

# ChickQUEST

## Teacher Guide

A Classroom Journey  
Through the Life Cycle  
of Chickens



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES



# Welcome to ChickQUEST

What can we learn from a chick? Find out with ChickQuest, a Science Alive 4-H School Enrichment program that challenges youth to use science, technology, engineering, and math skills to investigate the life cycle of an embryonic chicken egg. From monitoring living eggs to observing fluffy chicks, these lively activities pique curiosity, encourage collaboration and communication, and provide young scientists with unforgettable experiences.

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# Welcome to ChickQuest

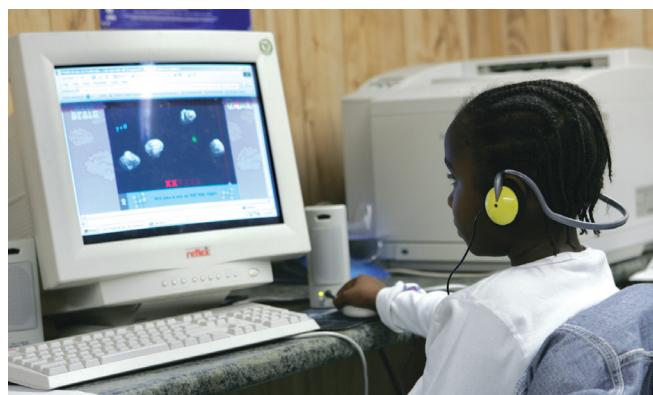
Hearing soft peeps from inside an egg they've been watching for 21 days brings Science Alive for youth. It's just one of the exciting adventures in ChickQuest, a 4-H Science Alive School Enrichment program. These lively lessons develop curiosity, encourage collaboration and communication, and deepen understanding of science, engineering, and technology while providing youth with an unforgettable experience.

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## What is 4-H STEM?

**STEM** stands for Science, Technology, Engineering, and Math. STEM education emphasizes process and design of solutions in learning, allowing youth to explore topics in a more personalized way and to develop critical skills for future academic work and employment. The STEM approach to learning is a perfect complement to 4-H's traditional experiential learning approach.

With a century of experience in youth education, 4-H plays a leading role in engaging youth to explore STEM with trained and caring adults in positive youth development environments and in a variety of non-formal science education settings. Inquiry-based STEM curriculum works from a common framework, including national science standards, to increase science literacy. It cultivates skills in science, technology, engineering, and math to prepare youth for full future participation in America's workforce.



An effective 4-H STEM experience engages youth through content, context, and delivery.

### Content

- Science, technology, engineering, and math content based on the national science education standards

### Context

- The Essential Elements of Positive Youth Development, fundamental to 4-H
  - Mastering life challenges
  - Cultivating independence with guidance from caring adults
  - Developing a sense of belonging with a positive group
  - Sharing a spirit of generosity toward others
- Reliance on trained, caring adult staff and volunteers acting as mentors, coaches, facilitators, teachers, and co-learners
- Perspective that youth are partners and resources in their own development
- Inquiry-based, hands-on, experiential approach that fosters the natural creativity and curiosity of youth

### Delivery

Experiences that are implemented in a variety of settings: clubs, camps, special interest groups, online, and in-school and out-of-school programs.



## What is ChickQuest?

Mystery, excitement, anticipation. Waiting for chicks to hatch has long been a favorite activity in elementary classrooms. Designed to deliver science, technology, engineering, and math content in the context of positive youth development, ChickQuest is a series of standards-based supporting activities written for classroom teachers and group leaders who facilitate a variety of 21st century learning environments. Lessons are arranged using the Experiential Learning Model (see page 5). Inquiry, collaboration, and communication are essential life skills practiced throughout. The *ChickQuest Logbook* provides an embedded evaluation tool, a useful resource for elementary science programs. Other helpful student assessments are available online in the form of skillathons for experiential evaluation and quizzes that prepare students for standardized testing formats. See more on skillathons on the ChickQuest Web site.



### Core Ideas

This curriculum reinforces these disciplinary core ideas from life sciences:

- LS2A: Interdependent Relationships in Ecosystems
- LS3A: Inheritance of Traits
- LS3B: Variation of Traits
- LS4B: Natural Selection

Students use scientific tools, articulate observations, record measurement data, read and interpret tables and graphs, use safety procedures, and communicate scientific findings. They use technology to set up scientific investigations and engineer solutions based on discoveries. Finally, students explore a wide range of agriculture-connected career opportunities in science, technology, engineering, marketing, sales, and transportation, all of which await their scientific knowledge and skills. A complete list of the national science standards addressed by this curriculum is available at [4Hchickquest.org](http://4Hchickquest.org).

