# Build IT/Build IT Scale Up: NSF ITEST Projects 2006-2014

- Targets science, engineering, IT (programming)
- Career awareness of STEM and IT
- In-school→informal education
- Underrepresented groups

# Why LEGO and Underwater Robotics?

- Grew out of ocean engineering research interests
- Presents unique, complex design challenges (e.g., buoyancy, control in 3-D)
- LEGO enables rapid prototyping, testing, redesign

# BUILD IT

Underwater LEGO™ Robotics

STEVENS Institute of Technology

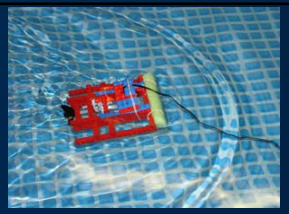
The Center for Innovation in Engineering and Science Education

http://www.ciese.org/buildit

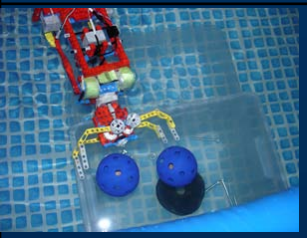
Straight Line Challenge: One motor → diameter of pool on surface; optimize gearing to achieve best propeller speed.

Slalom Challenge: Two motors enable steering; maneuver on surface to complete slalom course around two buoys in shortest time.

Submerge Challenge: Three motors, propellers, and other materials to control buoyancy.



Grabber Challenge: Design a motorized mechanical manipulator which can grasp specified objects.



Final Challenge: Timed competition to drive ROVs to pick up objects and place in goal at bottom of pool.

# Build IT Scale Up

- Four hub sites: informal and formal
- Partnerships: *NGCP and the League for Innovation in the Community Colleges*
- Version 2.0 curriculum
- Online resources
- Online and regional learning communities
- Planning for sustainability and institutionalization

**The Innovation=**

- Underwater Robotics Curriculum
- Prof. Dev.
- Assessments
- Research on Learning Outcomes


Informal Education Hub Site

- Girl-Serving STEM Organizations
- Summer Camps/ After-School


Formal Education Hub Site

- Disadvantaged Schools
- School-year STE courses

# Formal to Informal Adaptations

- Curriculum/Activities (Coral Reef Exploration)
- Language and promotion (e.g., Waterbotics, SeaBots, WaterWorks, Sci-Dive)
- Focus on collaboration and team-building, rather than competition
- De-emphasize formal assessments of student learning → motivation/engagement
- Support for varied background of instructors

# What We're Learning

- Evaluation must fit the context
- Embedded assessments at appropriate intervals
- Partner networks enable reach into under-represented groups
- Customization for targeted recruitment, program effectiveness, sustainability

# Career Pathways

- Use of role models
- Location for summer camps
- Creation of career portal
- Video interviews

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