### Pillar 4: Afterschool/Mentoring

Scientists from the New York Academy of Sciences (NYAS) developed an initial draft with collaboration from three of the STEM C project partners. The curriculum was pilot-tested in Spring 2015 (n=90) with students engaged in hands-on activities and record data at oyster restoration field stations. The information technology team beta

### Pillar 5: Community Exhibits

Student field trips include data collection, community and local restoration efforts. Collaborative efforts produced interactive exhibits tied to the CCERS project.

### Grant Information

Funded by a grant from the National Science Foundation

**Awards Number:** DRL 1448683

The CCC partnership is a three-year education research project. Ten organizations are working together to develop a curriculum to enhance STEM education in public middle schools. The lessons engage students and teachers in long-term restoration ecology and environmental monitoring projects in collaboration with peers, citizen scientists, STEM professionals, and community groups.

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### Curriculum + Community Enterprise for Restoration Science (CCERS): Diverse Teams Collaborate on STEM-C Project in New York Harbor

**Principal Investigator:** Lauren Birney, EdD
**Co-Principal Investigators:** Meghan Grause, PhD; Jonathan H. Maas, MBA; DePierre; Ronald New, PhD; & Nancy Wood

**Researchers:** Erica Watson-Currie, Ph.D & Michelle McInerney, M.A.

**Evaluation:** Gaylen Minor & Alon Nicolas

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### Pillar 1: Teacher Development

Professional development course trains middle school teachers in New York City public schools to develop and implement new CCERS curriculum to promote active learning of STEM C with Project Based Learning (PBL) & Bybee’s SE Model.

### Goal 1 - The Educational Model: Increase quality and effectiveness of STEM-C teaching and learning

- **Goal 2 - Teachers: Increase knowledge and instructional skill**
- **Goal 3 - Students: Increase knowledge of and interest in STEM C**

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### Pillar 2: Student Learning

Curriculum is aligned to Next Generation Science Standards (NGSS). Lessons incorporate harbor restoration activities with field site monitoring.

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### Project Based Learning (PBL) vs. Bybee’s SE Model

<table>
<thead>
<tr>
<th>Educational Models</th>
<th>Project Based Learning (PBL)</th>
<th>Bybee’s SE Model</th>
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<td>Rubrics, self-assessment, peer review, and reflective journals</td>
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### Pillar 3: Digital Platform

Teachers, scientists, and curriculum specialists try out and contribute to project-developed lesson plans, with learning activities, and optional resources using a standardized template. The database will also store measurements and observations collected by students on field site visits. Software is in development to record these in the field. Ultimately an online dashboard will enable students to analyze their own and others’ data, and to create charts and graphs for scientific purposes.

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### Project Description

Demand for jobs in scientific and technological fields continues to rise; however, the number of students entering higher education STEM-C pathways is low. Thus, employment opportunities in Science, Technology, Engineering, Math, and Computer Sciences (STEM-C) are currently outpacing supply of qualified applicants. New models for increasing students’ interest, efficacy, and intentions to pursue STEM-C careers are being designed and tested. One multi-faceted approach currently being developed and refined is the **Curriculum + Community Enterprise for Restoration Science (CCERS)**, funded by a grant from the National Science Foundation (NSF) to urban middle school students to explore the restoration of the oyster population in New York Harbor. The partners are: Pace University; Columbia University Lamont-Doherty Earth Observatory, New York Harbor Foundation, New York Academy of Sciences, University of Maryland Center for Environmental Science, New York City Department of Education, New York Aquarium, The River Project, and Good Shepherd Services. Extensive collaborative efforts are underway to develop this educational model and implement a sustainable project-based learning curriculum. Project-based science (PBS) emphasizes reforming pedagogy to motivate students to learn through long-term projects promoting inquiry and finding solutions to real-world problems. Activities designed around Bybee’s SE Model encourage students to act like scientists, building their critical thinking skills to construct meaningful understandings of ever-changing facts. The goal is to enhance STEM-C education by engaging participants in long-term restoration, ecological and environmental-monitoring projects. Partners will develop a replicable model for other restoration projects as suited to local environmental conditions. The model has five program pillars: 1) Teacher Training and Professional Development in Implementing PBS lesson plans and activities; 2) Teacher Certification - 25+ educators participate in PBS curriculum and authentic environmental fieldwork at oyster stations held in New York Harbor; 3) Digital platforms both as a repository for lesson plans and activities, and achieve for field data students and citizen scientists collect—a mobile application for data entry and image capture is in development; 4) Afterschool and summer program with doctoral students mentoring middle school students using hands-on environmental science activities; 5) Community exhibits with wet-lab education at local marine science institutions. This large scale training and learning initiative teams scientists with educators and practictioners in order to produce and disseminate a new model for curriculum development through community engagement. As teams enter their second year of partnership, teachers, mentors and facilitators are already able to achieve synergies in the lessons, activities, and materials they are producing.

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### Educational Models

**Educational Model:**

- **Educational Model:**
  - **Pillar 1: Teacher Development:**
  - **Pillar 2: Student Learning:**
  - **Pillar 3: Digital Platform:**
  - **Pillar 4: Afterschool/Mentoring:**
  - **Pillar 5: Community Exhibits:**

**Project Based Learning (PBL) vs. Bybee’s SE Model**

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### Collaborative Efforts

- **Collaborative efforts produced interactive exhibits tied to the CCERS project.**
- **Educational models: Project based learning (PBL) vs. Bybee’s SE Model**
- **Inquiry-based lessons, discussion, and inquiry cycles**
- **Pre- and post-tests, surveys, and student reflections**
- **Rubrics, self-assessment, peer review, and reflective journals**
- **Formative assessments, peer review, and portfolio assessment**
- **Pillar 1: Teacher Development**
- **Pillar 2: Student Learning**
- **Pillar 3: Digital Platform**
- **Pillar 4: Afterschool/Mentoring**
- **Pillar 5: Community Exhibits**

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### Grant Information

Funded by a grant from the National Science Foundation

**Awards Number:** DRL 1448683

The CCC partnership is a three-year education research project. Ten organizations are working together to develop a curriculum to enhance STEM education in public middle schools. The lessons engage students and teachers in long-term restoration ecology and environmental monitoring projects in collaboration with peers, citizen scientists, STEM professionals, and community groups. The grants from the National Science Foundation (NSF) enabled the development of a comprehensive project that integrates STEM education with real-world environmental issues. The project, titled "Curriculum + Community Enterprise for Restoration Science (CCERS): Diverse Teams Collaborate on STEM-C Project in New York Harbor" (CCERS), aims to enhance STEM education in public middle schools by developing a comprehensive project that integrates STEM education with real-world environmental issues. The project, titled "Curriculum + Community Enterprise for Restoration Science (CCERS): Diverse Teams Collaborate on STEM-C Project in New York Harbor" (CCERS), aims to enhance STEM education in public middle schools by developing a comprehensive project that integrates STEM education with real-world environmental issues. The project, titled "Curriculum + Community Enterprise for Restoration Science (CCERS): Diverse Teams Collaborate on STEM-C Project in New York Harbor" (CCERS), aims to enhance STEM education in public middle schools by developing a comprehensive project that integrates STEM education with real-world environmental issues.