

# **Biology CLASS : A new tool for measuring student attitudes and beliefs about biology**

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# Why create a Biology CLASS?

The CLASS (Colorado Learning Attitudes about Science Survey) is designed to distinguish novice and expert beliefs.

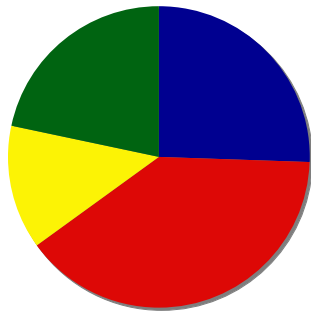
The physics, chemistry, and geology departments have already developed similar tools for their disciplines and found these tools useful for measuring student beliefs and encouraging more expert-like practices.

**Typically freshman-level classes see student attitudes shifting more novice rather than more expert. The CLASS can be used to measure whether interventions that can counteract that negative shift by, for example, adding more real-world connections to the course.**

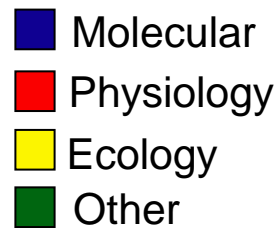
We sought to create a similar tool for the field of Biology.

# Biology CLASS Development

- Faculty input on question generation/modification
- Student Validation - Via individual interviews (n=22)
- Expert Validation - Via online survey ratings (n=80)



Subdisciplines of Experts (all PhD Biologists)



- Factor Analysis - Used to identify attitude categories
  - Initial analysis on Fall08 EBIO Introductory Biology (673 Students)
  - Verified robustness of categories on MCDB & IPHY courses
- Fall08/Spring 09 Department Participation
  - University of Colorado at Boulder
    - MCDB (n≈600), IPHY (n≈400), EBIO (n≈673)
  - University of British Columbia (n>1000)
  - Western Washington (n≈150)
  - University of Maryland (n≈150)



# BioCLASS Categories

R=robustness, statistical measure of how well statements in a category go together, higher values indicate that a category is more robust

