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The Science and Ethics of Animal Research

CURRICULUM OVERVIEW

Why do scientists use animals in research? Few topics elicit such a strong reaction as that of animal research, and many teachers are hesitant to address the subject. Yet every vaccine, breast cancer treatment, heart surgery technique, and prescription drug developed has used animal models and subjects. How do ethical considerations influence the use of animals? What does the history of animal research tell us about current views and policies? Furthermore, how can we discuss this topic in a respectful manner?

This curriculum introduces students to the way animal research is conducted, the numbers and types of animals used, alternatives to animal research, rules and regulations involved, and the bioethical frameworks used by those in support of, and in opposition to, this research. Throughout the unit, students are encouraged to consider how their own actions reflect their position on the issue. Lesson strategies and bioethical discussions engage students in science content, as well as promote an understanding of the role of science in society.

RESEARCH ETHICS SERIES ENDURING UNDERSTANDINGS

- The biomedical research process is complex and dynamic, requiring information and tools of reasoning.
- The biomedical research process is driven by potential benefits to humans and animals.
- The biomedical research process has evolved as scientists and other members of society have reflected on acceptable practices. It continues to do so as our knowledge expands.
- The biomedical research process requires active participation by scientists, consumers, voters, and research participants.

The Science and Ethics of Animal Research curriculum is part of NWABR's Research Ethics Series.

LESSON OVERVIEW

The **5 E Learning Cycle Model**, as publicized through its use in the BSCS (Biological Sciences Curriculum Study) science program, incorporates five phases of learning: engagement, exploration, explanation, elaboration, and evaluation. The lessons in this curriculum follow the 5 E Model, guiding students through this powerful cycle of learning. In the descriptions of the lesson plans provided below, notes indicate which stage of the 5 E Learning Cycle Model aligns with each lesson plan.

Lesson One: Introduction to Animal Research

“Engage”

Lesson One is made up of two activities. In the first activity, students begin a unit-long written conversation (Chalk Talk) in which they explore and share their thoughts and ideas about animal research by silently responding to statements, pictures, and questions posted on the classroom walls. The posters remain on the classroom walls throughout the unit and are revisited by students in Lessons 1, 3, and 5 of the unit. This provides teachers with a formative assessment of students' understandings about animal research and humans' uses of animals.

In the second activity, students explore a number of human activities which result in animal deaths: raising animals for food, hunting, abandoning animals in shelters (which results in euthanasia), using animals in scientific research, driving on U.S. roads and highways. Students predict the number of animals impacted by each activity and then compare their predictions to actual numbers. In addition, students take a closer look at animals used only for scientific research and make predictions about what types and how many animals are used for this purpose. Lastly, students consider any possible benefits and supervision for each category.

Lesson Two: Why Use Animals in Research?

“Explore & Explain”

Students begin this lesson by watching video vignettes exploring the “3 Rs” (*Replacement, Reduction, and Refinement*) that guide scientists in conducting humane research with animals. Student groups are then introduced to several types of models, including model organisms, which scientists may use to answer different types of research questions. Using a set of Research Model Cards, students explore research questions and evaluate possible methods to determine the most appropriate model for answering the research questions.

Lesson Three: History of Animal Research

“Explain”

Students are introduced to a brief history of animal research through a timeline mapping activity. Students are asked to order the events in the timeline and highlight the occurrence of significant events. A discussion about significant events and trends helps students understand the impacts of history on today’s regulations, governing bodies, and uses of animals in research. An extension to this lesson explores the meaning of the phrase *Not Tested on Animals*.

Lesson Four: Exploring Ethical Viewpoints

“Explore & Explain”

In this lesson, students are introduced to duties-based and outcomes-based ethical theories through a series of actual quotes from people who hold different views on animal research. Students then role-play the stakeholder positions. First students identify their stakeholder’s stance as coming from a primarily duties-based or outcomes-based ethical perspective, when possible, and then students align themselves around the room based on their stakeholder’s assumed support of or opposition to the use of animals in research. While standing with other student stakeholders holding similar views, students record their group’s top three supporting arguments. Groups with different perspectives then join together for a Structured Academic Controversy to present and listen to alternative viewpoints. Lastly, students drop their stakeholder roles and further define and justify their individual position on the issue.

Lesson Five: Case Study Decisions

“Elaborate”

In this lesson, students read one of three case studies involving animals in research. Students work through a Decision-Making Framework in small groups, in which they identify the ethical question, determine which facts are known or unknown, consider the values of different stakeholder groups, generate possible solutions, and then make and justify a decision about the case. This is a jigsaw exercise, in which students first meet in “like” stakeholder groups to become experts on the values and concerns of that group. Teams are then rearranged so that each new group has students from different stakeholder viewpoints. After sharing the views and values of each stakeholder group with their peers, groups work together to generate options for solutions to the case study. Lastly, students come to individual decisions about the case and write a thorough justification. [**Note:** Some field test teachers suggest transitioning from *Lesson Four* directly to the *Assessment* and using this lesson as a reflective tool for re-visiting the topic at a later date].

