Advancing the Levels of Inquiry in Teaching and Learning: Considerations in Moving from Effective Teacher to the Scholarship of Teaching and Learning (SoTL)

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National Science Foundation
Webinar
Enrichment Workshop
2011

Workshop Layout

• Welcome & Overview
• Background
  – Duderstadt, Jamieson & Lohmann – Designing effective learning environments
  – Boyer – Scholarship Reconsidered
  – Hutchings & Shulman – Levels of Inquiry
• Scholarship of Teaching and Learning (SoTL)
  – Definition
  – Participant Survey
  – Rationale
  – Resources
  – Practice
• Advancing Along the Levels of Inquiry – Suggestions and Strategies
• Summary and Next Steps
Workshop Objectives

• Participants will be able to
  – Describe innovation cycle of educational practice and research and its role in designing effective learning environments
  – Describe key features of SoTL and how it differs from Scholarly Teaching and Engineering Education Research
  – Explain rationale for SoTL
  – Identify SoTL opportunities in courses and programs
  – Locate SoTL resources

Preliminary Comments

Active & Collaborative Learning

• Effective learning activities
  – Recall prior knowledge – actively, explicitly
  – Connect new concepts to existing ones
  – Challenge and alter misconceptions
  – Reflect on new knowledge

• Active & collaborative processes
  – Think individually
  – Share with partner
  – Report to local and virtual groups
  – Learn from program directors’ responses
Participant Activities

- **Long Exercise** ---- 6 min
  - Think individually -------- ~2 min
  - Share with a partner ----- ~2 min
  - Report in local group ---- ~2 min

- **Short Exercise** ------ 4 min
  - Think individually -------- ~2 min
  - Report in local group ---- ~2 min

- **Individual Exercise** ---------- 2 min

Facilitator’s Duties

- Coordinate the local activities
- Watch the time
  - Allow for think, share, and report phases
  - Reconvene on time -- 1 min warning slide
- Ensure the individual think phase is devoted to thinking and not talking
- Coordinate the comments and questions by local participants
It could well be that faculty members of the twenty-first century college or university will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, processes, and environments.

James Duderstadt, 1999 [Nuclear Engineering Professor; Dean, Provost and President of the University of Michigan]

...objectives for engineering practice, research, and education:

To adopt a systemic, research-based approach to innovation and continuous improvement of engineering education, recognizing the importance of diverse approaches—albeit characterized by quality and rigor—to serve the highly diverse technology needs of our society

Activity 1

SoTL Interests/Webinar Goals

• Describe your interest in SoTL and what you’d like to get out of the webinar.

• Individually identify a few interests and goals – Please record them

• Report to the group

• Short Exercise ---- 4 min
  – Think individually -------- ~1 min
  – Discuss in your group ---- ~ 2 min
  – Select a few ideas to share with virtual group ---- ~1 min

Format from Russell Pimmel - Developing a Competitive Proposal - An Interactive, Web-Based Workshop - Division of Undergraduate Education - National Science Foundation, October, 2010
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ONE Minute
Scholarship Reconsidered: Priorities of the Professoriate Ernest L. Boyer

- The Scholarship of Discovery, research that increases the storehouse of new knowledge within the disciplines;

- The Scholarship of Integration, including efforts by faculty to explore the connectedness of knowledge within and across disciplines, and thereby bring new insights to original research;

- The Scholarship of Application, which leads faculty to explore how knowledge can be applied to consequential problems in service to the community and society; and

- The Scholarship of Teaching, which views teaching not as a routine task, but as perhaps the highest form of scholarly enterprise, involving the constant interplay of teaching and learning.


Levels of Engineering Education Inquiry

- **Level 0** Teacher
  - Teach as taught

- **Level 1** Effective Teacher
  - Teach using accepted teaching theories and practices

- **Level 2** Scholarly Teacher
  - Assesses performance and makes improvements

- **Level 3** Scholarship of Teaching and Learning
  - Engages in educational experimentation, shares results

- **Level 4** Engineering Education Researcher
  - Conducts educational research, publishes archival papers

Levels of Inquiry

- **Level 1: Excellent teaching**
  - Involves the use of good content and teaching and assessing methods

- **Level 2: Scholarly Teaching**
  - Involves good content and methods and classroom assessment and evidence gathering, informed by best practice and best knowledge, inviting of collaboration and review.

