

2nd Annual **ENGINEERING EDUCATION SUMMER CONFERENCE**

Creating Hands-On STEM Activities for Your Classroom -- Middle Grades through High School --

JUNE 23-25, 2009

8:30 AM - 3:30 PM

**Shaker Heights High School / MC²STEM High School / CSU
Handouts & Lesson Plans / 2 CEUs / Teacher Stipend
Opportunity for CSU Graduate Credit & Project Stipends / Lunch Provided**

Contact: Diane Burrowbridge (d.burrowbridge@csuohio.edu or 216-687-3617)



Cleveland State University
engaged learning

Ohio STEM Learning Network



**SHAKER HEIGHTS
CITY SCHOOLS
Shaker Heights, Ohio**

Engineering is one of the top three fastest-growing and most rewarding (as well as rewarded) career paths available today. Cleveland State University (CSU), through support from the University Transportation Center, and the Metropolitan Cleveland Consortium for STEM (MC²STEM) invite you to bring this exciting field to your classroom with hands-on pre-engineering activities learned at our three-day summer conference.

During this workshop, you will:

- Actively participate in STEM (Science Technology Engineering Mathematics) projects at the middle grade or high school level,
- Receive pre-engineering lesson plans and teaching resources to take back to your classroom, and
- Network with other professional educators wanting to bring engineering concepts into K–12 classrooms across Northeast Ohio.

The first two days of the conference will begin and end at Shaker Heights High School, though on Wednesday a bus will transport educators to and from the MC²STEM High School Campus at GE Nela Park. On Thursday, Cleveland State University, Stilwell Hall (SH) will be the conference location. For additional focus, participants will select either a middle grade or high school track for the entire 2009 E.E.S.C.

Shaker Heights High School is located at 15911 Aldersyde Dr., Shaker Heights, OH 44120 (for Tuesday and Wednesday)

Cleveland State University, Stilwell Hall (SH), for Thursday, is located at 1960 E. 24th Street, Cleveland OH 44115 (corner of Chester and E. 24th). CSU Campus Map weblink: <http://www.csuohio.edu/aboutcsu/campusmap.pdf>. Further directions will be provided during the conference.

Tuesday, June 23 - Shaker Heights High School, Room 275

- 8:00-8:30** Check-in / Refreshments / Survey / Handouts
- 8:30-9:30** Introductions / Engineering “Short” - Building a Human Suspension Bridge
- 9:30-9:45** BREAK
- 9:45-11:45** **Breakout Sessions**
- High School Session: Joe Marencik - Slot Car Design
Design, build, and test a 1/32 scale electric racecar. Assemble a Parma Slot Car chassis, design and form the body out of clay, then thermal-form out of plastic. Test your car body design in a wind tunnel and race against other participants!
- Middle Grade Session: Lorri Turner: An Investigation in Motion Using Aerodynamics
Soar into Newton's three laws of motion with an inexpensive balsa wood plane. Measure speed, centripetal force, elastic energy, and more while flying tethered planes. Receive help in developing lessons that explore weather-related interferences in flight, the dynamics of air pressure, and the process of scientific inquiry in your classroom.
- 12:00-12:45** LUNCH - provided
- 12:45-3:00** **Breakout Sessions**
- High School Session: Scott Kutz - Creating 3D Model of a F1 Racecar
Design and create an F1 type race vehicle through CAD (Computer Aided Design) software. Experience how your car can be analyzed in a virtual wind tunnel when designed with 3D modeling tools. Additionally, learn to add photorealistic renderings, animations, and create production drawings.
- Middle Grade Session: Amy Brodsky - 5th/6th grade Science Lab at Shaker Hts. Woodbury Elem.
Explore the design process at an Upper Elementary level. Learn how to do projects in your classroom such as an Egg Drop competition and Catapult designs. Get your students turned on to science as they build and test their creations! Also, learn about the elementary school Science Olympiad competition and how you can start a team at your school.
- 3:00-3:30** BREAK - Open Discussion for Teachers / Questions about Activities

Wednesday, June 24 - MC2STEM High School GE Nela Park

- 8:00-8:30** Meet at Shaker Heights High School for bus to MC²STEM High School
- 8:30** Bus departs for MC²STEM High School
- 9:15-11:30** **Breakout Sessions**
- High School Session: Jeff McClellan - MythBusters and Plato's Allegory of the Cave
Turn into MythBusters and test the scientific principles behind Plato's Allegory of the Cave. It is an example of the power of project-based learning to achieve understanding in multiple content areas.
- Middle Grade Session: Joe Marencik & Scott Kutz - Ultimate Straw Rocket / Confetti Launcher
Construct straw rockets and launch them using the Pitsco Straw Rocket Launcher. There are many topics that can be covered with this project: (a) how

launch angle affects launch distance, (b) how force affects launch distance and height, (c) how fin and nosecone design affects rocket performance, and more.

