# Experiments in Poultry Science

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Insert: A Closer Look embryology poster
- Eggonomics game
Dear Educator,

Embryology: Experiments in Poultry Science is designed to provide you with background information and exciting experiential activities dealing with life science for use in your classroom. Each activity is designed to be grade-level appropriate and has been correlated to U.S. National Science Education Standards.

Children have a natural sense of curiosity about living things in the world around them. Building on this curiosity, students can develop an understanding of biology through direct experience with living things, their life cycles and their habitats. This curriculum was developed with your students in mind. Many believe students learn best by interacting with the world – listening, observing, experimenting and applying their knowledge to real-world situations. Each activity within this curriculum follows these steps in the experiential learning model.

An additional goal of this curriculum is to help students develop life skills. Life skills help an individual live a productive and satisfying life. Within this curriculum your students will have the opportunity to develop life skills related to science processes, teamwork, keeping records, and planning and organizing.

We hope that Embryology: Experiments in Poultry Science is an enjoyable experience for both you and your students as well as a beneficial unit in your life science curriculum. Here are a few quotes from students who worked with our pilot:

The best part of learning about chickens and embryos was...

"I enjoyed everything we did, because we got to learn by doing, not just reading."

"Enjoyed the whole project because we actually did something instead of just looking at picture."

"This was wonderful because it did not seem like school, even though we were learning the whole time."

"It was fun the whole time."

"The best part was seeing how the chick hatched. It was cool how it packed its way around the shell."

"The best thing was when they hatched. It was really exciting. I also liked learning about hatching eggs. I learned so much that I didn't know before."

Acknowledgements

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Introduction

Embryology and national science standards

A classroom unit in embryology will help you meet the following national science standards:

**In order to conduct a scientific inquiry, you must be able to**
- Identify questions that can be answered through scientific investigations.
- Design and conduct a scientific investigation.
- Use appropriate tools and techniques to gather, analyze and interpret data.
- Develop descriptions, explanations, predictions and models using evidence.
- Think critically and logically to make the relationships between evidence and explanations.
- Recognize and analyze alternative explanations and predictions.
- Communicate scientific procedures and explanations.
- Use mathematics in all aspects of scientific inquiry.

**Structure and function in living systems**
Living systems at all levels of organization demonstrate the complementary nature of structure and function.
All organisms are composed of cells—the fundamental unit of life.
Cells carry on many functions needed to sustain life.
Specialized cells perform specialized functions in multicellular organisms.

**Reproduction and heredity**
Reproduction is a characteristic of all living systems.
In many species, females produce eggs and males produce sperm. An egg and sperm unite to reproduce.
Every organism requires a set of instructions for specifying its traits.
Heredity is the passage of these instructions from one generation to another.
The characteristics of an organism can be described in terms of a combination of traits.

**Regulation and behavior**
All organisms must be able to obtain and use resources, grow, reproduce and maintain stable internal conditions while living in a constantly changing external environment.
Behavior is one response by an organism to an internal or environmental stimulus.
An organism’s behavior evolves through adaptation to its environment.

**To succeed in technological design, you must**
- Identify appropriate problems for technological design.
- Design a solution or product.
- Implement a proposed design.
- Evaluate completed technological designs or products.
- Communicate the process of technological design.
Experiential learning model

Experiential learning means having students do hands-on activities, reflect on the meaning and apply what they learned. This process helps ensure that the students learn actively and make knowledge a part of their world. It also helps students answer questions such as “Why should I learn this?” and “Now that I know this, what do I do next?”

**Experience**
The model begins with experience, action. This immediately focuses the attention on the learner rather than the teacher. This requires active cooperation from the learner, coupled with guidance from the teacher to help maintain the learner’s curiosity. Teaching becomes a cooperative enterprise.

**Share**
Sharing is simply asking the group or individuals, What did you do? What happened? What did it feel like to do (whatever)? This step should generate lots of information to lead to the process step.

**Process**
The questions and discussion now become more focused on what was most important about the experience. Common themes that emerge from the sharing session are explored further. Often the key teaching points related to the subject matter are discussed.

**Generalize**
In this step the experience is related to a real-world example. This step helps the student to answer the questions, Why should I learn this? What did the experience mean to me personally? To my everyday life? Subject matter and life skill development can be discussed in this step. For example, if you hope that the activity helps students develop teamwork skills, then questions about teamwork would be appropriate.

**Apply**
This step helps the student answer the question, Now that I know this, what do I do next? Can students express what they learned? Can they use what they learned? Can the student actually apply the learning to a new situation?

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Experiential Learning Model

1. Experience the activity; perform, do it
2. Share the results, reactions, observations publicly
3. Process the experience; discuss, analyze, reflect
4. Generalize to connect the experience to real-world examples
5. Apply what was learned to a similar or different situation; practice

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Providing an experience alone does not create “experiential learning.” The activity comes first. The learning comes from the thoughts and ideas created as a result of the experience. This is a “learn by doing” or experiential process. Addressing each step in the process assures a purposeful plan to obtain a specific goal.
Life skill development

A skill is a learned ability to do something well. Life skills are abilities individuals can learn that will help them to be successful in living a productive and satisfying life. The following is a list of skills that students will develop through experiencing the activities within this curriculum. Also included is a set of criteria that can act as indicators to determine if the life skill is being developed.

Planning and organizing—A method for doing something that has been thought out ahead of time; how the parts can be put together.

