Assessment & Evaluation of Student Learning from Research Experiences:
A SoTL Perspective

Plenary Presentation at CUR-ISSOTL Pre-Conference; October 2013; Raleigh, NC

Kathleen McKinney, Illinois State University, kmckinne@ilstu.edu

Important Questions to ask yourself
- What are the goals/purposes of the assessment/evaluation (determine grades, provide students with detailed feedback, improve course or program, enhance learning, obtain funds, convince external constituencies of the value of student research…)?
- Who are your audiences beyond the self, if any (students, colleagues, community members, accreditation agencies, administrators, funding sources…)?
- How will you represent/share your findings, if at all (presentations, internal reports, publications, videos, web representations…)?
- Is there good fit among the outcomes/purposes, research question, theoretical constructs, measures and methods, and representations for the assessment/SoTL project?

My focus today is general but more about assessment and evaluation of students' work and outcomes from a research course/class/experience with the purpose of improving the experience for, and learning by, students.

Types of Outcomes to Measure
- Start by thinking about the learning and other objectives, outcomes of the research experience or program.
- What might be the intervening processes (the why and how that research experience contributes to learning outcomes) such as quality of mentoring relationship; structure of experience; student control and motivation)?
- Consider replicating findings from literature on outcomes of research experience (e.g., increased quality of interaction with faculty, improved writing and communication skills, knowledge of research skills, professional development, increased self-esteem, increased problem solving and critical thinking, greater satisfaction with college experience…).
- Know and apply theories about learning.
- Could there also be 'unintended' or 'unanticipated' outcomes to measure?
- Student attitudes/perceptions/beliefs/values.
- Student affective development.
- Student skills (methodological, statistical, writing, presenting, analysis, synthesis…).
- Student content knowledge.
- Measures of use/application/transfer of knowledge or skills.
- Communication, interactions, behaviors by students, peers, faculty/staff.

Types/Ways to Measure Outcomes
- Indirect (e.g. student perceptions) <---> direct (e.g., valid instruments/measures of learning) <---> performance measures (e.g., portfolios of work or capstone course products; behaviors)
- Static <---> growth/change measures (pre-post)
- Single <---> multiple methods/measures
- Existing instruments (e.g., URSSA, SURE, CURE) <---> create your own instruments
- Quantitative <---> qualitative measures
- Evaluation by other constituencies (users of findings; community members; professionals in the field)

General Data Gathering Strategies for SoTL and Assessment
- analysis of a product from the research experience (thesis, lab reports, journals, concept map, presentation, poster…) using a rubric
- interviews or focus groups of students
- questionnaires

- pre-post tests
- student reflections via journal or essay
- content analysis of text or documents (e.g., research report or paper)
- "think alouds"
- secondary analysis of existing data
- quasi-experiments or experiments
- observational research
- case studies of a student or a class or a project

Two Example Studies on Outcomes of a Research Experience in a Disciplinary Capstone Course from my SoTL Research Agenda
"THE SOCIOLOGICAL RESEARCH EXPERIENCE CAPTSTONE COURSE AT THREE INSTITUTIONS"
This study describes the objectives, structure, and outcomes of a one-semester, required sociology research capstone course as taught at three institutions. Pre- and post-questionnaires from students, syllabi from instructors, and a random sample of final research papers were analyzed. Results indicate that the main foci of the course are to conduct research, produce a paper/thesis, develop writing and presentation skills, and integrate past learning. Instruction in this course includes numerous 'best practices' from the literature on teaching and learning. There appears to be an under-emphasis, however, on helping students to apply 'theory' in their projects. The theses reveal a wide range of topics, methodological approaches, and quality with the Introduction/Literature Review and Discussion/Conclusion sections receiving the lowest quality scores.

"A MULTI-INSTITUTIONAL STUDY OF STUDENTS' PERCEPTIONS AND EXPERIENCES IN THE RESEARCH EXPERIENCE CAPSTONE COURSE IN SOCIOLOGY"
The purpose of this study is to describe student perceptions of and experiences in, as well as student self-reported learning and other outcomes from, a one-semester, required sociology research capstone course. The data come from students in a research experience/senior thesis capstone course as taught at three Illinois institutions varying in geographical location, size, degrees offered, and private-public status. Multiple methods for data collection were used including questionnaires, focus groups, and learning reflection essays. Results include that students have fairly accurate expectations about the course, self-report a range of skills and ideas they believe they learned in the course, and have an increase from pre to post in many positive attitudes about the course. In addition, themes from qualitative data include the following: students believe the strict course structure is important but also frustrating; they see the course as stressful and time consuming; they believe other courses do help prepare them for this class but that there are weaknesses in this preparation; they express pride in and ownership of their research project and products; and they report engagement in the discipline but mixed feelings about a future as researchers or sociologists.

