

The Role of Secondary Education In Solving Environmental Problems

By HAVEN KOLB

If the world's, or even the nation's, environmental problems are solvable within the framework of a more or less democratic sociopolitical system, then some major changes must be made in a large proportion of the citizenry with respect to knowledge, thought processes, emotions, and values. Such great changes will not be brought about through any one social agency. And schools may be among the least likely of such agencies. But if one is in a sinking ship, it is not unreasonable to assign a member of the crew to bailing, even though that activity, by itself, has little chance of success. With respect to environmental problems I think we are on a sinking ship and teachers may well be put to bailing.

By restricting the concern of this paper to secondary schools, the scope of possible achievement is shrunken far more than the span of the secondary years suggests. Many of the behavioral areas that effective environmental education must influence are essentially determined long before children reach secondary school. Among these are the affective areas of emotions and attitudes. At the secondary level, existing trends in these areas may be somewhat bent but are not eradicated. And perhaps some may be toned down while others are built up. However, it is in the cognitive domain that secondary schools can operate most effectively. Consequently, the principal thrusts of our efforts ought to be toward increasing the knowledge on which decisions may be based, toward illuminating the structure of

knowledge, and toward sharpening thought processes.

Whatever may be the possibilities of achievement at the secondary level, this level is the last at which the formal school system has an opportunity to try on a massive scale. Open-enrollment plans of post-secondary education may change this but have not done so at present. Even the present statistics on the pursuit of schooling beyond the secondary level are not relevant, because an unknown, but large, part of such schooling is in institutions where there can be no expectation that environmental matters receive attention. On the other hand, the great majority of youth of appropriate age-level are at least corporally in secondary schools. If it is worth the time of formal educational institutions to work toward objectives that might have impact on the solution of environmental problems, then effort at the secondary level will impinge upon a significant proportion of the future citizenry. The magnitude of the audience that may be reached overbalances, to my way of thinking, the paucity of confidence I have in the effectiveness of the instruction.

Concern Is Not New

Regardless of the prognosis, people in secondary education have been predictably prominent on the environmental bandwagon. But perhaps this is stated unfairly. If we look at some of the components of what is now thought of as "environmental" we observe that some secondary educators have long labored in the field. A few examples: During the 1920s a movement for what was termed social biology brought into the high school biology course considerations of water pollution, among other en-

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vironmental concerns. Perhaps that long ago—and certainly quite widely by the 1930s—many states had requirements in conservation education. Although that term has received many interpretations in practice and in implication differed much from present-day viewpoints, nevertheless conservation education often contained many of the topics that are held high by environmentalists today. And 10 years ago appeared a high school biology textbook that adopted a consistent ecologic approach in that high school subject.

The so-called environmental crisis did not, of course, suddenly burst upon us. Public awareness of it grew steadily during the 1960s, and schools reflected this. Someday, no doubt, a dissertation will be written on the subject. However, to discuss developments, even in secondary schools alone, is too large a task for a single paper. Therefore, I shall only touch upon a few illustrative examples and then describe rather fully one project with which I have had direct experience.

I have already expressed pessimism concerning the effectiveness of attempts to significantly alter basic attitudes in persons who have reached high school age. Nevertheless, for centuries there has been no lack of effort in this direction within many fields. For some secondary educators the whole of environmental education is bound up with attitudes under the rubric “values.” This is the characteristic approach of English teachers who have been drawn into the cause, though it is by no means confined to them. It is an approach that English teachers, from their training, have the greatest chance of successfully pursuing. Social-studies teachers also sometimes adopt this approach, but I believe they have a better one. When teachers of the natural sciences depend primarily on the “values” approach, I am unhappy.

Social-studies teachers seem most prone to call for an “action” approach. Indeed, to get students out of classrooms and into the community can be considered a good laboratory approach to social problems. If some teachers let students leap into action with subminimal consideration of issues and hypotheses, perhaps just as many others kill student interest and concern by reduction of social problems to books and talk. Earth Day severely jolted many of the latter, and to good effect.

The initiative for high school Earth Day activities was in many instances taken by teachers of the natural sciences—particularly of biology. Teachers of other subjects frequently joined in, but I like to think—without much evidence or, actually, in the face of some evidence to the contrary—that leadership by science teachers infused an element of rationality into an emotional experience. At any rate, from Earth Day I want to derive two points.

First, it seems to me that both the thinking and the feeling behind that day have been carried through the following months better on the high school level

than on the college level, where it originated. I think this can be documented by reference to the daily press.

