

Technology Education in the Overall Scheme

EDUCATION IN THE U.S. IS FACING SERIOUS PROBLEMS. TIMSS, The Trends in International Mathematics and Science Study (formerly known as the *Third International Mathematics and Science Study*) <http://nces.ed.gov/timss/data> shows a downward trend in the scientific and mathematical proficiency of the general population of students in the US compared to the rest of the world. *Technically Speaking: Why All Americans Need to Know More About Technology* (<http://www.nap.edu/books/0309082625/html/>), a joint study by the National Academy of Engineering and the National Research Council, points out that while the US has become more dependent on technology, we have become less able to understand or to think critically about technology. *The Bayer Report*, “What America Thinks About Science Education Reform: An Analysis of the Bayer Facts of Science Education I-V” <http://www.bayerus.com/msms/news/pages/factsofscience/analysis.html> shows that the general public in the US is aware of these problems and wants them addressed.

What are the solutions?

Money

Whether the data is analyzed on an international level, country-wide, by state or by school district, the statistics suggest that there is a correlation between money and academic achievement. The Supreme Court in New Jersey also came to that conclusion and mandated that the state pump huge amounts of money into its 30 poorest districts with the intention of providing the affected students educational opportunities commensurate with their peers from more affluent areas. It seems logical; whether it works remains to be seen.

On the national level, President Bush is focusing funding on improving reading and math (and if you read deeply enough, science) through his “No Child Left Behind” program. The intention of the program is to help close the achievement gap between disadvantaged and minority students and their peers. Success will be measured by standardized tests given to all students in grades 3-8. The main tool for the program is federal money.

Teacher Preparation

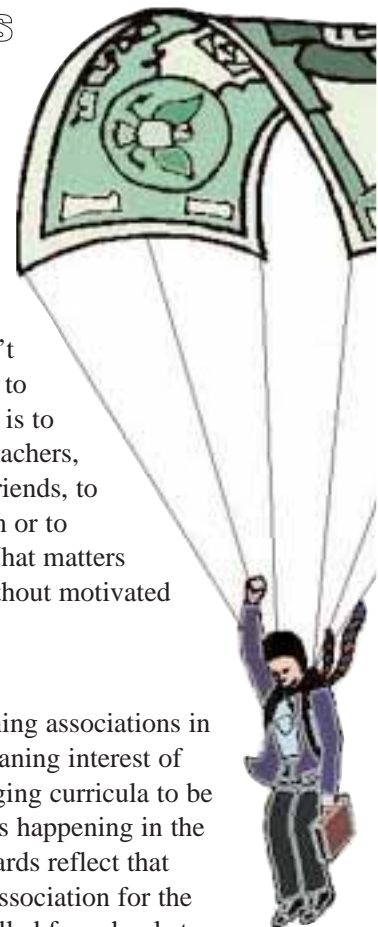
Some of the NCLB Act money is earmarked to improve teacher preparation. It’s intuitive that kids will learn more math from teachers whose academic preparation included mathematics, the same for science, English and every other subject. Data collected by the National Center for Educational Statistics, the National Science Teachers Association, and the National Council of Teachers of Mathematics validate that intuition.

Money and Teachers Solve the Problem?

So if we have the facilities, books, materials and highly qualified teachers will our schools reach the goal — to produce literate and especially technologically literate citizens? Anyone who has taught knows there is a missing ingredient — motivated students. If students don’t want to learn, they won’t. They have to have a reason to learn and whether it is to please their parents, to please their teachers, to get into college, to impress their friends, to get a job, to solve a personal problem or to simply know more doesn’t matter. What matters is that they want to learn because without motivated students we can’t reach the goal.

Motivating Students

In the nineties, the professional teaching associations in math and science responded to the waning interest of students in their subjects by encouraging curricula to be written so that it is relevant to what is happening in the students’ world. Their national standards reflect that philosophy. In 1993, the American Association for the Advancement of Science (AAAS) called for schools to reform curriculum to achieve scientific literacy by integrating math, science and technology education content. The National Science Foundation (NSF) saw the emerging design and technology movement that had grown out of



industrial arts as a venue to bolster technological literacy, integrate the delivery of math and science and as a way of linking both to the real world. One of the tangible results of NSF interest was funding of Project UPDATE (Upgrading Practice through Design and Technology “Engineering” Education).

Project UPDATE

The project produced nine Contextual Learning Units for grades K-6 that included science, math and technology materials supported by an array of tools, mechanisms and devices that help teachers include concepts and activities related to structures, mechanisms, pneumatics, electricity and control in their classrooms. Teachers received 35 hours of training. Teachers who became trainers received 105 hours. Learning math, science and technology within contexts proved motivating to students.

It appears NSF’s suspicions may be right, context can improve learning. One participating school, Cook-Wissahickon Elementary School in Philadelphia, PA (79% of students on assisted lunch programs) showed increased attendance and remarkable improvements in test scores. Cook-Wissahickon third graders scoring at the basic level on the Stanford Achievement Test (SAT) #9 increased 42% in math, 59% in science and 35% in reading. Other school also showed improvement, although the results were not as dramatic. These students were definitely motivated.

Children Designing & Engineering

The success of Project UPDATE encouraged NSF to support the development of another series of contextual units. Working collaboratively with six New Jersey industries, Children Designing & Engineering <http://children.designing.org> produced 12 learning units.