Robustness measurements from EBIO pre-survey responses

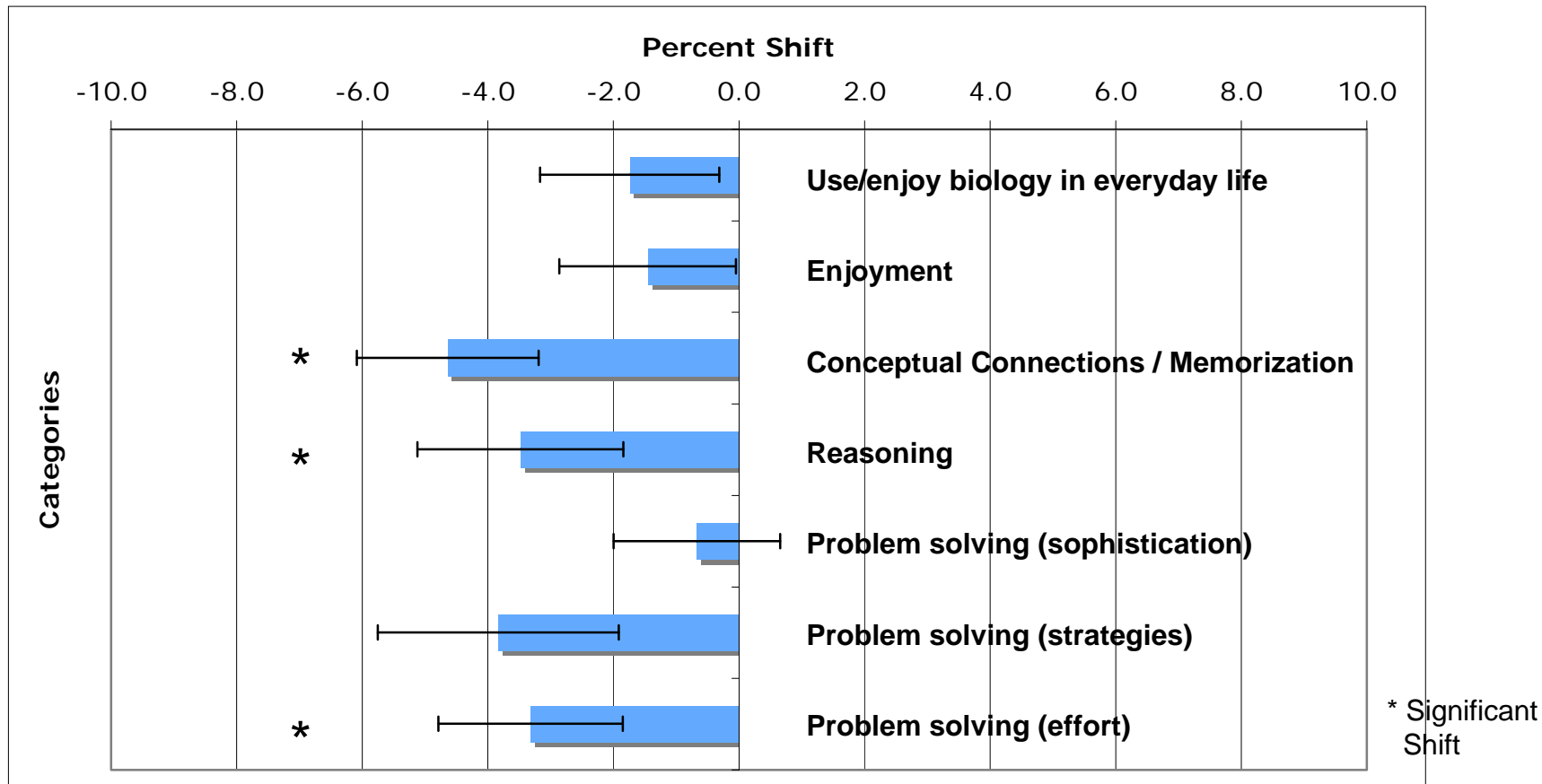
- Enjoyment (R: 8.7)
- Problem solving (sophistication) (R: 7.0)
- Problem solving (strategies) (R: 6.6)
- Use/enjoy biology in everyday life (R: 6.3)
- Problem solving (effort: strategies + enjoyment) (R: 6.2)
- Reasoning (R: 6.2)
- Conceptual Connections / Memorization (R: 5.0)

\*\* Unlike the Physics & Chemistry CLASS, the Biology CLASS includes questions related to enjoyment in the problem-solving categories (especially problem solving effort).

