


**MEMORANDUM**

**July 13, 2015**

**TO:** The Honorable Chair and Members of The School Board of Miami-Dade County, Florida

**FROM:** Alberto M. Carvalho, Superintendent of Schools 

**SUBJECT:** **TRANSMITTAL OF INFORMATION CAPSULE, *THE USE OF ANIMAL DISSECTION IN SCIENCE EDUCATION***

Attached please find a copy of the Information Capsule, *The Use of Animal Dissection in Science Education*. Animal dissection in U.S. science classrooms has become a controversial practice. Animal rights groups have strongly urged educators to discontinue animal dissection and growing numbers of students are reporting that they are uncomfortable with animal dissection and experimentation. As a result, alternatives to animal dissection, such as computer simulations, the use of three-dimensional replicas, and videos, have become increasingly popular in science classes.

This Information Capsule summarizes the prevalence of animal dissection in U.S. classrooms, as well as the advantages and disadvantages of animal dissection. A listing of organizations that offer free loan programs through which teachers and students can borrow non-animal dissection alternatives is provided. Research that compares the effectiveness of real-life dissections and virtual dissections is also summarized. Finally, many states have adopted policies that allow students to opt out of animal dissections. The issues that experts believe should be addressed in these policies are presented.

If you need further information, please contact Ms. Marie Izquierdo, Chief Academic Officer, Office of Academics and Transformation, at 305 995-1451, or Ms. Gisela Feild, Administrative Director, Assessment, Research, and Data Analysis, at 305 995-2943.

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Attachment

cc: School Board Attorney  
Superintendent's Cabinet  
Ms. Deborah Karcher  
Ms. Gisela Feild  
Dr. Aleksandr Shneyderman



# INFORMATION CAPSULE

## Research Services

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Christie Blazer, Supervisor

### THE USE OF ANIMAL DISSECTIONS IN SCIENCE EDUCATION

#### At a Glance

Animal dissection in U.S. science classrooms has become a controversial practice. Animal rights groups have strongly urged educators to discontinue animal dissection and growing numbers of students are reporting that they are uncomfortable with animal dissection and experimentation. As a result, alternatives to animal dissection, such as computer simulations, the use of three-dimensional replicas, and videos, have become increasingly popular in science classes. This Information Capsule summarizes the prevalence of animal dissection in U.S. classrooms, as well as the advantages and disadvantages of animal dissection. A listing of organizations that offer free loan programs through which teachers and students can borrow non-animal dissection alternatives is provided. Research that compares the effectiveness of real-life dissections and virtual dissections is also summarized. Finally, many states have adopted policies that allow students to opt out of animal dissections. The issues that experts believe should be addressed in these policies are presented.

The use of animals in the classroom has been an established part of the science curriculum in the U.S. since the 1960s and continues to serve as an educational tool for teaching biology, anatomy, and other life sciences, such as physiology, psychology, nutrition, and genetics. Nationwide, students dissect preserved animals throughout all levels of science education, starting as early as sixth grade (National Anti-Vivisection Society, 2015; New England Anti-Vivisection Society, 2015a; Los Angeles Unified School District, 2013; Lalley et al., 2010).

Animal dissection in U.S. classrooms, however, has become a controversial practice. Animal rights groups have strongly urged educators to discontinue animal dissection. People for the Ethical Treatment of Animals (PETA) believes that animal dissection is immoral and unethical. They maintain that computer technology allows students to “virtually” dissect animals instead of actually cutting them open. In addition, growing numbers of students have begun to report that they are uncomfortable with the use of animals in dissection and experimentation (Shine, 2014; Oakley, 2012; Lalley et al., 2010; Akpan, 2001; People for the Ethical Treatment of Animals, n.d.).

Both the National Science Teachers Association and the National Association of Biology Teachers support animal dissection in the classroom when the procedure is conducted within the established guidelines of proper care and use of animals, and with consideration to the age and maturity level of students. The associations oppose regulations or legislation that would eliminate educators’ decision-making role regarding dissection (National Science Teachers Association, 2008; National Association of Biology Teachers, n.d.).

