

Collaborative Assessment of Interdisciplinary Learning

Carleton College



WHITMAN
COLLEGE

Science Education
Resource Center
(SERC)

HHMI
HOWARD HUGHES MEDICAL INSTITUTE



Our collective HHMI proposals stated a commitment to develop assessment tools to better understand and articulate the benefits of interdisciplinary science education, including:

- pre- and post-experience surveys of instructors and students**
- scholarly analysis of student course work by faculty.**

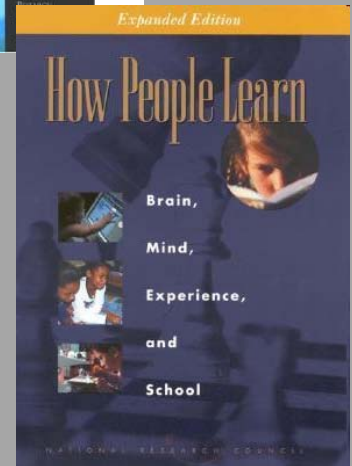
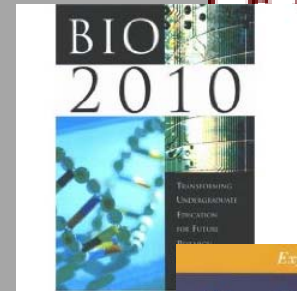
Motivation for Project

The 21st c. Learner: The role of interdisciplinary and integrative learning in liberal arts and science education.

College students are "novices" to science and interdisciplinary modes of inquiry.

The literature is thin on how to assess interdisciplinary learning for “novices”. Experts, which are understood a little better, do not learn like novices.

This project is developing an evidence-based approach, using qualitative and quantitative methods, to assess “novice” learning by students in a wide range of science-rich courses in college.



Elements of Work

- **Interviews with faculty & students (self-report)**
- **Online surveys (self-report)**
 - Course instructors
 - Pre & post surveys of enrolled students
- **Faculty team inquiry & analysis of student work in interdisciplinary courses (performance-based)**



Steering Committee

Grinnell College

Jim Swartz (task master)

David Lopatto (surveys,
student interviews)

Mark Levandoski

St Olaf College

Mary Walczak

Whitman College

Jim Russo

Carleton College

Trish Ferrett (qualitative)

Cathy Manduca (SERC, task
master)

Ellen Iverson (SERC, faculty
interviews)

Gudrun Willett (SERC,
faculty interviews)

Hope College

Joanne Stewart (qualitative)

Lorna Hernandez-Jarvis

Consultant--Whitney Schlegel, Indiana University

Interviews (preliminary results)

Subjects

- Faculty who have taught interdisciplinary courses
- Students

Findings

- Students and faculty have difficulty with terms such as: interdisciplinary, complexity, multi-causal, integrative.
- Many faculty are motivated to teach interdisciplinary courses to help students see how knowledge from multiple disciplines can inform real-world or complex problems.



The Qualitative Piece - Faculty Inquiry on Student Work

- 10 faculty, 1-3 from each of 5 colleges.
- team inquiry into student learning in their own courses using *qualitative methods of analyzing student work*.
- analysis with respect to more specific ID learning goals targeted by faculty.
- better articulation of ID learning goals, grounded in real student work

Neuroscience

Abrupt Climate Change

Chem-Bio Intro Course

Infectious Diseases

Faculty & Student Surveys

Create an approach like the existing CURE survey that includes:

- rubric for faculty to describe what activities and goals are emphasized in the course**
- rubric for students to self-assess their learning gains on the same items**

Sample (of 50) Faculty Questions

Students read primary scientific literature.

Students work on a project or problem entirely of student's own design.

Students work on problems that have no clear solution.

Students work a project or problem entirely of student's own design.

Students study an interdisciplinary problem.

Students study problems with multiple causes that operate simultaneously and interactively.

Sample (of 50) Student Questions

Please rate how much learning you gained from each element you experienced in this course.

A project or problem entirely of student's own design

Working in small groups or teams.

Working on a problem that requires integrating ideas from both science and non-science disciplines.

Attempting a complete understanding of a complex problem.

Reading primary literature from multiple disciplines or fields of study.

