Role-Playing in the Biology Classroom

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Today, students are much concerned about the social implications of their studies. This is as it should be. There is no doubt that the study of biology is necessary for a thorough understanding of man's problems and for the development of solutions to these problems. However, what a teacher may find obviously relevant often has little meaning to a student. Therefore the teacher must try to show the student the importance of each topic: its relationship to contemporary man and to the man of the future.

Students can be helped to a greater awareness of the complex relationships that exist between biologic studies and social problems by means of role-playing in the classroom. The unusual situation of attempting to understand the position of another person and of having studied that position so well that others can be convinced of its validity is a challenge and a valuable experience. In addition to providing a variety of activities—independent research, small-group discussion, debates—the technique stimulates a different kind of interest in biology and maintains interest at a high level.

Preliminaries and Arrangements

Organization of role-playing begins with the recognition of a problem, such as the destruction of wildlands, overpopulation, or genetic engineering. Then the teacher and the class find a suitable setting for examination of the problem: a town meeting to discuss rezoning, a congressional hearing to consider changing a law, or a debate between candidates for elective office. The students are given some background information, and each is assigned or selects a role to play within the setting.

The students are first asked to research the problem in general. Subsequently they search for the attitudes, opinions, and reasoning that their assigned roles would represent. Students with roles that have similar interests may form small groups to discuss strategies.

Two or three days before the meeting, the students prepare position papers, if they desire; however, they must be prepared to answer questions and to discuss and defend any statement they make.

Physical and procedural arrangements vary with the program, but an attempt should be made to duplicate the actual setting as closely as possible. Chairs and tables should be appropriately arranged, a rostrum should be provided, and the students should be given identification cards. One student is assigned the role of judge or chairman; he is responsible for control of the program and for summarizing the session.

In selecting roles for the students, as wide a spectrum of backgrounds as possible should be chosen—from motel owners to doctors. Best results seem to be obtained when both sides of a controversial topic are about equally represented or are weighted slightly toward the view opposed by most of the students. Those students assigned the roles of authorities are expected to have appropriate documentation to support their statements. All students are encouraged to challenge unsupported statements and to be wary of faulty arguments and false logic.

Each session has four parts: presentation of position papers, interrogation of those testifying, a conference of the lawmakers to prepare their decision, and a general discussion. Most sessions last two class

Fig. 1. Arguing for the right to build an industrial complex on a filled estuary, "contractor" makes a satisfying point.
periods. (If they last much longer, interest begins to wane.) Usually there is much duplication of testimony—a situation not uncommon in actual town meetings and hearings. If the pace of the session slows down because of this, students may be directed to limit their testimony to new information or to restrict themselves to major arguments. The question periods can become quite hectic; if so, they require firm control by the student chairman. The conference of lawmakers may take place in private chambers or before the class; but if the latter arrangement is chosen the class must remain as observers only. During the follow-up general discussion the decision of the lawmaking group is examined from social, political, scientific, moral, and economic viewpoints.

Industrialize a Seaside Town?

Environmental problems hold many possibilities for role-playing. In the following typical situation the students are presented with this background:

A once-fashionable seaside resort of 10,000 people depends almost entirely on a diminishing tourist trade for its income. The only year-round source of income is a small but flourishing fishing industry. The population has been decreasing for the last two years because of a lack of jobs. There is little money available to maintain homes and buildings in attractive condition. The school system is suffering badly, the dropout rate is high, young people tend to leave the town permanently, and arrests of juveniles have risen precipitously. Most of the unemployed belong to minority groups.

On the north and west sides of the town is a large estuary. A land developer has purchased the estuary shore in order to build a heavy-industry complex, which will include a small oil-refinery and a metal-treatment plant.

A hearing is called by the mayor to determine whether it will be in the best interest of the town to extend a permit for the "industrial park." After this hearing the town council will make the final decision. (Incidentally, the mayor recently was elected for the fifth consecutive time, in an election that drew few voters and aroused little interest.)

The roles to be played are as follows:

MEMBERS OF THE TOWN COUNCIL

Mayo
Barber
Retired professor of English
Owner of beach-front hotel
Owner of novelty shop
Owner of fishery business
PTA president
Lawyer

PERSONS TO TESTIFY

Lawyer for the land developer
Economist for the land developer
State Conservation Dept. representative
State senator
State university ecologist
School board president
Police chief
Motel owner
Oil refinery representative
NAACP representative
Owner of sport-fishing boats
President of hunting and fishing club
Social studies teacher

JUDGE (presides over the hearing)

Control Population by Law?

The population problem is an excellent subject
for role-playing. A suitable setting would be a congressional hearing to gather testimony on measures to control population growth in the United States. Four students are responsible for presenting an outline of population-control measures they believe could be translated into law. They are requested to include actions that would be necessary in an overpopulation crisis. Copies of the outline are given to each class member two days before the hearing, so that effective counter-arguments can be prepared.

Four other students are asked to prepare counter-testimony. The rest of the class is assigned roles as members of Congress; they will hear the testimony, question the witnesses, and offer the concerns of the special interests they represent.

