Assessing the Effectiveness of the Independent Project Experience

Presentation to the

NEASC – CIHE ASSESSMENT FORUM

December 3, 2009

A Collaboration among:

Brown University
Providence, RI

Rhode Island School of Design
Providence, RI

Connecticut College
New London, CT

Wellesley College
Wellesley, MA

A Collegium in Student Learning funded by the Teagle Foundation

Project Snapshot

- *Project Title:*

  "Using Cognitive Principles to Enhance Graduate and Undergraduate Learning in Independent Research Projects"

- *Participants:*

  Nancy Friese, Painting and Printmaking, RISD

  Beth Hennessey, Psychology/Pforzheimer Learning & Teaching Center, Wellesley College

  Dore Levy, East Asian Studies/Comparative Literature, Brown University

  Denise Pelletier, Art, Connecticut College

  Naoko Shibusawa, History, Brown University

  Kathy Spoehr, Cognitive & Linguistic Sciences, Brown U.

  Matt Zimmt, Chemistry, Brown University

  With the advice of: Laura Hess, Becky More, Kathy Takayama, Sheridan Center for Teaching & Learning, Brown University

  Kathleen McSharry, Associate Dean of the College, Brown University

Plan for this Session

- The nature and importance of independent research projects
- Insights from Cognitive Science
  - Acquiring expertise
  - Situated learning and apprenticeships
- Applications in three disciplines
- Implications and loose ends
- Comments, observations, questions from the audience

for more information contact:
Kathryn_Spoehr@Brown.edu

Independent research projects:
Nature and importance

- Fundamentally different from classroom work.
- Highly discipline-specific
- Important to both graduate and undergraduate education
- Poorly understood from an assessment point of view
- Embody important concepts from cognitive science

for more information contact:
Kathryn_Spoehr@Brown.edu

Insights from Cognitive Science

- The acquisition of expertise
  1. Integration of individual concepts into larger knowledge structures.
  2. Knowledge structures organized by relationships among those concepts. Examples:

     causality, class inclusion relations, properties of category members
  3. The nature of the relationships that organize the conceptual knowledge structure changes substantially as expertise within the field increases.
  4. Experts organize related concepts using principles that foster creative work in the field.

for more information contact:
Kathryn_Spoehr@Brown.edu

What Difference Does Practice Make?

- How much preparation time does it take to become and expert?
  - Chess: ~10 years
  - Music composition: ~10 years
  - Music performance: ~10 years
  - Scientific research: 10-12 years
  - Medical and x-ray diagnosis: 10+ years
  - Poetry: 10-20 years

from Ericsson, K. A., Krampe, R. T., & Tesch-Romer,C. (1993) The Role of Deliberate Practice in the Acquisition of Expert Performance. Psychological Review, 100(3), 363-406.

Acquiring Expertise:
Situated Learning and Communities of Practice

- Basic elements of situated learning
  - Legitimate peripheral participation
  - Scaffolding
  - Community of practice
  - Distributed knowledge/distributed learning

for more information contact:
Kathryn_Spoehr@Brown.edu

Implications for Assessing Research Projects

- Research proficiency is a very long continuum
  - Assessment at different stages requires different standards
- Research is as much about process as product
  - Assessment of projects must capture both
- Student research is an exercise in doing what experts do
  - Assessment standards must reflect expert practice ***in the discipline.***
  - The assessment standards are an embodiment of what it means to be an expert

Developing the Assessments

- Focus on undergraduate thesis or honors project
  - Extensions “down” to directed research and “up” to Masters/Ph.D. projects (in some cases)
- Identification of disciplinary research and situated learning style
  - Huge variation among disciplines
- Explication of expert-level practice in the discipline
- Translation into a ***framework*** (rather than a rubric/assessment standard, etc.)