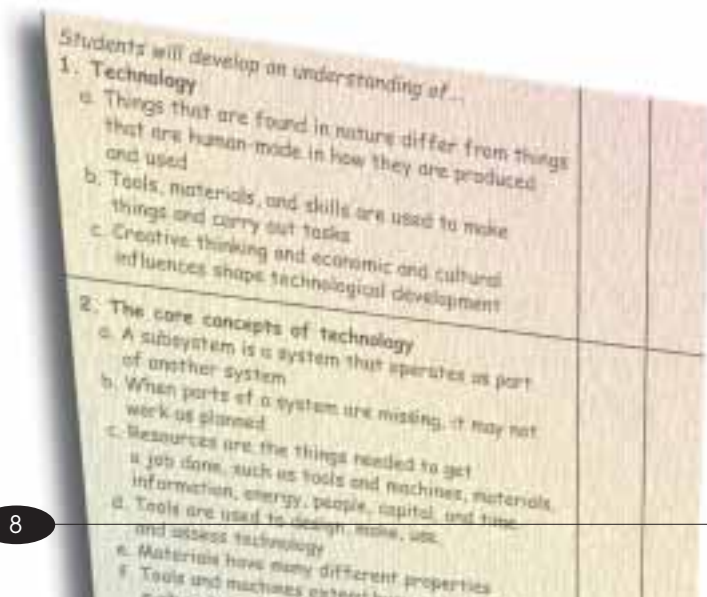


Students whose teachers have used CD&E haven’t yet taken standardized tests, but the reactions of teachers, students, administrators, parents and the outside evaluator to CD&E have been extremely positive. Once again, we’ve seen highly motivated students.

National Standards

While NSF was funding these two projects, they were encouraging the technology education community to develop national standards. NSF support and hard work by the International Technology Education Association produced, in 2002, the national standards — Technology for All Americans <http://www.iteawww.org/TAA/TAA.html>.

Approximately half the states have some form of state technology standard <http://www.education-world.com/standards/state/index.shtml>. In some states they are contained within science standards or as in Massachusetts they have evolved as a combined science and technology/engineering standard. Maryland requires at least one credit in each year K-12, but is still in the process of developing standards. Michigan and Connecticut have stand-alone standards for technology education. New Jersey just joined them when Governor James E. McGreevey signed a bill on May 5, 2003 establishing technology education as the eighth core curriculum — although the standards themselves are yet to be written. The consortium that lobbied for the bill — the New Jersey Business & Industry Association, the NJ Technology Council, and the Technology Educators Association of New Jersey — will have to remain vigilant that opponents of the bill don’t dilute the end result by shifting the emphasis to educational technology or by not requiring state-level testing.





Irony

While technology education is gaining respect in the political and educational arenas, and with the public at large, we are being threatened from within. As more states adopt technology education standards and as more teachers retire, the demand for newly minted technology education teachers is on the rise while simultaneously our undergraduate capacity nationally continues to shrink.

NSF to the Rescue

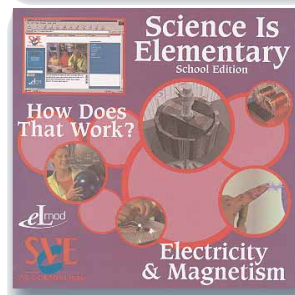
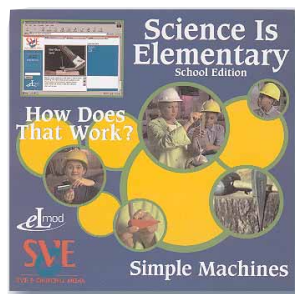
Once again, the National Science Foundation has recognized that technology education has a role to play in helping the United States achieve technological literacy and that the profession needs help to do that. NSF has requested proposals to increase the number of Ph.D.s in technology education to strengthen programs and to replace those professors retiring. It also looks to increase the level of activity in technology education at the post-doctorate and the master's level. NSF is offering five year grants of up to \$10 million to make it happen. There have been several responses to their request for proposals. One group applying that I know intimately includes Appalachian State University, Carnegie-Mellon University, the University of Georgia, Goldsmiths College, London University, The College of New Jersey, and the New Jersey Science Center.

Whichever group receives the funding, if you are interested in becoming the next generation of college professors training technology teachers, you should have the opportunity. The same is true if you are looking for advanced professional development at the masters level. Check back with *Ties Magazine* in the fall for an update.

These fine suppliers of educational materials are offering **FREE** brochures and catalogs about their products. Check out their websites or call for information and/or materials.

SVE & Churchill Media

<http://www.svemedia.com>



E-Learning Modules or “eLMods” integrate core classroom material with solid Internet content, high-quality video and audio, quizzes, and interactive text. Developed in response to customer requests for Internet-based learning that works within technology limitations, eLMods allow students to access rich media without a high-bandwidth connection.

ELMods work by taking the core content of the program and delivering it from a CD-ROM for use on an individual computer or loaded onto a network for school-wide use. This content, which would normally need a high-bandwidth connection, is then

readily available for use through a familiar browser interface. If the user has an Internet connection, he or she can take advantage of enhanced features, such as approved Web resources, online encyclopedia content, and extended worksheets and activities.

All programs include an assessment function with pre- and post-use tests to help track students' mastery of the topics, a custom presentation feature to allow teachers to segment and personalize programs, and a powerful searching function that locates information in video lessons, the encyclopedia, and quizzes.

Science Is Elementary: Electricity & Magnetism eMod explores the major concepts of electricity by explaining the atom and the flow of electrons and shows the relationship between magnets and electricity.

Science Is Elementary: Simple Machines eMod discusses how the wheel, level, axle, and pulley are fundamental components to machines used today and examines the plane, wedge, and screw.