### ChickQuest Logbook

The colorful and engaging *ChickQuest Logbook* is an integral part of the curriculum. Engaging, hands-on activities guide students' step-by-step discovery of science concepts and methods of study while introducing them to scientific habits of mind and scientific ways of knowing. Top-of-the-page essential questions focus students' attention on core concepts. These are questions youth might ask, intended to prompt reflection and further questions and to direct their own inquiry.

Just as for all research scientists, the logbook is designed to be an account of a student's participation in the project, from recording inquiry and brainstorming to completing diagrams, graphs, and charts and sketching final projects. It contains the steps taken during science investigations and in the engineering design process. Entries and observations should be brief and concise. The logbook is an indicator that certain activities happened at specific times. Reflections on successes, mishaps and changes for next time are valuable for learning.



For the teacher or group leader, the *ChickQuest Logbook* becomes a valuable assessment tool—a personal record of a student's work that showcases his or her participation and understanding. Logbooks help keep scientists and engineers organized;

they also provide a great opportunity to show off hard work. As teachers date and initial each entry, the *ChickQuest Logbook* becomes an affirming record of efforts and achievements.

### The Website

Online resources support, expand, and enrich the ChickQuest curriculum every step of the way for teachers and students alike. You'll find skillathons, quizzes, book lists, and recommended websites. Also included are instructions for ordering curriculum, logbooks, and kits; background information on reproductive systems and fertilization; and in-depth information about the incubator.

### The Video

A seven-minute video, linked from the ChickQuest website, enhances the educational experience. *The Egg: Ohio's Perfect Food* takes viewers on a tour to learn about Ohio's egg industry from the henhouse to the consumer. A companion viewing guide on pages 51-52 in the *ChickQuest Logbook* helps students get the most from this armchair field trip.

# What is Science Alive: 4-H School Enrichment?

4-H school enrichment programs are dedicated to the delivery of creative and integrated science content within and outside of the classroom. Emphasis is placed on helping students become proficient in their understanding of science and competent in their ability to apply science knowledge in meaningful ways. The 4-H school enrichment curriculum materials are aligned with academic content standards and improve the instruction of science by expanding the repertoire of highly effective hands-on science activities.

## Role of the Teacher

Your leadership is critical to the success of the 4-H science experience. Young people thrive when they connect with dedicated, enthusiastic adults who provide for the essential elements of youth development: a sense of belonging within a positive group, mastering life's challenges, cultivating independence while accepting guidance from caring adults, and sharing a spirit of generosity toward others. Their confidence grows as they learn difficult concepts or apply new skills. They begin to relate more effectively to other young people and adults—all results of effective leadership.

## Responsibilities of a 4-H School Enrichment Leader

- Order and obtain curriculum materials and resources from your local county Extension office (in Ohio). Leaders in other states can order materials directly from the Ohio State University Extension eStore at [estore.osu-extension.org](http://estore.osu-extension.org).
- If offered in your area, attend training sessions.
- Share 4-H opportunities (camps, fairs, special events) available to enrolled students.
- Contact your local 4-H professional for possible assistance, volunteers, training, and more. If asked, return completed student enrollment forms and surveys.
- Make use of classroom/community partners. The local 4-H professional is your skilled and willing ChickQuest partner and may be able to provide trained community volunteers as community-school partners. Room parents and other volunteers from your school may be able to join the training and then partner with the teachers conducting school enrichment activities.

## Role of the 4-H Professional

The university Extension office in your county and the 4-H professional may be able to provide the following services in support of 4-H school enrichment activities:

- Teacher-ready curriculum materials
- Teaching equipment and supplies
- Curriculum supervision
- Assistance with delivery of the curriculum
- Partnerships with community resources
- Materials for student evaluation and for bringing closure and celebration to the unit