Second, Earth Day set the seal on something that has been long brewing: the loosening of frontiers between disciplines. Talk about the isolation of disciplines antedated C. P. Snow’s *The Two Cultures*, and efforts to do something about it on the post-secondary level have occurred sporadically since. Likewise, serious experimentation with team teaching—an interdisciplinary step—has a history in secondary education of perhaps two decades. But I think that looming social problems, and, conspicuously among them, environmental problems have done more to further interdisciplinary teaching than did all previous argument.

Let me cite a few examples from many that have come to my attention. At the 1970 convention of the National Education Association a session was sponsored jointly by the National Science Teachers Association and the National Council for Social Studies. At this session the need for interdisciplinary teaching in environmental education was emphasized and an example of such a program in Palo Alto, Calif., was described. This past fall the National Science Teachers Association published a list of projects in environmental education at the secondary level. This is a useful guide to the present situation. Most such projects in environmental education either explicitly invoke cooperation between science teachers and social-studies teachers or assume it. One interesting project now under way in Minnesota outlines a three-way cooperation among English, social studies, and science. This project was briefly described in *Science Teacher*, September 1970.

Lastly I cite a project with headquarters at the University of Delaware. It is called, tritely enough, “Man and His Environment,” but it has been developed under the aegis of an entity called the Population Curriculum Project and seems to contain a larger input from population research than do other environmental projects. It was described at the 1970 meeting of the National Association of Biology Teachers by its director, Robert Stegner.

Approaches Through BSCS

I should like now to describe an undertaking that is currently functioning, that illustrates some—certainly not all—of the contributions that secondary schools can make toward solving environmental problems, and that promises a degree of success. It originated in an address that Bentley Glass made to the steering committee of the Biological Sciences Curriculum Study in the fall of 1968. The tide of concern for the environment was even then rising, but the address was not aimed directly at that concern. Glass pointed out that in less than a decade BSCS had effected widespread changes in subject-matter emphases, in instructional goals, and in methodology of high school biology instruction. Although

these changes had not been, and still are not, universally accepted in schools and, moreover, have never been considered definitive, Glass urged BSCS to bend at least part of its future efforts toward establishing in biology education a sector directly relating modern biologic discovery to currently pressing social problems.

As a result of this address a committee on Biological Science and Society was formed within BSCS. During the summer of 1969 this committee, chaired by Glass, met for two days in Boulder, Colo. From this meeting came three major proposals. One was that each committee member construct a position paper on a socially significant biologic topic. It is indicative of the direction of thinking at that time that four of the six selected topics dealt directly with environmental problems. A second proposal was that a conference be planned at which the Biological Science and Society committee might meet with a group of social scientists to interact on the suggested topics or others that might later be suggested.

A third proposal requires a somewhat more lengthy description. During its decade of existence, the central thrust of BSCS had been toward biology education in secondary schools. It was, then, natural that the committee should look to secondary schools as the avenue through which any materials it might produce should be channeled. Therefore, the committee proposed that a group of high school teachers be convened to work out plans for instructional action. The unit of representation was to be a school rather than an individual teacher. Each selected school was to be represented by a biology teacher and a social-studies teacher, and the school administration was to agree that the pair of teachers would be given the opportunity to work together in teaching a course to one or more classes during the following school year. It was the intention of the committee that during a summer meeting each pair of teachers should develop some sort of science-and-society instructional scheme and then attempt during the ensuing academic year to put that scheme into action.

During 1970 each of these three proposals was pursued. And the working out of each has contributed to the development of the others.

The first proposal was obviously preliminary to the other two. As was to be expected, neither the membership of the committee nor the selected topics remained stable, but some rough drafts were produced on pollution, the exploitation of resources, and genetic counseling.

The second proposal required funding. The first meeting of the Biological Science and Society committee had been supported by BSCS itself, but this support was inadequate for the contemplated week-long conference with a doubled personnel. Eventually support was obtained from the Rockefeller Foundation. To secure participants from the social sciences BSCS approached the Consortium of Pro-

fessional Associations in the Social Sciences. The usual difficulties of timing, prior commitments, and failure of communication occurred. The last was particularly threatening because prospective participants from the social sciences received only second-hand descriptions of the intent of the conference. However, difficulties were surmounted, and 13 conferees worked together in Boulder for five days in August 1970.

