toys to solve problems and develop skills in critical thinking. Understanding what technology education is, its ramifications for school and society, and properly delivering its instructional content and opportunities to students has been the major thrust undertaken by the administration and staff at the school.

At Dranesville, technology education includes both information and design technologies. The information technologies include several types of computer equipment used as tools to supplement the curriculum. Classrooms are equipped with Apple IIe or Macintosh LC computers (Kindergarten up to Grade 3) and Apple IIgs computers (for Grades 4-6). Two of the Macintosh LC computer stations have CD-ROM players that enable students to use talking books or other multimedia resources. Two IBM-compatible computers are available to students in a mini-laboratory. In the lab, students can use computer-aided design (CAD) and animation software to produce illustrations for special research projects or books. Students use the computers in small- and large-group instruction as well as individually. The school has more than 200 software programs that allow students to develop problem-solving skills, participate in simulations and reinforce skills.

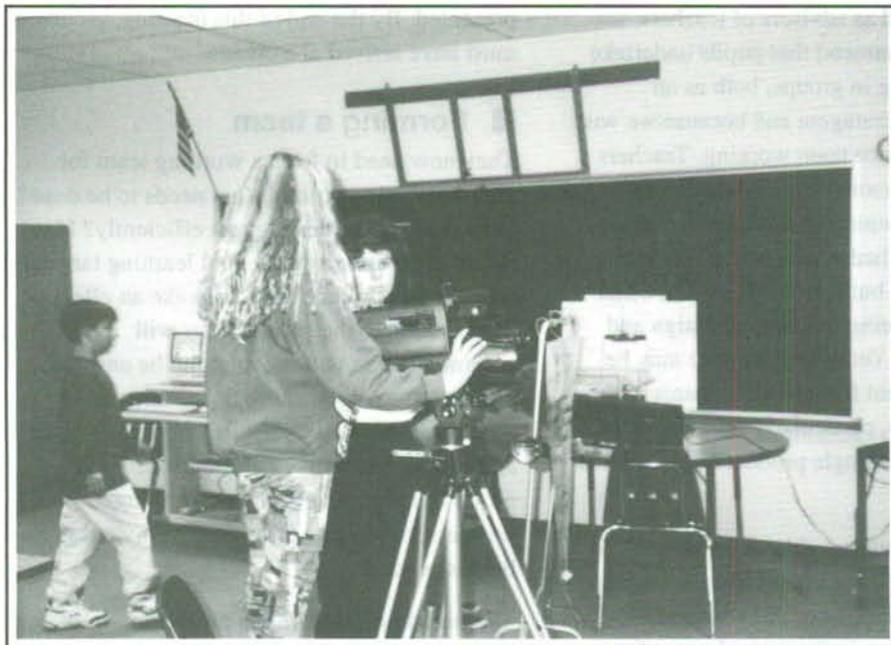Designing and making sailing ships

■ Technology throughout the curriculum

Technology is integrated with the whole curriculum. Upon completing a social studies unit on the early explorers, for example, students constructed a sail-powered vessel that would travel a distance of three feet. Young designers described their vessel using word processing and desktop publishing software. They kept track of the materials that were used in the building process by creating bar and pie graphs with graphing software. Once the vessels were tested, the pertinent data (length and height of the vessel, etc.) was collected and analysed with database management software. A graphics program was used for the final representation of the vessel that the students designed and built.

There is evidence of technology programs throughout the school: in hallways and pod areas as well as in classrooms. Students have the opportunity to explore a variety of toys and materials that involve them in problem solving. Puzzles, Lincoln Logs and Tinkertoys encourage students to build and expand on creations. The school library offers opportunities to use computers and multimedia equipment. There is a computerised catalogue and MANDY (subject-search software) to help students in their enquiries about authors or titles and CD-ROM players which enable students to access electronic encyclopaedias or information about subjects which interest them.

Laser disc players and videodiscs are used as teaching tools (especially for demonstrations, simulations and electronic field trips). Students can thus travel to the National Zoo, the National Gallery of Art or the Grand Canyon! In a study of rocks and minerals, students used the Windows on Science series laser disc to obtain information about a design brief. Their challenge was to make a device that could move a heavy rock. The laser disc had many clips of simple machines that aided students in solving the design problem.

Telecommunication activities are available to all students. The activities vary from sending Valentine messages or participating in treasure hunts to collecting scientific data on weather conditions. Students produce and edit their own videotapes. The school's communications studio is equipped with two editing decks and with monitors that allow students to make professional-looking videos for classroom

Students produce and edit their own videotapes

A device to help the rats of Nimh

A group of musicians from Bolivia recently presented an assembly at the school. The music teachers challenged the students to design and make an instrument that duplicated the sounds that they heard in the native music. Students discovered the relationships between materials used and their effect on pitch, resonance and volume. One technology activity involves kindergarten students in designing and constructing ears for Mickey Mouse, another has first graders designing and testing ways of lifting blocks, and second graders creating vehicles to move items from one place to another. A further activity explores the challenge of a diver using air tanks and weight belts to try to get to the bottom of a pool of water; students are inspired to design and construct safe diving gear. In the upper grades, children studying insects design their personal bug and describe its purpose, habitat and living patterns. They then mechanise the bug using electric, pneumatic or elastic power.

In design technology activities, students use CAD or graphic software to create a design plan or blueprint for their project. The students build their project using their hands and hand tools to assemble paper-towel rolls, rubber bands, string, fabric, straws, wood, manipulative toys (Lego, Gearopolis and Tinkertoys, for example), and simple machines. The design process is documented in reports and drawings that are prepared using desktop publishing software.

The novel *Mrs Frisbee and the Rats of Nimh* by Robert C. O'Brien, introduced students to a technologically advanced community of rodents. Students then worked in teams to design labour-saving devices for the rodents. They brainstormed ideas and drew several solutions, chose the best one and drew a scale model of the device. They then used Lego to construct the model and tested it to ensure that it met their purpose. All models and plans were shared so that all the students could benefit from the learning experiences of each other.

The excitement and involvement of students is evident throughout the school. The staff is committed to making technology the new basic as they integrate it in all aspects of the curriculum and prepare children for the future.

projects. Students can also create graphic presentations with the computer and then add voices or music to complete a video. They use the video cameras to tape segments that are used for the schools news network, WDES. Closed-circuit television allows students to view the news, see special guests or visit other classrooms.
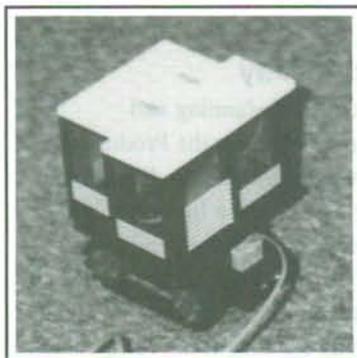
■ A problem-solving approach

Design, or engineering technology, is about identifying needs, generating ideas, planning, creating, testing and finding the best solutions. Technology activities, using a design brief format, help the students become aware of ways in which technology affects home, work and life-styles. Technology activities supplement lessons in language, mathematics, science, physical education, music, art, health or social studies. The activity can be thought of as a mathematics or scientific concept.

Teddy bears are all around the school to help create a child-friendly environment. After studying literature involving teddy bears and reading and dramatising a story about the teddy bears' picnic, first grade students designed and made a waterproof hat for the bears to use during inclement weather. They explored the properties of materials and made choices to determine which were appropriate for meeting their needs. A news segment was videotaped and shared with the rest of the school population via the closed-circuit TV facility.