



GEOLOGY & GEOPHYSICS AT TEXAS A&M UNIVERSITY

Improving Geoscience Education Through the Scholarship of Teaching and Learning

Dr. Bruce Herbert

2012 GSA/NAGT Short Course



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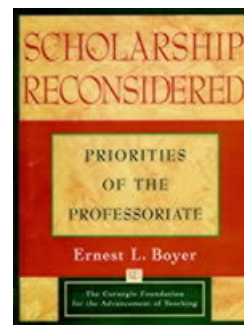
Universities & Knowledge Societies

New Models of Scholarship

The work of Ernest Boyer and the Carnegie Foundation for the Advancement of Teaching stimulated debate about definitions of scholarship at research universities.

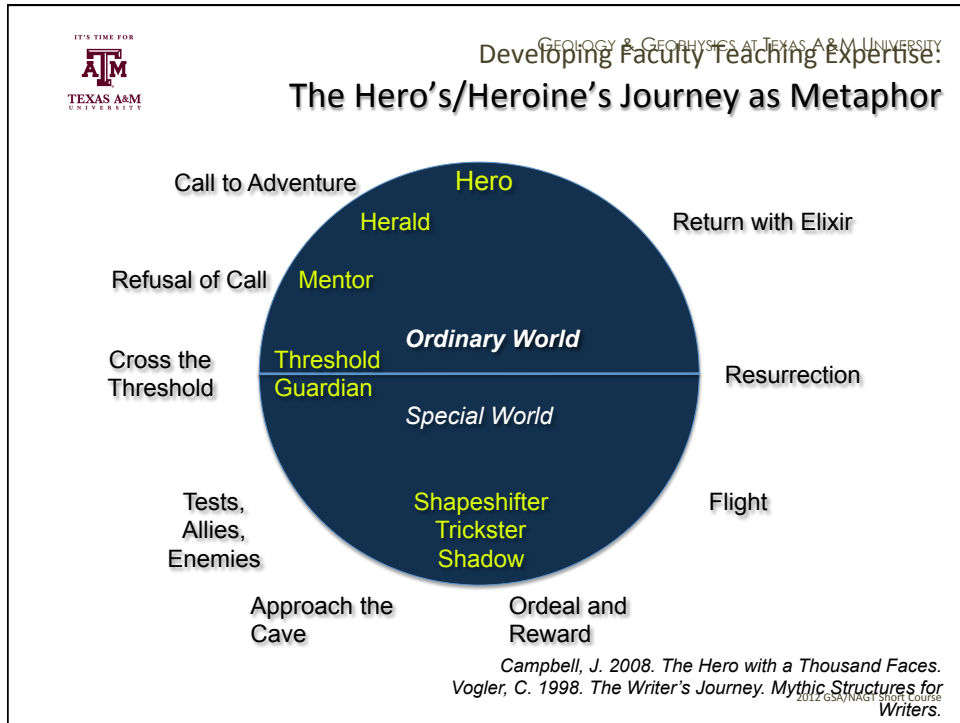
Boyer stressed the need to expand the definition of scholarship

- Discovery of knowledge
- Integration of knowledge
- Application of knowledge
- Teaching



Scholarship Reconsidered: Priorities of the Professoriate. 1990. Ernest L. Boyer. San Francisco: Jossey-Bass, Inc.

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IT'S TIME FOR
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Reflecting on Graduate Student Mentoring

We found integrating science and education works to prepare my students for their academic careers.

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Scholarship of Teaching and Learning

The improvement of teaching and learning is a dynamic and ongoing process, just as is research in any STEM discipline.

At the core of improving teaching and learning is the need to accurately determine what students have learned as a result of teaching practices.

This is a research problem, to which STEM instructors can effectively apply their research skills and ways of knowing. In so doing, STEM instructors themselves become the agents for change in STEM teaching and learning.



