Boosting Science Learning

the challenge

Geoff N Masters

Australian Council for Educational Research
The Need

an informed and science-literate society

science education as education for citizenship -- a level of scientific literacy that enables informed choices on such matters as ...
The Need

☑ Climate change (greenhouse effect)

☑ Hunger and Health (pandemics; genetic engineering; cloning; radiation; stem cell research)

☑ Sustainable Development (water conservation; salinity)

☑ Energy Use (nuclear energy)
The Need

a supply of world-class scientists

“Technological innovation is the main source of increased productivity, the major tool of economic competition in the world market, and the most important driver of economic growth.”

World Bank Report on Knowledge for Development
"Whatever way you stack it, we need somewhere around an extra 75,000 scientists by 2010... I think the major needs are going to be at top end (doctoral level) and in the enabling sciences (chemistry, physics and mathematics)."

Peter Andrews, Queensland Chief Scientist
The Reality

decline in school science enrolments

The percentage of Year 12 students studying Biology, Chemistry and Physics declined steadily from 1976 to 2002.
The Reality

% of Year 12

Year

BIOLOGY
The Reality

% of Year 12 CHEMISTRY

Year

76 78 80 82 84 86 88 90 92 94 96 98 00 02

70 60 50 40 30 20 10 0
The Reality

% of Year 12

PHYSICS

Year

76 78 80 82 84 86 88 90 92 94 96 98 00 02
Many young people complete Year 12 with minimal exposure to school science and relatively low levels of scientific literacy.
The Reality

decline in tertiary science enrolments

The number of university students studying physical and materials sciences fell by more than 31% between 1989 and 2002.

Australian Council of Deans of Science
TheReality

The proportion of Australian PhD’s in Science and Engineering dropped from 46.9% to 37.2% between 1989 and 2002.

Australian Government’s Innovation Report 2004-05
The Reality

In 2001, only 1% of tertiary graduates in Australia were in the physical sciences.

(UK: 5.2% OECD mean: 2.6%)

OECD, 2003
The Reality

Male physicists outnumber female physicists by 9:1

Australian Institute of Physics
The Reality

shortage of Australian scientists

“Far from solving the problem of finding 75,000 researchers in Australia, ... we are producing less of the very scientists we need.”

Peter Andrews, Queensland Chief Scientist
The Cause?

Science does not engage students

Liking for science declines between Year 4 and Year 8.

Trends in International Mathematics and Science Study
The Cause?

Students’ early foundations (including their grasp of mathematics) are strong determinants of their later uptake of physical sciences studies.
Year 10 students generally have negative views of science and scientists and are not motivated to pursue science careers.

Giali & Treagust, 2003
Many high school students perceive school science to be:

- uninteresting
- unimportant
- irrelevant to their lives
- a matter of learning provided facts
- difficult to learn
The Paradox

The very courses that have been designed to provide a rigorous foundation for the future study of science appear to be turning many students off science.
The Paradox

Not only are these courses not meeting the needs of the majority of students, they also are not producing significant numbers of students wishing to pursue science as a career.
The Solution?

Research Conference 2006

What will it take to boost science learning?
Enjoy the conference!