Invent a device that launches a spoonful of confetti into the air. In this challenge, (1) play a creative-thinking game, (2) discuss the need for a launcher, (3) brainstorm ways to launch confetti, (4) follow design process to build prototype.

11:45-12:30

LUNCH - GE Nela Park

12:45-3:00

2 Breakout Sessions - by either High School or Middle Grade

One group will be given a one-hour tour of the GE Lighting Institute while the other group will continue with hands-on activities and discussions

3:00-3:30

Bus returns to Shaker Heights High School

Thursday, June 25 – Cleveland State University, Stilwell Hall

8:30

Meet at Cleveland State University, Stilwell Hall - Foxes Den, SH 130

8:45-9:45

Dr. Nigamanth Sridhar - Wireless Sensors to Monitor Traffic in Temporary Work Zones

Short-term duration work zones can be hazardous areas and therefore merit active monitoring of traffic and driver behavior. Dr. Sridhar and his partners have developed a monitoring system using low-cost sensors to monitor traffic in these work zones. Dr. Sridhar will present details of this sensor-based solution and will demonstrate the use of sensor nodes for collecting traffic data. Dr. Sridhar will then lead a discussion on curricular topic areas that come into play with this project that students in middle grades and high school can contribute to.

9:45-10:00

BREAK and Questions for Dr. Sridhar

10:00-10:45

Presentation by Society of Women Engineers (SWE) and Cleveland Engineering Society (CES)

10:45-12:15

Breakout Sessions (3)

Experience a Driving Simulator / Play with a VEX Robotics Robot / Learn to Ride a Segway. Dr. Jackson, SWE, and CES also available for questions.

12:15-1:15

LUNCH - CSU Foxes Den, Stilwell Hall 130

Fenn College of Engineering Overview – Gregg Schoof
Discussion of Graduate Course Offering - Dr. Debbie Jackson

1:15-2:15

Dr. Wenbing Zhao -Touch-Based Instruction: Bringing the Fun and Excitement of iPod Touch into the Classroom

Discover the science and engineering behind the iPod: a wonderful media player as well as a highly portable computer with built-in multi-touch screen and accelerometers. Witness demonstrations of how to incorporate iPod touch into your classroom instruction. Dr. Zhao will also share his experiences, and lessons learned, from using iPod touch to teach computer networking at CSU.

2:15-2:30

BREAK and Questions for Dr. Zhao

2:30-3:00

Project Stipend Application Explained - Diane Burrowbridge & Dr. Sridhar

3:00-3:30

Post-Conference Survey / Open Discussion

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Presenters:

JOE MARENCIK

High School Session Presenter

Joe has worked as a Shaker Heights High School Physics teacher for 19 years. Currently, he teaches AP Physics C, Project Physics, and Engineering Applications. He holds a Bachelor of Science in Physics, a Master of Arts in Curriculum and Instruction, and is currently working on a Doctor of Education in Technology Management. Engaging in the Pre-Engineering outreach activities allows him to better prepare students for post-secondary engineering programs and increased job marketability. In addition to this commitment, Joe developed the summer space science camp for the Shaker Heights City School District, for which he transformed a school bus into a space station; built a small working replica of the Sojourner Mars Rover; and devised a full-scale, working replica of the Lunar Rover. Recently, Joe was awarded a 2009 Arthur S. Holden Teacher Award for Excellence in Science Education. One of the highest awards the Martha Holden Jennings Foundation grants, Joe will receive a \$7500 grant for classroom equipment and attend a two-day retreat "think tank" for the Ohio Department of Education.

K. SCOTT KUTZ

High School Session Presenter

K. Scott Kutz is in his 28th year of teaching architecture, design, engineering, and technology classes at all levels including preschool, elementary, middle school, high school, and university. He is currently teaching at Westlake High School. He has served on the writing team for Ohio's Technology Academic Content Standards, as well as written model lesson plans on topics such as architecture, communication technology, and innovation. He has authored articles for professional magazines such as *TechDirections* as well as *The Technology Teacher*. In the spring of 2003 he was selected for the Ohio Technology Education Association and International Technology Education Association Teacher Excellence Award. In 2006, he was selected for the Jennings Scholar Award, Kent State University School of Technology Vision 21 Award, and the Technology Education Outstanding Teacher Award, sponsored by the Air Force. He wants to simply be known as a teacher who helps students create their future.