Example Assessments: Independent Research

- Visual art – Nancy Friese, RISD
- History – Naoko Shibusawa, Brown
- Chemistry – Matt Zimmt, Brown

Example Assessment

Visual Art – Nancy Friese, RISD

Example Assessment

History – Naoko Shibusawa, Brown University

- Process more important than product
- Necessary elements:
  1. introduction to topic and its historiographic significance
  2. brief historiographical section
  3. brief discussion of sources consulted and methodology used

plus …

Example Assessment

History – Naoko Shibusawa, Brown University

- More necessary elements:
  4. Argument and focus
     - The essay should contain a clearly stated thesis (argument) that is employed in a relevant fashion throughout each chapter.
  5. Analysis
     - analyze rather than merely narrate or summarize
     - considers historical context and change over time
     - considers and evaluates the nature of the source materials
     - differentiates between cause and correlation

plus …

Example Assessment

History – Naoko Shibusawa, Brown University

- More necessary elements:

6. Counter-arguments and explanations
   - analyses of other positions are accurate, nuanced, and respectful.
7. Evidence
   - attribution is clear and fairly represented
   - quality of secondary sources is appropriate
8. Conclusions and implications
   - clearly derived from evidence and analysis and qualified in an appropriate and balanced way
9. A bibliography: primary and secondary sources

plus …

Example Assessment

History – Naoko Shibusawa, Brown University

- Writing style has
  - sense of purpose, organization, compelling writing, professional tone
  - appropriate paragraphing, quotation usage, sentence structure, word choice, grammar, spelling, mechanics.
  - Appropriate length for the topic
  - use of *Chicago Manual of Style*

Example Assessment

Chemistry – Matt Zimmt, Brown University

- Six assessment categories
- In each category the following benchmarks are set:

1	minimum expectation of undergraduate to continue project after 1 semester
2	•
3	•
4	•
5	undergraduate functioning at the level of an advanced/highly capable graduate student

Example Assessment

Chemistry – Matt Zimmt, Brown University

- Category I: Project definition

1	student understands her/his specific project objectives
2	student understands her/his project objectives within the broader context of the lab's work
3	student can discuss project within the context of lab and literature precedent
4	student layers novel elements/directions onto pr-existing project
5	student develops novel project based on self-identified holes in lab or literature work

Example Assessment

Chemistry – Matt Zimmt, Brown University

- Category II: Synthetic Manipulations

1	perform water/air insensitive manipulations as specified in a detailed procedure
2	perform water/air insensitive manipulations as specified in a detailed procedure; independently performs standard purification methods
3	appropriately modify previously performed procedures to accommodate new compounds; works out procedures
4	develop appropriate procedures by combining multiple sources
5	optimize reaction procedure using mechanistic hypotheses and prior results

for more information contact:
Kathryn_Spoehr@Brown.edu

Example Assessment

Chemistry – Matt Zimmt, Brown University

- Category III: Data and Analyses

1	independently collects adequate quality spectroscopic/physical characterization data and seeks assistance when quality is insufficient
2	independently interprets spectroscopic data as consistent/inconsistent with desired or expected outcome
3	determines possible origin/identity of unexpected product or results from data
4	designs/identifies alternate experiments to confirm expected/unexpected results
5	discerns failures/limitations of working model and identifies/explores alternatives

for more information contact:
Kathryn_Spoehr@Brown.edu

Example Assessment

Chemistry – Matt Zimmt, Brown University

- Category IV: Data Presentation

1	presents chronological summary; can answer questions regarding manipulations performed
2	describes progress within context of project; presents rationale/guidance for future work
3	presents efforts to overcome impediments in a way that stimulates ideas and discussion
4	presets project in context; literature and resulting motivation, project goals, results, and implications for discipline and future work
5	

Example Assessment

Chemistry – Matt Zimmt, Brown University

- Category V: Literature Utilization

1	reads and asks questions regarding provided literature references
2	develops literature search skills to find specific information needed
3	identifies and reads literature to answer questions/queries regarding aspects of project
4	develops familiarity with literature/researchers dealing with closely related systems
5	all of #4 plus reads and attempts to integrate ideas/facts from literature in areas peripheral to project

for more information contact:
Kathryn_Spoehr@Brown.edu

Example Assessment

Chemistry – Matt Zimmt, Brown University

- Category VI: Project Advancement

1	advances project through a limited number of steps that work as originally designed
2	advances project through to completion if no impediment is encountered
3	advances project through an impeding step
4	completes project and draws rudimentary conclusions regarding initial hypotheses
5	all of #4 plus reflects critically on and proposes improved paths for project execution.

Ongoing Project Work

- Frameworks are in use during the current academic year
- Refinements and adjustments as necessary
- "Fall-out"
  - Back-filling curriculum in the participating departments
  - Research mentoring skills
- Expansion to related fields
  - Mini-seminars with faculty from similar disciplines
  - Seminars for graduate students

    self-reflection, learning mentoring skills

And finally …

Comments, observations, questions from the audience