

# C.R.E.A.T.E. an Animal Behavior Course Through Use of Primary Literature

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## What is C.R.E.A.T.E.?

C.R.E.A.T.E. is a method for teaching science courses through deep engagement with scientific literature. Developed by Sally Hoskins and colleagues<sup>1</sup>, it has been adapted for a range of introductory and advanced undergraduate biology courses.

## Key components of C.R.E.A.T.E.:

For each article, students:

**Consider:** connections between previous knowledge and core concepts in Introduction by creating a concept-linking map

**Read:** Methods & Results and connect them by cartooning methods for each result

**Elucidate the Hypotheses:** tested with the data presented in each table and figure

**Analyze and Interpret the Data:** to provide and explain answers to research questions

**Think of the Next Experiment:** and diagram the methods and predicted results

## How was C.R.E.A.T.E. adapted for Animal Behavior?

- No textbook
- Two-week intensive class on pervasive themes and common misconceptions
- Five 2-3 week case study based modules
- C.R.E.A.T.E. activities used for pre-class preparation and in-class group work
- “Just-In-Time” lectures interspersed with in-class activities and discussions
- Class-designed research projects derived from findings in published studies
- Evaluation: individual and group work, participation, and open-book exams

## Student responses to C.R.E.A.T.E.:

### Strengths

- Not learning from a book
- Learning to read primary literature
- Ability to understand and deeply discuss primary literature
- Application of core concepts to current case studies
- Connections between new and pre-existing knowledge

### Challenges

- Not learning from a book
- Too many readings
- Too much time spent on homework

### Literature Cited:

<sup>1</sup> Hoskins, S., Stevens, L., and Nehm, R., (2007) Selective Use of Primary Literature Transforms the Classroom into a Virtual Laboratory. *Genetics*, 176:1381-1389.

## Example Module: Learning and Social Transmission of Information

### Core Concepts: Information Processing, Conditioning, Individual and Social Learning, Constraints on Learning, Teaching, Information Centers, Benefits and Costs of Group Living

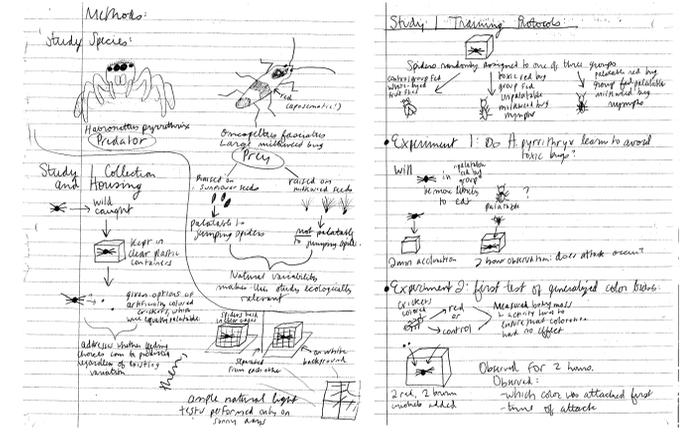
### Articles Assigned:

- Galef, B.G. & Wigmore, S.W. 1983. Transfer of information concerning distant foods: A laboratory investigation of the 'Information-centre' hypothesis. *Anim. Behav.* 31:748-758.
- Taylor, L.A. et al. 2015. Flexible color learning in an invertebrate predator: *Habronattus* jumping spiders can learn to prefer or avoid red during foraging. *Behav. Ecol.* 27:520-529.
- Thornton, A. & Sampson, J. 2012. Innovative problem solving in wild meerkats. *Anim. Behav.* 83:1459-1468.

### Concept Connections Map:



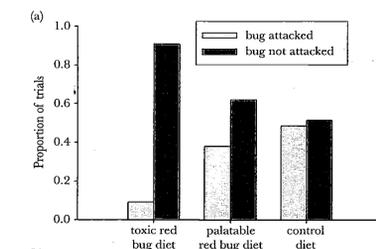
### Methods Cartoon:



## Data Interpretation:

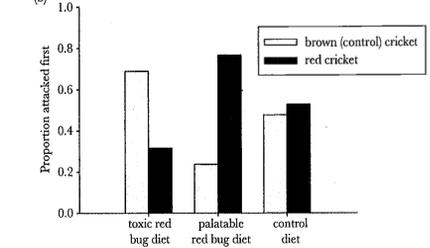
(all work shown by L. Johnson)

Q: How did the proportion of palatable red bugs attacked differ between the three treatment groups and these proportions change after two weeks without exposure to spiders?



A: During the first trials, toxic red bugs were attacked in a significantly low proportion of trials by the spiders on the palatable red bug diet, while the proportion of bugs attacked to not attacked was far less by spiders in the other groups. After two weeks, the proportion of bugs attacked to not attacked was nearly equal across the three treatment groups.

Q: How does the proportion of trials in which either a red or control cricket was attacked first differ between experimental groups and did these proportions change after two weeks without exposure to spiders?



A: There was no significant difference between the proportions of red and brown crickets attacked in Experiments 1. However, when spiders had been trained such that they had experience with learning, the palatable red bug diet ate the PRBs much more, and in the toxic red by proportion these most.

## Next Experiment: Does information from conspecifics change the foraging behavior of the cockroach *Blabareus giganteus*?

- Students collaborated to design research question & experiment
- Modeled after rat experiment by Galef & Wigmore (1983)
- One lab session spent conducting pilot studies
- Novel results that provide foundation for follow-up thesis studies

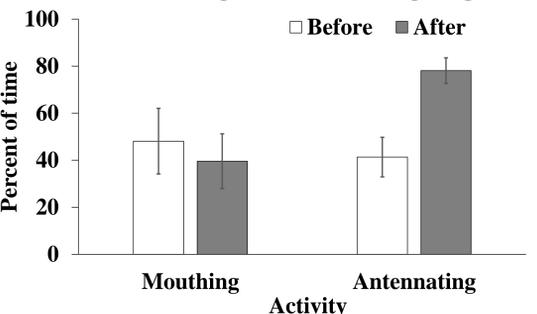


Figure 1. Mean percent time spent interacting with non-preferred odor (banana) before and after interaction with a demonstrator. There was a significant difference in the time spent antennating ( $t=3.66$ ,  $df=13.29$ ,  $p\text{-value}=0.003$ ) but not in the time spent mouthing ( $t=0.460$ ,  $df=15$ ,  $p\text{-value}=0.652$ ).