IMIRS & Sandwich STEM Partnership Presentation: 2/11/15

IMIRS: Institute of Marine Innovation, Research & Sustainability
IMIRS & Sandwich STEM Academy: Developing the Partnership

Sandwich, MA STEM Academy

Institute for Marine Innovation, Research, & Sustainability (IMIRS) in Lewis Bay, Yarmouth, MA

Presented by: Dr. Steve Kramer, C. Eben Franks, Dave Deconto, Brian Braginton-Smith, Tom Whittlesey, and Gil Newton
OVERVIEW

- A collaboration between Sandwich STEM Academy and Lewis Bay Research Center (LBRC) to establish an incubator space for student engagement with business and research professionals.
- LBRC is a non-profit research facility dedicated toward sustainable land and water usage.
- IMIRS was founded by an LBRC group whom identified a need to encapsulate all of the growing connections between regional students, local educators and professionals.
- IMIRS name is derived from *immersion* – to immerse in authentic and experiential learning.
- IMIRS – a hybrid of education & innovation.
A critical educational need was identified by Gil Newton and members of the Sandwich STEM Science advisory board in 2014

- Motivating, inspiring, and nurturing PBL-STEM students requires sustainable industry pathways with "hands-on" exposure to Cape Cod's high-technology workforce
- To educate the community in environmental stewardship, since it's imperative the next generation of young professionals learn how they can sustain and benefit from a healthy ecology and economy
SANDWICH STEM ACADEMY
Science, Technology, Engineering, & Math
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IMIRS
Institute of Marine Innovation, Research, & Sustainability

SANDWICH STEM ACADEMY
Science, Technology, Engineering, & Math

PROVINCETOWN CENTER FOR COASTAL STUDIES

CAPE COD AQUARIUM

CAPE COD COMMUNITY COLLEGE

DEPARTMENT OF NATURAL RESOURCES

LEWIS BAY RESEARCH CENTER

NATIONAL MARINE LIFE CENTER

MARINE BIOLOGICAL LAB

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AQUAGEN

WOODS HOLE OCEANOGRAPHIC INSTITUTION

TROPHOS

ZEPHYR EDUCATION
IMIRS Mission

IMIRS is creating an incubation space for connecting students with professionals in marine technology, engineering, and environmental science. IMIRS will focus on authentic and experiential projects to study human impacts on the environment, while driving innovation to address the present and imminent challenges we are facing.

IMIRS creates a continuum between STEM K-12 academics, college curriculum, and career opportunities aligned with leadership, social responsibility, community restoration, and global environmental efforts.

A community-based STEM education center for the next generation of citizen-scientists, engineers and leaders.
IMIRS Vision

IMIRS aims to become an institute that catalyzes the restoration of Cape Cod’s community, economy, and ecology. By bridging education with innovation, IMIRS will build a continuum between learning and job opportunities.

In light of the global nature of our humanitarian and environmental challenges, IMIRS will strive to develop an international educational platform, including: student exchange programs, distance learning, crowd data-aggregation, and innovation forums, in effort to foster collaboration and information sharing towards solutions.

IMIRS Tenets:
- Incubator for Education & Innovation
- Authentic & Experiential Learning Projects
- Community & Ecological Restoration
- Workforce Development
- Local & Global Impact
Existing Partnerships

- To support the IMIRS vision, STEM Academy Faculty are working closely with area professionals on workshops, professional development, field studies and student-community programs.

- Ecology & Gardening Club (Renee Fudala, Dave Deconto, Paula Chambers)

- Robotics/ROV Club (Ginger Lavelle, Steve Kramer, Eben Franks)

- Climate Change Project – Manomet Center for Conservation Science (Amy Ferreira, Petra Sheeley, Beth Brazil)

- Transboundary Pollution (Renee Fudala, Arly Davis, Libby Smith, Jane Kittredge, Brian Braginton-Smith)

- Antarctic Penguin Studies (Beth Simmons & 7th Grade)

- Glider & AUV project (Beth Simmons & 7th Grade)
Planned STEM Partnerships

- **Ecology of Cape Cod** - New course starting 2015/2016 year (Gil Newton)
- **OceansWide** – Summer program in Acadia National Park – ROVs, conservation, ocean exploration, research projects, internships (Eben Franks)
- **Citizen-Scientists: Cape Cod, Caribbean and Guam** (Brian Braginton-Smith, Eben Franks)
- **STEM Academy: Discover Science** (Paula Chambers, Brian Braginton-Smith)
- **STEM 9-12 Field Studies** (Steve Watson, Steve Kramer)
- **IMIRSV Design** – Summer workshops on site/architecture design of IMIRS plans (Tom Whittlesey)
- **Art of Impact** – Fall/Spring workshops on environmental art and digital mapping (Tom Whittlesey)
Ecology Club: Dave Deconto & Renee Fudala

