Teaching STEM with Robotics: Creating and Implementing NGSS-plus-5E Lessons

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Organized and supported by K-12 STEM education researchers from NYU Tandon School of Engineering, this highly interactive workshop will be led by three experienced science and math teachers from NYC public middle schools. It will include: 1) a brief interactive introduction to NGSS and 5E instructional model, 2) illustration of a successful NGSS-plus-5E lesson created and implemented by teachers, 3) discussion of implementation experiences and challenges, and 4) constructive feedback and reflection session for participants.

The teachers leading the workshop have multi-year experience in creating and implementing LEGO robotics-enhanced STEM lessons in their middle school classrooms, creating and implementing NGSS-plus-5E lessons, and conducting workshops to share their experiences with peers. The organizers do not wish to limit participants to the use of any specific robotic or mechatronic platform for demonstrating STEM concepts to students. Nonetheless, it will be beneficial for participants to have working knowledge of at least one robotic or mechatronic platform used in K-12 STEM education.

During the workshop, up to 16 participants will improve their practical understanding of utilizing NGSS for lesson planning and practice the use of use of 5E instructional model for lesson planning. The example lessons created and implemented by the teachers integrate LEGO robots in an authentic manner for teaching key middle school STEM concepts. Workshop attendees will observe demonstrations of the lesson activities using LEGO robots (provided by the organizing team) in groups to simulate learner experience. This will be followed by a discussion of goals of the lessons, pedagogical methods, instructional strategies, and challenges of classroom implementation and suggested modifications for different classroom conditions among the organizing team, teachers, and participants. The workshop will conclude with a constructive feedback and reflection session soliciting participant opinions regarding the relative merits of the presented approach.

The workshop will emphasize the creation of NGSS-aligned classroom implementable lessons that use robotics to engage students with STEM content. It will demystify process of creation of NGSS-aligned lessons for K-12 educators, address the challenges and benefits of their classroom implementation, and encourage participants to engage students with key science and engineering practices through use of technologies such as robotics. Participants will further receive access to rich content developed by the organizers to support creation and implementation of NGSS-plus-5E lessons as a part of a multi-year research effort, in addition to planning and implementation support from the project staff in the following academic year as needed.