Perspectives

The Human Sciences Program and the Future

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I cannot recall if it was Paul Sears or Garrett Hardin who some years ago, in referring to ecosystems first said, "You cannot do one thing." If there is one equally important idea that I have learned over the past thirty years of teaching science, it is that you cannot *teach* one thing. To be effective a science teacher cannot teach just content, or just the skills and processes necessary to do science. If those of us who teach wish to intrinsically involve students in the natural sciences, we must make a conscious effort to teach the values we place on knowledge and the processes of science, and also the implications of knowledge and these processes for the individual and for humankind. It is the integration of knowledge, and the processes and values of science that place the scientific enterprise in a social context for our audience.

From the inception of the National Science Foundation programs in the late 1950s through the early 1960s to improve the teaching of the sciences and mathematics, organizations such as the Biological Sciences Curriculum Study (BSCS), were devoting their efforts to upgrading the content of the textbooks and developing laboratory activities that involve students in the processes that scientists follow in the production of new knowledge. The values scientists place on knowledge and the way in which science self-corrects over time were given little explanation. But more importantly, the social implications of new knowledge were sidestepped in favor of C.P. Snow's "Two Cultures" [1961]. As a society, we held to the idea that scientists produce new knowledge and social scientists describe the implications of this new knowledge for society.

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But in the mid-1960s and into the early 1970s, the scientific community came under a great deal of social pressure not only to explain their scientific discoveries, but to justify the way in which society used these discoveries. The word became "relevant" and although many of us who teach grew weary of hearing the word, and we knew many of our students did not know what they wanted from science teachers, we also realized we must respond by attempting to make science education relevant to our students.

In several important ways, this cry for relevance provided new stimuli for scientists as well as teachers of science. It soon became evident that if we were going to teach the principles of atomic physics, we would also have to discuss atomic bombs, Hiroshima and Nagasaki, nuclear power plants, radiation sickness, and the possible destruction of the world through nuclear war. At the same time, biology teachers, who had been involved in teaching the basic biology of human reproduction and genetics, were now expected to confront social issues such as birth control, the Pill, amniocentesis, and abortion.

It was at the height of this period of teaching "relevant" science (1968-72) that BSCS identified the need for a middle school/junior high school life science program. From the beginning, those involved realized that if the program was to be a success it must deal with topics that would attract the attention and hold the interest of the emerging adolescent, the ten-to-fourteen-year-old. In order to do this it was important for individual activities to have a personal or group value.

Probably more than any other program ever produced with the financial support of the National Science Foundation, the Human Sciences Program is based on sound research data concerning the interests and characteristics of the learner. The findings of developmental and cognitive psycholo-

gists and brain researchers were studied and are reflected in the final product. The modules and activities are interdisciplinary and personalized, allowing for considerable flexibility. Thoughtful and intelligent people assumed that this quality product would be well received by parents and teachers. [*Ed. Note*: The Human Sciences Program is now available through National Science Programs, Inc., P.O. Box 41, 908 W. Wilson Street, Batavia, IL 60510.]

But times have changed and the pendulum has now swung in the opposite direction. The Human Sciences Program draws the attention of the emerging adolescent learner to basic human activities related to learning, perception, and knowing at a time when the Moral Majority would cover the eyes and ears of the youth of the nation, except for those ideas that they feel are appropriate. While the Moral Majority would put an end to research in the behavioral and social sciences and support only that research directly related to national defense and warfare, the Human Sciences Program encourages students to conduct activities that demonstrate a variety of legitimate ways in which human beings make their world meaningful, and to understand that what we think we know today will be replaced by a more acceptable explanation tomorrow.

Living with the unknown and temporary solutions to problems has always been difficult for a large, scientifically illiterate segment of our society. While the strength of science rests on uncertainty, openness, and risktaking, the poorly educated demand absolute certainty. Curriculum materials such as those contained in the Human Sciences Program teach students to ask questions and to seek answers. More importantly, these activities prepare students to live productive lives with incomplete answers and tentative solutions to difficult problems.

Will a pluralistic culture that in 1981 hopes for a return to a pre-1960 society, make use of a curriculum produced in the 1970s for use in the 1980s? Will small, single-issue subsets in the larger society finally keep that curriculum from reaching its maximum potential in the schools? These important questions remain unanswered for the Human Sciences Program, but they also raise a variety of questions that are basic to the future of curriculum development and public education in the United States.

We have witnessed a reduction of funds for curriculum development and science education at the national level because a few single-interest groups have been permitted to intimidate our legislative bodies. By their actions these groups have halted the distribution of new knowledge and skills, brought an attitude of closure to classrooms, and restricted the rights of classroom teachers to expose their students to the ideas and concepts which are essential to a free and democratic society. Several of the most important experiments in curriculum development that were sponsored by the National Science Foundation in an attempt to integrate the natural sciences, social sciences, and humanities in the nation's schools have been labeled as un-American in Congress. At the same time, those in positions of leadership at the federal, state, and local levels have failed to speak out in opposition to these single-issue groups.

