

Scholars challenge colleges to reform STEM learning

October 15 2015



'We want students to develop a deep understanding of core ideas they can build on and put to use, not just facts they can regurgitate,' said Michigan State University science education scholar Melanie Cooper. Credit: Michigan State University

America's colleges and universities need to transform not only how but what they teach in introductory science courses, a group of scholars from

Michigan State University argues in *Science* magazine.

Melanie M. Cooper and colleagues say college [students](#) are expected to learn too many facts that do not connect across their coursework or prepare them to apply scientific knowledge in their lives. They believe a different set of strategies taking hold in K-12 schools can be used to improve learning in [science](#), technology, engineering and mathematics, or STEM, during the first two years of college.

"We want students to develop a deep understanding of core ideas they can build on and put to use, not just facts they can regurgitate," said Cooper, Lappan-Phillips Professor of Science Education and professor of chemistry. "This is starting to happen for younger students and there's no reason it should stop at 12th grade."

The MSU team makes its argument in a Perspectives paper in the October 16 edition of *Science*, one of the world's preeminent science research journals. Co-authors are Marcos D. Caballero, Diane Ebert-May, Cori L. Fata-Hartley, Sarah E. Jardeleza, Joseph S. Krajcik, James T. Lavery, Rebecca L. Matz, Lynmarie A. Posey and Sonia M. Underwood.

As MSU faculty members from multiple science disciplines, the co-authors have spent the past two years doing what they recommend for institutions across the country: working together with faculty colleagues in their respective disciplines to decide what students should master in each "gateway" course. These are generally lecture courses with large enrollments and often little student participation.

The authors argue that faculty with diverse expertise at each institution must be involved and agree on core ideas to emphasize, such as "evolution" for biology or "structure and properties" for chemistry. They also must require students to use the content the same way scientists do.

Teaching scientific practices, such as constructing models and using evidence to make arguments, is another key element of the Next Generation Science Standards, or NGSS, now influencing changes in K-12 schools in many states.

"As in the NGSS, the focus is on students using core ideas, scientific practices and crosscutting concepts to make sense of phenomena or design solutions to problems and not only on memorizing numerous concepts," said Krajcik, who is also a Lappan-Phillips Professor of Science Education and director of the CREATE for STEM Institute at MSU. "Once students graduate from college they will need to make use of their knowledge and not just know concepts."

MSU has been transforming its gateway chemistry, biology and physics courses as one of eight universities participating in the Association of American Universities' Undergraduate STEM Education Initiative. The MSU project is funded by the Helmsley Charitable Trust and the MSU Office of the Provost.

With curricular changes rolling out in courses - all general chemistry sections at the university now include the changes - the MSU researchers continue to collect evidence about the best ways to adapt instruction and assessment and, ultimately, to improve student learning.

More information: Challenge faculty to transform STEM learning, *Science* 16 October 2015: Vol. 350 no. 6258 pp. 281-282 [DOI: 10.1126/science.aab0933](https://doi.org/10.1126/science.aab0933)

Provided by Michigan State University

Citation: Scholars challenge colleges to reform STEM learning (2015, October 15) retrieved 25

April 2024 from <https://phys.org/news/2015-10-scholars-colleges-reform-stem.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.