JEFFREY D. McCLELLAN

High School Session Presenter

Jeffrey David McClellan serves as the Head of School for MC² STEM High School. McClellan joined the Cleveland Metropolitan School District in July 2008 with a wealth of knowledge as an educator and an administrator. Jeff graduated from Ohio Northern University with a Bachelor of Science in Biology and a certification to teach high school science. He went on to receive his Masters Degree in Educational Leadership from the University of Dayton and is currently working on his doctoral degree at National-Lewis University in Chicago, Illinois. Prior to joining CMSD, Jeff served the Lima City School District as a senior high school Science teacher. Following five years teaching, he was appointed as a Leader In Transformation of Lima Senior High School into three autonomous small schools. In this role, Jeff was responsible for the development and implementation of one new small school: this school became the School of Multiple Intelligences. Jeff has been recognized by KnowledgeWorks Foundation as a "Champion of Change," and featured in the KnowledgeWorks publication, *Small Moments Big Dreams*, for his work as a School Leader. He was also the recipient of the 2008 YMCA Black Achievers Anthony K. Thompson Award for a demonstrated commitment to help youth achieve academic and social goals.

LORRAINE TURNER

Middle Grade Session Presenter

Lorri currently teaches 7th grade Science at Monticello Middle School in Cleveland Heights, Ohio. She is the Teacher Leader for the science department at Monticello. She is a National Board Certified teacher in Early Adolescent Science, has Masters degrees in both Education and Clinical BioChemistry, and an undergraduate degrees in Biology and Chemistry. She is also a Certified Medical Technologist ASCP, Certified Specialist in Clinical Biochemistry ASCP. Lorri presented at the National Science Teacher's Conference in Cincinnati, Ohio in November 2008 and at the Ohio Middle School Conference in Sandusky, Ohio in February 2009. She is currently working with WVIZ and the SMART Consortium on the creation of video materials for teachers and students in the middle level. As a part of a statewide assessment activity, Lorri has been videoed sharing her teaching and assessment strategies. This summer she will participate with Ohio Department of Education members on the Content Advisory Committee for the development of questions for statewide testing of middle school students.

AMY BRODSKY

Middle Grade Session Presenter

Amy currently runs the Science Lab at Woodbury Elementary School in Shaker Heights, a 5th and 6th grade building. Students come to the science lab with their class as a weekly special where Amy does hands-on activities to supplement the curriculum being taught in the classroom. Prior to taking this position last school year, she taught both 5th and 6th grade at Woodbury. Amy is finishing her 6th year as a teacher in Shaker. In addition, Amy also runs the school's Science Olympiad team, where Woodbury Elementary School has placed 1st at the Cleveland State Regional Science Olympiad competition for the last 4 years. She also runs a Science Club, which meets once a week after school to do science enrichment activities. These clubs' culminating event is the Milk Carton Derby, where students research, design, and construct boats made strictly of milk cartons and duct tape, then board the boats and race them in our school's pool. Amy is also one of the OAT testing coordinators for the building, runs the science activities at their 6th grade camp, serves on the District Leadership Team, and is an IB coordinator for Woodbury as Shaker Heights City School District prepares to apply to the International Baccalaureate program.

NIGAMANTH SRIDHAR, PhD

Cleveland State University Faculty

Dr. Sridhar is an Assistant Professor in the Department of Electrical and Computer Engineering at Cleveland State University. His primary areas of research interest lie at the intersection of Software Engineering and Distributed Systems, with a special emphasis on small embedded systems such as wireless sensor networks. Dr. Sridhar directs the Dependable Systems and Networks Research Group, which focuses on making programming of sensor systems more accessible to scientists and researchers outside the field of Computer Science. Dr. Sridhar received Ph.D. (2004) and M.S. (2000) degrees in Computer Science and Engineering from The Ohio State University, and a M.Sc. (Tech., 1997) degree in Information Systems from Birla Institute of Technology and Science, Pilani, India. He also received a \$450,000 NSF CAREER Award in 2008.

WENBING ZHAO, PhD

Cleveland State University Faculty

Dr. Zhao is an Assistant Professor in the Department of Electrical and Computer Engineering at Cleveland State University. His primary areas of research interest lie in investigating ways of building highly dependable and secure distributed systems. Over the past several years, his research focus has evolved from building fault tolerance systems using reliable group communication toolkits, to the integration of replication and transaction processing, to state machine replication based on the Paxos algorithm, and to Byzantine fault tolerance. Dr. Zhao directs the Secure and Dependable Computing Research Lab funded by NSF. Dr. Zhao also has great interest in teaching innovation. Recently, he pioneered a project on touch-based instruction using iPod touch, which is funded by the CSU Center for Teaching Excellence. Dr. Zhao received Ph.D. (2002) and M.S. (1998) degrees in Electrical and Computer Engineering from University of California, Santa Barbara, and M.S. (1993) and B.S. (1990) degrees in Physics from Peking University (also referred to as Beijing University), Beijing, China.