

## **UC Merced**

# **Proceedings of the Annual Meeting of the Cognitive Science Society**

### **Title**

Reasoning about Ecological Systems

### **Permalink**

<https://escholarship.org/uc/item/9vn088kh>

### **Journal**

Proceedings of the Annual Meeting of the Cognitive Science Society, 26(26)

### **ISSN**

1069-7977

### **Authors**

Zimmerman, Corinne

Tobin, Renee M.

Cossey, Andrea

### **Publication Date**

2004

Peer reviewed

# Reasoning about Ecological Systems

Corinne Zimmerman (czimmer@ilstu.edu)

Renée M. Tobin (rmtobin@ilstu.edu)

Andrea Cossey (alcosse@ilstu.edu)

Department of Psychology, Illinois State University  
Campus Box 4620, Normal, IL 61790 USA

## Introduction

Ecological systems are quite complex and dynamic, and are often poorly understood (Groves & Pugh, 2002). The multiple cause-and-effect relationships and second-order effects in such systems are difficult to learn and teach (Hogan, 2000). One example is the use of “bio-control,” where the introduction of a species to prey or feed on an unwanted species is used as an alternative to chemical herbicides or pesticides. Because of the complexity of ecological systems and the potential side effects and long-term consequences of such actions it is often difficult to predict precisely the how the system will change over time. Therefore, it is important to understand how individuals think about the ecological systems and the environmental problems that they are being asked to make decisions about.

The purpose of this study was to examine students’ reasoning about an ecological management proposal. Such reasoning can be influenced by many factors including conceptual understanding of ecological systems, perceived and actual scientific knowledge, the way information is presented and the influence of other individuals who support or oppose the proposal. In the current study, we focus on two of these factors. First, we were interested in exploring whether the process of self-evaluation (i.e., making students aware of their perceived and actual scientific knowledge) would affect reasoning and decision making. Attitudes, thoughts and beliefs are often automatic or non-conscious, but the conscious evaluation of one’s own beliefs or attitudes may be one method for changing thoughts or behaviors (e.g., Bargh & Chartrand, 1999) and so requiring individuals to reflect on their current understanding of science could affect beliefs, reactions, or decisions. Second, we wanted to determine if an ecological management proposal described as a species *introduction* would invoke different mental models than one described as a species *reintroduction*. We hypothesized that the word “reintroduction” may support the inference that the species was “meant” to be part of the ecosystem.

## Methods

Eighty undergraduates read and evaluated a brief news article (294 words) that described a proposed initiative to introduce wolves to the Rocky Mountain region. The article was adapted from an online newsletter (“Poll shows strong support for wolves,” 2001). Two versions were created with the initiative described as either an introduction or a

reintroduction. Participants were asked a number of questions, including whether or not they would support the initiative if required to vote today, their certainty and confidence in their decision, and whether they felt qualified to vote on such an issue. Students also completed a questionnaire to assess perceived and actual background knowledge either before or after reading and evaluating the proposal. Five items assessed perceived scientific knowledge. Actual background knowledge was assessed with a 20-item multiple-choice test covering basic ecological knowledge. Participants were randomly assigned to one of four conditions created by crossing *topic* (introduction vs. reintroduction) with *order of self-evaluation* (before or after evaluating the proposal).

## Results

A relationship between the *topic* and voting decision was evident. Participants in the reintroduction condition were more likely to vote in support of the initiative (87.5%) than those in the introduction condition (62.5%) ( $\chi^2(1) = 6.67, p < .01$ ), supporting the idea that this subtle, one-word manipulation may invoke different mental models. *Order of self-evaluation*, however, did not influence voting decisions. We predicted that people who took the test before making a decision would be less certain, confident, and feel less qualified than people who took the test after they made their decision. There was a main effect of order ( $F(1,76) = 7.21, p = .009$ ) on this composite variable, but no main effect of topic or interaction between order and topic ( $F_s \approx 1$ ). This effect was not due to differences in either perceived or actual knowledge ( $F_s \approx 1$ ). Making individuals aware of their own knowledge did not affect the decision itself, but it did affect certainty and confidence with which they made their decisions.

## References

- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54*, 462-479.
- Groves, F. H., & Pugh, A. F. (2002) Cognitive illusions as hindrances to learning complex environmental issues. *Journal of Science Education and Technology, 11*, 381-390.
- Hogan, K. (2000). Assessing students’ systems reasoning in ecology. *Journal of Biological Education, 35*, 22-28.
- Poll shows strong support for wolves* (2001). Retrieved May 2, 2003, from <http://www.sinapu.org/Pages/wolfPoll.html>.