URSSA

Undergraduate Research Student Self-Assessment

What is URSSA?

URSSA is the Undergraduate Research Student Self-Assessment, an online survey instrument for programs and departments to use in assessing the student outcomes of undergraduate research (UR) in the sciences. URSSA focuses on what students learn from their UR experience, rather than whether they liked it.

What does URSSA measure?

URSSA includes both multiple-choice and open-ended items that focus on students' gains from UR. These gains include

- skills such as lab work and communication
- conceptual knowledge and linkages in their field
- deepened understanding of the intellectual and practical work of science
- growth in confidence and adoption of the identity of scientist
- preparation for a career or graduate school in science
- greater clarity in understanding what career or educational path they might wish to pursue.

Other items probe students' participation in important research-related activities that have been shown to lead to these gains (e.g. giving presentations, having responsibility for a project). These activities, and the gains themselves, are based in the research on "best-case" scenarios of UR, and thus together constitute a core set of items that examines the outcomes of the research experience itself. Using these items as a group helps to align the assessment of a particular UR program with research-demonstrated outcomes.

In addition to the core items, optional items can be included to probe particular program features that are included to supplement UR (e.g. field trips, career seminars, housing arrangements).

URSSA is a tool for measuring students' self-reported gains from their research experience. Our research shows that students are very capable of noticing their own growth—and also where they have grown little or not at all. Student self-report is not the only measure of the success of a UR experience, but it is an important component. URSSA measures some outcomes, such as growth in confidence, or the decision to become a scientist, that only students can tell us about. We encourage faculty and departments to use URSSA as one part of a more comprehensive evaluation plan that addresses all their program goals and outcomes.

How was URSSA developed?

The survey questions ("items") in URSSA are based on our group's extensive, interview-based research and evaluation work on undergraduate research. This work includes:

- an eight-year study of undergraduate research at four liberal arts colleges, with over 350 interviews;
- evaluation studies of UR programs at two research universities and one national laboratory, totaling 350 interviews and survey responses from over 150 students; and
- an extensive literature review aligning all well-designed, published research and evaluation studies of UR.

This grounding in research means that URSSA measures things we know to be important—it "asks the right questions."

Once initial survey items were developed based on this body of research, they were tested with students in "think-aloud" interviews to see if students interpreted the wording in the same way we intended. The items were then refined and tested again.

With this refined version of URSSA, we solicited help from faculty and UR program directors to gather a large student data set. This pilot study included over 500 students in 24 colleges and universities, which enabled us to conduct statistical tests of the items' validity and reliability. Using Confirmatory Factor Analysis, we compared how student responses fit the hypothesized structure of the survey and found that the data met accepted standards for model fit. We also tested survey items to learn if they functioned as we intended. Based on these results, some survey items were removed from the survey or changed when they did not meet our criteria for acceptable item functioning. Optional items about UR program elements were developed in consultation with UR program developers and department UR leaders.

The URSSA team includes people with a broad range of applicable expertise. Anne-Barrie Hunter, Sandra Laursen, and Heather Thiry are education researchers who specialize in qualitative research, especially interview-based research. With other colleagues, they have studied several undergraduate research as researchers and program evaluators since 1999. Laursen is also a chemist who has conducted laboratory research both as an undergraduate and as a research advisor to undergraduates. Timothy Weston is an expert in student assessment, survey development, and quantitative research in education.

Our department already believes that undergraduate research is a good thing. Why should we assess student outcomes?

Indeed, the value of undergraduate research as part of a student's science education has been long known to faculty who work with UR students—but only recently have the outcomes of UR been documented in well-designed research and evaluation studies. Research also suggests that there are many different paths by which to develop effective UR programs. Good assessment data can help programs refine their offerings to optimize students' UR experience.

Science departments and UR programs at universities and labs need well-designed, inexpensive evaluation tools so that they can assess student outcomes, improve their programs and inform their stakeholders. Funding agencies also need tools to measure the impact of their efforts, for example in examining the effectiveness of innovative models of UR.

Why should our program use URSSA?

- flexible—URSSA is constructed with a set of *core items* on student gains from UR. Other items probe students' participation in important activities that help to secure these gains. Because these core items are based on research, they must be used as a set. *Optional items* can be selected or added to customize your survey to probe students' experiences of specific program elements that you have added to the basic research experience, such as speakers or field trips.
- free—There is no charge to use URSSA at this time.
- easy to use—Numeric results are available as raw data, summary statistics, cross-tabs, and graphs. Users can also download all responses in a pre-formatted Excel file. These are standard features of the SALG platform through which URSSA is delivered.
- refined by user input—URSSA has been methodically developed, with input and feedback from UR program directors and departmental leaders. We conducted extensive testing and revision through "think-aloud" interviews with students to make sure they understood the questions the same way we intended.
- piloted with students—URSSA was tested with over 500 UR students at 24 colleges and universities nationwide, in summer 2008.
- validated—URSSA has high content validity because it is based on carefully gathered research and evaluation data. In addition, student responses from the large pilot study were used to conduct statistical tests of validity and reliability. Using Confirmatory Factor Analysis, we compared how student responses fit the hypothesized structure of the survey and found that the data met accepted standards for model fit. Items that did not meet these standards were removed. The pilot testing shows that URSSA sensitively detects patterns of difference in students' experiences and in programs.

How can our program use URSSA?

For groups of 10 or more students, URSSA is delivered through the SALG website, which offers tools for online assessment of students' learning gains from college science classes. UR programs or departments can set up a customized copy of URSSA and generate a link to send to students to complete the survey.

At present, the SALG site offers a transitional version of URSSA, so that URSSA is available to research programs for summer 2009. We are working with the SALG developers to develop a more robust and stand-alone version of URSSA for the future.

URSSA is designed for evaluation use by departments and programs, not by individual research advisors. To protect the confidentiality of students' responses and the trust between students and their advisor, URSSA should not be used with small groups of fewer than 10 students.

We do encourage research advisors to gather feedback from their own students. We suggest that you gather your research students as a group for informal conversation. Ask students what they have gained from doing research. Wait to see what they raise spontaneously, then probe for the broad gains areas from URSSA that interest you most. Open-ended questions work best! Other good questions to ask students are what was the "best" thing about their research experience, what could be improved, and what surprised them most about research.

URSSA has been developed for the natural sciences. It is based on outcomes reported by students and faculty who were engaged in lab, field, programming and computational work, in fields including biology, chemistry, physics, psychology, mathematics, engineering, and computer science, although the latter three fields were less represented. While URSSA may serve as a useful model for UR assessment instruments for the social sciences and humanities, it is not grounded in research or literature on these fields and is not validated for use in those fields.

If you report findings from URSSA in a presentation or publication, please cite the instrument:

> URSSA, Undergraduate Research Student Self-Assessment (2009). Ethnography & Evaluation Research, University of Colorado at Boulder, Boulder, CO. www.salgsite.org

Contact us

If you have questions or comments about URSSA and its use, please contact Anne-Barrie Hunter at abhunter@colorado.edu. If you have questions or comments about the SALG site, please send an e-mail to help@salgsite.org.

Further reading

Several of our group's articles include extensive reference to others' published work on undergraduate research. Other articles are forthcoming, and our book on UR will be published by Jossey-Bass in 2010.

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

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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.

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Hunter, A.-B., Weston, T. J., Laursen, S. L., & Thiry, H. (2009). URSSA: Evaluating student gains from undergraduate research in the sciences. *CUR Quarterly*, spring 2009.

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