## 2016 MITS Summer Professional Development Institutes:

## Using Science and Engineering Design Practices to Engage Your Studentsin Inquiry-Based Learning

**North Shore Region**
One-Week Institute for Middle and High School Educators
***Research and Resiliency: Exploring the Ways Local Ecosystems are Responding to Global Change***

How do scientists study, protect and improve the health of the coastal habitats along the North Shore? How can an up-close look at a local marine environment help you to bring a perspective on global change to your students? During this institute, work alongside research scientists and land managers engaged in primary research and gain some first-hand experience in the techniques of field data collection and analysis. Investigate the ecology of some North Shore marshes, tidal flats and rocky shores, and look for evidence of the continuous threats to them, including more frequent storm events, water intrusion due to sea level rise, invasive species, nutrient loading, coastal runoff and tidal restrictions.

Collect data in the field and learn how you can share your data with others from similar habitats in other parts of the world. Use your data to determine and evaluate the health of a local or distant ecosystem. Explore engineering solutions that could help to minimize the impact of climate change on local habitats, and investigate how organisms are responding to global change in their efforts to adapt to changing environmental conditions. Gain experiences to help you engage your students in their own authentic scientific field research and introduce them to potential career opportunities. The week will be filled with field trips, inquiry-based, minds-on, hands-on investigations, and discussions aimed to highlight ways research is supporting human efforts to enhance the resiliency of local ecosystems.

**Collaborators:** Mass Audubon’s Endicott Wildlife Sanctuary, Plum Island Ecosystems Long Term Ecological Research, Ipswich River Watershed Association, Ipswich High School, Boston University
**Dates:**July 11-15; June 18 On-Site Introductory Session; Fall Callback November 5
**Cost:** $350/participant; $325/participant for 2 or more teachers from the same school district
**Optional Graduate Credit:**Cambridge College; Framingham State University

**Cape Cod Region**
One-Week Institute for Grades 3-8 Educators
***Movers and Shakers: Exploring Earth Science and Curriculum Frameworks in the Coastal and Marine Environment***

What makes the flora, fauna and geology of Cape Cod unique? How does its natural history set it apart from the rest of Massachusetts? Spend a week exploring the geological and topographical features of the Cape and investigating the earth science concepts that are relevant to the Cape’s distinctive coastal environment. Uncover evidence of Cape Cod’s glacial history and examine landforms, sub-surface topography and changing coastlines to understand and explain its current but changing landscape. Learn and practice core sampling techniques in a tidal marsh before returning to the lab to analyze soil layers that will provide a look back through geological time. Locate and examine kettle holes, learn how they form, and identify the plant and animal species that depend on them for survival. Visit science laboratories in Woods Hole and witness some of the science and engineering practices and instruments involved in studying the ocean processes. Tour a marine animal hospital and examine how Cape Cod’s unique geology impacts the biological communities in the region.

Over the course of the institute, gain experience with using the Science and Engineering Practices to create exciting inquiry-based, minds-on, hands-on, interdisciplinary STEM investigations for your classroom. Engage with earth science to see what really makes the arm of Massachusetts, Cape Cod, unique.

**Partners:** National Marine Life Center, Thornton W. Burgess Society, Mass Audubon’s Long Pasture Wildlife Sanctuary, Woods Hole Oceanographic Institute, Massachusetts Maritime Academy
**Dates:** July 11-15; June 18 On-Site Introductory Session; Fall Callback November 5
**Cost:** $350/participant; $325/participant for 2 or more teachers from the same school district
**Optional Graduate Credit:**Cambridge College; Framingham State University
*Housing available for Cape Cod Region.*

**Metro-South Region**
One-Week Institute for Grades 3-8 Educators
***Feathers, Rocks, Flights, Wildlife and Shocks: The Importance of Human Connections With Nature***
Do you feel disconnected from the world around you? Does your work environment have you staring at four walls, isolated from the sun or weather? Do you want to find ways to engage your students in an appreciation of the outdoors using classroom and field- based activities? This engaging institute will highlight ways humans influence and are affected by the natural world, even in their own backyard, and will examine the physical, chemical and biological factors at play in these interconnected relationships.

