

Toward the Tipping Point

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In this issue and in the May issue, APS Members will have the opportunity to learn about new work by psychologists who are bringing their research out of the laboratory and into a variety of education settings (e.g., elementary school classrooms, Web-based tutoring systems, etc.). Their work represents some of the innovative research supported through the Cognition and Student Learning research program of the Institute of Education Sciences. The Cognition and Student Learning program was one of the Institute's first three research programs. We have received over 400 applications for this program since 2002 and funded 35 projects representing an investment of nearly \$28 million. The investigators include some of the finest cognitive scientists in our country. Their projects include developing and testing instructional approaches, curricular materials, assessments, and computer and Web-based systems for supporting individualized and group instruction across a number of academic domains (e.g., reading, mathematics, physics, history). Their work covers every grade from pre-kindergarten through high school and college.

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The investigators address questions that are relevant to teachers and students and that will contribute to our understanding of cognitive principles. For example, one research team is examining how to use knowledge from cognitive science to design homework questions that are most effective in supporting student learning. Another team is developing a hand-held assessment tool to help teachers provide individualized instruction to young students as they learn to read. Readers of the *Observer* this month and May will learn considerably more about several projects funded through the Cognition program. In this column, I would like to provide a context for this research.

In education, we are now at the beginning of a metamorphosis – the transformation of education into an evidence-based field. By evidence-based, I mean an endeavor in which decision makers routinely seek out the best available research and data before adopting programs or practices that will affect significant numbers of students. Since its creation in November 2002, the Institute has focused on moving the field of education to the tipping point, after which current modes of operating will be replaced with empirical ones. Critical to this effort is the production of rigorous and relevant education research. The Institute is building one component of this needed education research through the Cognition and Student Learning research program.

Over the past 25 years, cognitive science has generated important fundamental knowledge on how people learn. Cognitive scientists have identified a number of basic principles regarding how information is acquired, manipulated, and retained. For the most part, however, these principles have not been incorporated into education instruction or in materials that support teaching and learning.

One explanation for the limited use of instructional practices based on cognitive science rests in the differences between classrooms and laboratories. In contrast to learning in laboratory settings, learning in classrooms typically involves content of greater complexity and scope, delivered and tested over much longer periods of time, with much greater variability in delivery, and with far more distraction and competition for student time and effort. Before principles of learning from cognitive science can be applied to classroom instruction, we need to understand if the principles generalize beyond well controlled laboratory settings to the complex cognitive and social conditions of the classroom.

A second explanation is that there has been little incentive for researchers to do the hard work of engineering solutions to improve learning based on cognitive science. Just as fundamental knowledge of biochemistry derived from the laboratory does not solve health problems unless effective therapies can be constructed from that basic science, so too knowledge of how brain and mind work does not lead directly and immediately to methods and approaches that will enhance learning in the everyday world. For each drug that proves effective in the field, there are hundreds that failed but appeared promising based on laboratory models. Education solutions, just like health care solutions, must be engineered and tested. Many that seem promising and aligned with the most up-to-date cognitive theorizing will fail.

At the Institute, the overarching priority is research that contributes to improving academic achievement. We believe that knowledge gained from cognitive science – and particularly knowledge gained from cognitive research conducted in education settings – can provide the foundation for building a new generation of curricula and instructional practices. The Cognition and Student Learning program is intended to provide incentive to researchers to extend their science to provide a basis for developing solutions to applied problems in education.