



Need for Alternatives for Animals in Education and the Alternative Resources

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Summary

Animal use in education, research, and testing has been a subject of controversy. Undoubtedly, the outcomes of animal use have benefited both man and animals. Science has since made tremendous progress, however, and the advancements in modern technologies have opened up a plethora of sophisticated tools and techniques that potentially can replace the old and outdated methods. The discovery/development of alternatives and the newer, realistic approaches and ideas for the replacement, refinement, and reduction of animal use in education have changed the very face of teaching laboratory exercises in Zoology/Life Sciences. The avenues of animal use and the alternatives in education are reviewed from the perspective of India, with emphasis on modernizing the curriculum for programs in these subjects.

Keywords: vivisection, computer simulations, digital alternatives, CPCSEA, UGC

1 Introduction

Animals have long played an important role in education and research. In higher education, in particular, animals are used to teach systematics, anatomy, physiology, pharmacology, and psychology. Many science courses use dissection to help students understand animal anatomy and also to provide them with skills in medical operation/surgical techniques. The practice of animal dissection in laboratories dates back to the late 1800's. The two aspects of animal killing in science education include dissection and vivisection, for which approximately 170 species of animals are used. Dissection is the exploration of dead animals to study their anatomy and physiology, whereas vivisection is animal experimentation, involving cutting, burning, shocking, drugging, starving, irradiating, blinding, or killing of animals.

Every year, millions of animals – cats, frogs, fetal pigs, grasshoppers, minks, earthworms, rats, mice, dogs, pigeons, lizards, etc., – are dissected or vivisected in schools, colleges, and universities. In most of these cases the animals are captured live from the wild. In fact, to meet the heavy demand of the classrooms a single supplier catches 3000 frogs per month, one report says. The consequent loss of biodiversity is unimaginable and poses a serious threat to the fragile environment. The World Conservation Union reported in 2004 that one-third of all amphibian species around the globe, including frogs, were threatened with extinction. For example, thousands of frogs were collected and killed in India for educational purposes, resulting in a decline of the population of aquatic amphibians such as *Rana (=Euphlyctis) hexadactyla* and *Rana (=Hoplobatrachus) tigrina (tigerinus)*. People for the Ethical Treatment of Animals (PeTA) have estimated that about 6 million frogs are killed for

dissection each year. Similarly, the declining population of *Sara hardwickii (Uromastix hardwickii)*, the spiny-tailed lizard, is notably attributable to their large-scale removal from the wild for the purpose of education and research (Dr Krishan K. Sharma, personal communication). Although habitat loss, pollution, and climate change are the primary causes for the decline of the population of these species, demand for dissection specimens increases pressure on this threatened species.

An appropriate and commonly accepted goal of education is to teach individuals to think independently in an analytical and critical way. To achieve this goal, a teacher must become less of an authority, whose role is to simply pass on information, and more of a facilitator, whose role is to promote questioning, exploration, and synthesis. In addition, teachers – and, more importantly, the education boards, the Boards of Studies, and Academic Councils – should frame syllabi and courses in such a manner that ethical education is disseminated and does not contradict the curriculum. It is ironic that Zoology/Life Science teachers on one hand emphasize the importance of biodiversity/wildlife conservation but on the other hand practice dissection in education (Sathyanarayana, 2009). It has been much debated as to whether animal dissection is a process of learning or skill development. According to Rosse (1995), dissection is a destructive (rather than a constructive) process that destroys many of the specimen's structures and their spatial relationships, precluding reexamination by the students. Generally, dissection is too focused on the acquisition of facts while failing to teach students to conceptualize and synthesize (Rollin, 1990). In the realm of basic sciences, it provides little learning, and whatever skill is acquired has no relevance to the future careers of the learners (Akbarsha, 2007).



2 The changing scenario

As the widespread use of animals in education and testing simmered, complicated by many side effects, a sense of awareness raised an alarm for a group of people: “the visionary ones.” It was the effort and far-sightedness of these “visionaries” that resulted in the 3R principles. The 3R principles – Reduction, Refinement, and Replacement of animal use in research – were proposed by W. M. S. Russell and R. Burch (1959). The 3R concept, also called “alternatives,” delineates the idea of abolishing unethical, unnecessary, and unscientific experiments in bio-medical research, as well as inculcating a sense of care for and humane treatment of animals.