Citations to a Selection of Example Studies Assessing/Evaluating Undergraduate Research Experiences at the Student, Course, or Program Levels
Alexander, B. B., Foertsch, J., Daffinrud, S., & Tapia, R. (2000). The "Spend a Summer with a Scientist" (SaS) program at Rice University: A study of program outcomes and essential elements, 1991-1997. *Council on Undergraduate Research Quarterly*, *20*(3), 127–133.

Bauer, K. W., & Bennett, J. S. (2003). Alumni perceptions used to assess undergraduate research experience. *Journal of Higher Education*, *74*(2), 210–230.

Campbell, A., & Skoog, G. (2004). Preparing undergraduate women for science careers. *Journal of College Science Teaching*, *33*(5), 24–26.

Chandra, U., Stoecklin, S., & Harmon, M. (1998). A successful model for introducing research in an undergraduate program: Confronting the challenge of drawing minorities into graduate computer programs at Florida A&M University. *Journal of College Science Teaching*, *28*(2), 116–118.

Chaplin, S. B., Manske, J. M., & Cruise, J. L. (1998). Introducing freshmen to investigative research—a course for biology majors at Minnesota's University of St. Thomas: How "investigative labs" change the student from passive direction-

follower to analytically critical thinker. *Journal of College Science Teaching*, *27*(5), 347–350.

Cole, F. L. (1995). Implementation and evaluation of an undergraduate research practicum. *Journal of Professional Nursing*, *11*(3), 154–160.

Cooley, E. L., Garcia, A. L., & Hughes, J. L. (2008). Undergraduate research in psychology at liberal arts colleges: Reflections on mutual benefits for faculty and students. *North American Journal of Psychology*, *10*(3), 463–472.

Cox, M. F., & Andriot, A. (2009). Mentor and Undergraduate Student Comparisons of Students Research Skills. *Journal of STEM Education*, *10*(1), 31–39.

Craney, C., McKay, T., Mazzeo, A., Morris, J., Prigodich, C., & de Groot, R. (2011). Cross-discipline perceptions of the undergraduate research experience. *The Journal of Higher Education*, *82*(1), 92–113.

DiBiasio, D., & Mello, N. A. (2004). Multi-level assessment of program outcomes: Assessing a nontraditional study abroad program in the engineering disciplines. *Frontiers: The Interdisciplinary Journal of Study Abroad*, *10*, 237–252.

Ferrari, J. R., & Jason, L. A. (1996). Integrating research and community service: Incorporating research skills into service learning... *College Student Journal*, *30*(4), 444–451.

Foertsch, J., Alexander, B. B., & Penberthy, D. (2000). Summer research opportunity programs (SROPs) for minority undergraduates: A longitudinal study of program outcomes, 1986-1996. *Council on Undergraduate Research Quarterly*, *20*(3), 114–119.

Gafney, L. (2005). The role of the research mentor/teacher: Student and faculty views. *Journal of College Science Teaching*, *34*(4), 52–57.

Hakim, T. (1998). Soft assessment of undergraduate research: Reactions and student perceptions. *Council on Undergraduate Research Quarterly*, *18*(4), 189–192.

Hathaway, R. S., Nagda, B. A., & Gregerman, S. R. (2002). The relationship of undergraduate research participation to graduate and professional education pursuit: An empirical study. *Journal of College Student Development*, *43*(5), 614–631.

Hunter, A.-B., Laursen, S. L., & Seymour, E. (2007). Becoming a scientist: The role of undergraduate research in students' cognitive, personal, and professional development. *Science Education*, *91*(1), 36–74.

Hunter, A.-B., Weston, T. J., Laursen, S. L., & Thiry, H. (2009). URSSA: Evaluating student gains from undergraduate research in the sciences. *Council on Undergraduate Research Quarterly*, *29*(3), 15–19.

