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ABSTRACT

A conflict exists over the use of animals in the classroom. One aspect of this use involved the dissection of animals. Animal protection advocates report that dissections constitute abuse of the animals dissected. The advocates state that what is learned by dissection could be more effectively learned by other means. Some science educators state that dissections do not constitute abuse; they are educationally justified. They claim that dissections actually help students to better understand and appreciate the animals. The purpose of this study was to investigate how animal dissections affected student attitudes toward and the learning of information about the animals dissected. A comparison was made of the knowledge gained and the attitudes influenced by dissection with that gained and influenced by a lecture presentation. It was found that students who were taught by lecture experienced greater gain in achievement than did the students who dissected a frog. However, there was no significant difference in achievement between minority students who dissected a frog and those receiving the lecture. Students who attended neighborhood schools expressed more positive beliefs about frogs with dissection instruction, but non-neighborhood school students indicated more positive beliefs with the lecture approach. No significance was found concerning feelings toward frogs between the two treatment groups. (CW)

THE EFFECT OF ANIMAL DISSECTIONS ON STUDENT ACQUISITION OF KNOWLEDGE OF AND ATTITUDES TOWARD THE ANIMALS DISSECTED

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THE EFFECT OF ANIMAL DISSECTIONS ON STUDENT ACQUISITION OF KNOWLEDGE OF AND ATTITUDES TOWARD THE ANIMALS DISSECTED

Recent years have brought with them the heightened public awareness of and interest in animal protection and welfare. Although much of the interest and awareness has centered on the moral use of animals in research, there likewise has been an increase in the number of questions regarding the proper utilization of animals in the instructural process, from the elementary classroom through university courses. The result has been an aggravated controversy between animal protection advocates and a group primarily composed of biologists--educators and scientists.

A significant portion of this controversy pertains to the dissection of animals. Animal protection advocates report that dissections constitute abuse of the animals dissected. The National Anti-Vivisection Society (NAVS) (1985) stated that "It is morally unjustifiable...for humans to inflict pain on, deprive basic needs from, overpower, dominate, exploit or abuse nonhuman animals" (p. 3). Other advocates state that what is learned by dissection could be more effectively learned by other methods. Rollins (1981) said that "we all recall dissecting frogs; we all recall learning nothing" (p. 105). Regan (1983) stated that dissections are both unnecessary and unjustified. The information sought by dissections is obtainable from other sources. According to Regan, drawings are just as useful in learning anatomy and physiology. Regan stressed that the value

of the dissection experience cannot outweigh the rights of the utilized animal. A further claim advanced by animal protection advocates is that dissections results in students being less sensitive to animals. The NAVS (1985) expressed the opinion that schools teach students "to be insensitive to the sentience of other living creatures" and that students "are forced to abandon compassion" (p. 4). Regan (1983) said that to permit or require animal dissections encourages the development of the belief that "nonhuman animals don't count morally" (p. 368). This belief then contributes to the formation of a "throw-away attitude toward animals, as if these sensitive creatures were commodities or things" (p. 368).

Science educators counter these statements by asserting that animal dissections are educationally justified. In a study to identify the competencies that preservice biology teachers needed to gain, James and Stallings (1977) found that "dissection of laboratory specimens" ranked seventh in a list of fifty-three identified competencies. Although specifically discussing science fair projects, McBurney (1978) expressed several pertinent points regarding animal use. He stated that science involves action and that it is a way of doing things. A "diagram of a frog" is not science. He further expressed that models, charts, and diagrams do not facilitate the understanding of science. Students must be actively involved in science. Sieber (1986), Jackson (1986), Hoskins (1976, 1979), and Igelsrud (1986)

claimed that animal dissections need not be abusive and that the dissections aid students in better understanding and appreciating the animals. Igelsrud (1986) stated that dissections, themselves, are neutral. If insensitivity occurs, it is the responsibility of the teachers. Teachers need better preparation and need to better prepare the students prior to the dissections.