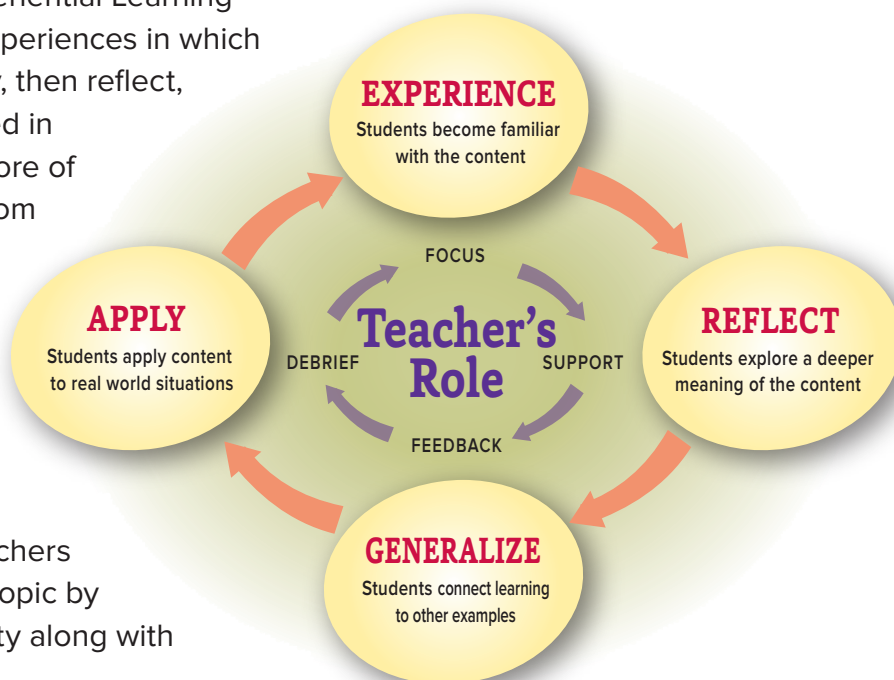


**4Hchickquest.org**

Curriculum Materials

# What is the Experiential Learning Model?

Each of ChickQuest's 18 hands-on activities is organized in a unique experiential form. The Experiential Learning Model provides for optimal learning experiences in which participants first experience an activity, then reflect, generalize, and apply what they learned in meaningful ways. (See figure.) At the core of this experiential process is the classroom teacher. The duties of this individual include helping students focus on the tasks at hand, providing support and feedback for the learning taking place, and debriefing students to determine what was done well, what could have been done differently, and where to go from here. In this way, teachers can nurture and cultivate interest in a topic by guiding students to complete an activity along with recognizing them for a job well done.



Adapted from the works of David Kolb, (1984), *Experiential Learning: Experience as the Source of Learning and Development*, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., and Laura Joplin (1995), *The Theory of Experiential Education* (pp.22-29), Dubuque, Iowa, Kendall/Hunt Publishing Co.

After completing an activity, time is allowed for processing. Process questions (Active Questions) are provided to help group members integrate what they observed and experienced. Rather than focusing on answers being right or wrong, the purpose of these questions is to consider all answers as possible solutions and then explore why a particular answer might be more appropriate than others. Process questions increase the depth of understanding and meaning young people get from activities. They can also serve as benchmarks for the adults to assess their own performance as teachers.

..... Process questions

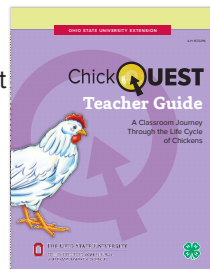


# Preparation Checklist

## Preparing for Instruction

### Two Months Prior to Egg Arrival

- If possible, contact and partner with your local 4-H professional, who welcomes the opportunity to provide support and service throughout ChickQuest. He or she will help you get started, keep things running smoothly, troubleshoot to prevent problems, and make a plan for the hatched chicks. The 4-H professional knows where to obtain fertilized eggs, the incubator, and a kit of teaching materials with instructions. If a 4-H professional is not available, your local Extension office may be able to identify other knowledgeable people willing to serve as advisors.
- Become familiar with the ChickQuest Teacher's Guide, layout of lessons, skills and content covered. See Lessons at a Glance, available at [4Hchickquest.org](http://4Hchickquest.org).
- Plan your calendar: Look for a 25-day period and start your eggs on a Tuesday to guarantee a hatch during the week.
- Order the ChickQuest classroom pack with 25 ChickQuest Logbooks and the 21-Day Calendar. Place the calendar poster next to the incubator and fill in the proper dates once the eggs arrive.



- Anticipate daily tasks. Plan for 10 to 15 minutes per day for students to observe and record data during the 21 days of incubation.

Notes





## Preparing the School and Classroom for Chicks

### One Month Prior to Egg Arrival

- Inform administrators and teachers about the presence of the incubator and eggs; consult your district's policy handbook for specific rules and regulations.
- Enlist the support of custodial staff and share ways they can help maintain round-the-clock quality care for the embryonic eggs: Keep room temperature constant and lights on 24 hours a day, seven days a week; confirm that the incubator's electric power remains on at all times.
- Contact your media specialist and/or science specialist for assistance to help you build a classroom collection of books and multimedia tools for the unit. (See Lesson 1 for ideas.)
- Set up a level, sturdy table in a low-traffic area in the room to minimize disturbances to the incubator and its contents. The incubator must be plugged into a dependable electrical outlet. Avoid drafts, doors, and sunny windows to minimize temperature fluctuations.