The 3R concept originally was introduced with respect to research activity, but the idea snowballed, as educators, animal welfare groups, scientists, conservationists, and academics realized the potential of alternatives in education and teaching. Now they have seriously pondered the lack of relevance of killing animals for the sake of knowledge. Historically, plenty of animals were easily available for a lesser number of students, but with the ever-increasing number of schools and colleges, the student population has swollen while animal numbers have declined – the situation has reversed itself (Akbarsha, 2007).

Over the past several decades, educators have begun to question the value of this use of animals. Many reports suggest that there is a strong correlation between the way we treat animals and the way we treat fellow humans. Being instructed to cut into an animal without fear of opposition or retaliation from the helpless animal marks animals as “objects” and thus fosters a sense of devaluing animals.

The enormous strides made by computer science, information technology, and allied fields have changed the very face of the education system. Innovative methods of teaching anatomy, physiology, behavior, and psychology are available in various formats for a variety of species. Computer simulations, three-dimensional (3-D) models, videotapes, cadavers, and other alternatives involve little or no use of animals. This has resulted in millions of animals being saved. Teachers and professors have started recognizing that students can learn equally well through the use of modern technology, and reports published in scientific journals testify to it (van der Valk, 1999).

Teachers play an important role in framing the courses and syllabi, and the fate of hundreds of animals hangs on them. There was a time when teachers relied on and preferred animal dissection for the purpose of knowledge dissemination, rebuffing the latest technologies. This could be attributed to an unwillingness to adopt the modern technology or to their lack of awareness/understanding about it. However, effective campaigns, relentless efforts by the welfare organizations, ethical issues, budgetary concerns, and innovative technologies have made an impact. The attitude of teachers has changed or is changing, and they have come forward and proposed substituting the use of computer simulations and multimedia presentations in place of the conventional dissections. Today, the Zoology/Life Science teachers are experiencing an ethical crisis over animal dissections and experiments (Chitrakleha, 2009).

3 Laws regarding animal welfare

India has one of the most comprehensive animal protection laws in the world. Detailed codes of conduct govern the use and treatment of animals, both domestic and “wild.” The Constitution of India, section 51 A(g) demands from the citizens as their fundamental duty to protect and improve the natural environment including forests, lakes, rivers, and wildlife and to have compassion for all living creatures.

The Prevention of Cruelty to Animals Act, 1960, Section 17(2) (d) & (f) advocates the rational use of animals in experiments and education. The law clearly states that “*experiments on animals are avoided wherever it is possible to do so; as for example in medical schools, hospitals, colleges and the like, if other teaching devices such as books, models, films and the like may equally suffice.*”

The Wildlife (Protection) Act, 1972, provides legal protection to all species included under various schedules, i.e., schedule I to schedule VI. Some of the commonly used animals in dissection, such as sharks and rays (Elasmobranchii), Bonnet macaque (*Macaca radiata*), Rhesus macaque (*Macaca mulata*), and freshwater frogs (*Rana* spp.) are protected under these schedules. The ongoing use of animals for dissection/vivisection in education in India is in violation of the legal provisions (Vasudevan and Surpriya, 2011). Following reports of dissection of frogs at a Medical College without permission of the Chief Wildlife Warden, a team of officials from the District Forest Office raided the college premises. The District Forest Officer (DFO) said frogs were found on the premises, and the college authorities did not have permission to dissect them (*Tribune India*, September 30, 2009). Ignorance of the law is no excuse for those who kill animals.

In addition to these animal welfare rules, The Breeding of and Experiments on Animal (Control and Supervision) Rules, 1998, govern the care and concern about experimental animals, and it is monitored by an independent Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), a statutory body under the Prevention of Cruelty to Animals Act, 1960, in the Ministry of Environment and Forests.

