

Global Issues in High School Biology Textbooks



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In establishing the theme of the September, 1984 issue of *The American Biology Teacher*, which focused on human ecology, guest editor Rodger Bybee, wrote, "In biology education, we must begin with a new vision, presently a conceptual design with *global dimensions*" (p. 104). Global dimensions would seem to be a natural aspect of biology education because biology has taught us so much about the unity of life. From the study of evolution, we learn that all living things originated from a few primitive life forms. From genetics, we learn that the genetic code is a universal code for terrestrial life forms. From biochemistry, we learn that the basic mechanisms of life are very similar in seemingly diverse life forms. Finally, from ecology, we learn that we are all part of an interrelated web of life on spaceship earth.

The stage would then seem to be set for biology to take a lead in bringing a global perspective to science education. But, what are the global dimensions of biology education in recent years? One indicator is the attention devoted to global issues in biology textbooks, because textbooks have been identified as the prime determiners of science curricula (Stake and Easley 1978; Yager and Stodghill 1979). During a recent study of the treatment of social issues in 22 high school biology textbooks published between 1963 and 1983 (Rosenthal 1984), I had the opportunity to assess the global dimensions of these textbooks. The purpose of this article is to describe the results of that assessment.

Background and Definitions of Terms

A *social issue* is defined here as "a matter that has been or is disputed by society or is yet to be decided by society" (see "issue," Guralnik 1980). The term "issue" needs to be distinguished from both "concept" and "problem." A concept is an idea that

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groups objects or other concepts "on the basis of some common characteristic or relationship" (Gorman 1972). An example of a concept in biology would be "the basis of all food chains are photosynthetic organisms." Problems "are perplexing questions or situations that call for a practical solution" (Ladd 1982). An example of a biology-related problem is "how can we supply enough food to feed a growing population?" Issues, however, "represent divisions of opinion, ethical disagreements, clashes of ideas and beliefs" (Ladd 1982). An example of a biosocial issue is: "Who shall be fed when food resources are limited?"

The extent to which a social issue has worldwide implications is the *global dimension* of the issue. A social issue with a substantial global dimension is a global issue. Global issues can be presented with varying degrees of global dimensions. The degree of globalism in a textbook presentation depends not only on the nature of the issue, but on the global perspective of the author(s). Thus, some social issues that clearly have global implications, i.e., are global issues, may be presented only from the viewpoint of the United States.

Methods of Analysis

Twenty-two high school biology textbooks, published between 1963 and 1983, were selected. Nineteen of these were editions of textbooks identified as among those most frequently used in biology classes (Weiss 1978, Table B 2.2) and/or having the greatest percentage of national sales in 1976 (Lowery and Leonard 1978). Three textbooks with first editions dated 1980 or later were added to the 19 to give additional data on recent trends. The 22 textbooks used are listed in Table 1.

The total length of each textbook was determined

to the nearest tenth of a page by actually measuring, page by page, the amount of text. These measurements excluded space devoted to title pages, reading lists, illustrations, prefaces, chapter summaries, outlines, questions, etc. It was felt that these would be a more meaningful measure of total length than the numbered pages in each book.

The textbooks were read in random order and the contents analyzed and classified as to whether they did or did not deal with a social issue. If the latter was the case, the relevant portion of the text was classified into one of 12 categories of social issues (Table 2), and the length of the selection was measured to the nearest tenth of a page. The amount of space devoted to each category was then expressed as a percentage of total text length. The lengths of selections with a global perspective were added to give an estimate of the global dimensions of each textbook.

The twelve categories of social issues were based on an extensive review of the literature on biosocial issues and a questionnaire mailed to 25 experts in biology, ecology, bioethics, social studies and science education. The questionnaire included a list of 87 so-

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cial issues and a list of 14 categories of social issues. Respondents were asked to classify each of the 87 issues into one of the 14 categories or to create new categories if necessary. Twenty questionnaires were returned and analyzed.

The analysis included: (1) determination of the modal responses for each issue; (2) comparison of the modal responses with those of the investigator; (3) identification of categories that were ambiguous. There was a mean percentage of agreement [(number of questions for which the modal responses agreed with investigator/87) × 100] of 84% between the modal responses of the panel and the investigator. The panel recommended no substantial changes in the list of categories but they revealed two categories to be ambiguous and overlapping of other categories.

Table 1. Textbooks Used in Present Study

Title	Author(s)	Publisher	Date	(Edition)
<i>Biology: Living Systems</i>	Oram R. F.	Charles E. Merrill	1973	(1st ed.)
			1976	(2nd ed.)
			1979	(3rd ed.)
			1983	(4th ed.)
<i>High School Biology (Green Version)</i>	Biological Sciences Curriculum Study (BSCS)	Rand McNally	1963	
			1968	
<i>Biological Science: An Ecological Approach</i>		Houghton Mifflin	1973	(3rd ed.)
			1982	(5th ed.)
<i>Biological Science: An Inquiry into Life (Yellow Version)</i>	Biological Sciences Curriculum Study (BSCS)	Harcourt, Brace and World	1963	(revised ed.)
			1968	(2nd ed.)
<i>Biological Science: Molecules to Man (Blue Version)</i>	Biological Sciences Curriculum Study (BSCS)	Houghton Mifflin	1973	(3rd ed.)
			1980	(4th ed.)
			1963	
<i>Biological Science: A Molecular Approach</i>		D. C. Heath	1968	(revised ed.)
			1973	
<i>Modern Biology</i>	Moon, Otto, & Towle Otto & Towle Otto, Towle & Bradley	Holt, Rinehart & Winston	1963	
			1969	
			1981	
<i>Macmillan Biology</i>	Creager, Jantzen, & Mariner	Macmillan	1981	
<i>Scott Foresman Biology</i>	Slesnick, Balzer, McCormack, Newton, & Rasmussen	Scott Foresman	1980	
<i>Biology, The Science of Life</i>	Hanson, Lockard, & Jensch	Houghton Mifflin	1980	

