

1-Day Workshop on Integrating Computing and Robotics into Mathematics Education

ESC of Cuyahoga County, 6393 Oak Tree Blvd, Independence OH 44131

Wednesday, August 9, 2017 - 8:00 am to 3:30 pm

Registration **free** at <http://bit.ly/CSTEMAugust9>

Register deadline **August 3**, space is limited, first come first serve

We invite you to attend the 1-Day C-STEM Workshop on *Integrating Computing and Robotics into Mathematics Education*. This event is hosted by the Northeast Ohio STEM Ecosystem and organized in partnership with the Ohio Department of Education, Ohio Council of Teachers of Mathematics, Northwest Local School District, and University of California Davis Center for Integrated Computing and STEM Education (C-STEM) (<http://c-stem.ucdavis.edu>).

Through generous funding from NSF, California Math and Science Partnership grants and key Industry partners over the past several years, the C-STEM Center has been actively engaged in developing innovative computing and robotics technology for K-12 teaching and learning; creating teacher-tested curricula that are aligned with Common Core State Standards --- Mathematics; and, providing engaging professional development for teachers including those without any prior computing and robotics experiences. The [C-STEM Math-ICT Curriculum](#) and [C-STEM ICT Pathway](#) provide K-12 students with up to 13 years of hands-on integrated math and computer science education with coding in Blockly and Ch/C/C++. The curricula have been implemented in over 60 school districts.

C-STEM Curriculum supports the teaching of mathematics with computer programming and robotics – either as part of a standard math course or as an elective – to give mathematical concepts context and relevance while still requiring the same amount of rigor as traditional instruction. Results have shown that teaching math with computer programming and robotics presents an unprecedented opportunity to improve the success of all students, regardless of their race, gender, family background, income, or geographic location. It is a cost-effective way to close the math achievement gap and at the same time provide computer science education for all students without adding teachers or new courses.

Students in middle school Applied Math classes in the Northwest Local School District (NLSD) recently took part in an Ohio Department of Education funded program to explore mathematical concepts using C-STEM Mathematics-ICT Curriculum for 6, 7, and 8 grades. Through both personalized and collaborative group computing and robotics activities, students learned and reinforced their algebraic thinking skills with arithmetic operations in whole and decimal numbers, fractions, measurement, variables, data conversion, lines, angles, ratios and proportions. Outcomes from the year-long control group comparison study showed significant improvements in student learning.

In this workshop, leaders and teachers from the NLSD will present their findings and experiences implementing C-STEM's integrated math with computing and robotics curricula resources. You will learn more about the C-STEM Center and the rich set of cost-effective technical and curricular resources available to educators and students through hands-on activities including the freely available [C-STEM Studio](#) and [RoboBlockly platforms](#). Attendees will learn how to integrate [C-STEM Raspberry Pi and Arduino technologies](#) for physical computing into their classroom teaching and join the Maker Revolution, suitable for absolute beginners with no programming experience.

We welcome you to join us in preparing students in Ohio for college and careers through integrating computing and robotics into mathematics education!

Regards,

Workshop Planning Committee



Workshop Agenda

7:30 – 8:00 am	Registration and Software Installation
8:00 – 8:20	Welcome and Introductions Timothy Sisson, Northeast Ohio STEM Ecosystem Buddy Harris, Director, Office of Innovation, Ohio Department of Education Kim Yoak, Executive Director, Ohio Council for Teachers of Mathematics
8:20 – 9:10	Keynote Speech: Integrating Computing and Robotics into Mathematics Education Dr. Harry H. Cheng, Professor and C-STEM Center Director
9:10 – 9:30	C-STEM Implementation and Student Learning Outcomes in Northwest Local School District, Ohio Leslie Sibernagel, Curriculum Supervisor, Northwest Local School District
9:30 – 9:40	Break
9:40 – 12:00	Hands-on Session* C-STEM Studio on Windows and Mac Laptop for Learning Mathematics with Computing and Robotics Dr. Harry H. Cheng <i>(*Bring your own laptop, robots will be provided)</i>
12:00 – 1:00	Lunch and Plenary Panel Session: Supporting Student Learning Math through Integrated Computing and Robotics Leslie Silbernagel, Curriculum Supervisor, Northwest Local School District Panelists: Heather Kidd, Math Coach, Northwest Local School District Julie Metzner, Teacher, Colerain Middle School Audrey Schmidlin, Teacher, Pleasant Run Middle School Scott Fortkamp, Teacher, White Oak Middle School
1:00-2:00	Hands-on Session* Physical Computing and Learning Mathematics with Raspberry Pi Dr. Harry H. Cheng <i>(*Raspberry Pi with sensors will be provided)</i>
2:00 – 2:10	Break
2:10 – 3:30 pm	Hands-on Session* Physical Computing with Arduino Dr. Harry H. Cheng, C-STEM Center Director <i>(*Arduino with sensors will be provided)</i>