4 Initiatives in alternatives to dissection

The use of alternatives got its due attention and significance when Jenifer Graham, a high school student in California, sued her school for insisting that dissection was the only method it recognized for learning frog anatomy. Following this event, more students objected openly to dissecting animals, which resulted in the genesis of “Choice-in-Dissection-Laws.” These laws made provisions for the students to choose between animal dissection and alternative learning modalities. Today, many countries, including Argentina, Switzerland, Norway, the Netherlands, and Denmark, have enacted legislation to prohibit dissection below the university level, and several other countries do not require it.



Being a country with a human population of more than a billion, India, too, had witnessed many such incidences, and some of the State Education Boards and Universities have acted to shed, partially, syllabi involving animal use in Life Sciences programs (Salunkhe, 2009). The Zoology students of the University of Kerala complained to People for Animal (PfA) trustees regarding the painful killing of frogs by pithing without anesthesia. Pithing involves the insertion of a sharp object into an animal's skull and moving it around vigorously to "scramble" the brain. This is a common practice for rendering frogs "brain-dead" for physiology experiments. This indeed has traumatizing effects on the students. The PfA forwarded their petition to the Vice-Chancellor, the Registrar, and the Chairperson of the Board of Studies. As a result, all frog experiments were removed from the syllabus from 2005-2006 onwards.

At the same time, the University Grants Commission (UGC) requested all the Universities and Colleges to ensure the strict adherence to the provisions of the Wildlife (Protection) Act 1972 while procuring animals for use in laboratories. At the request of I-CARE and PfA, the University Grants Commission (UGC) constituted an Expert Committee in 2010 to look into the possibility of reducing/dispensing with the dissection of animals in colleges and universities. The Ministry of Environment and Forests (Government of India), New Delhi also asked the UGC to explore the possibility of ending the practice of dissecting animals in laboratories. These initiatives taken by the UGC boosted other organizations, such as the Pharmacy Council of India, which sent letters to all Pharmacy institutions to use computer simulations as an alternative to use of animals. Rather slowly but steadily, the revamping of traditional animal-based programs took place. These laws, regulations, guidelines, and notifications require the educators to use non-invasive alternative methods to replace the killing of animals in the laboratories.

The Medical Council of India, the apex board that decides the course structure and sets laws for medical colleges, has conceded that exemplary and innovative alternative tools are available that can replace or at least lessen the use of animals for the purpose of education. The Council directed the medical schools to replace the use of live animals in medical course experiments with sophisticated non-animal training methods, such as computer-aided learning (Medical Council of India, 2009).

A number of Zoology/Life Science/Medical/Pharmacy and Veterinary Educators in colleges and universities have played a role in preventing the animal killings, improving the learner's (students') learning experiences by replacing dissection with modern, effective, and economical non-animal, student-friendly alternatives in the science laboratories.

The biggest tickets to ecstasy for animal welfare, teachers, and scientists were earned when the UGC accepted the Expert Committee's recommendations and enacted new guidelines, which is historic (http://www.ugc.ac.in/notices/guidelines_animaldissection.pdf). For the first time, animal dissection is almost completely removed from the university courses. This triumph was made possible by the painstaking efforts of many

authorities, teachers, scientists, animal welfare organizations and, in particular, MGDC, PfA, I-CARE, and PeTA India, to name a few.

5 Alternatives: what are they and where?

Alternatives, in the present context, are defined as educational aids or teaching approaches that replace harmful animal use or complement humane education. Humane education in the Life Sciences is progressive education for which the teaching objectives are met using humane, alternative methods where animals are free from harm and students have freedom of conscience in an education that encourages holistic perception and a respect for life (Jukes and Chiuria, 2003). In their book, "*The Principles of Humane Experimental Technique*," Russell and Burch (1959) defined the Replacement alternatives as methods that permit a given purpose to be achieved without conducting experiments or other scientific procedures on animals. The 3R concept has evolved today as "the science of alternatives," making tremendous changes in laboratory techniques across the world in knowledge; only humane science can be good science. The use of non-animal methods in experimentation is integral to credible research.