Although they advocate the study of animals in biology courses, some biologists question the use of dissections. Moyer (in Henig, 1979) exclaimed that biology needed to be taught, not necrology. He further stated that biology teachers were taught animal dissections and, therefore, they tend to emphasize them. Orlans (1988) asks "do we want to retain dissection...or is there a better way of studying life and life processes?" (p. 6). Orlans (1980) stated that the overriding concern regarding the use of animals in the classroom should be that "humaneness supercedes curiosity". She questioned whether dissection is a valuable exercise or is it retained because it is one of the "rites of passage" through biology (1988, p. 6). Orlans (1988) expressed the opinion that dissections should be eliminated. Clearly biology teachers are left with attempting to decide if animal dissections are educationally justified.

Purpose

The purpose of the study was to investigate the influence of animal dissections on student achievement and attitudes. The

following two research questions were addressed in the study: are animal dissections beneficial in the acquisition of knowledge by students concerning the animals dissected? and do animal dissections affect the attitudes that students possess towards animals? A comparison was set up to investigate which method of instruction, dissection or lecture, most affected student achievement and attitudes. The influences of gender, race, and school type were also studied. The frog was the specific animal used in the study.

Method

The sample population for the study consisted of 350 students enrolled in a required biology course in five secondary schools of a large, metropolitan school district. The district's secondary schools consisted of both neighborhood and nonneighborhood schools. Neighborhood schools were comprehensive schools attended by students of given communities. Nonneighborhood schools were alternative schools. Each had a specific emphasis. The nonneighborhood schools were open to students from throughout the district. Of the 350 subjects, 179 were white and 171 were nonwhite; 200 were female and 150 were male. The classes were taught by seven teachers whose biology experience averaged almost seventeen years.

The design of the investigation used the pretest-posttest format with two independent groups. The classes were randomly

assigned to the two groups. Parallel instruction with similar objectives was provided both groups. One group performed a highly structured frog dissection in order to learn about frog structure, function, and adaptation. The second group learned about these items from a lecture.

Before beginning either treatment, students were administered a pretest consisting of attitude and knowledge components. Upon completion of the treatment, the students were given the posttest which also consisted of attitude and knowledge components. The attitude component of each test consisted of two parts, beliefs and feelings. These parts measured what the subjects believed about frogs and how they felt toward frogs. The pretest score on each component was used as a covariate for that component. The total math stanine of the California Achievement Tests was used as a second covariate for the achievement component.

Face validity was determined for both the knowledge and attitude sections of the pre- and posttests. A panel of six science educators was asked to determine whether each knowledge item measured what it was intended to measure. The panel was also asked to ascertain the validity of the attitude sections. The two instruments were revised according to the recommendations of the two panels and the final instruments were deemed to be valid.

The reliabilities of the two tests were determined using the Kuder-Richardson Index. The reliability of the pretest was found to be .54 and that of the posttest was .68. The low reliability on the pretest was understandable since it measured prior knowledge of the students. The reliability on the posttest was moderate and acceptable, especially since this method is usually conservative (Nunnally, 1964).

The structured laboratory exercise and lecture materials were reviewed by the same qualified science educators. The panel provided input and the laboratory and lecture materials were revised accordingly.

Results

Analysis of covariance (ANCOVA) was employed to determine if differences in posttest achievement scores of dissection and lecture groups were statistically significant. The tests of significance revealed two differences related to the two treatment groups (Table 1). The type of instruction (dissection and lecture) was revealed to be a main effect. The results suggest that higher achievement scores regarding frog structure, function, and adaptation occur with a lecture method of instruction.

One interaction effect was identified. Although the interaction effect was not significant at the .05 level, it was significant at the .1 level and is included because of its

TABLE 1

Tests of Significance for Posttest Achievement

Source	SS	df	MS	F
Within Cells	2518.85	332	7.59	
Regression	348.37	2	174.19	22.96
Instype (A)	31.24	1	31.24	4.12**
Sex (B)	.00	1	.00	.00
Race (C)	46.99	1	46.99	6.19**
Schtype (D)	79.60	1	79.60	10.49***
AB	.11	1	.11	.01
AC	25.58	1	25.58	3.37*
AD	1.41	1	1.41	.19
BC	8.40	1	8.40	1.11
BD	2.68	1	2.68	.35
CD	1.03	1	1.03	.14
ABC	3.45	1	3.45	.46
ABD	1.38	1	1.38	.18
ACD	1.67	1	1.67	.22
BCD	2.82	1	2.82	.37
ABCD	9.83	1	9.83	1.30

*p < .1 **p < .05 ***p = .001

possible implication in the teaching of biology in metropolitan school districts. The interaction was between type of instruction and race (see Figure 1). The results indicate that white students scored at a higher level than black and other minority students in both dissection and lecture groups, but not equally so. The difference in achievement score between white and minority racial groups was much greater with the lecture method of instruction than with the dissection method. The results suggest the notion that lecture instruction better facilitates learning for white students but that dissection or lecture instruction is equally effective when teaching minority students about frogs.

