STEM Preparation through Marine Science and Engineering Projects

Project Funded by SCHEV under NCLB

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Project Director & Ray Ferrari Professor
Dr. Manorama Talaiver
Dr. Sueanne Mckinney
Dr. Daniel Dickerson
Co Project Directors
Old Dominion University
Norfolk, Virginia

Located in historic Norfolk.
- Founded in 1930 as a division of the College of William and Mary.
- Old Dominion is now one of only 101 public universities with a Carnegie/Doctoral Research-Extensive distinction.
- Approx. 20,000 students
- Proximity to NASA Langley Research Center
- 200 miles south of Washington DC
Lean Institute at ODU is Your Host

Focus on Research, Education & Short Courses, Conferences and Implementation

* Implementation is done with the help of Virginia Applied Technology and Professional Development Center

SCHEV-Project Director’s Orientation- Verma 08/08
MarineTech Project Goals

- Employ marine science concepts in teaching math and science
- Create inquiry based learning experiences for the students using marine science kits
- Attract students towards marine science and technology careers
- Prepare students for marine careers by strengthening their STEM skills
- Increase awareness among teachers about marine careers

Increase global competitiveness of US shipbuilding, repair and marine industry
Workforce Problem within the Shipbuilding and Repair Industry

Root Cause and Proposed Solution

- "Aging" Workforce Rate
- High Attrition Rate
- Industry Image
- Lack of Career Information & Basic Education

Shipbuilding and Repair Industry Labor Problems

Proposed SBRCED

Larger Pool of Qualified Candidates

Improved Career Awareness

Enhanced Industry Image
Aging Workforce

Workforce Experience Distribution

Source: Crosscut Panel Presentation
Activities

1. Marine Kits 1-4
   Project based learning related to marine science and technology. Activities tied to SOL and relate to shipyard operations, shop construction, ship stability and ship disaster investigation. Each participating teacher to receive four marine kits.

2. Sea Perch Robot
   Design and build an underwater submarine robot and participate in a competition. Learn about engineering and science behind underwater robots.

3. Math/Science Concepts
   Improve quality of math and science instruction by integrating project based activities, manipulatives and other engaging activities.
Activities (Contd.)

4. Curriculum Integration Discussion
   Collaborate with the teachers from other school districts about integrating project based learning within the curriculum and provide support and guidance through Moodle.

   **Online Workshops**

   Online workshop on 21st Century Skills & Inquiry Based Learning – Conducted and Moodle support provided by ITTIP faculty.

   **Sea Perch Competition Summer 2009**

   Each participating teacher will receive a SeaPerch kit to take back and work with a team of students to build the underwater submarine robot during the academic year. Sea Perch competition will be conducted during Summer 2009.
# MarineTech Project Schedule

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<thead>
<tr>
<th>No.</th>
<th>Major Task\Month</th>
<th>2008</th>
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<th>2009</th>
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<td>Summer Workshop- Norfolk</td>
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<td>Teachers Develop Instructional Plan</td>
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<td>7</td>
<td>Teachers Build Sea Perch Robot with Students</td>
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<td>Sea Perch Competition in Norfolk &amp; Richmond</td>
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<td>Project Director's Orientation</td>
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SCHEV-Project Director's Orientation- Verma 08/08
## Summer 2008 Workshop Schedule

<table>
<thead>
<tr>
<th>Site</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
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<tr>
<td>ODU, Norfolk, Virginia</td>
<td>Sea Perch MIT faculty</td>
<td>Sea Perch MIT faculty</td>
<td>Math/Science Dr. McKinney &amp; Dr. Dickerson</td>
<td>Marine Kits Dr. Verma ODU</td>
<td>Curriculum Integration Discussion Groups Dr. Talaiver</td>
</tr>
<tr>
<td>Hanover County, Central Virginia</td>
<td>Math/Science Dr. McKinney &amp; Dr. Dickerson</td>
<td>Marine Kits Dr. Verma ODU</td>
<td>Sea Perch MIT faculty</td>
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| 8 hrs | 8 hrs | 8 hrs | 8 hrs | 6 hrs |