Ishiyama, J. (2001). Undergraduate research and the success of first-generation, low-income college students. *Council on Undergraduate Research Quarterly*, *21*(1), 36–41.

Ishiyama, J. (2002). Does early participation in undergraduate research benefit social science and humanities students? *College Student Journal*, *36*(3), 380–386.

Kardash, C. M. (2000). Evaluation of undergraduate research experience: Perceptions of undergraduate interns and their faculty mentors. *Journal of Educational Psychology*, *92*(1), 191–201.

Kremer, J. F., & Bringle, R. G. (1990). The effects of an intensive research experience on the careers of talented undergraduates. *Journal of Research and Development in Education*, *24*(1), 1–5.

Landrum, R. E., & Nelsen, L. R. (2002). The undergraduate research assistantship: An analysis of the benefits. *Teaching of Psychology*, *29*(1), 15–19.

Lopatto, D. (2004). Survey of undergraduate research experiences (SURE): First findings. *Cell Biology Education*, *3*(4), 270–277.

Lopatto, D. (2007). Undergraduate research experiences support science career decisions and active learning. *Cell Biology Education*, *6*(4), 297–306.

Mabrouk, P. A. (2009). Survey study investigating the significance of conference participation to undergraduate research students. *Journal of Chemical Education*, *86*(11), 1335.

Mabrouk, P. A., & Peters, K. (2000). Student perspectives on undergraduate research (UR) experiences in chemistry and biology. *Council on Undergraduate Research Quarterly*, *21*(1), 25–33.

McKinney, K., & Busher, M. (2011). The sociology research experience capstone course at three institutions. *Teaching Sociology*, *39*(3), 290–302.

McKinney, K., & Day, M. D. (2012). A multi-institutional study of students' perceptions and experiences in the research-based capstone course in sociology. *Teaching Sociology*, *40*(2), 142–157.

Nagda, B. A., Gregerman, S. R., Jonides, J., von Hippel, W., & Lerner, J. S. (1998). Undergraduate student-faculty research partnerships affect student retention. *The Review of Higher Education*, *22*(1), 55–72.

Nnadozie, E., Ishiyama, J., & Chon, J. (2001). Undergraduate research internships and graduate school success. *Journal of College Student Development*, *42*(2), 145–156.

Russell, S. H., Hancock, M. P., & McCullough, J. (2007). Benefits of undergraduate research experiences. *Science*, *316*(5824), 548–549.

Seymour, E., Hunter, A.-B., Laursen, S. L., & DeAntoni, T. (2004). Establishing the benefits of research experiences for undergraduates in the sciences: First findings from a three-year study. *Science Education*, *88*(4), 493–534.

Shellito, C., Shea, K., Weissmann, G., Mueller-Solger, A., & Davis, W. (2001). Successful mentoring of undergraduate researchers: Tips for creating positive student research experiences. *Journal of College Science Teaching*, *30*(7), 460–464.

Sublett, M. D., Walsh, J. A., McKinney, K., & Faigao, D. (2009). Student voices through researching and promoting learner autonomy. In C. Werder & M. M. Otis (Eds.), *Engaging student voices in the study of teaching and learning*. Sterling, VA: Stylus.

Summers, M. F., & Hrabowski III, F. A. (2006). Preparing minority scientists and engineers. *Science*, *311*(5769), 1870–1871.

Thiry, H., Laursen, S. L., & Hunter, A.-B. (2011). What experiences help students become scientists? A comparative study of research and other sources of personal and professional gains for STEM undergraduates. *Journal of Higher Education*, *82*(4), 357–388.

Thiry, H., Weston, T. J., Laursen, S. L., & Hunter, A.-B. (2012). The benefits of multi-year research experiences: Differences in novice and experienced students' reported gains from undergraduate research. *Cell Biology Education*, *11*(3), 260–272.

Ward, C., Bennett, J. S., & Bauer, K. W. (2005). Content analysis of undergraduate student research evaluations. Retrieved from http://www.udel.edu/RAIRE/Content.pdf

Zydney, A. L., Bennett, J. S., Shahid, A., & Bauer, K. W. (2002). Impact of undergraduate research experience in engineering. *Journal of Engineering Education*, *91*(2), 151–157.