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Student (and Animal) Welfare

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There are many worthwhile lessons to be learned from living organisms that could constitute decent science fair projects that involve no harm to the organisms involved. Studies on locomotion, behavior, interaction, care of the young, food preferences, and so on can all be conducted without any trauma to the organisms concerned and certainly would teach more than an ill-conceived application of little-understood technology to less understood animal systems.

Human-Animal Interactions

It is not going to be possible to isolate students from animals. At home they may have dogs or cats, or be given a baby chick or duck at Easter, or have an aquarium, or pull wings off of flies. By having as a major objective of animal use respect for living things, the latter will be unlikely to happen. Not only are students exposed to animals in the neighborhoods where they live, but zoological parks, wild animal parks, aquariums, and seaquariums are all sources of information about living organisms that transcend the classroom and can be profitable experiences to students trained in observation and understanding of living animals. Visits to national parks also provide opportunities to observe and understand.

The problem is not simply confined to animals in classrooms, but animals in relation to human beings everywhere. Field and community resource areas are rich in examples of human-animal interaction. We've all seen people feeding animals that should not be fed, attempting to pick up animals that bite, poking at, yelling at, running after, and in general endangering themselves, the animals, and those people who will come later to observe frightened and antagonistic organisms. Objectives of animal use should transcend the boundaries of the school. But only by beginning in the classroom can we teach those lessons that have applicability beyond the boundaries of the school.

Conclusion

I do not believe in random animal experimentation in secondary schools. I do believe in using animals to inculcate the kind of affective objectives that will stand the students in good stead, not only in the classroom, but what is more important, outside the classroom as well. Only then will they come to develop that respect for all living things we must have if our current environment is to remain unscathed for future generations to possess and enjoy.

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Abstract

Adolescents exhibit affection for numerous vertebrates and appear to sympathize and to identify with traumas these animals experience. Theraputic benefits students attach to nurturing and breeding certain vertebrates are evident; destruction of these same creatures produces clearly negative attitudes by students toward the science course and the instructor. "Case histories" documented while teaching high school students working with vertebrates are reviewed and are related to specific techniques (e.g., pithing) utilized by numerous instructors. Motivation, increased attention span, sustained interest, involvement with community issues and other desirable educational goals are demonstrated to be resultants of student involvement with living vertebrates studied in their "natural" state.

Introduction

The "charge" to speakers during this first segment of the conference is ". . . to examine the basic premise of education—and the extent to which animal studies may contribute." There are, in fact numerous premises, and reference will be made later to them under the rubric, "Educational Objectives." In order to make concrete the objectives, reference will be made also to specific in- and out-of-class hands-on activities with vertebrate animals. Consequently, my presentation will overlap somewhat with the objectives set for the afternoon session, and I am assuming that this paper will, nonetheless, meet with the approval of the chairman, and that it will be acceptable to subsequent speakers.

The Institute for the Study of Animal Problems (ISAP) clearly exists to relate to animal problems. My opening position suggests that numerous animal problems derive from people problems. Some kids in my neighborhood derived evident pleasure from dashing frogs against rocks in a nearby creek. Beetles were tortured with matches. These children were perhaps sublimating aggressions against creatures whose defenseless posture enabled these events to occur. A *Saturday Evening Post* cover by Norman Rockwell comes to mind. The cover was divided into four scenes: The first quarter showed a husband being reprimanded by the boss; the second scene depicted that husband expressing anger toward his wife after he arrived home. The third part of the scenario illustrated the wife yelling at her child and the last quarter of the cover enabled the viewer to see how the child vented his frustration on the pet dog. The child was vigorously wagging his finger in the face of the dog whose expression was priceless. No animal maltreatment was depicted by Rockwell, as we would expect. The scenario, however, has remained in my mind as one example of passing the buck to a defense-

less creature. And, one must wonder about the reasons children would have for dashing frogs to death against rocks.

Other problems of people include human, microbially-induced disease. Simply put, people become ill from reacting to various microorganisms. It is standard procedure to study reactions of animals to microorganisms associated with human disease to better understand the mechanisms of interaction. The problem becomes one of the animal which is the experimental entity. We accept utilizing the convenience of animal experimentation at the professional level, though not always, I must add. We find it objectionable that professional-level investigations have found their way into high school level texts. An example is found in texts which suggest the testing of Koch's Postulates. Koch asserted that finding and identifying the causative agent of that reaction we label a disease involved a four-step procedure. Briefly, one exposes some animal (or plant) to a pathogen and awaits a reaction. The animal or plant then is sacrificed and an attempt is made to isolate and to culture the suspected causative agent. Lastly, the cultivated agent is enabled to enter another but similar experimental animal (or plant) species and the investigator observes the reaction to determine the degree of similarity with that reaction observed in the former animal (or plant). Putting aside, for a moment, the potential danger to the student investigator or team, we must first recognize that animals are considered to be a sine qua non in the pursuit of knowledge about disease at the professional level; then we must recognize how people problems become animal problems when, at a secondary-school level untold numbers of animals suffer because of the hand-me-down process educators have evolved which result in professional-level investigations being adopted by amateurs.