Levels of Inquiry (cont’d)

- **Level 3: Scholarship of Teaching and Learning**
  - The Instructor (a) Is aware of modern pedagogical developments and incorporates them in his/her teaching where appropriate, and (b) Reflects on, assesses, and attempts to improve his/her teaching (classroom research)
  - Is public and open to critique and evaluation, is in a form that others can build on, involves question-asking, inquiry and investigation, particularly about student learning.
**SoTTL Experience - Long Exercise**

- Individually: Reflect on SoTTL Activities
  - Subscribe to teaching journals?
  - Read/skim teaching journals?
  - Attended teaching conferences/workshops?
  - Published articles on teaching & learning?
  - Other activity in scholarship of teaching and learning?
    - Attended a teaching effectiveness workshop
    - Introduced new teaching strategy and/or content and assessed for improvement of learning

- Discuss in Groups of 3-4
  - Share SoTTL experiences/activities

- Prepare 2-3 stories to share with the larger group

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**Activity 2**

**SoTTL Experience**

- **SoTTL Activities**
  - Published articles on teaching & learning?
  - Subscribe to teaching journals?
  - Read/skim teaching journals?
  - Attended teaching conferences/workshops?
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- **Report to whole group in 1 minute**
Why should we care about SoTL?

One Reason - Calls for evidence-based promising practices

Book Ends on a Class Session

Thinking Together: Collaborative Learning in the Sciences – Harvard University – Derek Bok Center – www.fas.harvard.edu/~bok_cen/
Cooperative Learning Research Support


- Over 300 Experimental Studies
- First study conducted in 1924
- High Generalizability
- Multiple Outcomes

Outcomes

1. Achievement and retention
2. Critical thinking and higher-level reasoning
3. Differentiated views of others
4. Accurate understanding of others’ perspectives
5. Liking for classmates and teacher
6. Liking for subject areas
7. Teamwork skills

Problem-Based Cooperative Learning

At M.I.T., Large Lectures Are Going the Way of the Blackboard

By FELICIA KUEH
Published January 13, 2009

CAMBRIDGE, Mass. — For as long as anyone can remember, introductory physics at the Massachusetts Institute of Technology was taught in a vast windowless amphitheater known by its number, 13-001.

http://web.mit.edu/edtech/casestudies/teal.html#video

http://www.ncsu.edu/PER/scaleup.html
PROBLEM-BASED LEARNING

UD PBL articles and books
UD PBL in the news
Sample PBL problems
UD PBL courses and syllabi
PBL Clearinghouse
PBL Conferences and Other PBL sites
Institute for Transforming Undergraduate Education
Other related UD sites

“How can I get my students to think?” is a question asked by many faculty, regardless of their discipline. Problem-based learning (PBL) is an instructional method that challenges students to “learn to learn,” working cooperatively in groups to seek solutions to real-world problems. These problems are used to engage students’ curiosity and initiate learning the subject matter. PBL prepares students to think critically and analytically, and to find and use appropriate learning resources. — Barbara Duck

PBL2002: A Pathway to Better Learning
Recipient of 1999 Herbugh Certificate of Excellence

http://www.udel.edu/pbl/
*Cooperative Learning Adopted*

The American College Teacher:
National Norms for 2007-2008

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<th>All – 2005</th>
<th>All – 2008</th>
<th>Assistant - 2008</th>
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<td>Cooperative Learning</td>
<td>48</td>
<td>59</td>
<td>66</td>
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<tr>
<td>Group Projects</td>
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<td>36</td>
<td>61</td>
</tr>
<tr>
<td>Grading on a curve</td>
<td>19</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Term/research papers</td>
<td>35</td>
<td>44</td>
<td>47</td>
</tr>
</tbody>
</table>

http://www.heri.ucla.edu/index.php

Questions/Comments?

- Reflect on the session thus far
- Identify questions and/or comments
- Raise your virtual hand
BREAK
15 min

BREAK
1 min
Why do SoTL?

• Fosters significant, long-lasting learning for all students
• Enhances practice and profession of teaching
• Brings faculty’s work as teachers into the scholarly realm.
• ?

Basic Features of Professional and Scholarly Work

• It requires a high level of discipline-related expertise
• It is conducted in a scholarly manner with clear goals, adequate preparation, and appropriate methodology
• The work and its results are appropriately and effectively documented and disseminated. This reporting should include a reflective critique that addresses the significance of the work, the process that was used, and what was learned.
• It has significance beyond the individual context.
• It breaks new ground or is innovative.
• It can be replicated or elaborated on.
• The work both process and product or result is reviewed and judged to be meritorious and significant by a panel of ones peers.

