

An Overture

The Crisis in Science Education

It is no shocking revelation to science teachers that severe problems have dogged science teaching in the public schools for more than a decade. Science and technology have been subtly cloaked with a sinister image by the media, and students tend to shy away from anything scientific, scorning science as "too difficult and not relevant" to life's real business of making money.

What has long been a daily frustration to our nation's science teachers became an "official" national crisis last May. A National Convocation on Precollege Education in Mathematics and Science was convened by none other than the prestigious National Academy of Sciences. And, it was no small-time gathering of teachers, principals, and concerned parents. Personages with genuine national clout were in attendance, including state governors, senators, prominent scientists, and industrial leaders. Cabinet members Terrell Bell and Caspar Weinberger thought the event important enough to merit delivery of prepared addresses, as did Carl Sagan, John Glenn, and 40 or so other notables.

Our own unofficial dean of science education, Paul DeHart Hurd, keynoted the convocation by highlighting the current status of science in the schools. Citing impressive documentation, Dr. Hurd wielded a verbal two-by-four, leaving no room for doubt that school science is in a sorry, if not abysmal, state: "Students do not particularly like science courses and thus dislike is acquired early. By the end of third grade, nearly half of the students feel they would not like to take science." Studies cited by Hurd show that they, indeed, don't take science. Fewer than 20% of recent high school graduates have had three years of science. And, to make the situation appear even more dismal, students' science and mathematics achievement over the last two decades is on the decline according to the *Scholastic Aptitude Test* (SAT) and *National Assessment of Education Program* (NAEP).

Several of the distinguished speakers at the NAS Convocation dwelt on the current shortage of qualified science teachers. Surveys conducted by the National Science Teachers Association were frequently mentioned. One such survey indicates that more than half of recently employed science teachers do not meet minimal state requirements to qualify for the scientific subjects they teach. Yet, for the 1971-80 period, there has been a 65% decline in the number of science teachers trained by the colleges and universities of our country. Of those trained and qualified to teach science, an ever-increasing proportion opt for more lucrative jobs in business and industry.

Blame for our current calamity is most frequently placed on lack of federal support, especially on the part of the National Science Foundation. Due to the "threat" of Sputnik, 47% of NSF's 1959 budget was used for science education. This has declined steadily and steeply to a current low of less than 2%. Probably due to statistics such as these being bandied about in an unflattering way, NSF recently established a Commission on Precollege Education to study the matter. The charge to the commission is "to define a national agenda for improving science and math education" and to "develop an action plan."

In developing their "action plan," my sincere hope is that the commission will propose mechanisms and monies to make a start toward accomplishment of these minimal objectives:

1. Provide adequate physical resources (labs, equipment) for teaching science in every school district in the country.
2. Establish a national expectation that a reasonable knowledge of science and mathematics be required of every high school graduate and for admission to any school of higher learning.

Continued on p. 471

The Kepone event not only led to human damage but threatened the environment on a broad scale and continues to represent an environmental hazard. What can be done to prevent these disasters? Miller (1978) points out that one agency administrator responded to criticism by saying, "we could accomplish a great deal if we were able to keep track of what toxic chemicals are entering our environment." Although Kepone was evaluated and registered, the screening process could be improved by giving special attention under FIFRA, to chemicals that display 1) persistence in the environment, and 2) bioconcentration. These two characteristics plus the usual health hazard information should raise considerable doubt concerning continued use of a substance. In our opinion, pesticides that display persistence or bioconcentration, or which cause cancer in laboratory animals should be banned. Does FIFRA do this? No, it does not!

It is not possible in this article to review the FIFRA legislation and its many amendments. The act results from a very complex interaction of social and institutional forces that lead to what is called the "Balancing Test" (Miller 1978). These forces presently prevent an outright ban unless other factors are taken into account such as a balance between beneficial uses and risks. Under FIFRA a substance can be suspended for use if it can be shown that the risk to the environment far outweighs the factor of beneficial use. But all of this is not clear cut. If the act were changed to read that use of pesticides that show persistence, bioconcentration, or cause cancer in laboratory animals be suspended from use, an administrator might better be able to evaluate toxics reaching the environment today. Continued use of the "Balancing Test" will not always lead to protection of the environment and human health.

Crisis in Science Education

. . . from p. 459

3. Provide that every elementary school in the nation has at least one teacher who specializes in teaching science.

4. Establish the national expectation that students are exposed to some science instruction every school day of their K-12 school careers.

5. Establish funding so that salaries of the most capable science and mathematics teachers are competitive with salaries provided by industry.

6. Establish minimal (but high quality) standards for the pre-service science and mathematics preparation for teachers at all levels.

7. Provide opportunities for continuing in-service education in science and mathematics for all elementary

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teachers and teachers of junior high and high school science and mathematics.

8. Establish procedures for national recognition of schools, curricula, students, and teachers who exemplify excellence in science and mathematics education.

9. Develop public relations programs emphasizing the need for parental involvement in childrens' education, stressing the need for scientific literacy for future citizens.

10. Encourage non-school programs that foster interest in science and mathematics (museums, interactive science centers, science "olympics" competitions, science-oriented TV programs, traveling science shows for youngsters).

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