# Introductory Biology Course (EBIO) : Freshman Level

## Students show shifts towards more novice views

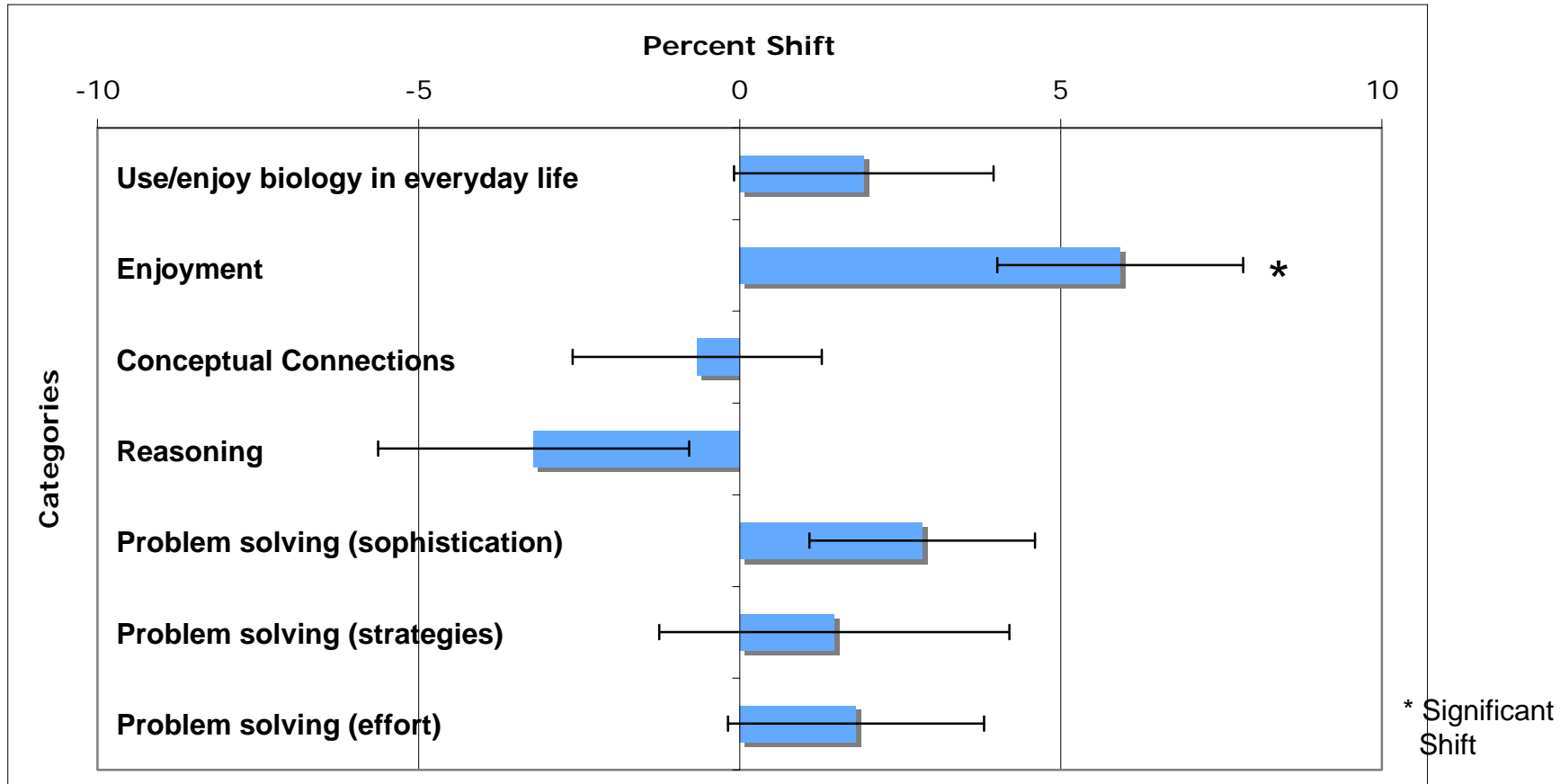
More Novice ← → More Expert



Overall: The average percent each student agreed with experts is 55% (POST).