Keynote Speech: Integrating Computing and Robotics into Mathematics Education

Abstract.

The mission of the UC Davis Center for Integrated Computing and STEM Education ([C-STEM](#)) is to close the achievement gap for underrepresented minorities in STEM, including women, and to develop 21st century problem-solving skills for *all* students. The C-STEM program provides an integrated mathematics, computer science, and robotics education for K-12 students along with extensive professional development offerings for teachers. The C-STEM Center studies how to use computing and robotics technology to increase student interest and help them learn STEM subjects with an emphasis on Algebra, the gatekeeper for STEM disciplines. The C-STEM Center also studies how to streamline computing curriculum into other STEM subjects, such as science and engineering, in elementary, middle, and high schools, as well as the first two years of college. The C-STEM integrated Math-ICT curriculum provides students with up to 13 years of computer programming experience in Blockly and Ch/C/C++ to prepare all students to be college and career ready by the time they graduate from high school. In this presentation, I will share with the audience how we have developed our leading-edge educational computing and robotics technologies ([C-STEM Studio](#) and [RoboBlockly](#)), [Common Core State Standards Math compliant C-STEM Math-ICT curriculum](#) resources, and C-STEM Studio for Raspberry Pi and Arduino platforms for the maker revolution. I will discuss strategies and best practices for teaching integrating computing and robotics with math education in K-12 settings to help close the math achievement gap and prepare students for post-secondary study. I will impart how access the level-playing field and curriculum-based [RoboPlay Challenge and Video Competitions](#) impacts students' motivation and learning, especially for at-risk students from underrepresented and social economically disadvantaged groups.

Biography of the Speaker:

Dr. Harry H. Cheng is a Professor in the Department of Mechanical and Aerospace Engineering, Graduate Group in Computer Science, and Graduate Group in Education, and Director of the Integration Engineering Lab at UC Davis. He has established research programs in robotics, intelligent networked mechatronic and embedded systems, and integrated computing and STEM education. He founded and directs the UC Davis Center for Integrated Computing and STEM Education (C-STEM). C-STEM is now a UC Approved Educational Preparation Program for Undergraduate Admission for all UC campuses and has UC A-G Program Status for admission to UC/CSU. Over the last decade, he has pioneered the work on systemically integrating computing and robotics into K-12 formal math education with a focus on Algebra, the gatekeeper for STEM fields. His work on C-STEM has profoundly changed lives of many young men and women. Dr. Cheng is an internationally recognized leader in robotics and mechatronics fields. He has taught computer programming, robotics, and engineering software design at UC Davis since 1992. Throughout his career, Dr. Cheng received many awards, including the inaugural UC Davis Chancellor's Innovator of the Year award in 2016, the 2015 Distinguished Scholarly Public Serve Award from UC Davis Academic Senate, and the 2013 MESA Achievement Award for a cumulative contribution to the field of Mechatronic and Embedded Systems and Applications (MESA) from the ASME.



Workshop Planning Committee

- Timothy Sisson, Northeast Ohio STEM Ecosystem
- Leslie Silbernagel, Curriculum Supervisor, Northwest Local School District
- Kim Yoak, Executive Director, Ohio Council for Teachers of Mathematics
- Buddy Harris, Director, Office of Innovation, Ohio Department of Education
- Harry H. Cheng, Professor and C-STEM Center Director, University of California, Davis

Organizers: Northeast Ohio STEM Ecosystem, Northwest Local School District , and the UC Davis Center for Integrated Computing and STEM Education.

Partners: Ohio Department of Education, Ohio Council of Teachers of Mathematics, Science Education Council of Ohio, Vilros

Location and Directions

Educational Service Center of Cuyahoga County
 6393 Oak Tree Blvd
 Independence OH 44131