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SCHEV-Project Director’s Orientation- Verma 08/08
Marine Industry Careers

Marine Science Industry

Research Fields
- Marine Science
  - Marine Biologists
- Oceanography
  - Physical
  - Chemical
  - Geological
- Merchant Marine
  - Engineers
  - Navigators
  - Sailors
- Deep Sea Exploration & Fishing
  - Engineers
  - Navigators
  - Sailors

Commercial Fields
- Navy, Coast Guard
  - Engineers
  - Navigators
  - Sailors

Defense Fields
- Ship Building & Repair
  - Engineers
  - Technicians
  - Journeymen
  - Trades
  - Managers
  - Accountants
Shipbuilding and Repair Career Paths and Earnings

Middle School
- College or University (1-4 years)
  - Management Positions
    - Average earnings per year $80,000 and above
  - Naval Architects
  - Engineers
    - Average earnings per year $51,000 - $95,000

High School
- Community College and OJT Training Program (1-4 years)
  - Lead Persons
  - Foreman
  - CAD Designers
    - Average earnings per year $35,000 - $60,000
- Craft and Technology Training
  - Welder
  - Fitter
  - Pipe Fitter
  - Electrician
  - Others
    - Average earnings per year $42,000 - $45,000
Apprentice Program at Northrop Grumman

Required Qualifications
Applicant must be a General Education Development (G.E.D) diploma holder, high school graduate or have qualifying G.E.D score and minimum of 18 years of age

Trades Available
- Boilermaker / Shipfitter
- Carpenter / Joiner
- Design Drafter / Electromechanical
- Electrical
- Machinist
- Pipefitter
- Sheetmetal
- Welder
- Composite
- Painter
Career Paths for Marine Industry

Consider a Career in Shipbuilding

For more information about Careers in the Shipbuilding Industry, go to: www.nsrp.org - Crosscut Initiatives

Good Paying Jobs... Cool Careers!!

*Earn As You Learn*

Shipbuilding & Repair Workforce Career Pathways
MarineTech Project – Main Components

1. Training in inquiry based learning kits
2. Training in 21st century skills
3. Marine Career Awareness
4. Sea Perch Competition
Teacher’s Workshop
August 11-15, 2008
Norfolk, Virginia
Teacher’s Workshop
August 11-15, 2008
Norfolk, Virginia

SCHEV-Project Director’s Orientation- Verma 08/08
Sea Perch: Integrating Ocean Exploration into the Classroom
Program Overview

- Sponsored by the Office of Naval Research
- Recruiting the Future Generation of Naval Architects
- National Naval Engineering Research and Education Consortium
Teacher Workshop Goals

- Become proficient in building a Sea Perch
- Understand directions, theory and concepts behind materials and design
- Gain skill with various tools
- Learn how to utilize Sea Perch for data collection
- Classroom connections
- Connections with local resources (MOS, universities, engineering societies)
Classroom Implementation

- Determine classroom time available to build
- Number of students and kits
- Time of the year
- Testing and field work
- Funding for kits and tools
- Guest lecture from MIT researchers and industry members
NOAA Ocean Exploration

- Expedition website
  - http://oceanexplorer.noaa.gov/
- Curriculum material
- Activities
Sea Perch Testing - Teacher’s Workshop - Norfolk, Virginia
Sea Perch Showcase/ Competition – Summer 2009

- Goal – Showcase SeaPerch built by various teams.
- Audience- Students, Teachers, Parents.
- Suggestions for Summer Showcase dates?
  
  June 27, 2009  Hampton Roads
  July 11, 2009  HR- Portsmouth
  June 13, 2009  Central Virginia
Cruise Aboard Fay Slover & Presentations by Marine Professionals.