# Human Anatomy Course (IPHY) : Sophomore/Junior Level Students show a more expert shift in enjoyment of biology.

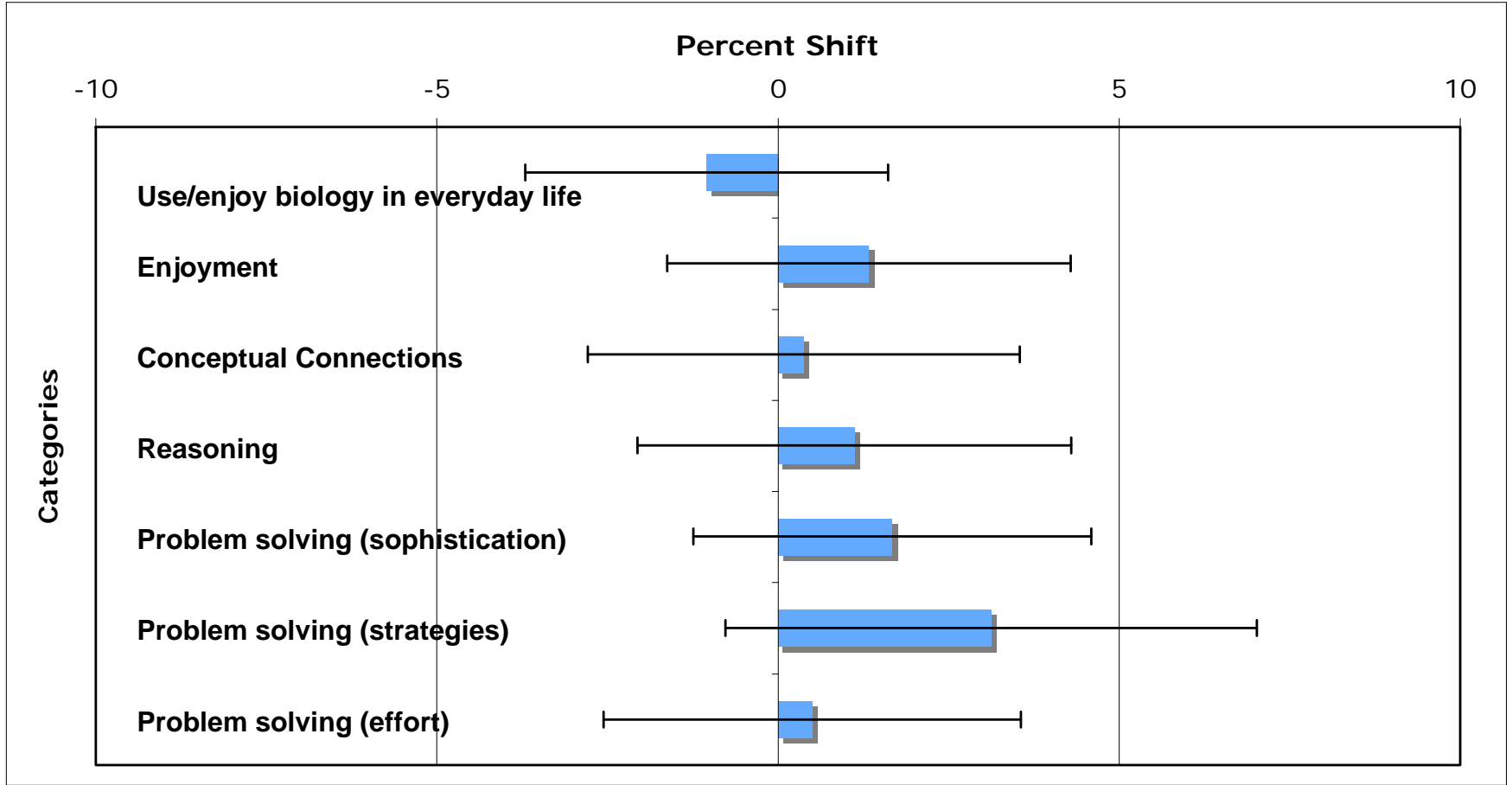
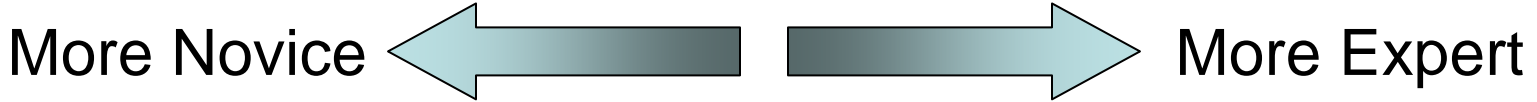
More Novice ← → More Expert



Overall: The average percent each student agreed with experts is 65% (POST).

# Principles of Genetics (MCDB) : Freshman/Sophomore Level

Students generally show small positive shifts towards more expert views



Overall: The average percent each student agreed with experts is 71% (POST).

# Summary

- Unlike the physics and chemistry CLASS, statements of enjoyment are categorized with statements about problem solving effort.
- Similar to what has been observed on the Physics and Chemistry CLASS, Biology students tend to shift towards more novice views in introductory courses.
- As the students progress through their biology major, the shifts become more similar to experts, but very few of these shifts are significant.

# Future Directions

- Analyze additional data collected in junior/senior spring 2009 IPHY and MCDB courses
- Examine whether biology majors start off with or develop more expert-like beliefs when compared to non-majors
- Determine if M.D. experts think similarly or differently from Ph.D. experts and see how those views align with the responses from pre-med students

# Acknowledgments

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