Before describing this conference and its results, I must return to the third proposal, which involved high school teachers. Funding for this venture was secured from the National Science Foundation. It was officially referred to as a conference, but to avoid confusion I shall use the educationist's jargon and call it a workshop. During the spring of 1970, announcement of the workshop was distributed as widely as possible, but because the media available to BSCS were largely publications reaching science teachers, it seems probable that the initiative for response originated principally with them. At any rate the response was good, and it was possible to be sufficiently selective that the 15 pairs of teachers were derived from 11 different states, ranging from Florida to Washington and from Massachusetts to Texas. Minnesota, Wisconsin, Illinois, and Maryland were each represented by two schools.

Encounters at the Workshop

The workshop met at Boulder from June 22 to July 4, 1970; that is, a month prior to the conference of biologists and social scientists. The BSCS staff—especially Thomas Cleaver and James Robinson—worked with the teachers. In addition two members of the Biological Science and Society committee, John A. Moore and Claude Welch, presented papers and led discussions. The position papers developed by other members of the committee were also available to workshop participants.

Though I was not present at the workshop, I have discussed it with a number of the participants, both high school teachers and staff. The following comments result from putting these discussions together and seasoning the mix with considerable experience in secondary schools.

The two groups of teachers—biology teachers and social-studies teachers—did not communicate easily with each other, at least initially. Even the two teachers of a pair, who came from the same school and who had previously agreed to work together on a course in their school, did not always understand each other. This is not surprising to me. In large schools—say, of more than 2,200 students—teachers in different departments may have little contact with each other, and, if contact is achieved, it is seldom concerned with the structures of the teachers' disciplines but rather with general educational matters, administrative details, or athletic and social affairs. In smaller schools the contacts may be more frequent and close; but there, too, the nature of the contact

does not often contribute to mutual understanding of disciplines.

Further, the staff of the workshop did not communicate well with the high school teachers. In the history of BSCS this is unusual, for the confraternity of secondary and university people in that organization has been one of its distinguishing features and, in my opinion, a fundamental factor in its success. Much of the difficulty at the workshop probably arose from the nebulosity of its task and the divergence of viewpoints from which the participants approached the task. In the long run this initial chaos may have been a good thing. It forcefully demonstrated that interdisciplinary projects are not to be undertaken lightly and require great effort even to get under way. I believe this to be an important point for others who wish to promote similar undertakings.

Whatever their personal and factional relationships, the teachers were committed to the attempt to work together in the fall, teaching a course to one or more classes of high school students. What should be the nature of the course? Apart from the understanding that it was to interrelate methods and materials from biologic science with methods and materials from the social studies, no prescriptions were offered.

By the end of the workshop 11 of the 15 teacher-pairs had produced written plans for their proposed courses, ranging from one-page sketches to a nine-page outline. It is interesting to observe that every one of these was oriented toward environment, and within this theme by far the major emphasis was placed upon pollution. Matters in the area of medicine, such as organ transplantation, psychiatry of crowding, genetic engineering, drug abuse, the meaning and management of death, the control of reproduction—these received very little attention. They are certainly serious matters that must have been within the purview of the biology teachers, if not of the social-studies teachers. Perhaps the biology teachers failed to convey their concern, or perhaps the teachers felt these matters would not appear relevant to high school students, or perhaps the teachers were overwhelmingly swayed by the publicity of the spring of 1970. At any rate the teachers plunked for environment.

Variety of Lesson Plans

Aside from the unanimity of theme, the written plans showed great variety. The divergence of viewpoints among the teachers resulted in a wide repertoire of means. One teacher-pair proposed merely "to incorporate the environmental unit into my regular biology classes" and "to incorporate units on environment into my world history and U.S. history classes." Obviously, in this case a minimum of teacher interaction was contemplated. On the other hand, another pair outlined a special course, "Society, Environment, and Science." The teachers of this course

agreed to work closely together throughout a semester. They specified prerequisites and expected to solicit enrollees from among students they had previously taught. They had arranged with their school principal for special scheduling and had submitted a special budget.

Other plans ranged between these extremes, but most approached the second more nearly than the first.

Some topical skeletons from these plans illustrate the developed thinking in the workshop. Here is an example:

- I. A. Introduction
- B. Water pollution
- C. Air pollution
- D. Population
- E. Culminative action
- II. A. Man's past
- B. Man's present
 - 1. Social and biologic implications of urbanization
 - 2. Social implications of environmental manipulation
 - 3. Social implications of overpopulation
 - 4. Social implications of misused science
- C. Man's future
 - 1. Social implications of genetics
 - 2. Social implications of medicine
- III. A. The human population
- B. Cities and the consequences of high population densities
- C. The local community (a student forum)
- IV. A. Population
- B. Environment
- C. Natural resources
- D. Pollution

One plan was devoted solely to water pollution, but in the milieu of the particular school this may not have been unreasonable. Despite some vagueness, considerable overlap, and a tendency toward narrowness of vision, most of the plans appeared feasible. In general, then, most of the teacher-pairs reached some stage of cooperation during the workshop and, at its conclusion, the prospect for some real interdisciplinary teaching appeared good.

