

\$10 million Awarded to Pennsylvania Schools and Universities to be Part of a 21st Century National Center for Cognition and Science Instruction

A consortium of three Pennsylvania universities, two nonprofit organizations, scores of Pennsylvania's middle schools and the Pennsylvania Department of Education were awarded a \$10 million grant over five years from the US. Department of Education to establish a "21st Century Center for Cognition and Science Instruction."

The purpose of the Center will be to draw upon the advancements in the field of cognitive science - how the mind receives, processes, stores and retrieves information and knowledge - to develop and evaluate theoretically driven modifications to existing middle school science curricula to improve student learning.

The Center will work collaboratively with the US Department of Education's Institute of Educational Sciences to conduct research to inform educators and policy-makers, and to provide national leadership to improve current curricula and identify general principles for the design of future science curricula. The Center will conduct a systematic series of studies involving up to 180 middle schools to test and refine such strategies.

Current levels of science achievement at the elementary, middle school, and secondary levels suggest that the United States is neither preparing the general population with levels of science knowledge necessary for the 21st century workplace, nor producing an adequate pipeline of future scientists. In the 2005 National Assessment of Educational Progress (NAEP), only two percent of U.S. students attained advanced levels of science achievement by Grade 12. Moreover, many U.S. students are not attaining mastery of rudimentary science knowledge and skills. It is unlikely that the United States can continue to produce leading scientists and engineers without providing a strong science education to our children and adolescents.

The 21st Century National Center will draw upon the strengths of the University of Pennsylvania's Graduate School of Education and Institute for Research in Cognitive Science; Temple University's Spatial Intelligence and Learning Center (SILC); and the University of Pittsburgh's Learning Research and Development Center. Outreach and dissemination of research findings will be conducted by Research for Better Schools. The Center will be managed by the 21st Century Partnership for STEM Education.

Program of Research

The major goal of the Center on Cognition and Science Instruction is to develop and evaluate theoretically driven modifications to two existing middle school science curricula to improve student learning. A secondary goal is to work cooperatively with the Institute of Educational Sciences to formulate and carry out the results of supplementary research studies that are responsive to the needs of science education practitioners and policy makers.

The Center's primary research study will involve modifications and refinement to the Holt and FOSS curriculum in years 1-2, and an experimental, random assignment test of efficacy of the curriculum adaptations in years 3-5.

Development of Curriculum Modifications (Years 1-2)

The research team will apply theoretical principles of cognitive science to modify two middle school science curricula, Holt and FOSS, and conduct small-scale pilot studies to evaluate the modifications. The research team will also develop teacher professional development materials and resources to support the use and teaching of the modified curriculum. When all modifications have undergone the full cycle of small-scale piloting and one year of large scale testing, analysis and refinement, an efficacy trial will be conducted to evaluate the impact of these curriculum modifications on student learning.

Efficacy Trial (Years 3-5)

The efficacy trial involves 180 middle schools with 90 schools in each curricular group (i.e., Holt or FOSS) randomly assigned into three experimental treatment groups: control, limited treatment, and full treatment. The control group will use the standard Holt or FOSS curriculum with no additional professional development; the limited treatment group will use the standard Holt or FOSS curriculum and receive professional development on the curriculum content; and the full treatment group will receive the curriculum modifications plus professional development on the modifications and curriculum content. Outcome measures include Grade 8 state standardized science assessments and researcher developed science assessments. The goal of the trial is to determine whether the curricular modifications improve science learning compared to business as usual science curricula.

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