

# Revitalizing Achievement by using Instrumentation in Science and Engineering



## RAISE: A GK-12 Project (URL: [raise.poly.edu](http://raise.poly.edu)), Grant# DGE-337668

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### PARTNERSHIPS

- Polytechnic University
- George Westinghouse HS
- Marta Valle HS
- Paul Robeson HS
- HS for Technology, Arts, and Telecommunication
- INDUSTRY PARTNERS
- American Museum of Natural History
- Con Edison
- FIRST
- Honeybee Robotics
- Symbol Technologies

### PEOPLE

- Two engineering faculty and one faculty with extensive experience in secondary education
- 13 RAISE fellows
- Nine high school teachers
- ≈400 high school students

### COURSES AFFECTED

- Active Physics
- Marine Science
- Regents Living Environment
- Regents Physics
- Math A (Algebra)

### OVERVIEW

- 13 RAISE Fellows deployed in four NYC high schools and paired with teachers
- Fellows develop sensor-based lab experiments and demos to illustrate scientific phenomena
- Lab modules are designed so that every member in a group has an active role in the experiment
  - Team members must constantly interact with one another to complete lab assignments
- Experiments demonstrate connections between real-world applications and high school science
  - In some cases, sensor-based experiments illustrate concepts that would be difficult to illustrate in the absence of sensors

- Integration of real-time sensors alleviates the drudgery of manual data collection and allows students to focus on concepts to be learned
- Each school is equipped with 4 computerized setups, accommodating four students per setup
- Sensor-based labs and Vernier's LoggerPro software allow instructors to convey material through a wide range of learning styles:
  - Graphical user interface displays sensor measurements through which visual learners easily pick up the concept
  - Team-based tasks require group effort which ultimately benefits auditory/verbal learners
  - Hands-on lab activities aid the tactile/kinesthetic learners

### OBJECTIVES

- Elevate academic achievement of students in STEM disciplines
- Prepare students to succeed on standardized exams (tutoring)
- Inspire an underserved student population for higher education and productive career opportunities in STEM disciplines
- Provide technology literacy to students and teachers
- Reinforce science and math skills of students
- Provide unique professional development opportunities for NYC teachers
- Build lab infrastructure for sensor-based STEM curriculum and instruction
- Advance discovery and learning through technology-enhanced STEM curriculum and instruction

### TRAINING FOR RAISE FELLOWS

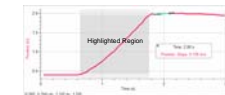
- RAISE fellows are provided extensive hands on training in mechatronics using Parallax Inc.'s "STAMPS in Class" educator's program
- Education/pedagogy workshops for RAISE fellows
  - Lesson planning and effective questioning techniques (pedagogical skills)
  - Student behavior and cognition
  - Learning theory and styles
  - Classroom/group management skills
  - Effective communication/presentation skills

### DAMPED VIBRATIONS

- Damped vibrations occur naturally in numerous natural and engineered systems
- No material is ideal and thus all oscillating systems experience damping
- Accelerometer is used to observe the exponentially decreasing acceleration of a mass-spring system
- After recording the acceleration time history, system parameters (e.g. frequency and damping ratio) are obtained



Students performing the experiment



Highlighted Region

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