## Prevalence of Animal Dissection in Classrooms

While the exact number is unknown, it is estimated that between six and 12 million animals are dissected annually in high schools across the U.S. The most commonly dissected vertebrate animals are frogs (accounting for approximately half of the animals dissected in elementary and secondary schools), cats, and fetal pigs. Other animals used in dissection include sharks, perch, rats, pigeons, salamanders, rabbits, turtles, snakes, mink, foxes, and bats. Invertebrate animals used in dissection include crayfish, grasshoppers, earthworms, clams, squid, sea urchins, and cockroaches. In addition, organs from cows and sheep are harvested for classroom dissection. Animal specimens used for dissection are obtained from a variety of sources, including their natural habitats, breeding facilities, slaughterhouses, fur ranches, and shelters and pounds (Last Chance for Animals, 2015; National Anti-Vivisection Society, 2015; New England Anti-Vivisection Society, 2015b; The Humane Society of the United States, 2013).

The use of animals as dissection specimens in U.S. science classrooms remains a prevalent practice. Surveys of middle and senior high school science teachers indicate that between 75% and 84% of respondents report using dissection as a teaching tool (National Anti-Vivisection Society, 2015; Martindale, 2012; Oakley, 2012). In a survey of senior high school science teachers in Ontario, Canada, 94% of respondents reported conducting dissections in their classes. The majority of respondents (88%) agreed or strongly agreed that “real animal dissection is important to the teaching of biology” and 56% agreed or strongly agreed that “there are no substitutes for real animal dissection” (Oakley, 2012).

Dissection is practiced most frequently in North America. It is no longer used in elementary and secondary schools in many countries, including Argentina, India, Israel, Slovak Republic, Switzerland, and The Netherlands, and is rarely used in schools in England, Germany, and Sweden (Shine, 2014; Oakley, 2012).

## Advantages of Animal Dissection

Advocates of animal dissection claim that it provides students with an understanding of animals' internal structures more effectively than the use of models, charts, simulations, and textbooks. They claim that dissection simulations are not realistic and fail to adequately promote the learning of biological and anatomical concepts (Los Angeles Unified School District, 2013; Akpan, 2001). Proponents have cited the following advantages to physical dissection:

- **Students participate in a hands-on experience.** Advocates maintain that the greatest advantage of physical dissection over virtual dissection is that it is hands-on and exploratory experience that promotes student inquiry and engagement. They claim that virtual dissections do not provide opportunities for actual interaction with specimens in terms of cutting, probing, and exploration. Educators say that students are fascinated when they examine a real-life specimen and that dissections create lasting impressions and vivid memories. Studies have found that learning is more effective when students use more of their senses in the process. During dissections, students learn through their eyes, ears, nose, hand muscles, and the touch-sensitive nerves in their fingers (Edwards et al., 2014; Boettcher, 2013; Linton, 2013; Kaye, 2012; Martindale, 2012; Oakley, 2012; Lalley et al., 2010; Brown, 2009; Hubbard, n.d.; Wilhelmi, n.d.).

- **Students acquire additional skills.** Hughes (2001) noted that in addition to advancing students' biological and anatomical knowledge, a number of other skills are learned in the laboratory context, such as time management, experimental design, task organization, report writing, and teamwork. Students also learn to be neat, careful, and clean at the laboratory bench.
- **Students who wish to pursue careers in science and medicine are introduced to laboratory procedures.** Some educators believe animal dissection is indispensable to the advancement and improvement of medical knowledge and education. They say that dissection provides future doctors, biologists, and veterinarians with the opportunity to discover whether they possess the aptitude for this type of work (Los Angeles Unified School District, 2013; Akpan, 2001; Hubbard, n.d.). Brown (2009) stated, "You don't want to take your animal to a veterinarian who doesn't know what the inside of an animal looks like."
- **Students are provided with a more realistic experience.** Many teachers claim that simulations reduce the realism of the learning experience in science education. One science teacher reported that students were often surprised when they first studied images of dissected animals and then proceeded to conduct an actual dissection. The teacher noted, "They can't identify structures, because what the structures look like virtually and what they look like in reality, is different." For example, in virtual dissections, all frogs are the same. In actual dissections, there may be differences between each frog (Oakley, 2012; Akpan, 2001; Hubbard, n.d.; Wilhelmi, n.d.).