The attitude component of the test was comprised of two parts, feelings and beliefs. Because each was a dependent variable, multivariate analysis of covariance (MANCOVA) was employed to determine if differences in posttest feelings and beliefs were statistically significant. The MANCOVA identified one area of significance related to the two treatment groups (see Table 2). As interaction effect was revealed between the type of instruction (dissection and lecture) and type of school (neighborhood and nonneighborhood). The univariate analysis of covariance was then performed and revealed that "beliefs" had contributed to the difference, but "feelings" had not (see Table 3). Dissection group students from neighborhood schools indicated more positive beliefs about frogs than did lecture

FIGURE 1

Interaction Effect: Type of Instruction by Race
(Adjusted Achievement Means)

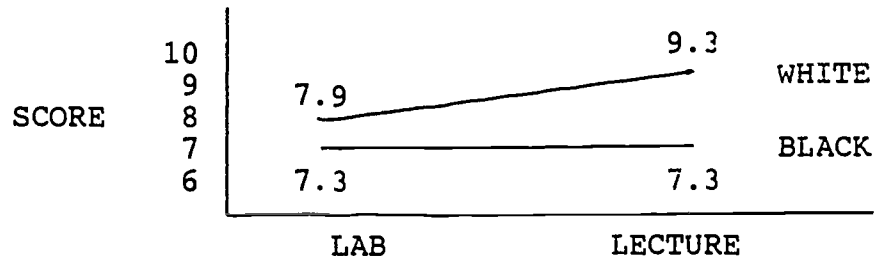


TABLE 2

Multivariate Analysis of Covariance Comparing
Posttest Attitude Scores

Source	Wilks	df	F	Level of Significance
Instype (A)	.999	2,331	.13	.881
Sex (B)	.973	2,331	4.54	.011*
Race (C)	.990	2,331	1.51	.222
Schtype (D)	.988	2,331	1.94	.146
AB	.988	2,331	1.92	.149
AC	.995	2,331	.69	.505
AD	.977	2,331	3.83	.023*
BC	.996	2,331	.61	.545
BD	.996	2,331	.61	.545
CD	.995	2,331	.74	.477
ABC	.998	2,331	.25	.776
ABD	.995	2,331	.82	.442
ACD	.998	2,331	.24	.788
BCD	.998	2,331	.32	.724
ABCD	.996	2,331	.61	.546

*p < .05

TABLE 3

Univariate Analysis of Instruction Type by School Type

	Group SS	Error SS	df	F	Level of Significance
Posttest Feelings	.05233	61.952	1,332	.280	.597
Posttest Beliefs	.99856	52.263	1,332	6.224	.013*

*p < .05

group students from the neighborhood schools (see Figure 2). Nonneighborhood school students in the lecture group indicated more positive beliefs about frogs than did the nonneighborhood students who dissected the frogs. The neighborhood students in the lab group indicated more positive beliefs about frogs than did the nonneighborhood lab students. But, nonneighborhood lecture students indicated more positive beliefs about frogs than the nonneighborhood students who performed the dissection. No significance was found concerning feelings toward frogs between the two treatment groups.