As a result, the 14 categories were reduced to the 12 listed in Table 2. A further validation of the 12 categories resulted from the content analysis of the 22 textbooks referred to earlier (Rosenthal 1984); all issues identified in that analysis could readily be assigned to one of the 12 categories. For example, the social issue cited earlier, i.e., "who should be fed?" would be classified in the category "Food Supply/Agriculture."

Results and Discussion

Global dimensions were found almost exclusively in five of the 12 categories of social issues: population, food/agriculture, human health, energy resources and environment (see asterisks, Table 2). The percentage of space devoted to global perspectives of these issues was very small, ranging from 1–5% of the total text. Furthermore, the list of topics approached from a global perspective was quite limited: population growth, population control, food supply, uses of resources, farming the tropics, destruction of ecosystems and diseases (primarily malaria) of developing countries. Very few of the textbooks addressed all of these global issues and, in almost all cases, the treatments were brief and superficial. The conclusion from this study was that there is a lack of a global perspective in the 22 textbooks. The impression one gets from reading them is of the United States as an island, untouched by and untouched the rest of the world.

The 1963 edition of *Modern Biology* (Moon, Otto & Towle) is especially deficient in global perspective, referring only briefly to tropical diseases. In discussing human progress, it states without qualification that "Life is, for the most part, easy, pleasant, and enjoyable" (p. 423). The 1969 edition (Otto and Towle) gives a more extensive treatment of tropical diseases but, again, presents no other issues in global terms. The 1981 edition (Otto, Towle & Bradley) adds brief references to the global aspects of population growth, food supply and environmental problems.

The most recent edition of *Biology: Living Systems* (Oram 1983) also shows an increase in the number of topics in which global implications are discussed, compared to the earlier editions. These references may be very brief, as in the case of malaria ("Even today in tropical regions, at least a million persons per year die of malaria," p. 247) or more extensive, as in the case of farming the tropics:

... in recent years there has been great pressure to develop the land now occupied by the tropical rain forest. Roads are being cut, and many areas are still being cleared for agricultural purposes. Unlike forests in other biomes, the tropical rain forest is unable to recover through secondary succession once destroyed. Some scientists believe that all tropical rain forests will

Table 2 Categories of Social Issues in High School Biology Textbooks
The Nature of Science The Sociology of Science Human Behavior *Population *Food Supply/Agriculture Human Reproduction Human Genetics *Human Health Evolution *Energy Resources *Environment Space Research/Exploration
*indicates categories treated from a global perspective

be destroyed by the year 2000 if current development of the land is not stopped. (p. 666).

The BSCS Blue Versions of 1963 and 1968 contain no references to world problems. The 1973 edition has an extensive and quite sophisticated presentation of population problems in various countries around the world. The 1980 edition eliminates this, but touches on a greater variety of global issues; however, the treatment of each is minimal.

The BSCS Green Version and Yellow Version give the greatest sense of global perspective; both in the number of issues treated as global matters and in the length and depth of the treatments. In both of these textbooks, the earlier editions give more space, and a more sophisticated treatment, to global issues than do the later editions (1982 and 1980, respectively). This may be due in part to the shorter length of the texts, a general trend in biology textbooks in recent years.

The Macmillan *Biology* (Creager, Jantzen & Mariner 1981) gives some attention to the global aspects of population growth, food supply, disease and use of resources. The Houghton Mifflin textbook (Hanson, Lockard & Jensch 1980) is less globally oriented, and the Scott Foresman *Biology* (Slesnik, Balzer, McCormack, Newton & Rasmussen 1980) is almost devoid of global references.

It seems, therefore, that those textbooks that began in the 1960s with few or no references to conditions in other countries have given increased attention to global matters in recent years; those textbooks that began with quite lengthy treatments of at least some global issues have increased the variety of issues treated, but devoted less space to each issue; and, the three textbooks published for the first time in recent years give scant recognition to the global nature of biological problems. Even the best of the textbooks, from the global point of view, the BSCS Green

and Yellow Versions, hardly live up to the promise implicit in the statement that

The many interdependent global problems include the population explosion, environmental pollution, and the distribution and use of energy and resources. These problems threaten, if not the survival of the human species, the quality of our lives. (BSCS Green Version 1982, p. 723).

Conclusion

The results of this study indicate that a global perspective in biology education is indeed "an imagined world" (Bybee 1984, p. 104), rather than the real world of biology education. The real world of biology education, based on the study of almost two dozen textbooks published during the past 20 years, gives little recognition to how current issues impinge on the lives of people outside the United States or to how the lives of people in the United States are influenced by conditions in the rest of the world.

My purpose in describing the results of analyzing the global dimensions of these textbooks, i.e., the real world of biology textbooks, is to enable us to imagine a world of biology textbooks with truly global dimensions. Beyond imagining, it is a plea to educators, writers and publishers to do what needs to be done to help biology textbooks bring the global realities and the reality of globalism to high school students.

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