

SCHOLARSHIP OF TEACHING AND LEARNING: SELECTED EXAMPLES FOR “STEM” DISCIPLINES.

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Overview: Handelsman J, Ebert-May D, Beichner R, Bruns P, Chang A, DeHaan R, Gentile J, Lauffer S, Stewart J, Tilghman SM, Wood, WB. 2004. Scientific Teaching. *Science* 304: 521-522.

General Introduction to SOTL: Choose several papers from Resources at The Carnegie Foundation for the Advancement of Teaching. <http://www.carnegiefoundation.org/publications/index.asp?key=498> For inspiring examples, see The Gallery of Teaching and Learning, <http://gallery.carnegiefoundation.org/> For good SOTL programs with diverse resources see Indiana University’s award winning program www.indiana.edu/~sotl/ or the Illinois State site: <http://www.sotl.ilstu.edu/resLinks/index.shtml> Scan abstracts for the new *International Society for the Scholarship of Teaching and Learning* <http://www.issotl.org/conferences>.

Another Overview: T. Angelo. Ed. 1998. *Classroom Assessment and Research: An Update on Uses, Approaches, and Research Findings*. Jossey-Bass

Overview of types of SOTL: Nelson, C.E. 2004. Doing It: Selected Examples of Several of the Different Genres of SOTL. *Journal of Excellence in College Teaching*. 14 (2-3): 85-94. PDF of short version: http://mypage.iu.edu/~nelson1/00_Genres.pdf

Student and Teacher Conceptions in Science:

Duit, Reinders. 2007. Bibliography – STCSE: Students' and teachers' conceptions and science education. Online www.ipn.uni-kiel.de/aktuell/stcse/stcse.html [Cites 7,700 studies and reviews]. [I include this here to show that there is a LOT already known and because this searchable data base will often help you frame alternative factors.]

Overview of Alternative Assessment Approaches:

National Science Foundation. 1997. *User-Friendly Handbook for Mixed Method Evaluations*. NSF97-153. Updated 5/00; 131 pp.; Free. PDF: www.ehr.nsf.gov/EHR/REC/pubs/NSF97-153/pdf/mm_eval.pdf [The 2002 User-Friendly Handbook for Project Evaluation. <http://www.nsf.gov/pubs/2002/nsf02057/start.htm> includes a chapter on culturally responsive methods.]

Marshall D. Sundberg. 2002. Assessing Student Learning. *Cell Biology Education*. 2002 Spring–Summer; 1: 11–15. doi: 10.1187/cbe.02-03-0007 link at: <http://www.pubmedcentral.gov/tocrender.fcgi?iid=3364>

Biology:

Coalition for Education in the Life Sciences (CELS). Links to Professional Societies in the Biological Sciences Educational Activities. <http://www.wisc.edu/cels/cels/edulinks.html>

Hake, Richard R. 1999. *REDCUBE: Research, Development, and Change in Undergraduate Biology Education: A Web Guide for Non-Biologists*. <http://physics.indiana.edu/~redcube/> [47 biology-educator profiles; 446 references (including 124 relevant to general science-education reform)].

Anderson, D.L., Fisher, K.M., & Norman, G.J. 2002. Development and Evaluation of the Conceptual Inventory of Natural Selection. *Journal of Research in Science Teaching*, 39, 952-978. www.biologylessons.sdsu.edu/CINS6_03.pdf 2004 revision: www.sci.sdsu.edu/CRMSE/CINS%20v%209-12-04%201.doc

Biology Concept Inventory (BCIa genetics and evolution; BCIb cell and molecular biology, scientific method). Also (1) an on-line web tool for coding student responses to essay type questions and (2) "Ed's Tools" greatly speeds the inventory development process. For an account for access through Bioliteracy website <<http://bioliteracy.net>> contact Mike Klymkowsky <Michael.Klymkowsky@Colorado.EDU>

Sundberg MD. 2003. Strategies to help students change naïve alternative conceptions about evolution and natural selection. *Reports of the National Center for Science Education* 23(March-April):23-26. <http://www.ncseweb.org/newsletter.asp?curiss=38> [Accessed 2/22/06]

Sundberg MD, Dini ML, Li E. 1994. Improving student comprehension and attitudes in freshman biology by decreasing course content. *Journal of Research on Science Teaching* 31: 679-693.

