

4-H ChickQuest: Connecting Agri-Science with STEM Standards in Urban Schools

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Abstract: *While young students are more capable of scientific inquiry than previously believed, elementary school teachers are often inexperienced in and lack confidence with teaching science. ChickQuest is a 4-H-created embryology curriculum for third-graders that meets Ohio state science standards, teaches STEM skills, and promotes ongoing interaction with the experiment. Extension educators work closely with teachers to provide logistical and content support, decreasing any anxiety associated with having eggs and live animals in the classroom. This article explores the experience of third-grade teachers in a large, urban school district that implemented the ChickQuest curriculum. Implications for Extension educators are identified.*

Introduction

"Curiouser and curiouser!" said Alice, and the same might be said of today's elementary students. Within recent years, the science education community has recognized that young children are capable of higher-level inquiry than previously believed. (Metz, 2008) STEM (Science, Technology, Engineering, and Math) skills are stressed in middle schools and high schools; however, these areas receive little attention in elementary school. Unfortunately, elementary science teachers are usually less likely to enjoy science or to feel confident about teaching science. (Gunning & Mensah, 2011; Roseman & Koppal, 2008)

National 4-H (2006) and others also have documented the disconnection between youth and commercial agricultural production. Urban youth, particularly, often lack the opportunity to see live farm animals and do not realize where their food originates. (Kinder, 2008; Marie & Baker, 1996)

During the 2010-11 school year, most third-grade classrooms in the Akron, Ohio, School District participated in ChickQuest, a 4-H embryology curriculum that meets state science standards, includes daily math and reading, and allows students to "do science" through hands-on experiments, charting, hypothesizing, and other forms of inquiry. (Horton, Warkentien, & Gogolski, 2009)

Goals

The ChickQuest curriculum has several ambitious goals.

1. Meet State Standards—ChickQuest meets many of Ohio's third-grade science standards while using the core subjects of reading and math. The curriculum also meets the Ohio math academic content standard relating to measurement. Using ChickQuest's logbook,

students keep track of the incubator's temperature and humidity and engage in other measurement activities.

2. Teach 21st Century and STEM Skills—Using the logbook, each student learns about other birds and life cycles, records observations and results, thinks creatively about hypotheses, and solves problems. Students interact with the embryology experiment daily, rather than learning only from a book.
3. Decrease anxiety about teaching science—Elementary school teachers found the teacher's guide and accompanying posters and student logbooks to be helpful. Teachers also found assistance from Extension professionals was invaluable.
4. Increase the connection between students and commercial agricultural production—With 4-H's skill at writing curricula for project clubs, reaching out to schools to provide enrichment during the school day is a natural, and appropriate, fit. (Tochterman & Carroll, 2004) An accompanying DVD allows students to discover how eggs for eating make their way from farm to grocery.
5. Scaffold learning on familiar experiences—ChickQuest allows students to apply scientific and mathematical concepts to something real and familiar. After all, every student has eaten an egg!

According to a post-project survey, only 14% of the teachers used live animals in the classroom before ChickQuest. "I didn't use anything as engaging as hatching chicks!" one teacher wrote. "Science came alive this year!"

Case Study: Akron Public Schools

Akron Public Schools, a large urban school district with more than 23,000 students, adopted ChickQuest for most of its 1,800 third-graders for Spring 2010. With help from a STEM K-8 Excellence Grant (Ohio Board of Regents), the district purchased supplies, incubators, brooders, teacher guides, and student logbooks. Primary impetus for the project came from the district's Science Learning Specialist, who invited the curriculum's authors to present a workshop for 74 third-grade teachers. The area's Extension educator handled the main logistical challenges—finding viable eggs and homes for the chicks.

As the eggs incubated, students in 74 third-grade classrooms tackled lessons involving observation, hypothesis testing, and problem solving. Several lessons focus on the life cycle of other egg-bearing animals. Some incorporate engineering by asking students to design and construct nests and egg catchers.

Nearly half (49%) of the 36 teachers reporting felt "negative" or "neutral" toward the ChickQuest curriculum before the workshop. Many teachers asked a variety of questions and expressed concerns. Questions included: "What if none of the eggs hatch?" "What if a chick dies?" "Could someone get salmonella?" However, after the workshop, the teachers felt more confident; only 12% felt "neutral," and none felt "negative" toward the curriculum. "The training made a big impact," wrote one teacher. "I felt confident."

Every teacher surveyed agreed that the ChickQuest curriculum engages and excites students about science. Moreover, teachers became more confident about teaching the life cycle. As a result, the Akron Public School District committed to teaching ChickQuest to all third-graders during the following school year.

Challenges

ChickQuest's greatest challenge is timing. Teachers want the incubator set-up to not interfere with state testing days. And everyone wants the chicks to hatch on a weekday. Those helping with the incubators and eggs face a tight window.

A second challenge is overcoming anxiety about teaching a new curriculum, particularly one involving eggs. The pre-project workshop and support from the 4-H Extension educator and other volunteers helped to alleviate these concerns.

Although every class hatched at least one or two chicks, the unhatched eggs also presented an opportunity to learn. The ChickQuest curriculum asks students to study their temperature and humidity charts to hypothesize why the eggs were not viable. Observing that not all fertile eggs reach viability is an important part of teaching the life cycle.

Conclusions and Implications for Extension Educators

In the August 2011 issue of the *Journal of Extension*, Kenyatta Nelson-Smith asks, "Why aren't we involved in urban education?" ChickQuest offers a natural bridge between rural and urban settings.

Extension can make a difference by:

- Helping run the pre-project workshop
- Setting up and taking down incubators and brooders
- Teaching teachers and students how to candle the eggs
- Visiting classrooms regularly to answer teachers' and students' questions.

One teacher wrote, "The students LOVED ChickQuest. The entire building was excited about science." But Extension educator participation is vital to success. Extension professionals and volunteers helped teachers feel more competent about teaching new content and using new materials. One teacher stated, "I felt I could ask questions when in doubt, and they answered my questions as well as the kids' questions." Another declared, "I couldn't have done it without their help."

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