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## Igniting interest in Science, Technology, Engineering and Math

*Students raising baby chicks from eggs receive hands-on, standards-based lessons in life science.*

### Situation

Interest in science, technology, engineering and math (STEM) subjects starts early in a child's education. However, budget constraints and assessments often limit elementary school teachers from providing enriching and memorable science-based lessons.

### Extension's Response

For more than a decade, Colorado State University Extension 4-H youth development agents have introduced students to the life sciences through the fostering of eggs, hatching, baby chick growth and development. Since 2003, Larry Hooker, CSU Extension 4-H and youth development agent in Arapahoe County, has enriched classroom learning through embryology outreach using a curriculum that supports 4-H's STEM initiative and meets state department of education science standards.

Hooker typically provides teachers with an incubator, fertile eggs, and the equipment needed to care for newly hatched chicks: a brooder for raising chicks, heat lamp, feeder, feed, shavings and water container, teacher's manual, instruction sheets and three classroom visits. For 21 days, fertilized eggs grow in an incubator until baby chicks hatch. Once hatched, chicks remain in the classroom for approximately a week before they return to the farm they came from, or are adopted as 4-H poultry projects.

During incubation, students explore embryo development by 'candling' eggs—a process that involves shining a very bright light through eggs to see if embryos are alive and well. Students work in teams or as a class to make sure incubator conditions are just right. Incubators must be kept at incubator temperature (99.5 degrees F) and monitored on a daily basis. Students also keep track of the number of days that go by so they know when to expect hatching to begin.

The cost to participate depends on the level of involvement. Arapahoe County Extension rents incubators for \$25.00 each plus \$1.50 per student. Fertile eggs cost \$20.00 per dozen. Hooker encourages teachers to participate at whatever level works for them. According to Hooker, some teachers have their own incubators and only want fertilized eggs. Others want incubators and eggs and no presentation. Most teachers want incubators, eggs and a presentation.

During the 2010-11 school year, Hooker provided embryology outreach to 1,362 students and 112 teachers from 24 schools throughout the county. While outreach revenue generated \$2,091 that money is reinvested in supplies and equipment, such as maintaining, repairing or replacing any one of the 22 incubators which make the program possible.



### The Bottom Line

Elementary students introduced to the life cycle through the 4-H baby chick embryology outreach program learn more than basic science information. Overall they:

- Become excited about science
- Gain knowledge of life science and are able to use scientific terminology

Many students:

- Become more responsible during the project
- Are immersed in their learning
- Learn respect and compassion

## Results

For the past nine years, Arapahoe County Extension has engaged a total of 5,491 elementary school students in embryology outreach. Verbal and written evaluation testimonials conducted by Hooker report knowledge gains.

In 2010, 84 percent of teachers who returned post-program evaluation forms indicated their students increased their scientific knowledge as a result of participating in an embryology program. Specifically, students learned about genetics and embryonic development: chicks take 21 days to hatch and come in many colors, just like people. Students also learned that roosters are necessary for fertile eggs, that chick development requires heat and moisture, and that candling eggs shows chick development.

Teacher responses also showed that embryology outreach not only increased student scientific knowledge but also helped students develop life skills. Specifically, students learned:

- how to deal with death (many of them have never lost anyone close to them);
- to appreciate little animals and nature;
- the importance of sharing; and,
- how happiness and joy exist alongside disappointment and sadness.

The 4-H embryology curriculum also allows classroom teachers to integrate other disciplines, such as technology, math and interpersonal communications through the use of computer presentations, writing and other skills.

Beyond science and technology, embryology projects teach students how to cooperate as they develop citizenship and leadership skills. "Embryology gives the inner city youth a great opportunity to experience life," Hooker says. "They begin to understand what life means and have a little different outlook on what is going on in their lives; this shows me this program has an impact on their lives."

*"We have done this program since the very beginning (2003) and would never go without it. It brings about a special excitement and a hunger to learn. Even those students that are a bit withdrawn seem to connect better with what is going on."*

—Teacher, Dry Creek Elementary

*"We love this program, but this year things were different. We had two chicks die and that really made the class think. Life is precious and I think some of them know that now."*

—Teacher, Village East Elementary

## Enhancing State Standards

To be competitive at home and abroad, Colorado needs a workforce that is strong in science, technology, engineering and math (STEM). Only 32 percent of current college graduates earn STEM degrees compared to 66 percent in Japan and 59 percent in China. 4-H youth development nationwide has set a goal to prepare one million new youth to excel in STEM fields by 2013. 4-H science-based, school enrichment programs help to meet this goal. In particular, hands-on classroom science projects, such as embryology, can enhance state curriculum standards, reinforce student learning and keep costs low.

To learn about statewide embryology efforts, visit: [www.ext.colostate.edu/impact/embryology\\_statewide\\_ss.pdf](http://www.ext.colostate.edu/impact/embryology_statewide_ss.pdf)

## Contact Information

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