## Preparing Students for Egg Arrival

### One Week Prior to Egg Arrival

- Build anticipation and excitement for ChickQuest.
- Introduce expectations, rules, and procedures (see Lesson 1).
- Guide students toward an understanding of their responsibilities as young scientists providing quality care for embryonic eggs.
- Invite youth to share this exciting experience with their families (See Family Letter—Resources, page 64).

## Preparing for Incubation

### One Week Prior to Egg Arrival

- Set up the incubator according to the operating instructions. Check to see that the hygrometer and thermometer are working. If available, contact your 4-H professional for troubleshooting help at any time during this project. Allow time to ensure that everything is fully functioning and ready to provide an ideal habitat for eggs.
- Start incubator. **IMPORTANT:** Incubator must run two full days (48 hours) before the eggs can be placed inside.
- Check for the required ideal conditions inside the incubator. Temperature should be 99.5° F and humidity should be 60%. Improper temperature and humidity can result in a poor hatch.

### On the Day Eggs Arrive

- Handle with care! Do not wash eggs unless visibly dirty; use a warm, damp cloth to gently remove soil but avoid removing the natural protective coating.
- Use a LEAD PENCIL to mark an “X” and “O” on opposite sides of each egg for record-keeping tasks. Number each egg on top of the large end for identification purposes.
- Follow instructions provided by your 4-H professional to determine when and how to place the eggs in the incubator.

### During Incubation

- Plan and prepare for steps to take once hatching begins on Day 21. If available, consult your 4-H professional when questions arise.
- Take the automatic egg rotator out of the incubator at the end of Day 18 to prevent injury to chicks when they hatch.
- Prepare brooder box with your students (see Lesson 18 on page 62).

### After Hatching Starts

- Remove chicks from the incubator and place in a warm brooder box within two to six hours of hatching.
- Remove and discard all remaining unhatched eggs 60 hours after the first chick hatches. Disconnect, clean, and disinfect the incubator.

### At the End of the Project

- Evaluate student results with a skillathon activity. For details, visit [4Hchickquest.org](http://4Hchickquest.org).

It is best to pick up the eggs within four hours of when they have been laid.

Store small end down at a temperature between 50-65° F and 60% humidity.

Never store eggs more than 10 days after they are laid.

Put eggs in heated incubator within 24 hours of obtaining them.

## Notes

## Scientific Habits of Mind

Certain thinking skills associated with science, technology, engineering, and math are essential for lifetime learning. These values, attitudes, and skills are thought of as “habits of mind” and influence a person’s approach to knowledge, learning, thinking, and acting.

The American Association for the Advancement of Science (AAAS) tells us that science education should strive to foster and reinforce three values: curiosity, openness to new ideas, and informed skepticism. Quality science education should encourage questions, be open to new ideas, and help students pursue answers.

Students should be able to do careful observations, keep records, and use measurement tools, calculators, and computers. These, along with estimation, computation, and basic number skills are useful in everyday life.

Students benefit in every arena when they can communicate ideas and share information with clarity; read and listen with understanding; participate in group discussions through the ability to summarize, share, and re-state as well as to wait patiently, respect others, and take alternative perspectives.

Education should prepare students to think critically, distinguish between facts and opinions, recognize good arguments and evidence, and be alert for generalizations, misleading information, and vague explanations.

Through ChickQuest and other Science Alive 4-H School Enrichment Programs, you are helping establish scientific habits of mind and a science literate America.



**4Hchickquest.org**

Skillathons



# Welcome to ChickQuest!

## Prepare the Chick Habitat

### 4-H STEM Abilities

- Observe
- Compare
- Troubleshoot
- Hypothesize
- Measure
- Use tools

1

### Scientists ASK QUESTIONS

What is a habitat? A habitat is a home for a living thing. The incubator will be the home for the egg before it hatches.

Use data from the measurement tools to fill in the chart. Compare the incubator habitat to your own habitat. List other things in the habitat that help meet the needs of those who live there.

Habitat Data Collection

	Habitat #1: Incubator	Habitat #2: Classroom	Habitat #3:	Habitat #4:
Air Temperature				
Humidity				
Other Things That Meet Needs				



2

**Did you know?**  
In the wild, a bird sits on the egg in a nest to keep it warm. Moisture from the bird's body provides humidity and keeps the egg from drying out.



