



National Center for
Technological Literacy®

Museum of Science, Boston

Statement of Dr. Ioannis Miaoulis, President of the Museum of Science, Boston
and Director of the National Center for Technological Literacy
on Innovations in Math and Science Education
before the Subcommittee on Technology, Innovation and Competitiveness
of the Senate Commerce, Science, and Transportation Committee
April 26, 2006

Good morning and thank you Mr. Chairman, members of the subcommittee. I will not take your time reiterating the well-documented educational problems facing this country. Mr. Chairman, and members of the subcommittee, it is clear you recognize the challenges with the introduction of your National Innovation Act. I am most grateful for the opportunity to share with you an exciting education innovation spreading across the nation. I will offer some policy suggestions at the conclusion of my time.

History

Massachusetts was the first in the nation to incorporate engineering into its state K-12 frameworks or standards. I am proud to have been a part of that process while serving as Dean of Engineering at Tufts's University. These state standards were modeled after the International Technology Education Association standards. The state then rightly moved to include engineering in the state assessments – because we know if it isn't tested, sadly, it isn't taught.

Rationale

I understand the concern for math and science education but I am worried that K-12 technology and engineering education is overlooked. The reason may be that the existing curriculum was adopted over 100 years ago when technology was not as pervasive. Our science curriculum focuses on the natural world but rarely the human-made world – the things students interact with everyday.

The beauty of engineering is that it is the connector. It is the application of math and science that provides relevance to students. This answers the perennial question, "Why do I have to learn algebra?"

Definitions

Many people are unclear about the definitions of science, engineering and technology education. Science is the study of and inquiry into the natural world. Engineering is designing under constraints, which impacts both the natural and the human-made world. New technologies are the result of the engineering process.

Many people confuse educational technologies (or IT gadgets) in the classroom with technology education, the study of innovation and design. That is why I prefer to stick with the term, “engineering education;” there is no room for confusion.

National Center for Technological Literacy

To promote engineering in K-12 classrooms across the nation, the Museum formed the National Center for Technological Literacy.

Educator Resource Center

Our first mission was to find resources for teachers to use. We created an online Educator Resource Center, like Amazon, that contains only engineering and technology curricula (the way we define and understand it). Frankly, we found very little at the elementary level, some fair middle school curricula, and some very expensive high school programs.

Engineering is Elementary

To fill the void, we are developing the “*Engineering is Elementary*” curriculum that meets the national and state standards. With some corporate seed money and a generous grant from the National Science Foundation, we are developing a series of 20 engineering units for children in grades K-5. These units are aligned with popular science topics and are heavily weighted in literacy and social studies so it is very easy for teachers to integrate them into their lessons.

After publishing just 7 units, we have been overwhelmed with the interest we have received from across the nation. We partner with other science centers, universities, school districts, and others around the country to provide the teacher professional development and help disseminate this exciting curriculum. In fact, these units, which are thoroughly pilot and field-tested, are currently being reviewed by NASA for their Explorer Schools program.

Results

Not only are the kids having fun while learning, and the teachers are raving about the units, we have the data to show that we are busting some unfortunate myths children (and teachers) have about engineers and technology. Most children and teachers think that technology is an electrical-device of some sort. They think engineers mostly work in construction or with electricity. These are fields that typically do not attract women or minorities. They don't understand that this pen, these windows and water bottles, are forms of technology, designed by engineers. They have no idea of the vast array of careers that are available to them in the wide range of fields of engineering that our innovation economy needs.

Engineering the Future

We are also field-testing a full-year high school course, "*Engineering the Future*," for students in grade 9 or 10 in which students apply math and physics to solve real-world problems. Similar to the elementary curricular results, initial findings show an increase from 45% to 79% in understanding that examples of technology include not only electronic devices but also devices that satisfy human needs.

Outreach

We have been invited to help, in one way or another, in 25 states. Whether it is serving as a keynote speaker, providing advice on standards revision, offering teacher professional development workshops, or providing curricula, the interest K-12 engineering education is growing.

Why Us?

We are not your typical curriculum developers. We are not text book publishers. The Museum is a non-profit science and technology center. Our Board of Directors, representatives of national and multi-national companies, believe this is a national imperative. They support the mission of the National Center for Technological Literacy to enhance technological know-how by introducing engineering as a new discipline in K-12 schools and to present technology as equal to science in the informal education setting.

We hope you agree.

Policy Recommendations

Please consider the following as you craft innovation legislation:

- Include engineering/technology teachers alongside math and science teachers in any and all incentive programs enacted to recruit, train, mentor, retain and further educate teachers. These teachers should teach the engineering and innovation process. Many people remember technology education as ‘shop class.’ Well, I am afraid it will remain shop class, if these teachers are not provided with continuing educational opportunities to bring their skills up to 21st century expectations.
- Be sure to define “engineering/technology education” to include the engineering design process. Senator Kennedy’s New National Defense Education Act has a fine definition and has included technology teachers as well math and science teachers in the various teacher programs.
- As you define “rigorous curricula,” consider requiring that each student take at least one engineering/technology course for graduation. The problem-solving skills taught in engineering will benefit all students, even if they do not pursue a technical career.
- Remember, museums are excellent providers of teacher professional development, a resource that is likely under-utilized in many communities. Be sure they are eligible participants.
- Science assessments will soon be required by No Child Left Behind. First, work to insure that they mirror the newly adopted NAEP Science 2009 Framework which includes “Technological Design” as a required skill set. Second, require some measure of progress as with the Annual Yearly Progress for reading and math. If there are no repercussions, states will not likely invest much in their success.
- Finally, if we are truly concerned about innovation and global competition, it is time for a major commitment and investment in technological literacy. The National Center for Technological Literacy is perfectly positioned to serve the nation in this capacity. We work with other science and technology centers and state departments of education to upgrade their engineering/technology standards, assessments, curricula, teacher preparation and certification programs. If we can be of service in your state, please let me know.

I am happy to answer any questions you may have.