Assessment

“Evaluate”

At the beginning of *Lesson One*, students engaged in a silent Chalk Talk regarding their personal understandings and beliefs about animal research. By beginning successive lessons with students adding to these conversations, students are able to observe how these understandings and beliefs change and/or grow through the unit as they add to the “conversation.”

At the culmination of the daily lessons, students engage in a whole class discussion about what they observed and how their understandings and beliefs about animal research have or have not changed over the course of the activities. This provides teachers with a formative assessment of students’ understandings about animal research and the use of animals in and by society.

As a summative assessment, students will create an Action Plan of how they will exercise their personal position on the use of animals in and by society based on background information and ethical principles.

Research Ethics Series

The Science and Ethics of Animal Research is part of the following curricular set:



The Social Nature of Scientific Research

- How is scientific research different from other ways of discovery and learning about the world?
- How does the ethical conduct of scientific research lead to a process that promotes accountability, integrity, and intellectual honesty?
- How are scientific research, society, and culture shaped and influenced by each other?
- How does scientific research develop and change in response to new evidence, knowledge, and the application of new tools?
- What is my role and responsibility in being a scientific literate citizen?



The Science and Ethics of Animal Research

- Why do scientists use animals?
- How does the history of animal research influence current views and policies?
- How do ethical considerations influence the use of animals in research?
- How can my actions reflect my position on the use of animals in research?

A poster that details the 3 Rs of animal research: Replacement, Reduction and Refinement is also available.



The Science and Ethics of Humans in Research

- How does the history of research with humans influence attitudes, policies, and current practices?
- Why do scientists involve humans in research? How do scientists recruit, engage, and partner with participants?
- What is the process used to make decisions regarding humans in research, and how are costs and benefits evaluated?
- How does the process of carrying out ethics trials involving humans influence the time needed to develop new cures and treatments?
- How can my actions reflect my position on research involving humans?

Each unit is designed to be used independently or as part of a larger curricular set.
All three units are available from <http://www.nwabr.org>.



Correlation to National and Washington State Science Standards

National Standards Alignment: Science (Grades 5-12)

	Lesson One: Introduction to Animal Research	Lesson Two: Why Use Animals in Research?	Lesson Three: History of Animal Research	Lesson Four: Exploring Ethical Viewpoints	Lesson Five: Case Study Decisions	Assessment
Unifying Concepts and Processes						
Systems, order, and organization.		X				X
Evidence, models, and explanation.		X				

National Research Council. (1995). *National Science Education Standards*. Washington DC: National Academies Press.

National Standards Alignment: Science (Grades 5-8)

	Lesson One: Introduction to Animal Research	Lesson Two: Why Use Animals in Research?	Lesson Three: History of Animal Research	Lesson Four: Exploring Ethical Viewpoints	Lesson Five: Case Study Decisions	Assessment
E. Science and Technology						
Abilities of technological design.		X				
Understandings about science and technology.		X	X			
F. Science in Personal and Social Perspectives						
Risks and benefits.		X				
Science and technology in society.			X	X		
G. History & Nature of Science						
Science as a human endeavor.			X			
Nature of science.				X		
History of science.			X			

National Research Council. (1995). *National Science Education Standards*. Washington DC: National Academies Press.

National Standards Alignment: Science (Grades 9-12)

	Lesson One: Introduction to Animal Research	Lesson Two: Why Use Animals in Research?	Lesson Three: History of Animal Research	Lesson Four: Exploring Ethical Viewpoints	Lesson Five: Case Study Decisions	Assessment
E. Science and Technology						
Abilities of technological design.		X				
Understandings about science and technology.		X	X			
F. Science in Personal and Social Perspectives						
Science and technology in local, national, and global challenges.	X	X	X	X	X	X
G. History & Nature of Science						
Science as a human endeavor.			X	X	X	
Historical perspectives.			X			

National Research Council. (1995). *National Science Education Standards*. Washington DC: National Academies Press.

Washington State Standards: Science (Grades 6-10)

	Lesson One: Introduction to Animal Research	Lesson Two: Why Use Animals in Research?	Lesson Three: History of Animal Research	Lesson Four: Exploring Ethical Viewpoints	Lesson Five: Case Study Decisions	Assessment
Inquiry						
2.1.4 Investigating Systems: Modeling. Analyze how physical, conceptual, and mathematical models represent and are used to investigate objects, events, systems, and processes.		X				
2.2.5 Nature of Science: Evolution of Scientific Ideas. Understand how scientific knowledge evolves.			X			
Application						
3.2.1 Science, Technology, and Society: All People Contribute to Science and Technology. Analyze how scientific knowledge and technological advances discovered and developed by individuals and communities in all cultures of the world contribute to changes in societies.			X			
3.2.1 Science, Technology, and Society: Relationship of Science and Technology. Analyze how the scientific enterprise and technological advances influence and are influenced by human activity.	X	X	X	X	X	X

Washington State Office of the Superintendent of Public Instruction. (2005). *Science—K-10 Grade Level Expectations: A New Level of Specificity*. Washington: Office of the Superintendent of Public Instruction.