



# Science is Real! Communicating Science to Middle School Students in the Natural State

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## An Experimental Test of the Sexually Selected Egg Color Hypothesis on Eastern Bluebirds (*Sialia sialis*)

Female bluebirds prefer to mate with brighter blue males as they feed their chicks at higher rates than duller males. Recently, ecologists (Moreno et al. 2003) have proposed that egg color may serve to motivate males to feed their young, specifically dark blue eggs. The blue pigment in eggshells is a powerful antioxidant, so chicks hatching from 'bluer' eggs should have superior immune systems.

This hypothesis predicts males mated to females with darker blue eggs will feed their chicks more (because the survival probability of the chicks is high) than those mated to females laying paler blue eggs. In order to experimentally test this hypothesis, I have quantified the color of eggs and swapped eggs between nests that have the most and least blue eggs. Male feeding rate was recorded, as was the immune system of the females and chicks with simple blood tests. I am currently watching the videos and expect results shortly to share with my eagerly awaiting students. My study should contribute to the general understanding of the function of egg color in birds and potentially establish the health status of bird populations without using disruptive and harmful methods.



## Can Carbon Nanotubes be used as a Growth Promoting Substratum for Neuron Regeneration

Approximately 255,000 people live with a spinal cord injury (SCI) in the United States. It is important to find a means by which to stimulate regeneration towards recovery of function. Research is in progress in our laboratory towards use of an appropriate growth promoting substratum to stimulate such regeneration. Our and other initial findings suggest neurons grow longer neurites when cultured on functionalized carbon nanotubes (CNTs). We have further evaluated the effectiveness of CNTs to promote neuron regeneration by determining the concentration of CNTs optimal for neuron regeneration. Also important is ensuring that these CNTs are not toxic to the neurons. With the growing use of nanoparticles in medicine and their increasing presence in our environment, we must ensure that their use will not result in toxic effects. Therefore, we also tested each concentration for neuron compatibility and confirmed CNTs did not have a toxic effect on neuron survival and regeneration.

## Incorporating Research in the Classroom

### Scientific Method:

All aspects of the study were recreated in the classroom including the hypothesis, experimental design, data collection and analysis



### Field Equipment:

Students had the opportunity to handle a variety of scientific tools



### Data Analysis:

Students determined feeding rates by watching videos and compared their results to egg color.



## Teaching Techniques

### Journaling

By recording what they know and what they are learning, students discover how to organize their knowledge around core concept and concept relationships

### Components of Journaling

- Prior knowledge and New knowledge
- Relating what they are learning to what they know
- Activity write-up: What I did? What happened? Why it happened?
- Summarizing summaries: learning to extract main ideas of fiction and non-fiction text



## Analyzing Data and Drawing Conclusions

- Students were introduced to fellows research
- Students were given fictional data similar to the data collected in fellows research
- Students analyzed the data by solving for statistical locators and plotting the results
- From their data, students developed conclusions



## Anatomy and Function of a Neuron

- A model of a neuron was constructed from common household items
- A teacher led discussion and described the anatomy of a neuron and how each part functions
- The class was led in an activity to model and help them better understand the function of a neuron



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