Photo courtesy of University of Illinois-Springfield

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Conceptualizing Teaching as Research

- Informed by the work of others
- Includes an explicit question or hypothesis about teaching-learning relationships
- Shaped by an explicit design or plan for addressing the question at hand
- Collecting credible data as evidence, analyzing the evidence and drawing conclusions
- Reflecting and taking action through an iterative and ongoing process
- Results are documented and disseminated
- The practitioner is principally responsible for the inquiry plan and process

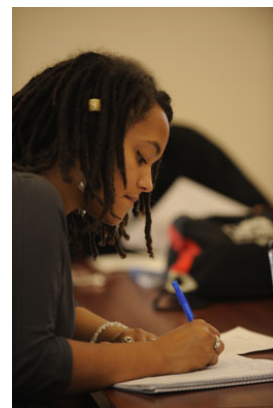


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Identifying Your Question

- **What works?** – These are questions that seek “evidence about the relative effectiveness of different [teaching] approaches.”
- **What is?** – These are questions that seek to describe, but not evaluate the effectiveness of, different teaching approaches. These are also questions that seek to describe how students learn.
- **Visions of the possible** – These are questions related to goals for teaching and learning that have yet to be met or are new to the faculty member asking the questions.
- **Theory building questions** – These are questions designed to build theoretical frameworks for TAR similar to frameworks used in other disciplines.

Hutchings. 2000. *Opening Lines: Approaches to the Scholarship of Teaching and Learning*. Carnegie Foundation

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Quantitative and Qualitative Data

- Quantitative data are data in numerical form. Quantitative data are usually analyzed using descriptive and inferential statistics, are often used to answer “What Works?” inquiry questions, and are often used when the number of students being studied is large.
- Qualitative data are data in verbal, textual, or visual form. Qualitative data are usually analyzed using some kind of content analysis technique, are often used to answer “What Is?” inquiry questions, and are often used when the number of students being studied is small.

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Evidence of Student Learning: Direct Evidence

- Student performance on standardized and locally developed exams
- Student work samples (essays, lab reports, quizzes, portfolios, etc.)
- Student reflections on their own values, attitudes, and beliefs
- Behavioral observations of students (in person, via video- or audiotape, etc.)
- Ratings of student skills by field experience supervisors



Dr. Omar Harvey, a former CIRTL participant from Texas A&M

The above examples are adapted from "Assessing Student Learning: Guidelines for SACS Reaffirmation of Accreditation," a workshop for department chairs and program directors provided by the Vanderbilt Provost Office on January 9, 2007, and the [Vanderbilt University Assessment Web Site](#).

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Evidence of Student Learning: Indirect Evidence

- Responses to survey or interview questions asking students to assess their own learning
- Responses to survey or interview questions asking students to rate their satisfaction with a learning experience
- Reflections by instructors on student learning and teaching methodologies
- Course grades

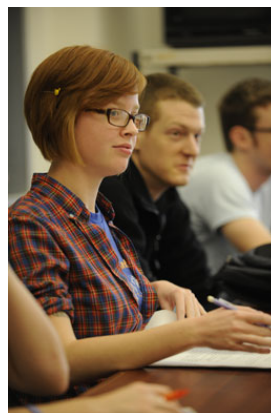


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Analyzing Evidence

- Identify samples of student work that represent high pass, medium pass, and low pass for a classroom activity.
- Focus on students' responses to a small number of higher-order thinking questions for a classroom activity.
- Track selected students' performance on several assignments over the academic term.
- Follow selected students or student teams in their development of a single assignment over the academic term.

Daniel Bernstein, et al., *Making Teaching and Learning Visible: Course Portfolios and the Peer Review of Teaching*, Anker, 2006, pages 34-35.

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Analyzing Evidence

- Look for patterns across samples of student work. Keep in mind that interesting results may emerge in subgroups of your student population.
- Develop a scheme for coding qualitative data.
- Employ descriptive and inferential statistics, such as normalized gain, for quantitative data.
- Triangulate—collect and analyze data from multiple sources.

Daniel Bernstein, et al., *Making Teaching and Learning Visible: Course Portfolios and the Peer Review of Teaching*, Anker, 2006, pages 34-35.

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Last Activity:
Engaging in the Scholarship of Teaching & Learning

Group discussion: What are the opportunities and
barriers for you?