How well did you gain an understanding of how scientists think

Even if I forget the facts, I'll still be able to use the thinking skills I learn in science.

Schedule

- **Interviews - completed**
- **Qualitative Work – faculty inquiry underway, analysis in summer 2010**
- **Surveys - Designed and initial implementation in AY 2009-10**
- **Integrate qualitative and survey results and revise surveys, implementing them in subsequent years.**
- **Four-year project, 2009-2012.**

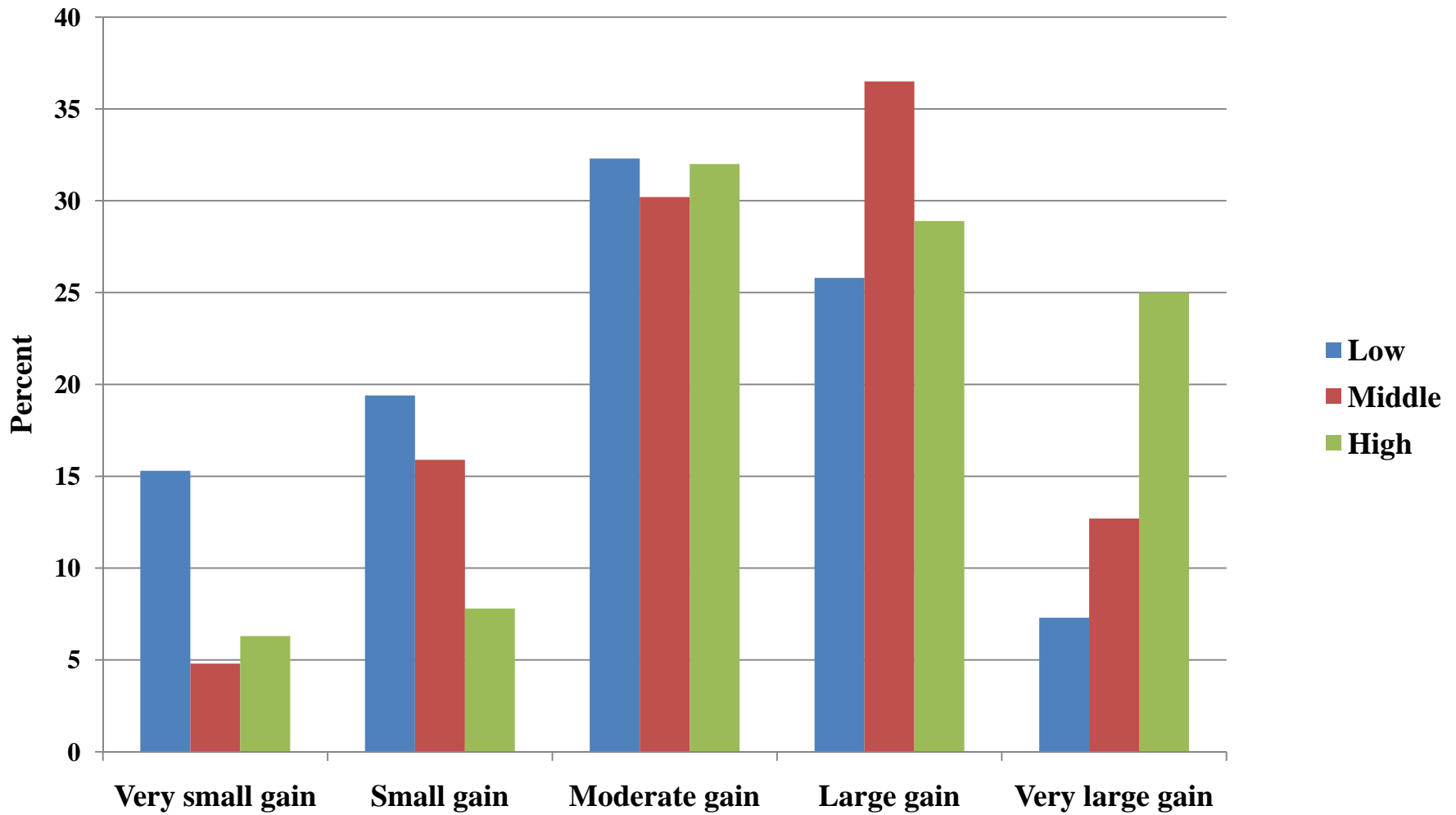
Preliminary Survey Results



Fall 2009, 42 courses from 6 campuses:

- Roughly equal numbers courses with high, medium, and low interdisciplinary content
- Faculty responses - **high ID rating correlates with high ID activities**. High ID courses ask student to read materials from multiple disciplines, low ID courses ask students to read text books, etc...
- Students recognize what faculty are doing – **congruence** indicates one type of survey validity.