### **Disadvantages of Animal Dissection**

Critics of physical dissection maintain that dissection is academically unnecessary and that virtual simulations are just as effective as real-life dissections for teaching students basic anatomy and physiology (National Anti-Vivisection Society, 2015; Edwards et al., 2014; Downey, 2013; Akpan, 2001; People for the Ethical Treatment of Animals, n.d.). They have cited the following disadvantages to physical dissection:

- **Dissection can be emotionally disturbing to students.** It has been reported that a significant number of students at every educational level are uncomfortable with the use of animals for dissection and experimentation (Edwards et al., 2014; Akpan, 2001; People for the Ethical Treatment of Animals, n.d.). Capaldo (2004) stated, "When students are forced to use animals in ways that they view as harmful, painful, stressful or lethal to the animals . . . students may suffer psychological trauma as a result of seeing themselves or others engaged in behavior that they find ethically objectionable." Critics of dissection claim that it dissuades some students from pursuing careers in science (Capaldo, 2004; People for the Ethical Treatment of Animals, n.d.).
- **Animals are harmed.** According to the People for the Ethical Treatment of Animals (2014), there are very real moral and ethical concerns over killing animals for the sake of

learning. The New England Anti-Vivisection Society (2015a) stated, “The treatment of animals destined for use in dissection and other educational purposes involves an inordinate amount of suffering, stress, and inhumane treatment.”

- **Students are exposed to dangerous chemicals.** Critics of animal dissection have expressed concern regarding students’ exposure to formaldehyde. Specimens are often embalmed with formaldehyde, a chemical preservative that can damage the eyes and cause asthma attacks and bronchitis. The Environmental Protection Agency has designated formaldehyde as “a hazardous air pollutant, water pollutant, and waste constituent” and the U.S. Department of Health and Human Services’ National Toxicology Program has identified it as a carcinogen in humans (Last Chance for Animals, 2015; New England Anti-Vivisection Society, 2015a; Groff, 2013; Oakley, 2012; World Events Ending Animal Cruelty, n.d.).
- **Dissection chemicals harm the environment.** One of the National Anti-Vivisection Society’s (2015) major objections to animal dissection is that the use of hazardous chemicals poses potential harm to the environment.
- **Native populations are endangered.** The New England Anti-Vivisection Society (2015a) stated, “Given the ongoing destruction and fragility of natural habitats, the yearly removal of animals for dissection is wasteful, creates ecological imbalance, and further compromises already besieged natural resources.” Concerns tend to focus on frogs, where the collection of millions of specimens for classroom dissection has depleted many local populations (National Anti-Vivisection Society, 2015; New England Anti-Vivisection Society, 2015b; Groff, 2013).
- **Students are taught that animals are disposable.** Animal rights organizations maintain that dissection teaches students that animal life is expendable. Critics of dissection believe that the experience desensitizes students to the social value of animals and instills the view that animals are merely disposable resources (National Anti-Vivisection Society, 2015; New England Anti-Vivisection Society, 2015a; Capaldo, 2004; Akpan, 2001; Cunningham, 2000; World Events Ending Animal Cruelty, n.d.).
- **Real-life dissection is more expensive than virtual dissection.** Critics of physical dissections say it is more expensive than virtual dissection. Virtual dissection is more cost effective because the tools and resources are reusable. Simulations also save schools money on chemicals, lab supplies, and the replenishment of specimens (National Anti-Vivisection Society, 2015; Edwards et al., 2014; Brown, 2009; Akpan, 2001; Cunningham, 2000; People for the Ethical Treatment of Animals, n.d.; Physicians Committee for Responsible Medicine, n.d.).

### **Alternatives to Animal Dissection**

Animal rights activists and concerned educators have suggested several alternatives to the traditional method of animal dissection in the science classroom. The alternatives provide

simulated dissections through the use of various media, including computer simulations, three-dimensional clay and plastic replicas, videos, slides, charts, and drawing and labeling diagrams. Dissection simulations provide detailed, sophisticated graphics, interactive features, and in-depth accompanying text. Many also include lessons that extend beyond the traditional dissection experience, such as video and animation that show the motions of internal bodily systems and interactive tutorials about the animal's habitat (National Anti-Vivisection Society, 2015; Edwards et al., 2014; People for the Ethical Treatment of Animals, 2014; Downey, 2013; Los Angeles Unified School District, 2013; Oakley, 2012; Lalley et al., 2010; Brown, 2009; Akpan, 2001; Physicians Committee for Responsible Medicine, n.d.).