Roles for the population-growth hearing are as follows:

**FOR POPULATION CONTROL**
- Zero Population Growth representative
- Ecologist-conservationist
- Social worker
- Geneticist

**AGAINST POPULATION CONTROL**
- Economist
- Clergyman
- Industrialist
- "Green revolution" agriculturist

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**MEMBERS OF CONGRESS (FICTIONAL) AND THEIR INTERESTS**
- Alabama: fundamentalist, farming
- New Jersey: urban, black
- Indiana: blue-collar workers
- Florida: tourist industry
- New York: wealthy, suburban professionals
- Nebraska: Corn Belt farming
- California: college town
- Massachusetts: Catholic constituency
- Texas: cattle-ranching
- Alaska: undeveloped region

The above descriptions are not meant to characterize the attitudes of the people in any particular state. They are only intended to alert the student to influences that may guide the decisions of legislators—and to provide a diversity of opinion to enrich discussion. (It is interesting to note that students seldom take stereotyped positions when they have researched their roles well. For example, the student in the role of the Catholic clergyman usually reports that the church is not against population control per se; rather, it opposes certain means of control. It is important that students learn such distinctions. They should also understand that not all persons within a group think exactly alike.)

Because population growth in the U.S. has recently reached the equilibrium rate and because an "ecologic backlash" has produced much writing refuting the concerns of environmentalists, there is much ammunition available for good arguments from both sides.

**More Than Just Acting**

The initiation of role-playing should not be difficult for biology teachers, who have experience in

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leading group discussions, guiding independent study, and stimulating creativity through inquiry. Role-playing is an extension of these activities, not only in biology or in science generally but in other disciplines, primarily the social sciences. It is a pleasure to see class discussion spill out into the halls after class has ended or to learn that students have discussed the problem with their families over the dinner table. Even though role-playing seems to be "just acting," each student puts a part of himself into the role; and because of this the activity becomes more real and more meaningful.

Acknowledgment.—Fig. 1 photo is by William Freedman; fig. 2 and 3 photos, by Wilbur Hurst.

Auditioning AudioVisuals

By staff members of the Audio-Visual Center of Indiana University, unless otherwise noted

The cell, a functioning structure. Film: 16mm, sound, color; part 1, 29 min, part 2, 32 min. 1972. CRM Educational Films, Del Mar, Calif. Price not given.

If one is looking for teaching films that take up each of the many cell structures individually and discuss their functions, the title of this film (which is in two separate parts) is misleading, for that is not what it does. Rather, it takes up selected structures and their functions. Within this limitation the film does an interesting and professional job.

Part 1 begins with a variety of life forms and then turns to the cell as the basic unit of life. A series of shots of Paramecium through each of the several kinds of microscopes, illustrating increased magnification and resolution, is interesting. The first function dealt with is phagocytosis, and some interesting points are made. Unfortunately the visual presentation of a food vacuole fusing with a lysosome in Amoeba is not at all clear. The film progresses to a discussion of cellular reproduction and then to the involvement of microtubules in movement in cells. An interview with Richard McIntosh, of the University of Colorado, brings out contemporary theories of microtubule function. The film ends with a discussion of cell membranes, including facilitated transport by protein carrier molecules, and with a summary.

Part 2 begins with a discussion of the central role of protein molecules in all living cells and presents a good diagrammatic explanation of protein synthesis. This is followed by an interview with Elmer Anderson, who discusses sickle cell anemia as a genetic disease resulting from an error involving one amino acid. Protein synthesis requires energy. In another interview Lynn Margulis, of Boston University, discusses the role of the mitochondria and her views on the evolution of mitochondria. Because the ultimate source of the energy is sunlight, the logic of the film leads next to an interview with Donald P. Foose, of the University of California at Irvine, concerning the structure and functioning of the chloroplast. The product of photosynthesis—glucose—is then related back to protein production, and the uses of protein both for structural purposes and as hormones (some) and enzymes are discussed. The turning on or off of genes brings in a brief discussion of the Jacob-Monod hypothesis and the role of repressor proteins. This is then related to development.

David Suzuki, of the University of British Columbia, narrates both parts of the film and conducts the interviews. The photography is very good. However, one gets the feeling that there is rather too much narrative—that the film is a lecture that includes interviews. The film could have been made more compact, with more direct attention paid to cell structures and their functioning. For instance, there are better films and filmloops on mitosis. One must remember, however, that this film does not pretend to be all-inclusive. One suspects that a major objective was to bring viewers in contact with research biologists; and in this the film succeeds very well. It could be viewed profitably by high-school students and college undergraduates.

Harper Follansbee
Phillips Academy
Andover, Mass.


This film introduces the continuous and predictable sequence of light and dark and explains how nocturnal and diurnal organisms respond to this natural rhythm of the earth. It studies the responses of numerous plants and animals to the interruption of natural rhythm. The film concludes with an open-ended discussion of human response to altered rhythm brought on by advances in technology, considering such effects as "jet lag" and space travel.

The sound and visuals complement one another and are synchronized exceptionally well. The visuals are sharp, creatively organized, and well exposed.

The film may give the viewer the impression that only one kind of rhythm—light-dark—exists in nature. The experiments are explained superficially but, as an introduction, are certainly acceptable. The film would be useful from junior high through college.

Getting Rid of Junk Cars

The state of Minnesota is funding six counties under a new program designed to keep junked cars from becoming roadside eyesores. The counties have contracted with the state to collect auto hulks. The program is funded by a $1 auto-transfer surcharge.

Live-Animal Imports

Imports of live wildlife into the U.S. in 1971 (latest figures) were 103,000 mammals, 995,000 birds, 99,000,000 fish, 6,000,000 mollusks and crustaceans, 391,000 amphibians, and nearly 500,000 reptiles. The shipments were federally inspected to determine that the laws of the countries of origin had been complied with.