Biologists Meet Social Scientists

I return now to the conference of social scientists and biologists. Two major purposes were to be served. One was simply to provide an opportunity for selected persons from these two groups to interact. Then, if sufficient communication could be established, it was hoped that members of the two groups, working in pairs, might produce some written materials that could be tested for usefulness in secondary schools by the high school teacher-pairs from the June workshop.

The biologists' group consisted of the BSCS Science and Society committee: Bentley Glass, Garrett Hardin, Haven Kolb, Harold Liebherr, John Moore, and Claude Welch. (Bruce Wallace, also a member of the committee, could not be present.) The social scientists, from CONPASS, were Lewis Dexter, sociology; John Fraser Hart, geography; James Birren,

psychology; James Spuhler, anthropology; Robert Rienow, political science; Michael Teitelbaum, demography; and Gilbert White, geography.

This conference proceeded quite smoothly. By the end of the first day, agreement was reached on topics to be developed and on persons to develop them. Most of the remaining time was spent in writing, by individuals and by pairs, ending with reports to the whole conference.

The topics developed by pairs of conferees were "Population" (Hardin and Teitelbaum), "Aging" (Birren and Glass), "Hunger" (Hart and Liebherr), "Genetic Counseling" (Spuhler and Welch), and "Pollution" (Dexter and Kolb). In addition, White reacted to a document developed by Wallace on the environmental consequences of resources that are in the domain of the commons, Rienow developed an outline on the topic "Can We Afford to Poison Our Earth?", and Moore worked on a study guide for a synthesis of these topics.

The products of this effort—some subsequently touched up but most in the rough form resulting from rapid composition—were mimeographed and dispatched to the high school teacher-pairs. At present we do not know to what extent these materials have been used.

Comparison of the Conferences

One of the important results of the two conferences in the summer of 1970 was the contrast between the way the conferees interacted within the June group and the way they interacted within the August group. I have indicated that there was considerable difficulty of communication between the two groups of high school teachers: those who were biology teachers and those who were social-studies teachers. While there was certainly no instant meeting of minds at the August conference, each of the groups at least seemed to be using similar languages with many mutually intelligible idioms and figures of speech.

I think there is a credible explanation for the contrast between the two groups in communicability. It may have been noted that I have consistently referred to one of the high school groups as *social-studies* teachers and to one of the August groups as *social scientists*. There is nothing perjorative in either designation. The distinction conforms to usage and has some important implications.

In my experience the training background of high school social-studies teachers is predominantly in history. Geography usually has a place in it but is largely descriptive in nature. There is a scattering of courses in economics, sociology, and anthropology. On the whole, social-studies teachers, I think, look upon themselves as humanists. My experience is limited, but I have never met personally one who considered his work to be in the field of *science*, though I am sure some do exist. And, through the efforts of current curriculum projects, such as those

in geography and anthropology, the number is probably increasing.

On the other hand, all of the participants in the August conference, however widely their areas of investigation diverged from each other, nevertheless had some commonalities in the way they looked at problems and in means of attack on problems. We might say, metaphorically, that all recognized in Galileo something more than the loser in a tilt with the Inquisition.

If my conclusion from the contrasting behaviors of the participants at the two BSCS-sponsored 1970 conferences is valid, then it ought to be taken into account in future efforts to secure interdisciplinary cooperation at the interface between natural science and social concern. We must expect greater ease in securing cooperation at the college level than at the secondary level. But, as I indicated near the beginning of this paper, the *importance* of securing such cooperation is greater at the secondary level.

A second point can be made on the basis of experience from the two 1970 conferences. Whether communication be easy or difficult, the meeting of practitioners from diverse disciplines can be productive—and this at either the research level or the instructional level. It can be productive, of course, in the broadening of perspective in the conferees themselves. It can be productive, further, in the influence that the conferees can later wield among their colleagues. But, most importantly, it can be productive in the primary sense of producing materials that lead to action in instructional programs.