Researchers have found that most teachers use real-life dissection as a primary teaching method and only use simulated dissections as supplemental teaching aids or options for students who do not want to dissect animals (Martindale, 2012; Oakley, 2012). A survey of science teachers from Ontario, Canada found that respondents reported using a variety of alternatives to animal dissection. Eighty percent of teachers said they used CD-ROMS or computer programs, 77% said they used charts, posters, textbook diagrams, and/or overhead projectors, 67% said they used three-dimensional anatomical models, and 57% said they used videos. Twenty-two percent reported using other alternatives, such as written assignments, websites, field trips and virtual field trips, and dissection picture cards (Oakley, 2012).

According to the National Anti-Vivisection Society (2015), no state board of education requires participation in dissection as a condition of graduation, and no college or university requires dissection participation as a prerequisite for entrance.

Many organizations offer free loan programs through which teachers and students can borrow non-animal dissection alternatives at no charge. For example:

- The National Anti-Vivisection Society developed the BioLeap Lending Library of Life Science Materials, which provides students and teachers with free access to three-dimensional plastic models, computer software, videos, color transparencies, and other materials for a wide variety of animal species. The BioLeap lending library website may be accessed at <http://www.navs.org/education/bioleap-lending-program>. The BioLeap Resource Center may be accessed at <http://www.navs.org/education/bioleap-resource-center-remove>.
- The American Anti-Vivisection Society offers the Animalearn Science Bank, a lending library of alternatives to animal dissection and experimentation. The Science Bank has over 500 CD-ROMS, models, videos, and mannequins, all available for free. A listing of resources is available at <http://www.animalearn.org/sciencebank.php#.VYv5oPIViko>.
- The New England Anti-Vivisection Society/Ethical Science Education Coalition Alternatives Loan Library features free software, manuals, charts, and humane curricula. The library may be accessed at <http://www.neavs.org/resources/esecs-inventory-of-alternatives-to-dissection>.
- InterNICHE, a non-profit global network, offers a variety of alternative resources and literature, available for free loan, for teachers and students. A listing of alternative resources is available at <http://interniche.org/en/alternatives>.

- People for the Ethical Treatment of Animals has an online Dissection Alternatives resource center designed especially for educators. The site contains physician-narrated video demonstrations of virtual dissection software programs and comprehensive resource lists. The resource center may be accessed at <http://www.peta.org/teachkind/humane-classroom/dissection/dissection-alternatives/>.

### **Research Comparing the Effectiveness of Real-Life and Virtual Dissections**

There is no evidence that dissecting an animal in science class leads students to commit violent acts against animals (National Anti-Vivisection Society, 2015; Brown, 2009).

Most studies have concluded that high school students who perform virtual dissections score equal to or higher than students who perform real-life animal dissections on tested subject matter (National Anti-Vivisection Society, 2015; Oakley, 2012; Lalley et al., 2010; The Humane Society of the United States, 2008; Kopec, 2002; Akpan, 2001; Cunningham, 2000; Physicians Committee for Responsible Medicine, n.d.).

However, several studies have found that students who actually dissect animals perform better on practical laboratory tests than students who virtually dissect animals. In these studies, it was only on tests of theoretical knowledge that the two groups of students received similar scores (Montgomery, 2008; Cross & Cross, 2004; Hughes, 2001).

Experts agree that additional studies are needed to determine the effectiveness of virtual simulation and the extent to which it should be integrated into the science curriculum. For now, though, many researchers believe that virtual dissection can be a viable alternative to real-life dissection. Virtual dissection provides learning opportunities to students who would otherwise not engage in physical dissection due to moral or ethical concerns, and/or health concerns related to hazardous laboratory chemicals (Edwards et al., 2014; Lalley et al., 2010; National Science Teachers Association, 2008; Akpan, 2001).

