

Projector Center

Using an Overhead Projector to Initiate Discussion of Life and Non-Life

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The following demonstration and role-playing activity can be used to involve your students in a serious consideration of the following questions: 1) How does one differentiate between living and non-living? 2) How does one define life and death? 3) Are there certain situations in which active euthanasia could be morally "right"?

This activity is defined into four segments. The first three can be conducted within one class period; the last segment requires two separate class sessions.

Part I illustrates how the overhead projector can be used to display movement caused by a specific chemical reaction. This demonstration has been successfully employed in high school and college introductory biology classes.

"Alive or Dead?"

Part I—This part of the activity deals with the preparation and demonstration of "The Beating Heart." The directions are as follows:

1. *Preparation of "The Beating Heart."* Place a pool of mercury about $\frac{3}{4}$ " in diameter in a 3-4" watch glass. Cover the mercury with $6\text{M H}_2\text{SO}_4$. Add 1 ml. of $0.1\text{ MK}_2\text{Cr}_2\text{O}_7$. Place an iron nail in the watch glass so that its tip just touches the mercury and the nail lies along a radius of the glass.

2. *Demonstration.* Conduct this demonstration using an overhead

The Projector Center department presents ideas for improved and innovative educational uses of audio-visual devices. Also, full-page transparency master drawings of important organisms or biological ideas are included. Biology teachers are encouraged to machine copy these drawings to produce their own transparencies for use with overhead projectors.

Ideas are always needed for the Projector Center. Ideas for innovative science teaching uses of A-V devices and drawings for transparency masters should be sent to Dr. Charles Barman, *ABT* Projector Center Department Editor, **Horace Mann School, Northwest Missouri State University, Maryville, MO 64468**. (Guidelines for submissions are available in the January 1982 issue of *ABT*.) Please send an original plus 3 copies of all submissions. Full credit will be given, of course, to authors of all ideas or drawings published.

projector so that "The Beating Heart" can be projected on a screen or wall. Slowly add 0.5-2.0 ml. of $18\text{ M H}_2\text{SO}_4$ above the pool of mercury. As soon as rhythmic motion occurs in the mercury, stop adding the acid.

3. *Additional comments.* The pool of mercury will continue to beat for hours if the iron nail is held firmly in place. For this reason, you may prefer to use an iron wire connected to an external handle resting on a desk or table. This allows an easier adjustment of the position of the iron to give maximum beats.

Part III—Divide your students into groups of four or five and ask them to discuss the following:

1. Do you feel that the object projected on the screen was alive or dead?
2. Explain the rationale for your answer.

Provide time for each group to share its views with the rest of the class. At the end of this discussion, describe the composition of "The Beating Heart" to your students.

Part III—Pass out the following description of a hypothetical situation for your students to read:

John Doe, 18, has been in a coma and connected to a respirator for three weeks. Without the continuous aid of this machine, he would stop breathing and eventually his heart would cease to function. Electroencephalograph readings taken on John, 12 hours apart, indicate almost negligible brainwave activity. However, occasionally (about once every five minutes) John demonstrates the ability to swallow and blink.

John Doe's parents feel that he is dead. They believe that the signs of life exhibited by John are only due to the respirator. In addition, having their son connected to this machine is costing the Does over \$1,000 a week. Their monthly income can in no way support this medical service.

The medical staff attending John have mixed feelings regarding his condition. Some members of the medical team feel that John is still alive. Therefore, in their minds, to remove him from the machine would be an act of homicide.

Tomorrow Mr. and Mrs. Doe are going to court to seek a legal ruling

regarding the disconnecting of John from the respirator.

Part IV (Role-playing the court hearing)—Divide the class into two groups. One group is to defend the parents' point of view. They are to prepare some statements to show that disconnecting the respirator would not be homicide. The other group is to represent the point of view of the medical team. (Each group may elect one or more spokespersons to present their case. Encourage your students to simulate a court hearing.)

A few questions that you may want your students to consider as they prepare their defense or counterarguments are:

1. How is the John Doe situation

similar to "The Beating Heart" demonstration?

2. What is the definition of life and death?
3. Is the present legal definition of death in your state adequate to deal with modern medicine?

You are to role-play the judge in this court case. You are to derive your decision based on the information presented by each group.

Discussion

This activity could lead into a discussion about a legal definition of death. Some states have already adopted legislation of this type, while others are either in the process of debating the issue or have not yet addressed it.

Your students could be invited to find out whether their state has legislation that defines death. If such legislation exists, they could be given time to discuss some of the possible implications this legislation could pose to them and others in their state. If their state does not have a legal definition of death, a discussion could be initiated regarding some potential problems that could arise from an absence of this type of legislation.

Note: The "Alive or Dead?" activity is reprinted by permission from *Science and Societal Issues: A Guide for Science Teachers* by Charles R. Barman, John J. Rusch, and Timothy M. Cooney ©1981 by the Iowa State University Press, Ames, IA 50010.

Transparency Master: Crustaceans Parasitic on Fishes

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Most commercial and sport fishermen, especially those who frequent marine waters, are well acquainted with parasitic crustaceans scurrying about rapidly over the external surface of fishes. Sportsmen often refer to them as "fish lice" or "sea lice." Students of biology might also want to become familiar with these curious creatures, and would probably find it fascinating to observe and collect them. Identification of parasitic crustaceans to their general taxon (e.g., Copepoda, Branchiura, and Isopoda) is not difficult, and might add interest to an assignment on the invertebrates or arthropods. The accompanying plate illustrates some of the more common marine types from the coastal waters of California, and should be a useful aid in a discussion on symbiosis and related topics.

Copepods are perhaps the most common parasitic crustaceans and are found on both freshwater and marine fishes. Many copepods are quite active and crawl about freely over the external surface. Others are adapted for a sessile existence and become permanently anchored to a particular organ or a specific site on the body. *Caligus* sp. (fig. 1) and *Lepeophtheirus* sp. (figs. 2 and 4) are motile, whereas *Phrixocephalus* sp. (fig. 3), *Peniculus* sp. (fig. 5), and *Pandarus* sp. (fig. 7) represent less active examples.

Branchiurans superficially resemble copepods, but taxonomists now prefer separating the two. Freshwater and marine forms are prevalent in North America, with *Argulus* sp. (figs. 8 and 9) being the most common variety.

Isopods of the genus *Lironeca* (fig. 6) are generally larger than copepods and branchiurans. They

are frequently located on the gills and in the operculum; however, the mouth, fins, and external surface may also be infested.

Reference

KABATA, Z. 1970. Crustacea as enemies of fishes. In Snieszko, S.F., and Axelrod, H.R. (eds.) *Diseases of fishes, book 1*. Neptune City, N.J.: T.F.H. Publications.

Code:

1. *Caligus* sp., dorsal view of a female.
2. *Lepeophtheirus* sp., dorsal view of a female.
3. *Phrixocephalus* sp., embedded in the eyes of a sole.
4. *Lepeophtheirus* sp., dorsal view of a male.
5. *Peniculus* sp., embedded in the fin of a rockfish.
6. *Lironeca* sp., dorsal view.
7. *Pandarus* sp., attached to the fin of a shark.
8. *Argulus* sp., dorsal view.
9. *Argulus* sp., ventral view.