People need drugs of various types for various symptoms. Animals are invariably the test agents.

Technology and population expansion impact on the ecology, changing animal habitats and affecting myriads of niches established over the millenia.

Clearly, people problems result in problems for animals. There is a challenge for educators to enable students to grasp this concept and for these same educators to engineer biologic activities which will allow students to develop what Schweitzer called, "Reverence for life," while also acquiring knowledge about animals and about the organized techniques which help us to learn more about life processes. There are opportunities to "neutralize" the tendency to dash frogs to death. Our modus operandi, however, must be to nurture in students a respect for life, rather than to inculcate a potential callousness by virtue of biologic activities selected.

There are several incidents which have occurred to me and which might be instructive to those of you here as visitors and as guests. I title these incidents: "Personal References—The Negatives" and "Personal References—The Positive."

Personal References—The Negatives

In 1960, two years after initiating a Science Research Club in the Plymouth-Whitemarsh (Pennsylvania) School District, the local Exchange Club invited me to speak at a dinner meeting. Part of my summary of student research activities included a description of a 10th grader's blood study with an albino rabbit. Blood samples from peripheral circulation in the ear pinna were correlated with time in a long range study. After my talk, a gentleman who introduced himself as the Director of the local SPCA requested speaking with me alone. I became petrified with concern, of course. During the private exchange, he indicated a greater concern with the psychological welfare of

the 10th grader, than with the potential for damage to the animal. He summarized several instances when students were beset with guilt when the animals assigned to them died during projects. At the time, I was a fifth-year teacher and found our friendly dialogue instructive. It gave me a new perspective.

At some time prior to this experience, I demonstrated pithing a frog (following Blue Version BSCS instructions) to my student lab assistant. He fainted. The lesson of this event did not make its impress until the subsequent discussion with the SPCA Director.

At a private school in the suburban Philadelphia area where I served as Director of Science for eight years, we studied living Protista in depth. Following the first observation lab, I began to clean a slide by washing the mixed culture down the drain. Several students who saw this literally screamed, "What are you doing—you're killing them!"

Interestingly, in a later interview conducted by a reporter from the *New York Times*, this student exclamation was given visibility in the text of the article. The reporter's assignment was to present diverse views of teachers and of students relative to work with living creatures in the schools. This experience became another of the several which have influenced my teaching strategies.

The climax experience, however, involved an episode which occurred in a biology class in Israel where my daughter was an exchange student for one year. Her teacher brought to class a live fish which he then killed and dissected. She has been a vegetarian since and avoided zoology classes which included animal experimentation. She was graduated last year from Cornell with a major in botany and horticulture.

Personal References—The Positive

After twenty-one years in suburban secondary school level science education, I decided to intrude into inner city urban science education, again at the secondary level. Control in classes with students was accomplished through a series of animal behavior activities described later. The episode most memorable occurred after one of my biology students was suspended from school (for an offense in another class, of course). The Assistant Principal reported a comment made by the suspended student. "Okay, suspend me from school, but let me go to biology, my chicken needs me."

Team work is a teaching strategy designed to bring students together. Cooperation is the goal. Over a period of two years (September '76-June '78), I have formed teams of 3 to 5 students in ten sections of science classes. The total number of students involved was three hundred.

One alternative to team work is traditional "straight" teaching. That is, teacher at desk; each student at his/her desk, relating only to a text through pencil and paper activities. This latter approach is an acceptable option, but it lacks in its capacity to bring together often antagonistic ethnic groups. The Black and Hispanic high school students in my classes were enabled to relate through the medium of common concern for the vertebrates put, literally, into their hands.

Numerous minority children enrolled at inner city schools are exposed to animals: roaches, rats, and to street dogs. There is a competition for food among these animals and thousands of human residents in each of our cities. Children rarely see zoo animals. The antipathy they have toward creatures which remind them of those mentioned above would seem to be a form of conditioned reflex. Exposure to other, "friendly" forms (goldfish, frogs, birds, gerbils) reconditions their negative attitudes to-

ward lower creatures, in my experience. The students learn to trust the animals in their care and, subsequently, provide "tender loving care." Both the animals and their keepers can benefit.

Educational Objectives

The discussion above alludes to achieving general, desirable educational goals with students through the use of living creatures. What follows are a number of educational objectives which are more specific and which have been categorized.

To introduce the objectives, first let's define "education." The Latin root is, ducere: To draw out. We want students to be drawn out; to think; to attack problems with tentative solutions, at the least. Students are not vessels to be filled, by the teacher, with facts and predigested ideas (Baldwin, 1967).

An important educational objective is intrinsic in the title of John Dewey's (1916) text, "Democracy and Education." In this fine work, he asserts education's role to be that of accomplishing, among other things, two major tasks. One—to create social beings; two—to enable students to realize there is no finite aspect to learning. There is no "end." The "end" is the "means"—the means to more learning, more discovery. New ideas beg additional questions whose answers are to be sought through orderly processes and through life's experiences. The "reverence for life" ideal of Schweitzer, referred to earlier in this paper, is implicit in this work of Dewey. A respect and love for all creatures should be a minimal goal of public educational systems.