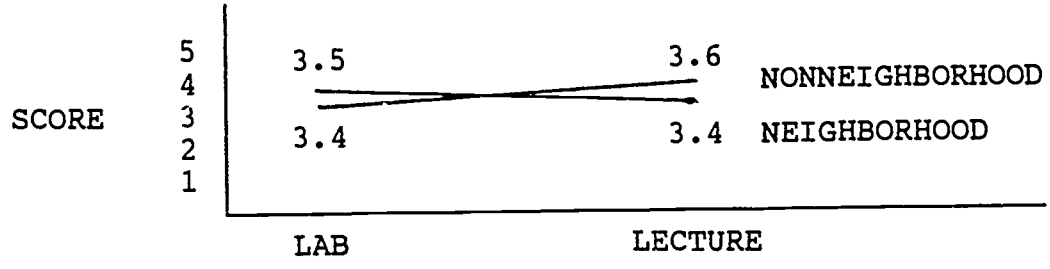
Conclusions

Several relevant conclusions can be formulated from this study. Where achievement is concerned, the method of instruction does make a difference. The lecture method produces greater achievement scores than does the dissection method of instruction. The interaction of race and method of instruction may be significant in achievement. White students score higher with the lecture form of instruction. Minority students score at the same level, whether the instruction is provided by a lecture or a dissection.

Feelings toward an animal are not influenced by the method of instruction used. A dissection does not change the feelings of a student toward the animal dissected. Lectures on animals

FIGURE 2

Interaction Effect: Type of School by Type of Instruction
(Adjusted Beliefs Means)



likewise have no influence on the feelings held by a student toward that animal.

Beliefs about an animal can be influenced by the method of instruction used. The beliefs of neighborhood school students are affected more positively by dissection than by lecture. The beliefs of nonneighborhood school students are affected more positively by lecture instruction.

Animal dissections can be educationally justified. Dissections do not need to be ignored in favor of a lecture or some alternative form of instruction. They do not produce less positive attitudes. Dissection instruction is the method to employ with neighborhood school students when beliefs are a concern. Not all students learn the same way. Different methods appear to be needed to insure that all students are reached. The teacher must select the appropriate methods for the instructional goals and the student population.

Implications and Recommendations

The results of this study suggest several implications for classroom instruction. As they are discussed it is important to remember that the students in the study were not encouraged to study for the tests. This study suggests that the type of instruction used can make a difference. It is vital that the classroom teacher establishes goals for each endeavor and uses appropriate methodology to accomplish those goals. The teacher

needs to be cognizant of the most effective methods of instruction to use with students of various backgrounds. An instructional method favored for one group of students is not always preferable for another. Lectures should be utilized if the primary goal is content, especially with white students. With minority students, dissection and lecture methods of instruction are similar in producing achievement. It is good educational practice to use a variety of types of instruction in order to reach the myriad of learning styles present in any classroom.

Animal dissections do not need to be avoided if one of the goals of instruction involves student attitudes toward animals. The dissection of an animal does not appear to negatively affect student feelings and beliefs regarding the animal dissected. If attitudes, specifically beliefs, are a concern or a goal, this study suggests that dissection is preferable for neighborhood school students. A lecture method of instruction appears to be favored for nonneighborhood school students, although the dissection experience did not negatively affect their beliefs.

Animal dissections are educationally justified when they result in the attainment of science goals. They can help in the acquisition of knowledge regarding the animals dissected. They can be utilized to affect in a positive way attitudes, specifically beliefs, concerning the animal dissected. The

morality of using animals was not addressed in this study. The teacher must still consider this issue.

The results of this study also suggest the following questions for future research.

1. Do the differences persist or is one method of instruction more conducive to long-term results?
2. Are beliefs more easily influenced than feelings?
3. What is the effect of animal dissections on actions?
4. What is the influence of teachers on the various methods of instructions?
5. How does sequencing of animal dissections and lecture influence student achievement and attitudes?
6. Do models and computer simulations affect student achievement and attitudes?
7. Does the dissection of some vertebrate other than the frog produce similar results?
8. Does a less structured dissection produce similar results?
9. What is the relationship between animal dissections and the attainment of specific science goals?

Watson (in Hofstein and Lunetta, 1982) said that there is insufficient data to support or reject many of the claims that have been made about the significance and the effect of laboratory instruction on science goal attainment. Hopefully, this study was one step in the direction of describing what animal dissection laboratory exercises can and cannot do. However, this study was preliminary and exploratory. It did not investigate the influence of multiple dissections. Only one dissection was completed. The dissection was highly structured.

A less structured (more exploratory) dissection might affect achievement and attitudes quite differently. It is also possible that a dissection of some other animal might have had a different influence. This study did not seek to answer all questions. The study sought to provide some empirical data relating to whether animal dissections are educationally justified.

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