Science education: the challenges ahead

Birthday celebration for Neal Lane, the “citizen scientist”

November 2, 2003
Bruce Alberts
President, National Academy of Sciences
U.S. National Academy of Sciences Charter (1863)

“The academy shall, whenever called upon by any department of the government, investigate, examine… and report upon any subject of science or art ,… but the Academy shall receive no compensation whatsoever for any services to the government of the United States”.
Independent policy advice from the National Academies

- More than 200 reports a year, 85 percent requested by the US government
- Full text released to the press, and to the public on our Website, when report is delivered to government
- Two types of reports: most “science for policy”, but many are “policy for science”
Our most difficult “policy for science” report

Published 1996
18,000 reviewers
250 pages

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine
National Science Education Standards

- **Guiding Principles**
  - Science is for all students
  - Learning science requires active engagement
  - School science should reflect professional science
  - Improving science requires system-wide reform

- **The Standards**
  - Content
  - Teaching (MUST READ THESE 25 PAGES!)
  - Professional Development
  - Assessment
  - Program and System
Supplement for teachers
The image we want for science
The good news

- Inquiry based science education precisely fits the needs for workforce skills that have been widely expressed by US business and industry.
What US business and industry need in workforce skills to compete globally

“While most descriptions of necessary skills for children do not list “learning to learn,” this should be the capstone skill upon which all others depend.

Memorized facts, which are the basis for most testing done in schools today, are of little use in the age in which information is doubling every two or three years. We have expert systems in computers and the Internet that can provide the facts we need when we need them. Our workforce needs to utilize facts to assist in developing solutions to problems.”

Robert Galvin and Edward Bales, Motorola, 1996
The bad news

Inertia
The most important challenge of the Standards for colleges and universities

- The alignment of introductory college science courses with the Standards

This means:

1). Inquiry-based teaching of science and its relation to society, for all students.

2). Inquiry-based, non-cookbook laboratory experiences associated with introductory science courses.
A new vision for introductory college science courses
A major mission for the Academies: Making a science out of education

- The goal is to use knowledge of what does and does not improve student learning, based on scientifically obtained evidence, to create a continuously improving education system at all levels.
How People Learn: Brain, Mind, Experience, and School
To create a continuously improving education system, we need a more effective system of education research, focused on classroom settings.

- It is critical that, as in science, we accumulate a commonly accepted body of knowledge based on confirmable evidence.

- Otherwise our nation’s schools will continue to be driven by one simple “magic bullet” solution after another, as new leaders seek a quick fix.
What is good research in education?

Published 2002
Urgently needed: more research on teaching science as inquiry in school classrooms
What keeps me up at night #1

- It is much easier to test for knowledge of science facts than it is to test for science understanding; inexpensive tests designed to hold teachers and schools “accountable” will trivialize science teaching and drive most students away from science.

- Every state is required to have a set of high-stakes science assessments in place by the 2007-2008 school year.
What keeps me up at night #2

- The US business community remains largely ignorant of their own vital interests, leaving science education vulnerable to political and economic forces that threaten our long-term national security.
What keeps me up at night #3

- Our best science teachers need to have much more influence on the education system; current trends will drive our talented teachers into more lucrative and respected careers.
- This influence is needed at every level: from school districts, to States, to the Federal Government.
- How can we institutionalize such an influence, as needed to create a continuously improving education system?
new Teacher Advisory Council at the National Academies

1. Designed to give a major voice for teachers in the work of the National Academies.

2. Each member must be spending at least 50 percent time as a K-12 classroom teacher of math, science, or technology.

3. First meetings held in 2002.
Teacher Advisory Council at the National Academies

Mission:

• In the broadest sense, to provide a much stronger voice for our nation’s best science, mathematics and technology teachers in national education policies.

• This will also require a strong connection to the leaders of business and industry.
A recommendation from our Teacher Advisory Council:

- State Councils are needed to provide a new voice for teachers at the state level, where most education policies are made.

- State Council members will be connected to the National Teacher Advisory Council via electronic networking.
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www.NationalAcademies.org