

Title of Project: Applying Mechatronics to Promote Science (AMPS)
Institution: Polytechnic University, Brooklyn, NY
PI/Co-PI: V. Kapila, M. Iskander, and N. Kriftcher
STEM Faculty Advisors: D. Czarkowski (ECE), M. Iskander (CE), V. Kapila (ME), R. Levicky (CBE), and M. Porfiri (ME)
Number of Fellows/year: 9 graduate students “AMPS Fellows”
Number of K—12 Teachers/year: 12 teachers/year
Number of K—12 Classes/year: 12 classes
School District Partners: Six middle schools, 2 each from Regions 4, 6, and 8
Target audience of the project: Middle school
Setting: Urban
NSF supported disciplines: Science, math, and technology

This effort will develop a partnership between Polytechnic University and 6 New York City middle schools to enhance student achievement in science, technology, engineering, and mathematics (STEM) disciplines. Specifically, 3 PIs, 3 senior personnel, 9 Fellows, and 12 teachers will collaborate with the **objective** to judiciously integrate mechatronics and robotics activities in science and industrial arts courses in order to (1) excite middle school students, (2) impart technology literacy to them, (3) naturally entice them to strive for achievement in STEM disciplines, and (4) encourage them to pursue STEM education and careers.

The AMPS team is a collaborative relationship among the PIs, senior personnel, Fellows, Principals, teachers, an education expert, an external evaluator, and the local engineering community. The project is *fully* supported by the university and school district administrators. The project team has planned an array of activities to create an exciting and engaging program to enrich the graduate education of Fellows and educational experience of middle school students. Project plans include: (1) recruiting, training, and deploying 9 Fellows in 6 schools; (2) addressing workforce diversity issues; (3) imparting technology literacy to teachers; (4) developing mechatronics and robotics based activities relevant for middle schools; (5) mentoring of Fellows by faculty and teachers; (6) conducting annually a career awareness day, a professional development day, a summer workshop on pedagogy for Fellows, and a training workshop for teachers; (7) utilizing local engineering community’s resources for outreach activities; (8) disseminating project outcomes; and (9) conducting project assessment. Synergistic activities will be developed by leveraging institutional outreach centers, *viz.*, Packard and YES Centers. Finally, the project team will develop strategic partnerships with the development office of the university, schools, school districts, local businesses, various foundations, and our governmental representatives to ensure longevity of AMPS-type activities.

Intellectual merits include: (1) introducing middle school students to STEM disciplines through mechatronics and robotics activities; (2) stimulating students’ interest in science and math through “high-tech” mechatronics-enabled apparatus for science labs and First Lego League (FLL) Robotics Competition; (3) providing technology literacy to students and teachers; (4) giving professional development opportunities to teachers; (5) introducing the PIs and Fellows to pedagogical techniques/issues; (6) imparting communication, leadership, and team-building skills to the Fellows; (7) integrating research and teaching activities of the PIs and Fellows in AMPS project; and (8) encouraging cross-pollination of education research and technical concepts among the university and school faculty.

Broader impacts include: (1) reinforcing STEM training and educational experience of a socially diverse and economically disadvantaged inner-city student body; (2) advancing discovery and learning through technology-enhanced STEM instruction; (3) preparing an underserved student body for higher education and productive career opportunities in STEM disciplines; (4) building the laboratory infrastructure for mechatronics and robotics based STEM curriculum and instruction; (5) broadening the ties of Polytechnic with local school districts to sustain and grow its outreach activities; and (6) disseminating our model of partnerships for adoption by others.