### **Student Choice Laws and Policies**

Student choice in this context refers to the right of students to refuse to participate in classroom activities and demonstrations, including animal dissections, they find objectionable on the basis of personal moral, ethical, or religious convictions. Student choice also refers to students' right to have access without penalty to alternative learning activities (Cunningham, 2000).

Many states have taken legal steps that allow students to opt out if they are uncomfortable with animal dissection. Students living in these states have the right to refuse to participate in animal dissections (Hughes, 2015; Last Chance for Animals, 2015; New England Anti-Vivisection Society, 2015b). According to People for the Ethical Treatment of Animals (2015), 23 states (Arizona, California, Connecticut, Florida, Hawaii, Illinois, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Texas, Utah, Vermont, and Virginia) and Washington D.C. have laws or policies giving K-12 students the right to choose an alternative learning activity instead of participating in animal dissection.

Experts believe that student choice policies should provide clear guidance on the following issues:

- An alternative educational activity is made available to students who do not wish to perform animal dissections.
- The alternative learning activity is at an academic difficulty level that is similar to the animal-based activity, requires time and effort that is equivalent to the animal-based activity, and is not excessive or punitive in nature.
- Students are not permitted to opt out of non-harmful observational studies of animal behavior.
- The policy designates which schools and/or grade levels are covered.
- The policy applies to all animals.
- Asking students to observe others performing a dissection, or letting students leave during the dissection but requiring them to return to study the dissected animal, are not appropriate alternative activities.
- The policy clearly states that students are to be informed in advance, preferably at the beginning of the course, if animal dissection or experimentation is part of the curriculum.
- Students have the option to choose not to dissect, even on the day of the activity. It is therefore important that students not be required to submit their concerns by a specific date prior to the animal-based activity.
- Teachers familiarize themselves with non-dissection teaching methods, such as virtual dissection, to ensure that all students receive the same quality of teaching.
- Students who choose not to participate in dissection are not assessed using dissected animals (Los Angeles Unified School District, 2013; The Humane Society of the United States, 2007; World Events Ending Animal Cruelty, n.d.).

One area in which student choice policies differ is the issue of parental consent. Many states, such as California, Connecticut, Florida, and Rhode Island, require parental or guardian consent in order for a child to be excused from animal dissection. Others believe that the student's own ethical values are of primary concern and that his or her decision to opt out of dissection should therefore not require parental consent (American Anti-Vivisection Society, 2015; The Humane Society of the United States, 2007).

### **Summary**

Animal dissection is still practiced nationally in U.S. classrooms and has long been an integral part of study in science education. The use of animals in the classroom, however, has become a controversial practice. Animal rights groups have strongly urged educators to discontinue animal dissection, and growing numbers of students are reporting that they are uncomfortable with animal dissection and experimentation. Still, an estimated six to 12 million animals are dissected annually in high schools across the country, and most science teachers report using dissection as a teaching tool.

The main advantage of animal dissection is that it provides students with the opportunity to participate in a hands-on, realistic learning experience. Critics point out, however, that dissection has many serious disadvantages, such as its emotionally disturbing effect on some students, the harm it causes to animals, students' exposure to dangerous chemicals, the endangerment of native animal populations, and the high cost of specimen replenishment, chemicals, and lab supplies.



Alternatives to dissection include computer simulations, the use of three-dimensional clay and plastic replicas, videos, slides, charts, and drawing and labeling diagrams. Many organizations offer loan programs through which teachers and students can borrow non-animal dissection alternatives at no charge. Several websites that offer access to a variety of resources were provided in this report.

Most studies have found that high school students who learn from virtual dissections perform as well or better on tested subject matter as do students who perform actual animal dissections. However, several studies suggest that students who perform real-life dissections may score higher on practical laboratory tests than students who perform virtual dissections. Experts agree that additional research is needed to determine the effectiveness of virtual dissection and the extent to which it should be integrated into the science curriculum. For now, however, many researchers believe that virtual dissection can be a viable alternative to real-life dissection, especially for those students who would otherwise not engage in physical dissection due to moral, ethical, or health concerns.

Many states, including Florida, have taken legal steps that allow students to opt out if they are uncomfortable with animal dissection. This report reviewed issues experts believe should be addressed in district and state student choice policies.

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