

# Building Educational Bridges

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Empirically tested principles of learning and memory rarely seem to find their way into actual classrooms. Teachers still use techniques and curricula that are suboptimal for student learning, and students still use study techniques that are ineffective. As a result, many students walk out of introductory courses without the solid foundation in the subject matter that they need for more advanced coursework and for success in their everyday lives.

What's more, many teaching tools and techniques are implemented without solid evidence that they enhance learning.

Ideally, there should be an iterative relationship between the laboratory and the classroom, in which evidence from research informs the development of interventions, which can then be tested in classrooms, which in turn produces results that inform further research.

To achieve this ideal, scientists and educators have begun a number of initiatives to apply the psychological science of learning more systematically in undergraduate classrooms and, importantly, to collect and analyze data regarding intervention effectiveness. Below is a sampling of these initiatives:

## **Center for Integrative Research on Cognition, Learning, and Education (CIRCLE; Washington University in St. Louis)**

CIRCLE was created with internal funding from the provost of Washington University to provide a resource for instructors to have their classes evaluated, with the important caveat that instructors allow experiments to be conducted in their classes. Codirected by APS Fellow Mark McDaniel and Gina Frey, CIRCLE employs the expertise of cognitive psychologists and subject-area experts to implement evidence-based interventions and to test them for effectiveness in the classroom. The results of intervention studies are shared with departments internally and published in peer-reviewed journals. Although many of the projects involve STEM (science, technology, engineering, and math) departments, CIRCLE is also working with the university's medical school, business school, psychology program, and other departments, based on requests for assistance from instructors.

## **The Carl Wieman Science Education Initiative at University of British Columbia (CWSEI-UBC)**

Nobel-Prize-winning physicist Carl Wieman launched the CWSEI at UBC in 2007 with the goal of achieving highly effective science education by evaluating what is being learned and applying proven evidence-based teaching practices to reach content-specific learning goals. STEM departments participate in a competitive proposal process, and the awarded funds are primarily used to hire Science Teaching and Learning Fellows (STLFs). The STLFs are junior faculty who have subject-area knowledge and have been trained in science education research. They collaborate with department faculty to implement changes in the classroom and evaluate their effectiveness. Until recently, the focus of the CWSEI has been on STEM fields, but plans are underway to expand the scope of the initiative to include other departments and develop better connections with psychological science research. *Psychological Science* Editor-in-Chief and APS Fellow Eric Eich is joining the staff at CWSEI-UBC in July.

## **Kalamazoo College and Albion College**

This grassroots effort is the collaboration of Robert Batsell, Jennifer Perry, and Autumn Hostetter (Kalamazoo College) with Andrea Ploucher Francis and Mareike Wieth (Albion College) and APS Board Member Thomas Carr (Michigan State University). For the past 5 years, Kalamazoo College has supported evidence-based learning by providing faculty with funding to apply and test evidence-based teaching innovations in their classes. The results of these projects are then shared at biennial meetings with the full faculty to encourage wider adoption of successful techniques. Currently, this group is investigating test-enhanced learning through between-classroom and within-student experiments to tease out what elements lead to better retrieval of material. Batsell, Perry, and Hostetter are analyzing their data now and plan to present their findings at the next full-faculty meeting in September 2015. Batsell and Carr are also writing a review of the test-enhanced learning literature, to be published in the journal *Teaching of Psychology* later this year.

## **Association of American Universities (AAU) STEM Initiative**

In 2011, the AAU began a 5-year initiative to improve the quality of undergraduate teaching and learning in STEM fields. The goal of the initiative is to change the culture of STEM departments in order to encourage the use of evidence-based, active learning techniques. Under the leadership of project director Emily Miller, the initiative team has developed a framework of institutional elements that foster change, broadly categorized as “Cultural Change,” “Scaffolding,” and “Pedagogy.” Participating institutions can apply for support for projects aimed at improving student assessments or faculty professional development and then communicate their findings through a collaborative network. The AAU STEM Initiative has created eight project sites to serve as hubs for conducting projects and disseminating results: University of Arizona, University of Pennsylvania, University of Colorado Boulder, Washington University in St. Louis, University of California, Davis, University of North Carolina at Chapel Hill, Michigan State University, and Brown University.

The examples provided here are by no means comprehensive, but they highlight a significant challenge: Can scientists find better ways to disseminate information and connect with teachers in different

departments and different institutions in meaningful ways? The results of classroom intervention studies often are not published in the same journals as laboratory studies of learning, and sometimes the results are never made publicly available. Classroom intervention projects have been concentrated heavily in STEM fields and are often content specific, making it difficult to generalize results. With so many independent projects underway, there is no easy way to find out about current research in one place. But these initiatives address these challenges and stand to foster more cross-disciplinary collaboration and more implementation of evidence-based teaching techniques.