# 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[1], 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:

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

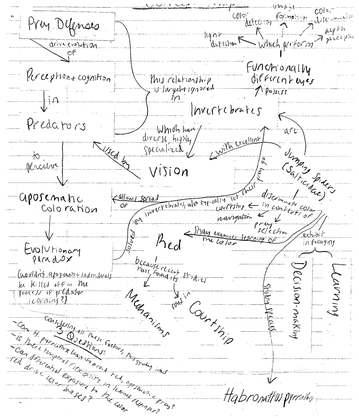
## Example Module: Learning and Social Transmission of Information

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

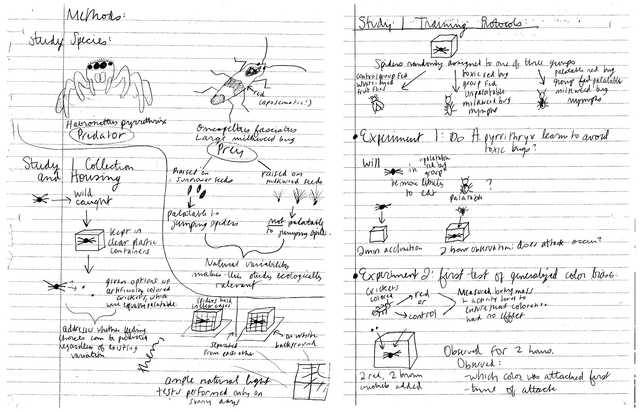
## Articles Assigned:

- 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:

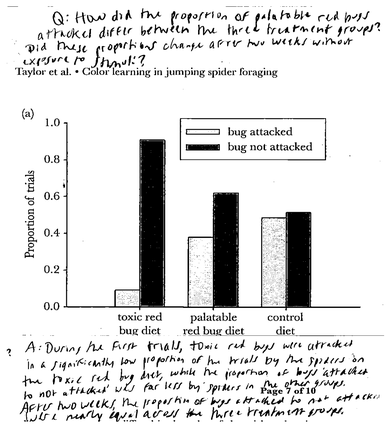


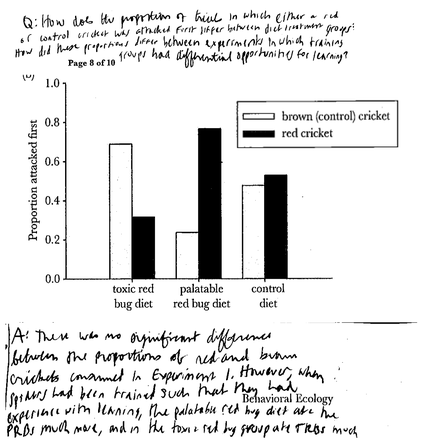

## Methods Cartoon:




## Data Interpretation:

**(all work shown by L. Johnson)**




## Next Experiment: Does information from conspecifics change the foraging behavior of the cockroach *Blaberus 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

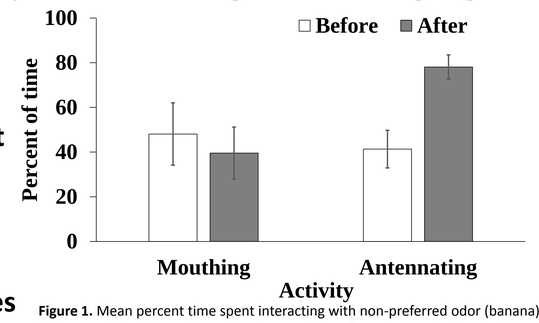



**Figure 1.** Mean percent time spent interacting with non-preferred odor (banana) before and after interaction with a demonstrator. There was a significant difference in the time spent antennating (t=-3.66, dF=13.29, p-value=0.003) but not in the time spent mouthing (t=0.460, dF=15, p-value=0.652).