- Cruise - A demonstration of the typical oceanographic operations performed aboard the Fay Slover.
- Cruise typically takes 1½-2 hours to complete. Activities –
  - CTD Cast
  - Small Sediment Grab
  - A Plankton Tow
- Day long program
- Possible Dates
Schedule for Fay Slover – Voting by Doodle

SCHEV-Project Director’s Orientation- Verma 08/08
NSF MarineTech

• Project funded by National Science Foundation.
• Saturday activities for students.
  - IT Exploration Activities
  - Shipbuilding Production Processes (hands-on)
  - Field Trips to Marine Museums & Shipyards
  - Introduction to ROV Operations and Applications
  - Introduction to Ship Design/CAD/ Simulation
Probable Dates for NSF-MarineTech Activities

Saturday Academy: Spring 2009 (for Students) (8 Saturdays/year)

Spring Dates  March 14, 21 and April 18, 25

Teacher Workshops – Two days

Central Virginia  - July 27, 28 ??

Hampton Roads – June 22, 23

Southside Virginia  - June 15, 16

Student Stipend  $1200 for 3 years

Teacher Stipend  $1800 for 3 years
Evaluations - Summer Workshops - Norfolk

SeaPerch

Math/Science Concepts

SCHEV-Project Director’s Orientation- Verma 08/08
Evaluations - Summer Workshops - Richmond

**SeaPerch**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number of Responses</th>
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<tbody>
<tr>
<td>Was the topic appropriate?</td>
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<tr>
<td>How relevant was the content?</td>
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<tr>
<td>Activity Organization:</td>
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<tr>
<td>Presenter - Adequately Prepared</td>
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<tr>
<td>Presenter - Knowledge of subject matter</td>
<td>4</td>
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<tr>
<td>Presenter - Responded to Questions</td>
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**Math/Science Concepts**

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Evaluations - Summer Workshops - Richmond

Marine Kits

- Was the topic appropriate?
- How relevant was the content?
- Activity Organization:
- Presenter - Adequately Prepared
- Presenter - Knowledge of subject matter
- Presenter - Responded to Questions

Curriculum Integration

- Was the topic appropriate?
- How relevant was the content?
- Activity Organization:
- Presenter - Adequately Prepared
- Presenter - Knowledge of subject matter
- Presenter - Responded to Questions
Comparison of Evaluation - Summer Workshop

**SEA PERCH**

- % of responses rated: Excellent/Very Good

<table>
<thead>
<tr>
<th>Response</th>
<th>NORFOLK (N=18)</th>
<th>RICHMOND (N=12)</th>
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<td>Was the topic appropriate?</td>
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**MATH/SCIENCE CONCEPTS**

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Comparison of Evaluation - Summer Workshop

**Marine Kits**

- Was the topic appropriate?
- How relevant was the content?
- Activity Organization:
- Adequately Prepared:
- Knowledge of subject matter:
- Responded to Questions:

**Curriculum Integration**

- Was the topic appropriate?
- How relevant was the content?
- Activity Organization:
- Adequately Prepared:
- Knowledge of subject matter:
- Responded to Questions:
Comparisons for Pre and Post Attitudinal Surveys (ODU and Richmond)

**Comparison of Pre and Post Surveys (ODU)**

- **ODU Pre (N=17)**
- **ODU Post (N=18)**

<table>
<thead>
<tr>
<th>% of Responses (Strongly Agree + Agree)</th>
<th>ODU Pre</th>
<th>ODU Post</th>
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<tr>
<td>There are a lot of career opportunities in the field of STEM and marine sciences.</td>
<td>110</td>
<td>90</td>
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<tr>
<td>There are numerous applications of science, Technology, Engineering and Math in marine</td>
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<tr>
<td>Ship building and repair industry offers many high paying jobs.</td>
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<tr>
<td>Labour shortage has reduced profits, impacted cost and delayed project completion for</td>
<td>110</td>
<td>90</td>
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<tr>
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**Comparison of Pre and Post Surveys (Richmond)**

- **Richmond Pre (N=15)**
- **Richmond Post (N=14)**

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<tr>
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Thank You

Contact Information:
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Old Dominion University
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E-mail averma@odu.edu