What kind of habitat is best for the egg? How do we prepare a habitat for chick eggs?

Draw a picture of the incubator habitat here. Include the thermometer and hygrometer and label them.

You are a ChickQuest Scientist! What questions do you have about incubating eggs? Habitats? Chicks? Can you fill this page with questions?

Date \_\_\_\_\_ Initial \_\_\_\_\_

ChickQUEST 3

ChickQuest Logbook pages 2-3—Scientists ASK QUESTIONS

## Introduction

Welcome to ChickQuest! In this lesson, students prepare the incubator and learn how to monitor the habitat for the embryonic chicks. What are the ideal conditions? Students will use measuring tools (thermometer and hygrometer) to compare the temperature and humidity in the incubator habitat with other familiar habitats.

### Materials

- ☐ Egg incubator
- ☐ 1-3 Thermometers
- ☐ 1-3 Hygrometers



Ask questions . . . . .

## Activities

1. Set up the incubator and have it running at the proper temperature (99.5° F) and humidity (60%) before beginning the lesson.
2. Ask students how they can prepare for the arrival of chick eggs. Brainstorm a list of what animals need to survive: air, water, food, and a living space or habitat. Include safety from predators and climate factors in the discussion. Identify the classroom and incubator as “habitat” areas.
3. Introduce the incubator and identify the need to maintain the ideal habitat. Ask: How does this incubator meet the needs of the embryonic eggs? Discuss and explain the ideal conditions and use the Supporting Information as needed:
  - Temperature of 99.5°F
  - Relative humidity of 60%
  - Covering for safety against harm and germs
  - Sturdy table near electrical outlet
  - Quiet corner to avoid bumps and traffic
4. Distribute *ChickQuest Logbooks* and explain how students will act as scientists over the next 21 days. Include some discussion of Scientific Habits of Mind (see page 9) and the need to use scientific abilities such as observation, record keeping, careful observation, and use of measurement tools.
5. Direct the students to the logbook; have them add personal information on page 1 and then turn to pages 2-3.
6. Introduce the measurement tools, thermometer and hygrometer, located in the incubator. What are the readings on these tools? Add the information to the Habitat Data Collection Chart. Answers should be 99.5° F and 60% humidity.
7. Ask the students to find the temperature and humidity of another habitat—the classroom. In addition to taking measurements in the classroom, decide on two other habitats to collect measurements. The school playground? The turtle aquarium in another classroom? Place the thermometer and hygrometer in the two additional habitats for at least 30 minutes to collect accurate readings.
8. Sketches of the incubator can be done while measurement tools are in place. Remind students to label the hygrometer and thermometer. Suggest they think like scientists and brainstorm a list of questions on page 3 of the logbook.

9. Collect measurements from the habitats: the incubator, the classroom, and the two additional areas identified by students. Add the data to the chart on page 2 of the logbook. Compare and contrast the data using the Active Questions to evaluate the learning and provide closure.

## Active Questions

- What do all animals need to survive?
- What habitat conditions are the best for hatching eggs? How are these conditions met in the incubator?
- Look at the data chart. Which habitat is the warmest? The coolest? Which habitat has the highest humidity? The lowest humidity?
- If the temperature gets too high (or too low) in the incubator, what should you do? [Troubleshooting: ask the teacher to turn the heater down/up] If the humidity gets too low? Too high? [Add or remove water]
- The outside temperature and humidity contribute to the general climate of an area. How can climate change cause trouble for animals in a habitat? [Winter/summer too long, temperature too cold/hot; animals cannot accommodate change and may die or migrate/move]
- What hazards might be found in a wild habitat? [Predators, disease, bad weather, humans disturbances]
- What hazards to the incubator might be found in the classroom? [Germs from handling, loss of electricity]
- Why is it important to show responsibility during this study? [Chicks could die if temperature is wrong] Name another time it is important to be responsible.

## More Challenges

1. Add “Other Ideas” to the Habitat Data Collection Chart and discuss possible answers. How do animals get food, water, protection from predators, and space for play/movement in the different habitats that are listed?
2. Make a hygrometer. Go to [4Hchickquest.org](http://4Hchickquest.org) for instructions.
3. Create a class chart titled: A Scientist is Someone Who...? Invite students to contribute ideas.
4. Investigate how other egg-laying creatures survive in the wild. How do they protect their eggs until they



- .....

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- .....