

NSF WORKSHOP

Ubiquitous Hands-On Learning: The Future of Engineering Education

Center for Mobile Hands-On STEM

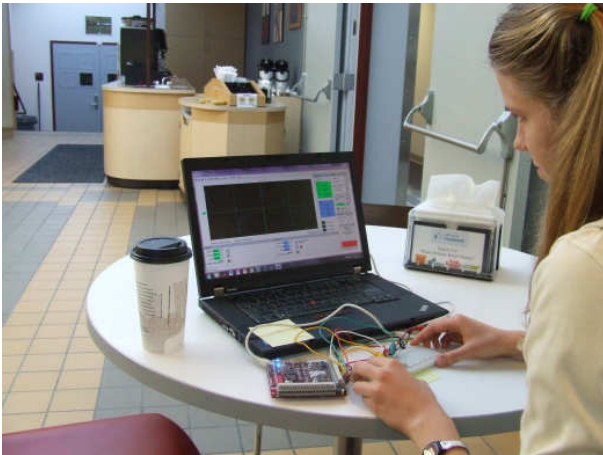
Georgia Tech, Virginia Tech, RPI, Rose Hulman, Howard, Morgan State, U. Albany

Atlanta, Georgia

Wednesday June 26, 2013

A shuttle bus will pick up attendees of the ASEE Annual Conference and Exposition to take them to Georgia Tech and return them to the Omni Hotel afterwards

12:30-5:00 (box lunch included)



Studies have demonstrated that concrete experimentation improves student understanding of abstract concepts and motivates students by providing examples of theory in practice. The model of having traditional, centralized laboratories requires expensive equipment and personnel; furthermore, students have limited access to these resources. Development of inexpensive and portable USB-powered oscilloscopes, function generators, microcontroller boards, and other portable electronic equipment has facilitated a new model of engineering education where hands-on experiences can be done ubiquitously anytime anywhere. Students can explore the theoretical concepts introduced in lectures with hands-on

activities either immediately in the classroom or at home rather than waiting for a scheduled laboratory time.

Benefits to Students: tools immediately and readily available for design projects, design competitions, and to just tinker and follow their own creativity to new areas of discovery. Online and distance learning students have equal access to hands-on activities as do on-campus students.

Benefits to Instructors: new way to facilitate inquiry-based learning through hands-on activities. They can develop course content anywhere and anytime; new ideas for labs, activities, and projects can be easily tried out at home rather than waiting until lab classrooms and technical staff are available. With minimum resources, teachers can easily integrate mobile hands-on activities into their courses.

Benefits to Institutions: new options for incorporating practical lab experiences into their curriculum without the need for expensive equipment and dedicated lab space since students have their own equipment.

Who should come to the workshop? Engineering administrators, instructors, laboratory staff, graduate students and post-docs interested in academic careers in all engineering disciplines.

Why should you come? Learn different models for the effective implementation of hands-on learning: 1) hands-on experiences in traditional lecture-based courses; 2) lab courses where students own their own equipment and do the labs at home; 3) studio classes; 4) flipped classes; and 5) online lab courses. Experience the use of several



different mobile learning platforms for measuring and analyzing physical phenomena, designing circuits, and learning programming. Participants will use a selection of low-cost electronic boards and portable instruments, which include the RPI Mobile Studio, **National Instruments'** myDAQ, **Digilent's** Analog Discovery board, **mbed** microcontroller platform to carry out a number of experiments during the workshop. The experiments will demonstrate the range of hands-on activities and some of the diverse theoretical concepts that can be taught via active hands-on learning. Participants will leave the workshop with a set of tested experimental procedures and other instructional resources.

The presenters of the workshop, **Ken Connor** (Mobile Studio, RPI), **Bonnie Ferri** and **Jim Hamblen** (TESSAL Center, Georgia Tech), and **Kathleen Meehan** (Lab-in-a-Box, Virginia Tech) have been engaged in pedagogical research on active learning and have designed, implemented, and assessed hands-on activities in numerous courses during their academic careers. They have formed the multi-institutional Center for Hands-On STEM, along with colleagues from Rose-Hulman, Howard, Morgan State, and Albany to facilitate the development of the common themes that have developed from their research. This workshop is supported by an NSF TUES Grant (Award 0817102) and technical support from Digilent, mbed, and National Instruments.

Registration Fee: \$35 by June 16, 2013, or \$50 late registration after June 16

Payable online or by check

Funds are available to help defray the cost of registration for workshop participants who work at community colleges and other two-year institutions of higher learning.

To register online:

https://epay.gatech.edu/C20793_ustores/web/store_cat.jsp?STOREID=224&CATID=303

For further information about the workshop or to apply for financial support to cover the workshop fee, please contact Bonnie Ferri (bonnie.ferri@ece.gatech.edu).



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