The EngrTEAMS Project: STEM Integration Curricula for Grades 4-8 (Curriculum Exchange)

Dr. Tamara J Moore, Purdue University

Tamara J. Moore, Ph.D. is an Associate Professor of Engineering Education at Purdue University. Dr. Moore's research is centered on the integration of STEM concepts in K-12 and higher education mathematics, science, and engineering classrooms in order to help students make connections among the STEM disciplines and achieve deep understanding. Her research agenda focuses on defining STEM integration and investigating its power for student learning. She is creating and testing innovative, interdisciplinary curricular approaches that engage students in developing models of real world problems and their solutions. Her research also involves working with educators to shift their expectations and instructional practice to facilitate effective STEM integration. Tamara is the recipient of a 2012 Presidential Early Career Award for Scientists and Engineers (PECASE) for her work on STEM integration with underrepresented minority and underprivileged urban K-12 students.

Dr. S. Selcen Guzey, University of Minnesota, Twin Cities

Dr. Guzey is a Research Associate at the STEM Education Center at the University of Minnesota. Her research and teaching focus on integrated STEM education.

Mr. Aran W Glancy, University of Minnesota, Twin Cities

Aran W. Glancy is a Ph.D. Candidate in STEM Education with an emphasis in Mathematics Education at the University of Minnesota. He is a former high school mathematics and physics teacher, and he has experience both using and teaching a variety of educational technologies. His research interests include mathematical modeling, computational thinking, and STEM integration. Specifically, he is interested in the ways in which integrating engineering or computer science into mathematics and science classes can support and enhance learning within and across the STEM disciplines.

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Target Grade Level: 4-8

Engineering to Transform the Education of Analysis, Measurement, & Science

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Description of the Project:

The *Engineering to Transform the Education of Analysis, Measurement, & Science* (EngrTEAMS) project is an engineering design-based approach to teacher professional development that has 50 teachers per year designing curricular units for science topic areas related to the Next Generation Science Standards. The project includes summer professional development and curriculum writing workshops, paired with coaching, to allow teams of teachers to design engineering curricular units focused on science concepts, meaningful data analysis, and measurement. Each unit goes through an extensive design research cycle to ensure its quality and is published in an online format for use across the United States and beyond. In 2013-2014, twenty-one units were developed and can be found on the website above.

Highlighted Units:

Floating Islands

Students design artificial floating islands for the purpose of habitat restoration. The unit introduces the context of a polluted lake. Through activities regarding water quality (a field trip – if possible), students explore the sources of pollution and pollutants for the lake system. Measurement and data analysis are used to collect and analyze the data for the field trip. Students design a prototype floating island with a predetermined perimeter that has maximum area, test it for its ability to clean the water and fit the predetermined criteria, and redesign based on the results of the test.

Rockin' Good Times

Students are presented with a client wanting to build an amusement park near a city in an earthquake prone area. Surveying fellow students on favorite rides, using model rides, and creating earthquakes with shake tables provide an environment of active and engaged learning. The iPad seismometer app gives students the opportunity to see how seismic waves are instantly measured and graphed. Pictures of existing anchoring systems and websites posting earthquake activity as it happens reinforces the real world context of the problem. Students choose a site based on stability of the underlying earth materials, while also considering other area concerns (distance of location from existing roads, housing, etc.) and then test various anchoring systems Cost constraints are included so students have the realistic challenge of working within a budget.

Rehash Your Trash

Students are faced with an engineering design challenge in which they must develop an automated sorting process for a recycling company that is transitioning from manual sort to single-stream, automated sorting. To develop the tools necessary for this challenge, students must learn about intrinsic and extrinsic physical properties as well as chemical properties. Specifically, students learn how density can be used to separate different types of materials, and while investigating this concept, students collect and analyze real data and apply their knowledge of proportional relationships.

EngrTEAMS Project is funded by the National Science Foundation under grant NSF DUE-1238140