Courses Tried in Two Schools

I return now to the high school teachers' workshop. When the teachers left Boulder some promising plans had been made. What instructional action has resulted? At present we have no full reports; however, I have gathered some information from two of the 15 schools.

At Cherry Creek High School, in Englewood, Colo., Daniel Van Gorp, biology teacher, and Mark Hampshire, social-studies teacher, working closely as a team, have carried their summer plans into the development of a one-semester course, which they call "Human Ecology." It has the following framework:

- I. Introduction: life styles, basic ecology, government, and politics
- II. Examination of ecologic problems: international, national, state, and local. The agencies and processes for resolving problems
- III. The population problem (includes laboratory experiments)
- IV. Air and water pollution (includes laboratory experiments)
- V. Man's relationship to man: priorities
- VI. Student presentation of projects that incorporate materials previously discussed

The school uses modular scheduling, which allows

class meetings in varied patterns. This has enabled the teaching team to include in the course a number of outside speakers and several field trips. Speakers have been used to present divergent viewpoints on a topic; for example, a biologist spoke on populations, a priest on birth control, and a social worker on planned parenthood. Discussions are based largely on current materials gleaned from newspapers, magazines, and television programs.

Both teachers are present at all class meetings; this promotes the exploration of varied points of view. Differences between the two members of the teaching team do develop, Van Gorp reports; but, he continues, "Both members of the team contribute to the class discussions and program. Students must have the benefit of this experience to fully understand the problems of today. Our team differences are constructive."

At Lansdowne High School, in a suburb of Baltimore, Md., Benjamin Poscover, biology teacher, and Thomas Fort, social-studies teacher, working as a team, have also developed a one-semester course, which they call "Society-Environment-Science." As in the Cherry Creek course, students are drawn from the 11th and 12th grades and have had courses in general biology and in world history.

The Lansdowne course is taught within the framework of conventional school scheduling. The class is divided into committees, which have responsibilities for working up presentations on such topics as air, water, population, and commercial activities. These presentations are developed not only from secondary sources, such as films, books, and magazines, but also from field experiences, laboratory investigations, and interviews with persons in the community. The aim is to create student awareness of the social implications of biologic matters that deal with the numbers of people, the needs of people, the interrelationships of people, and the expectations of people.

At both Cherry Creek and Lansdowne the courses are reported to be going well. Student interest and participation are high, though Van Gorp reports that students when ranging beyond the classroom "have run into frustrations and find the public quite apathetic to the environmental problem."

Because of their similarities, Cherry Creek and Lansdowne form a very biased sample of the 15 schools; but any assessment is premature. In the early summer of 1971 the 30 teachers will reconvene at Boulder to report their experience, to evaluate the project, and to make recommendations for possible future endeavors.

Opportunities and Responsibilities

Whatever may be the outcome of the BSCS un-

dertaking I have here described, there will undoubtedly be in the 1970s many similar undertakings. Environmental problems are not going to fade away. People of high school age will continue to be interested in these problems, the more so as they come to realize that all other social problems are corollary to them. Teachers will continue to seize the educational opportunities presented by this student interest. To me as an educator, the primary concern is this: that the scientist maintain his credibility as a scientist, that the humanist maintain his guardianship of culture and civility, and that both, true to their respective traditions, preserve in the midst of turmoil, faith in human rationality.

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desirable. This is largely a matter of pedagogic convenience. My primary aim in this paper is to stimulate educators to initiate courses and programs calculated to deal with a range of educational deficiencies. I am aware that a proposal for a course that seeks to transcend narrow disciplinary barriers remains in the realm of the abstract, regardless of whether it is a course in social biology or philosophic psychology or political economy.

Perhaps more important is the selection of highly creative teachers to staff such courses. More than ever before, we are in need of men and women who themselves are knowledgeable not only in their professional specialties but in a wide range of intellectual disciplines. We need (as Ortega y Gasset so wisely noted) professors who possess a remarkable talent for synthesis and integration. And we can hope that they will also possess the gift of creative teaching. The time has come for some unpleasant honesty: we do not now encourage or reward good and conscientious college and university teaching, and our rhetoric to the contrary all too often smacks of hypocrisy. These are the men and women who can make a course in Biology and Society a valuable addition to the university curriculum—teachers who can simultaneously impart valuable intellectual content as well as promote intellectual curiosity and the development of critical and analytic abilities. There are always highly creative students—whatever their primary interest or competence—who will pursue their curiosity into other realms of knowledge in their quest to become genuinely educated, cultivated, and sensitive persons. A major task of the university should be to institutionalize arrangements that will facilitate this endeavor.