

Science and Society: Enrichment Exercises in Biology

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A PROJECT TO INTRODUCE biology students to the impact of biology upon society, entitled *Societal Enrichments in High School Biology*, has been introduced at Cedar Falls (Iowa) High School. Brief individualized exercises have been designed to give the student an opportunity to discover the growing influence of the biological sciences on the world's cultural, economic, political, and social systems. To date, forty enrichment exercises have been developed around six controversial areas:

- Developments in modern genetics
- Human experimentation
- Human behavior control
- Health care problems
- Population control
- Environmental issues

Each activity presents a specific issue to the student through one or more concise, informational articles. After reading the materials, the student is asked to react to the issue. Methods that have been used include in-depth library research leading to a written report or class presentation; a class presentation directly involving other class members; a survey of persons in the community with a tape recording of the reactions, and presenting these comments to the class; further research into a subject area by contacting a resource person in the community; and discussion with the biology instructor on a one-to-one basis.

Of the six subject areas, modern genetics proved to be one of the most fruitful of the resource materials. Some of the topics that have been developed into exercises include the inheritance of human intelligence, cloning, "test tube babies," genetic engineering, eugenics through sterilization, genetic screening, and the correction of genetic defects.

The concept of genetic screening is presented by having the student read selected excerpts from the article "The Politics of Genetic Engineering: Who Decides

Who's Defective?" After reading the material, the student is directed to find out whether there are any mandatory genetic screening tests given in the state of Iowa. If such tests exist, the student is asked to investigate further the details of the tests and the purposes for administering them. The student is also asked to determine whether there are any other nonmandatory but frequently used screening tests in Iowa. The information gathered may be presented in the form of a written report. If the entire biology class happens at the time to be involved in the study of genetics, the material may be presented orally and discussed with other class members.

Another approach, entitled *Correcting Genetic Defects*, probably involves deeper thought on the part of the participant. The booklet *Genetic Counseling*, which briefly describes the process is assigned to read along with the news article "Correcting Enzyme Defects in the Test Tube." Then the student is asked a series of questions. For example: What implications might the new "intracellular engineering" techniques have upon the field of genetic counseling in regard to certain genetic diseases? What effects might intracellular engineering have upon the future incidences of the genetic dis-



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eases mentioned in the article? Do you feel that such techniques should be continued and developed? Since this topic deals with rather complex biological information, the teacher and student discuss information gained and interpretations made on a one-to-one basis.

The use of the human fetus in biological research is the topic of an exercise dealing with human experimentation. The student reads a brief article, "The Ethics of Human Experimentation," which speaks in part to the subject of using live aborted fetuses in research studies. Both sides of the issue are presented. The student is then asked to design his own set of ethical guidelines for future research on live fetuses. After the student has formulated guidelines, he or she is given an article that discusses the present guidelines as devised and regulated by the Department of Health, Education, and Welfare for comparison. Other exercises dealing with human experimentation have been developed around the use of retarded persons, felons, and the mentally retarded as subjects for scientific experimentation.

Control of human behavior through the use of such techniques as psychosurgery and chemicals have furnished topics for a number of enrichment exercises. Behavior modification-lobotomy is a subject for an exercise that can be brought to the attention of an entire biology class during a study of the nervous system. First, the individual doing the enrichment is asked to research the technique of lobotomy. Next, the student is asked to read several case histories describing both favorable and unfavorable results from using the technique. Finally, the student is asked to react to each case study. Should the technique be regulated? If so, how would you regulate this surgical technique? The student completing this exercise can present the information gathered along with his or her reactions to an entire class. Such a controversial topic usually generates a worthwhile discussion.

A method used in approaching the area of population control is an initial presentation to the student of an opinion from a medical researcher stating the scientist's belief as to when life begins. The student then surveys a sample of the student body, recording on tape their ideas as to when life begins. The opinion of the "authority" can then be compared with a variety of student opinions.

We can also involve the student in the area of environmental ethics. The nuclear power controversy is an especially relevant issue. Several exercises have been designed to deal with this subject. One deals with the subject of the safety of nuclear power plants to the environment. A student is given one major background article along with two supporting articles to read. In general the articles present some of the pros and cons of the issue. The student is asked to summarize the major points of the articles and submit them orally to an entire biology class. After the presentation and a question-answer session with the class, a questionnaire is ad-

ministered to the class members. The instrument is a yes-or-no type of device attempting to urge the student to take a definite stand on the questions. Students who appear to be definitely against nuclear power plant construction are then confronted with a copy of a letter addressed to the governor of Iowa. The letter strongly expresses opposition to power plant construction and contains a series of rather drastic energy conservation measures that the individual writing the letter promises to pursue. It is then determined how many students in the class would actually be willing to sign this type of letter. At this point a very interesting series of confrontations develop among the class members. Much good discussion results and a better understanding of the complexities of the problem seems to emerge.

Several enrichment exercises have been constructed relating to the issues of health care and modern medical techniques. The adequacy or inadequacy of health care in the United States is one subject brought under consideration. Enrichments dealing with controversial surgical procedures, artificial organ implants, and euthanasia upon demand are also included in the health care category.

The societal enrichment exercises have proven to be an inexpensive means of exposing biology students to some of the problems of our time. The number and variety of exercises are limited only by the imagination of the developer. Articles that can form the nuclei of new enrichment studies are published each week in the newspapers and news magazines. Although it has not been tried at Cedar Falls, it may be worthwhile to encourage students to construct additional enrichment studies that are continuations of teacher-devised studies.

We have used two methods of implementation. To some classes we have offered the exercises on a voluntary basis as extra credit opportunities. With other classes the completion of one enrichment exercise per semester has become a course requirement. A set of packets including all of the currently available enrichments has been produced. Each packet contains only those exercises relating to a particular controversial area. As new exercises are developed they can be added to the appropriate packet.

An ongoing process of evaluation is necessary for each exercise. Through constant solicitation of student opinion as to instructive value and interest, the less useful exercises can be improved or removed.

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