- STEM Academy students at the Sandwich boardwalk ecosystem salt marsh studies
- Educational outreach with IMIRS field trips learning about oysters and the benefits of algae
- Develop community aquaculture strategies to capture excess nutrients, pollutants, and carbon in our bays and estuaries such as Scorton Creek, and Sandwich Boardwalk
- Establish a STEM oyster nursery at IMIRS, with Sandwich oyster educational outreach
Eben Franks and Beth Simmons: ROV/Glider workshops

- Sandwich STEM Academy students building autonomous and robotic underwater vehicles (Gliders and ROVs). Last year’s all volunteer launched pilot program attracted 50 Sandwich 6/7 grade students.
- Field trip to Lewis Bay and Scorton Creek: ROVs with water quality sensors upcoming
Eben Franks: Regional and International Robotics ROV Competitions

Hosting ROV competitions in the Sandwich pool and IMIRS Aquarium with stadium seating
Organic Gardening: Brian Braginton-Smith

- The largest operational vertical wall algae photobioreactor on the US East Coast at IMIRS / AquaGen is available for STEM collaborative projects in organic gardening, clean water, algae fertilizers, biofuels, and renewable energy systems.
Marine Sciences: Brian Braginton-Smith

- The Parker River Restoration Project (PRRP) is one of the largest marine river ecosystem restoration efforts in Massachusetts. PRRP will provide a pedagogical platform for project-based-learning in ecological remediation.

Sandwich STEM students will work to develop a digital topographical map for modeling hydrodynamics, using 3D reflective sand technology for transboundary studies.
Transboundary Pollution: Brian Braginton-Smith

- A village center including a marina, multi-use facilities for academic space and marine technology incubator provides access to dock space for STEM Education projects at IMIRS

- Studies on pollution and water quality monitoring, plus digital apps and high-speed data download
Citizen-Scientist / Humanitarian Partnerships: Gil Newton, Eben Franks and Brian Braginton-Smith

Citizen-scientist outreach opportunities for IMIRS~STEM:

- High school grades 10-12 seminars offered in 2015: the Ecology of New England and Greenhouse Management
- Caribbean studies: environmental issues in Jamaica (pollution, loss of fisheries habitat, agricultural run-off, reef deterioration)
- Pacific Partnership: John F. Kennedy High School, Guam in the Marianna Islands, a US Territory, Equatorial Pacific Trieste Exhibit
- Establish high-speed data links to IMIRS for humanitarian partnerships
IMIRSV: Environmental Art & Design Projects
Tom Whittlesey

- Architecture & Imagination: Students research and design IMIRS site and buildings
- Field/Ocean trips for site specific installations, photography, and mapping studies
- Digital skill building exercises in: graphic, industrial, and environmental design
- Cross-Currents: Student ideation exercises with business/science professionals
- 3-D Printing with algae; Sustainable materials for modeling, furniture, and products
- Portfolio building and Student Exhibition
- Studio / Museum Tours
IMIRS Marine Campus
and
Parker River Research Village Center
OceansWide: Pauline Project

- Summer program on Cape Cod to immerse the community, students and scientists in critical ocean conservation, exploration, and research projects.
- Quartet of Northeastern institutes, ranging from Long Island –to– Cape Cod –to– Southern & Northern Maine.
- *Pauline Project* – a restoration of a historic fishing boat, which will be adapted into a state-of-the-art research vessel, equipped with cutting edge ROVs; hybrid engines; hydro-/geological sampling technology; and marine biology, algae, and detritus collection apparatuses.
- Pauline will lead multi-day expeditions in Lewis Bay, Nantucket Sound, and beyond… Supporting study on: fisheries, whales, plankton, and biodiversity; reef and remediation sites; shipwrecks & archaeology; physical & geosciences; maritime navigation & history; and individual research projects.
- Regional and international exchange opportunities for STEM students and life-long learners.
Industry Outreach: Eben Franks

- An engineering and marine technology innovation center and aquarium site provides field study program opportunities for STEM Students using the very latest in 21st century technology.

Electric Quadrofoil vehicle and Hyper-Sub (boat-submarine) technology.
Summary

An IMIRS~STEM partnership:
- State-of-the-art facilities in which professionals, passionate educators, and visionary innovators use the most current technology to inspire our students and advance the region’s economy
- An educational collaboration to develop hands-on community-based projects for promoting humanitarian enrichment
- Students and teachers with industry mentors and role models - developing career pathways
- A centralized Cape Cod location for educator professional development programs
- STEM curriculum contributes to local economic growth
- Building upon the STEM Academy success, IMIRS will enhance project-based learning and career pathways
“Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand.”

~Albert Einstein