

# Empowering youth currently underrepresented in STEM through authentic science research on local environmental challenges

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**Early Engagement in Research:  
Broadening participation through  
engagement in authentic science  
research**

The opportunity to participate in academically connected, community based science research programs can be incredibly empowering for youth with limited role models in the STEM fields and limited research opportunities due to a lack of financial resources and academic connections. Creating these opportunities takes purposeful work.

**Manhattan Cluster**



*“Heavy Metal Presence in Blue Mussel Shells in Hudson River Park”*

Partners: The City College of New York, Hudson River Park, The River Project, The Intrepid Sea, Air & Space Museum, Young Women’s Leadership Network, Lamont-Doherty Earth Observatory

Students in the Manhattan cluster worked on the Hudson River Park waterfront assessing heavy metal presence in blue mussel shells and distance from Combined Sewage Overflows (CSOs). They collected & sieved sediment samples for blue mussel shells and completed an analysis of the shells on scanning transmission electron microscope to detect heavy metal concentrations.

**Partnerships are critically important as  
it takes purpose work and  
organizational commitment**

A regional network of partners were engaged in order to develop summer research experiences for high school students underrepresented in STEM. Four clusters of partners including academic partners, local environmental groups, land managers and schools were developed, which brought together local colleges with research capabilities with community groups and schools.

**Mid Hudson Young Environmental  
Scientists**



Partners: Cary Institute of Ecosystem Studies, Marist College, Poughkeepsie HS, Arlington HS, Oakwood Friends HS, Lamont-Doherty Earth Observatory

The Mid-Hudson cluster ran two projects. One group studied the effect of salt pollution on terrestrial plant growth and different soil characteristics that influence salt retention. The second group looked at the roll of aquatic vegetation in supporting fecal indicator bacteria, to examine sewage contamination in fresh water.

**Thematic Working Groups Provided  
Consistent Design Elements Across  
the Clusters**

Working groups that spanned the clusters addressed common elements such as a tiered mentoring structure including peer and near peer mentoring, a common assessment tool, team research design, and a whole person development focus. Additionally we held a shared panel and poster session. The groups designed and vetted programmatic elements yet each program was unique with different blends of online, lab and field work pieces.

**The STEM Ambassadors Camp, New  
Jersey**



Partners: Rutgers University New Brunswick & Newark sites, 4H STEM Ambassadors, New Jersey City College, West Orange High Schools, Lamont-Doherty Earth Observatory

The New Jersey cluster research focused on the source and fate of microplastics in the Raritan River, NJ and the on zebra fish embryos. Students worked on the estuary collecting water and sediment samples and in the lab processing their samples. This cluster blended online teaching modules with field experiences.

**Developing the whole person**

Encouraging whole person development of each student is central to the program. Technical instruction on the use of scientific instruments, data interpretation and discussions cover how to successfully dissect a science journal article and developing a science poster are included. More importantly we discuss how build a STEM network for themselves, and how to help us work with them to support the diversity that is needed for all of science to be inclusive, and ultimately, meet the needs of our future.

**Rockland County Project: RISE**



Partners: Dominican College, Cornell Cooperative Extension, Spring Valley High School, Lamont-Doherty Earth Observatory

The Rockland cluster began with using the iNaturalist app to collect data and learn about their local environment. They then worked on projects ranging from microbiology and DNA sampling of enterococcus in the local streams to soil testing for metals and other contaminants, to wildlife inventories.



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