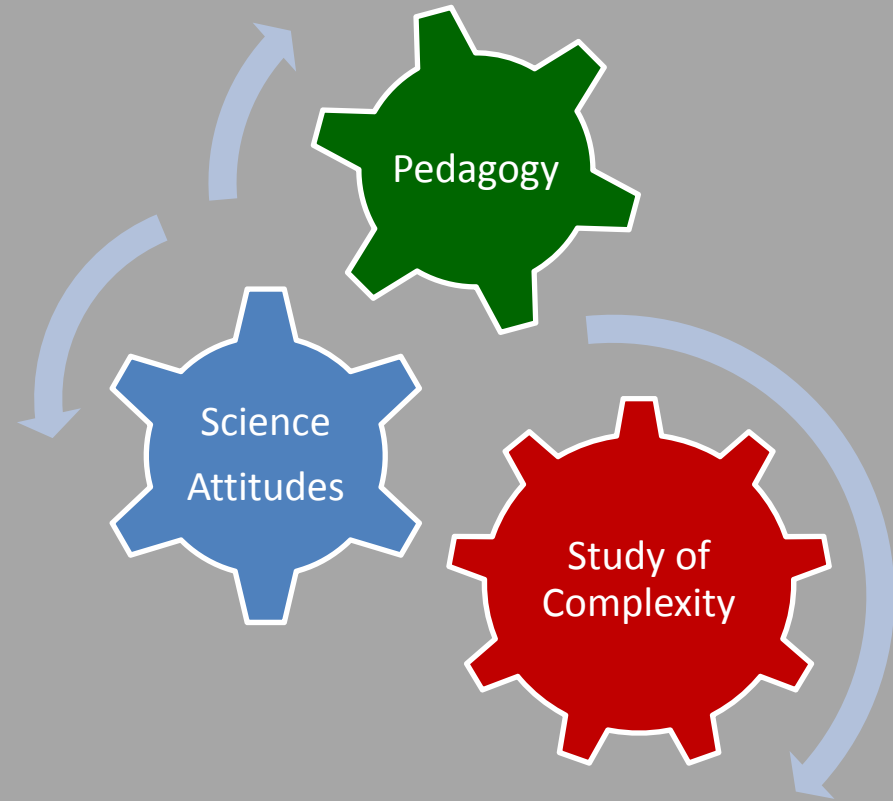
Distribution of student responses to evaluation of learning gains on studying an interdisciplinary problem categorized by faculty report of emphasis on studying interdisciplinary problems



What might we learn from RISC?

Once survey validity is more established, we will query RISC data with more “profound” questions.

EXAMPLE: What are the relationships between **degree of independent learning** (pedagogy), student attitudes about **nature of science**, and courses with a focus on **complex ID problems or systems**?



Preliminary Results: Qualitative Cohort

- Faculty are developing their ability to **articulate interdisciplinary student learning goals** - from their discussions, project work, and interactions
 - More **refined, concrete, interesting, and nuanced learning goals** and inquiry questions are emerging.
 - More **commonality about higher-priority learning goals** is emerging (multiple perspectives, capitalizing on what students bring with them...)
- No analysis yet, so no results about student learning
- Good faculty development, articulation, common ground!

Future Flavor of Cohort Project Results

Sample course level question that can be generalized:

How do students trained in the molecular and cellular life sciences *articulate the role of the biomedical sciences* as they acquire the tools of public health (PH) to define the obstacles to and possibilities for realizing reductions in the morbidity and mortality of infectious disease?

- Individual student journals over time
- Team positions papers on disease case studies (H1N1, malaria, HIV...)