Indicator:
Student can develop a part of a plan.

Keeping records—Recording selected useful information, usually focused for a specific purpose.

Indicator:
Student is able to categorize information and select useful information.

Teamwork—Work done by two or more people, each doing parts of the whole task. Teamwork involves communicating effectively, identifying and agreeing on a common task, dividing a task by identifying contributions by each person, accepting responsibility for one’s part of the task, working together to complete the task and sharing accomplishment.

Indicator:
Understands roles as essential and enjoys working together with others of similar interests/abilities.

Science skill

These skills represent the scientific thinking and process skills that are essential to scientific inquiry. An inquiry based science classroom uses and encourages the use of these skills in science activities.

Observing—Generating reasonable questions about the world based on observation.

Examples:
Seeing, hearing, tasting, smelling and feeling.

Comparing and measuring—Using simple measurement tools to provide consistency in an investigation.

Examples:
Sensory observations, weight, quantity, quality, temperature and capacity.

Relating—Developing solutions to unfamiliar problems through reasoning, observation and experimentation.

Examples:
Asking questions, making a hypothesis, understanding relationships, designing and conducting simple investigations, and identifying the control and variables in an investigation.

Applying—Using sources of information to help solve problems.

Examples:
Applying science learning to resolve current issues, inventing a new technology, using math and forming additional questions.
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Doing the right thing

Introduction

Because this embryology curriculum involves the use and study of a living organism, there are certain decisions and responsibilities that the class should consider before actually doing all the activities. This activity will help the class make decisions that are best for your class situation.

Some decisions that your class may want to consider include:

1. Should the class incubate the eggs or do a project without incubating eggs?
2. How many eggs does the class need?
3. Should the class create shell windows, conduct experiments and study in-vitro development, which will require the sacrifice of a few embryos?

Get ready

What does the class hope to learn from this embryology in-classroom project? Be familiar with the teachers’ guide and the individual projects contained within the material. Discuss the possibilities with the class.

You may also wish to pull together information from various sources discussing the pros and cons of experiments and using animals to study science. There are links to this information on the World Wide Web site (URL). Pull a cross-section of this information down off the Web and make it available for the students to read as part of this activity.

Do It

A. List the project objectives and some of the activities the class could conduct to accomplish them, such as incubating the eggs, shell windows, experiments and in-vitro development.

B. Select two of the activities for the class to discuss in more detail. The class might wish to select an ethical decision they deal with in their day to day life as well, i.e., lying, stealing, gossiping, or cheating.

C. Divide the class into six groups of at least three students each. This activity provides an opportunity to practice communication skills with real life situations. Ask each student to read background information on the topic and prepare for a debate of the pros and cons of these activities. They should take into consideration the decisions, consequences and responsibilities that must be made and undertaken for each activity. Ask them to compare the activity and possible alternatives. Give the students 20 minutes to assemble their arguments. This is not to be a debate but rather a time for sharing views and each group’s side of the argument. This will allow the groups to find facts that support their side or become more understanding of the other groups’ viewpoints. If you see that they are getting stuck on a strategy to use or need help clarifying their points, you will want to ask questions to help them think rather than giving them an answer.

D. The next day or the next class period ask the group to present its recommendation to the class. This recommendation should include but not be limited to the following points:

Embryology skill:
Hatching, observing and experimenting with embryos, and caring for the developing egg and chicks

Life skill:
Decision-making

Science skill:
Communicating

School subjects supported:
Science

Preparation time:
10 minutes

Activity time:
50 minutes: 20 minutes for group to prepare, 20 minutes for debate, and 10 minutes for class discussion

What you need:
Access to resources from scientific, agricultural and animal rights groups including Animal Industry Foundation, People for the Ethical Treatment of Animals, Animal Welfare Information Center, Americans for Medical Progress, Animalrights.net, Foundation for Biomedical Research, National Animal Interest Alliance, National Association for Biomedical Research and American Association for Laboratory Animal Science
1. What benefits are there to doing the activity and to doing the alternative activity?
2. What decisions should the class make before the activity starts?
3. Are alternatives available for class members who are not comfortable with the class’s decision?
   Ask the class to discuss the recommendation. Try to come to a consensus for each activity.

**Talk it over**

**Share**
- What factors did your group consider in making its decision?
- Where did you find information to help you make an informed decision?
- What decisions were the hardest? Why?
- How did you feel when the final decision by the group or class was different than the way you felt?

**Process**
- Why is it important to consider the ethical implications of doing these activities in a classroom setting?
- How did your group work through disagreements when trying to make a decision for the class?
- Why are ethics important to science and other professions?
- Why is it important to consider alternative ways of learning about embryology and other living things?

**Generalize**
- How has society benefited from research, studying embryos and chickens?
- What other ethical decisions have you made in your daily life?
- What type of ethical decisions do scientists, doctors and politicians have to make?
- Why do groups of individuals feel strongly about some issues?

**Apply**
- What did you learn about working in groups that may help you in the future?
- How might this exercise help you make ethical decisions in the future?
- Why is it important to consider the ethical implications of decisions you make in everyday life?

**Break Out**
- Consider having teams debate issues about this project or a current issue in society.
- Ask students to write a paper that presents both sides of an ethical issue facing society or their community.

**Evaluate it**
- Did the students think through their recommendations to the class?
- Did the students find reasonable alternatives to some activity?
- Did the students explain why they made the decisions they did?