Learn how scientists keep their fingers on the pulse of the earth, and delve into the physical processes that cause earthquakes. Investigate how animals and animal behavior are used by scientists and industry as inspiration to develop engineering solutions for everyday problems. Explore the role of geology in creating the unique habitat of our local Blue Hill Reservation, and gain insight into the impact of wildlife management strategies on humans and the ecology of an environment, including a focus on sustaining wildlife populations. Research how birds of prey can take advantage of landforms to conserve energy. Blend your new knowledge of meteorology and engineering design to build your own version of a flying contraption for human use. Open the door to new classroom possibilities for you and your students through inquiry-based, minds-on, hands-on experiences, and use the Science and Engineering Practices to understand the interconnectedness of the natural world.

**Partners:** Mass Audubon’s Blue Hills Trailside Museum, Blue Hill Observatory and Science Center, Weston Observatory
**Dates:** July 11-15; June 18 On-Site Introductory Session; Fall Callback November 12
**Cost:** $350/participant; $325/participant for 2 or more teachers from the same school district
**Optional Graduate Credit:**Cambridge College; Framingham State University

**Merrimack Region**
Hybrid Institute for Grades 3-8 Educators
***Rivers, Renewables and Revolutions: How Science Understanding Informs Innovations in Engineering***
Explore the living laboratory of Lowell and the Merrimack River Watershed through inquiry-based, minds-on, hands-on experiences. Using the mill industry of Lowell as a model, discover how scientific understanding continues to inspire and inform innovations in engineering. The confluence of two rivers — the Concord and Merrimack — is significant as the birthplace of the Industrial Revolution in America. Learn how the flow of these two rivers was used to power mill production. Design and build a model mill-and-canal system to see how water’s potential energy is transformed into the kinetic energy that powered Lowell’s machines. Explore the technologies that harness the power of the water and design models that are used in today’s renewable energy industry. Trace the evolution of scientific understanding about ecological systems to understand how the watershed is recovering from its more toxic, industrial past. Gather, analyze, and compare water quality data from ecologically diverse sites along the Merrimack River Watershed to learn about its current ecological health. Investigate the unfolding scientific understanding behind the Merrimack River’s 1890 renaming as the “River of Death”. Take a trip up Lowell’s “Mt. Trashmore” to see a cross-section of efforts to remove and recycle waste, and design your own plan for land management that you can model with your students. Gain ideas and experiences that will help you build inquiry-based science investigations into your own curriculum.

**Partners:** Mass Audubon’s Drumlin Farm Wildlife Sanctuary, Tsongas Industrial History Center, Lowell National Historical Park
**Dates:** On-Site July 18-22; On-Line June 18-August 5; June 11 On-Site Introductory Session; Fall Callback November 12
**Cost:** $400/participant; $375/participant for 2 or more teachers from the same school district
**Optional Graduate Credit:** Cambridge College; Framingham State University

**Southeast Region**
Hybrid Institute for Grades 3-8 Educators
***To the Moon and Back: Engaging Your Students in Earth and Space Science Through Inquiry***Blast off into inquiry-based learning with a journey from Earth to space in this hybrid course! Engage with online content, group discussions, and handson, minds-on inquiry activities, and explore ways to use technology, engineering and math to excite and educate your students about earth science concepts. Examine how tides are controlled by the moon and sun, create earth/moon models, and explain how tidal and weather events are important to local ports and harbors. Dig deep into soil science, collect your own samples, and uncover different properties and patterns of soil formation through data analysis. Explore ways to bring plate tectonics alive in your classroom while you investigate and explain the geographical features we see on Earth — above and below the ocean’s surface. Take a telescopic view as you investigate the stars and beyond, and bring astronomy into a context that is more accessible for students. Learn how technology and
engineering have advanced our understanding of earth and space systems. Throughout the institute, practice a variety of tools, methods and technologies, and tap into your background knowledge to construct inquiry-based activities to explore the realms of Earth and space with your students.

**Partners:** Lloyd Center for the Environment, Battleship Cove, University of Massachusetts Dartmouth
**Dates:** On-Site July 18-22; On-Line June 18-August 5; June 11 On-Site Introductory Session; Fall Callback November 5
**Cost:** $400/participant; $375/participant for 2 or more teachers from the same school district
**Optional Graduate Credit:**Cambridge College; Framingham State University