CASTL represents a major initiative of The Carnegie Foundation. Launched in 1999, the program builds on a commitment to teaching as scholarly work proposed in the 1923 report, Scholarship and Teaching, authored by former Carnegie Foundation President Ernest Boyer, and the 1997 follow-up publication, Scholarship Assessed, authored by Charles A. Ogborn, Mary Taylor Huber, and Gene Marshall.

The CASTL Program seeks to support the development of a scholarship of teaching and learning that makes significant, long-lasting impact for all students, enhances the practice and profession of teaching, and brings the recognition and reward afforded to other forms of scholarly work.

Achieving these goals involves significant shifts in thought and practice. For faculty, most important, meaning is a private art limited to the teacher and students; it is rarely evaluated by professional peers. The result? "The best--" turns former Carnegie Foundation President Lee S. Shulman, "are held in awe, and innovate." CASTL seeks to render teaching public, subject to critical evaluation, and visible to others in both the academy and the general community.

Currently, the CASTL Program is working with a wide variety of institutions (campuses, collaborative centers, and organizations), scholarship and learning, and community partnership and support. Theirs efforts are aimed and focused on the CASTL Institutional Leadership Program and the CASTL Affiliates Program.

Faculty involved in SoTL “frame and systematically investigate questions related to student learning—the conditions under which it occurs, what it looks like, how to deepen it, etc…. and do so with an eye not only to improving their own classrooms but also to advancing practice beyond it.” What differentiates SoTL from the ongoing self-assessment of our own teaching is that it is “public, peer-reviewed and critiqued, and exchanged with other members of our professional communities.”

Pat Hutchings and Lee Shulman of the Carnegie Foundation

SoTL Practice

• Select a Setting (~3 minute videos)
  – Physics – Harvard – Teaching through questioning
  – Physics – MIT – Studio physics
  – Biology – UMN – SCALE-UP

• Instructor emphasis (student learning outcomes):
  – Conceptual understanding
  – Systematic problem formulation and solving

• Watch video with viewing partner (faculty focus & student focus)
  – Identify potential questions for SoTL study
Video Examples

• Mazur – From Questions to Concepts – Physics – Harvard
  [link](http://www.youtube.com/watch?v=lBYrKPoVFwg)

• Belcher – Technology Enabled Active Learning – Physics – MIT
  [link](http://web.mit.edu/edtech/casestudies/teal.html#video)

• Wright – Inside Active Learning Classrooms – Biology – University of Minnesota -
  [link](http://www.youtube.com/watch?v=lfT_hoiuY8w)

Types of Questions

• Instructional Knowledge—components of instructional design

• Pedagogical Knowledge—student learning & how to facilitate it

• Curricular Knowledge—goals, purposes & rationales for courses or programs
3 types of reflection within each form of knowledge

• Content—What should I do…
• Process—How did I do…
• Premise—Why does it matter…

Examples for process reflection:

How did I (we) do at:
• Course design, methods & assessing effectively? (instructional)
• Facilitating student knowledge? Was I successful? (pedagogical)
• Arriving at goals & rationale for courses? (curricular)
SoTL Futures - Long Exercise

• Reflection Questions:
  – Are you interested in developing a SoTL project? Why-why not?
  – If yes, what question(s) would you explore?
  – What organizational resources and or support is available?
  – What organizational challenges do you face?
  – Thoughts on helping prepare the next generation of faculty for SoTL work?

• Discuss in Groups of 3-4
  – Share responses

• Prepare 2-3 responses to share with the larger group

Activity 2
SoTL Futures

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ONE Minute
Workshop Resources

• Handouts

• Websites
  – Carnegie Academy for the Scholarship of Teaching and Learning (CASTL) - http://www.carnegiefoundation.org/scholarship-teaching-learning
  – Collaboratory for Engineering Education Research - cleerhub.org

• Books
Guiding principles for scientific research in education

1. Pose **significant questions** that can be investigated **empirically**
2. Link research to relevant **theory**
3. Use **methods** that permit **direct investigation** of the question
4. Provide coherent, explicit chain of **reasoning**
5. Replicate and **generalize** across studies
6. Disclose research to encourage professional **scrutiny and critique**

*Source: Scientific Research in Education, National Research Council, 2002*

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**Workshop Resources**

Workshop Resources

• Additional
  – Center for the Advancement of Scholarship on Engineering Education; http://www.nae.edu/nae/caseecomnew.nsf

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Thanks for your participation!

- To download a copy of the presentation- go to:
  http://step.eng.lsu.edu/nsf/participants/

- Please complete the assessment survey-go to:
  http://www.step.eng.lsu.edu/nsf/participants/