Many different types of non-invasive animal alternative resources are available now, including models, manikins, multimedia computer simulators (CD-ROMS), online simulators, cell culture techniques, *in vitro* toxicology, molecular tools, functional genomics, tissue engineering, systems biology, cell-laden hydrogels, molecular and acoustic (sonotaxonomy) tools, microlabs, and ethically sourced animal cadavers. Field study of animals also is considered one of the best alternatives to dissection.

5.1 Models and manikins

The models are used to study the anatomy and to learn animal handling without animal stress. The three-dimensional plastinated animal models (Plastination is a chemical process that transforms the tissues of a dead animal into plastic) are available. A manikin is an anatomical model. For example, a manikin of a full-size dog has been designed for Cardiopulmonary Resuscitation (CPR) training. This alternative tool is helpful in teaching laboratory exercises in pharmacy and medicine. Manikins have been employed in veterinary education as well. Models of anatomic parts, whole-body manikins, and various computer-based learning programs have provided educators with training tools for students aiming to become professional veterinarians.

5.2 Digitalized CD ROM

The development of e-learning technology, a computer-based technology, has contributed significantly to our knowledge of effective Animal Science education. Students can be trained in animal anatomy using computers, and virtual reality technologies are revolutionizing the educational system. Today



we are in an Information and Communication Technology (ICT) era, and it requires that teachers be both digitally literate and liberally sensitive. The time has come to change the laboratory curriculum and put the available digitalized CD ROM, other animal alternatives, and web resources to good use. Teachers often cite the cost of alternatives resources and computers as a reason for not implementing them, but the alternatives provide great advantages.

The advantages of computer simulations include:

- Students can learn different variables at one time and various parameters on a large or small scale.
- Computers can offer scope for feedback, provide hints, and offer help.
- Experiments can be repeated at any time and almost anywhere.
- Teachers and students can make use of one CD-ROM repeatedly.
- These methods are cost-effective and affordable when compared to the cost of animals (dissection requires multiple animals to be purchased).
- They provide for conservation of animals and balanced ecosystems.
- They enhance the creativity of teachers, as opposed to the conventional dissection process.

5.3 Cadavers

Cadavers are dead animals from a humane and ethical source (for example, animals that died naturally or of illness, injury, accidents, or severe behavioral problems). An animal killed intentionally cannot be considered ethically sourced as it has been subjected to pain and suffering. The importance of ethically sourced cadavers and their implications for teaching and education is vividly described by Martinsen and Jukes (2007). Cadavers are used as alternative educational tools in veterinary colleges to facilitate learning of animal anatomy and to fine-tune surgical skills, especially for novice veterinary students (Tefera, 2011).

6 Conclusion

Dissection is an old-fashioned teaching and learning method that has worn out over the years and is of negligible use in the modern education system. With the advent of modern technology educators should frame curricula that expose students to the acquisition of knowledge through observation rather than through the archaic method of dissecting animals (Sathyanarayana, 2009). Laboratory curricula should be designed to develop the student's sense of responsibility towards animal welfare, as well as an appreciation of and respect for life. It is high time for universities to seek avenues that will minimize animal use for teaching purposes (Surendran and Easwaramohan, 2009), adhere to the UGC's new Guidelines regarding animal dissection, and offer alternatives for dissection. It has been rightly pointed out that a commitment by

the educators at the national and institutional levels is required to bring changes in the undergraduate curriculum that will result in a reduction of animal use in the laboratory curriculum. Field trips, biodiversity, biosystematics, and behavioral studies should be added to the curriculum to make teaching more interesting and learning more rewarding. Attention of readers is invited to the treatise "*The Use of Animals in Higher Education: Problems, Alternatives and Recommendations*," by Jonathan Balcombe, which has reviewed the state of affairs pertaining to alternatives in education (Balcombe, 2000). The weak point, as opined by an award-winning teacher, is "*most of us teach the way we were taught rather than the way we learn*." At the same time, alternative tools should be defined clearly and objectives should be set rationally, with a realistic approach to be undertaken regarding the welfare of the animals, the benefit to the students, and compassion for animals overall.

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