Chemistry:

Bibliography of Science Teaching Pedagogy with an Emphasis on Chemistry. Includes General Pedagogy, Active and Cooperative Learning, Critical Thinking writing, Learning Styles, Lab Classes, etc.

<http://www.calstatela.edu/dept/chem/chem2/LACTE/References1.html>

Bunce, Diane and Katherine Havanki . *Chemical Education Research References*.
faculty.cua.edu/bunce/BCCE/ChemEdResBibliographyReferences.doc

Chemistry Education Research overview: http://www.tomlinsonproject.mcgill.ca/teach_resources.htm

Coppola, Brian, *Chemical Sciences at the Interface of Education: An Infrastructure for Developing the Scholarship of Teaching and Learning (SoTL) for Future Faculty*. <http://www.umich.edu/~csie/>

Greenbowe, TJ. *Chemical Education Research Group List of Readings Part 1*
<http://www.chem.iastate.edu/group/Greenbowe/sections/readingsp1.htm>

Engineering.

Special Issue: The Art and Science of Engineering Education Research. *Journal of Engineering Education*. 94(1): 16 articles, all currently online at http://www.asee.org/about/publications/jee/upload/2005jee_sample.htm

Geology [And Knowledge Survey for All Fields]:

Edward Nuhfer, and Delores Knipp .2003. The Knowledge Survey: A Tool for All Reasons
To Improve the Academy 21:59-78. http://www.isu.edu/ctl/facultydev/KnowS_files/KnowS.htm

Dexter Perkins and Karl Wirth. 2005. Knowledge Surveys: Applications and Results. [17 pp. Poster, Geology]
http://serc.carleton.edu/files/NAGTWorkshops/assess/knowledgesurvey/small_perkins_p.pdf

Wirth, K. and Perkins, D. 2005 Knowledge Surveys: The ultimate course design and assessment tool for faculty and students. Proceedings: Innovations in the Scholarship of Teaching and Learning Conference, 19p.
<http://www.macalester.edu/geology/wirth/WirthPerkinsKS.pdf>

Mathematics:

ARUME Math Ed Paper Database Search Page. <http://betterfilecabinet.com/cgi-bin/arume.pl>

Rishel, Thomas. 2000. *Teaching First: A Guide for New Mathematicians*. Mathematical Association of America. [preliminary version available online at <http://www.maa.org/programs/tahandbook.html>]

Solomon Friedberg, et al. 2001. *Teaching Mathematics in Colleges and Universities: Case Studies for Today's Classroom*. American Mathematical Society, 2001. [Case studies on teaching. Faculty edition has guidelines for leading discussions about the cases.]

Physics:

Martinez, Kristy and Margaret Eisenhart. 2004. Literature Review of Best Practices in College Physics and Best Practices for Women in College Physics. 16 pp. Web only: http://advance.colorado.edu/research_best_practices.html
Full article <http://advance.colorado.edu/LitReviewBestPractices.pdf> [alternative instructional methods yield better learning and more positive attitudes.]

Physics Education Research overview: <http://www.tomlinsonproject.mcgill.ca/physics.html>

Redish, Edward F. 1994. The Implications of Cognitive Studies for Teaching Physics *American Journal of Physics* 62(6), 796-803

Where to find or publish SOTL research.

ERIC: "Education Resources Information Center (ERIC), sponsored by the Institute of Education Sciences (IES) of the U.S. Department of Education, produces the world's premier database of journal and non-journal education literature. ERIC provides a public Web site for searching **nearly 1.2 million citations** going back to 1966 and, with contributor permission, accessing more than **110,000 full-text materials** at no charge." THE place for initial literature searches. <http://www.eric.ed.gov/> See also <http://searcheric.org/>

SoTL Outlets for Presenting or Publishing. Illinois State's SOTL Program. List and links to other lists. Includes lists by discipline. Also links to resources including *other SOTL programs*. <http://www.sotl.ilstu.edu/pubOuts/index.shtml>
[List of 200+ Education Journals <http://www.isetl.org/resources/index.cfm?cat=0>]

NSF Overview.

Larry E. Suter and Joy Frechtling. 2000. *Guiding Principles for Mathematics and Science Education Research Methods: Report of a Workshop*. nsf00113 [Not focused directly on undergraduates but very interesting.]
www.nsf.gov/pubs/2000/nsf00113/nsf00113.html

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