Man: A Course of Study (MACOS) and, to a lesser degree, the three BSCS biology textbooks, have been identified by relatively small fundamentalist groups as inappropriate for schools, and beyond the scope of public education. Fundamentalist critics have made it clear that the teaching of modern biology and recent discoveries in the social sciences are beyond the role of public education. Consequently, schools have moved away from teaching the new curricula. As a result of this pressure, attempts at the integration of teaching of human biology with the social sciences and humanities have literally been removed from some communities.

Public education is at a critical time and place in the history of Western civilization. Several questions remain to be answered. Will the educational system in a democratic society encourage students to study a variety of economic systems and several of the world's major religions, and to personally identify the strengths and weaknesses of each? Or will we teach one economic system and one religion, and withhold data concerning the views of four-fifths of the world's population? Will the results of modern science be made available in public schools and be left open for discussion, even if it concerns human genetics, birth control, abortion, and homosexuality? Will teachers of psychology and sociology feel free to teach students to question the American system of advertising which transforms wants into needs? Is it un-American to encourage students to compare products before they buy? Should public school teachers identify for their students the problems that are the result of unlimited growth in human populations? Can recent knowledge of the long-term effects of malnutrition be included in the school curriculum? Will biology teachers be required to teach one selected myth of creation if they teach the results of scientific data concerning the concept of evolution?

Finally, where are those who support an open society? It seems that we have allowed the ultra-right to take control of our government, schools, and churches. Parents, teachers, publishers, and our leaders in education are not speaking to these issues, but allowing the free and open minds of the young to be covered by a veil of

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enterprise conclusions neither based on scientific data nor verified by the scientific process. These conclusions, arising outside the field of science and resulting from ignoring or misinterpreting scientific data, have no place in the science classroom as a part of the body of scientific knowledge.

The NABT, through its obligation to biological education, will make every effort to educate the public as to the unscientific nature of efforts to equate non-science with the scientific enterprise. NABT will resist attempts to place non-scientific dogma into the classroom as science. Wherever such efforts are attempted, NABT should correct the record and provide adequate scientific evidence designed to allow decision-makers full access to the facts by means of which to judge the efforts to intercalate non-scientific material into science classrooms or to remove or change the data of science to accommodate a given set of conclusions derived from outside the scientific enterprise.

The credibility and usability of science depends upon maintenance of the integrity of science as a discipline. While no feature in this policy is to be construed as preventing the full range of applications of science and the elucidation of its social and humanistic implications, there is an obligation to insure that the scientific data thus used is both accurate and derived within the accepted procedures of the discipline. Without the maintenance of the integrity of the initial data with which one works, any subsequent applications or derivations may be ill-conceived and of little service to the human enterprise.

NABT has an obligation to maintain the integrity of biology as a scientific discipline. To this end it must act to resist efforts to include in science classrooms materials derived outside the scientific process. It must insist that the data and concepts of science as presented to students meet the accepted standards of the discipline, and data which can best be described as para-scientific (creationism, astrology, anti-germ theory, etc.) cannot be condoned as science within classrooms.
(Adopted by the Executive Committee Oct. 23, 1980)

Publications and Teaching Materials

Annual Science and Technology Report to the Congress, 1981, published by the Office of Science and Technology Policy in cooperation with the National Science Foundation, is now available from the Superintendent of Documents, Government Printing Office, Washington, DC 20402. Price is $6.50. Request stock number 038-000-0504-9.

A manual describing how University/Industry cooperative research centers work and how to get one started has been published by the National Science Foundation's Division of Industrial Science and Technological Innovation. The *Practice Manual* is available free from Louis G. Tournazky, Division of Industrial Science and Technological Innovation, National Science Foundation, 1800 G. Street, N.W., Washington, DC 20550.

Software Evaluation

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matics, 1906 Association Drive, Reston, VA 22091. $3.50. About 85 p. (Contains 12-15 short articles on computers in education. Some are oriented toward precollege mathematics, but many of the points made are applicable to other disciplines.)

[Unknown Authors]. 1981. *Using microcomputers to teach science*. Cambridge Development Laboratory, 36 Pleasant Street, Watertown, MA 02172. $10.00 per booklet. 50 p. per booklet. (Crovello has not seen these, but the publisher provides this information: "One of the 50 page booklets gives a general overview of the topic, including hardware, software, and sources of further information. The other focuses on the various ways of using microcomputers to monitor and control laboratory experiments. These booklets will help both high school and college science instructors make more informed decisions on what hardware and software to buy.")

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ignorance. Can we stem this tide? Will we make our voices heard in order that the fresh air of openness may again reach the minds of our offspring? We have no choice. We must.

References

SNOW, C.P. 1961. *The two cultures and the scientific revolution*. New York: Cambridge University Press.