Another goal derived literally from the translation of the word education is to let the child out. Educational systems should provide both the atmosphere and the mechanics which will enable the curiosity of our young people to function for purposes of learning within the context of the discipline in question (Isaacs, 1974).

Developmental Psychology offers much to educators as guidelines for evolving curricula. Jean Piaget describes levels of development from the concrete to the hypothetico-deductive (Athey, 1970; Piaget, 1970). Dealing with theory before exposing children to fact would be counter-productive, according to his studies and to the follow-up investigations of his work. Animal studies, properly sequenced, would provide for a logical and predictable set of developmental outcomes for pupils.

Enabling both sides of the brain to function in educational settings finds strong support among researchers. We tend to cater mostly to only one side. We must devise activities which stimulate the mechanistic, logical processes and aesthetic potential of the entire brain. Science education is a "natural" to accomplish this goal, because of its stress—on science. There is equipment to be manipulated, materials to be observed, problems to be solved. The currently popular "hands-on" approach provides the medium to accomplish the goal of making active both the right and left sides of the brain. Animals provide instant "hands-on" activities.

Organization of knowledge and of the processes to obtain same is paramount in a technologic society. Students can, via animal studies learn to: observe; record; graph, if necessary; share data in written and/or oral form. Animals are great motivators, in my experience, to accomplish these goals of science education. Working and playing with animals lends fun to activities such as recording data, considered onerous by so many, including professionals.

Lastly, animal studies provide a means of making contact with the community. This contact could include projects to create or to support a local zoo. At the other extreme would be an activity to control city rat populations. Table 1 and Table 2 summarize several activities which have been found to accomplish the educational objectives described above.

Table 1: Classroom Activities and Educational Objectives with the Use of Living Vertebrates

VERTEBRATES

Goldfish

1. Respiration Rate
   a. vary temperature
   b. vary light
   c. with aspirin
   d. with 1:10,000 E_tOH
2. Conditioning with light
3. Curing a sick goldfish with "Ich"
4. Morphology—external

Frogs

1. Respiration rate at varied temperatures
2. Leap Frog (and Leap Man)
3. Feeding with *Drosophila*
4. Studying the Niche
5. Metamorphosis
6. Morphology—external

Birds (4 week chicks)

1. Perception of height vs. age
2. Distinguishing circles and squares
3. Morphology—external

Mammals (gerbils, hamsters)

1. Running mazes
2. Morphology—external

Table 2: Summary of Educational Objectives and Implementations Procedures With Vertebrates

Emotional: Students have an opportunity to nurture a creature of their choice through providing needs for life.

Social: Team efforts to nurture and to study vertebrates provide the context for group cooperation.

Intellectual: Gathering facts, elaborating processes, data-gathering, problem-solving presentation of a project are among the intellectual components associated with projects involving vertebrates.

Motivation: Certain vertebrates lend themselves to generating interest in biological activites among students who would otherwise be uninterested following a purely textbook approach.

Technical Skills:

1. Observing
2. Recording data in tables or in qualitative form
3. Investigating with a *control*
4. Manipulating equipment
5. Providing animal's needs

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Learning from Animals: Models for Studying Physiology and Disease

W. Jean Dodds

Abstract

Animals can serve as valuable educational tools for elementary and high school students. By teaching young people reverence for all forms of life at an early age, it is possible to instill in them a proper perspective concerning the welfare and humane stewardship of animals. Exemplary subjects include the various aspects of evolutionary and embryological development; normal physiological processes, the mechanisms and pathology of naturally occurring infectious, metabolic, genetic and neoplastic diseases and aging; and an appreciation of the inevitability of death. Such studies can serve as learning models for students because these processes parallel or closely resemble those of man. This approach teaches the ethics of animal usage and can be shown to result in benefits not only to humans but also to other animals. Although much has also been learned from research on experimentally-induced disease in animals, these techniques should be reserved for the appropriately supervised research laboratory and should not be practiced in the high school classroom.

Introduction

As a scientist with a deep-rooted love and compassion for living creatures, I am convinced, from my own experience, that research with animals can be humane as well as informative, and that such studies benefit not only mankind but also other animals. The answer to the current concern for humane care of animals, alleviance of pain and suffering, and reverence for all forms of life lies with our educational system. Children should be exposed to these principles in the home during early life. This contact can include the media via television and radio, books and magazines as well as parental guidance. One of the most important aspects is to teach children to be responsible for the care of animals—as, for example, with their own house pet. If this could be accomplished we will have reached the first step in preventing the accumulation of and need for mass euthanasia of unwanted dogs, cats, and other pets. The next opportunity for impact on the educational process is at the grade school and high school level. All children and young people should be taught about the basic biology, physiology, and behavior of animals and man, whether or not they intend to become involved with animals in later life. It is only by providing the proper setting and exposure to animals at this level that the scientist of tomorrow will be prepared to design