A DBER Science Education Seminar

Assessment of apprentice-based and course-based undergraduate research

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Course-based Undergraduate Research Experiences (CUREs) are a promising way of making STEM undergraduate education more authentic and meaningful. We will discuss the apprentice-model for undergraduate research (UR) which emphasizes scientific discovery and practices, collaboration, and trial and error. The educational benefits of participating in undergraduate research are sometimes at odds with more traditional scholarly outcomes such as papers, presentations and long-term career achievement in STEM. Instead, educational benefits are related to more difficult-to-assess constructs related to thinking and acting like a scientist such as solving problems, designing experiments, and analyzing data. The difference between scholarly and educational outcomes becomes more pronounced with CUREs given that students must receive grades and learn pre-requisite content and skills for future courses.

We will discuss evaluation use and outcomes embedded in the Undergraduate Research Student Self Assessment (URSSA), a survey developed by our group. After presenting our approach to survey development, we will compare assessment of UR and CUREs. Challenges for assessing educational outcomes include: 1) taking into account the different contexts for valid use of assessment instruments (e.g., student v. program level), 2) making a survey that generalizes to different settings and disciplinary content, 3) establishing discriminant validity between related survey constructs through design, and 4) and issues around using self-reported data. We will also discuss alternate and supplementary ways of assessing educational outcomes in both UR and CUREs.

Tim Weston is a research associate at the National Center for Women and Information Technology (NCWIT) where he has conducted evaluation and research for 20 years. Projects have included large-scale experimental evaluations of virtual tutors for the Institutes of Education Sciences (IES), assessing new STEM curricula and teaching methods, and designing and implementing tests and surveys, some used nationally. He has developed and analyzed quantitative observational protocols in comparative studies of research-based teaching, participated in studies of female representation in academic positions, a longitudinal study of high school girls moving into college and the workplace, the use of digital libraries to help teach computer science, and the pathways taken by students who transfer to four-year universities from community college, and the teaching practices of new mathematics professors.

Sandra Laursen earned a Ph.D. in chemistry from the University of California at Berkeley, joined E&ER in 2000 and has been co-director since 2007. She and maintains interests in both research and practice in science education, leading research and evaluation studies focusing on education and career paths in science, technology, engineering, and mathematics (STEM) fields. Particular research interests include the visibility of women and people of color in the sciences, professional socialization and career development of scientists, teacher professional development, organizational change in higher education, inquiry-based teaching and learning, and the challenges of improving STEM education in and out of the classroom and across organizations.