Education Recommendations from IOOS & ORION Workshops

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EXCOM
Sept 14, 2004
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Workshop Background
Participants

IOOS-COOS & Education

- **Observation system personnel** — Research, operations, education users
- **Education Networks** — COSEE, AMS projects, GLOBE, Sea Grant, NERRs, Sanctuaries
- **Practitioners** — Formal (K-12 and adult basic education), Informal (NERRs, Sanctuaries, Sci. Centers, Museums, Aquaria)
- **Under-represented groups**
- **Agency & prof society reps**
- **IT** — Edu digital libraries, SW tools, visualization, Tech Edu
- **Workforce/Post-secondary professionals**

ORION

- **Observation system personnel** — Research, engineering, IT
- **Education Networks** — COSEE, AMS projects, GLOBE, Sea Grant, NERRs
- **Practitioners** — Formal (K-16), Informal (NERRs, Sci. Centers, Aquaria, Museums)
- **Under-represented groups**
- **Agency & prof society reps**
- **CI** — Computing
Workshop Background
Objectives

IOOS

Objectives
❖ Develop a set of community recommendations and strategies for education efforts associated with IOOS
❖ Initiate an education network associated with IOOS-COOS
❖ Identify exemplary components of existing websites relevant to IOOS-COOS education

ORION

Objectives
❖ Develop set of education recommendations
❖ Develop candidate education efforts for each of the major ORION research questions
Workshop Recommendations
Education Goals

IOOS

Goals
❖ Develop and sustain a community of educators
❖ Create the workforce needed to develop and sustain the IOOS

ORION

Goals
❖ Increase understanding and appreciation of the oceans
❖ Engage communities in support of observatory exploration and discovery
❖ Stimulate and motivate citizens to pursue careers in science and technology
Workshop Recommendations

**IOOS Recommendations**

- Establish a collaborative network of educators that use IOOS information
  - National coordinating office
  - Education offices associated with the coastal and global components
  - Develop educator leaders—Use of observatory information and peer professional development
  - Embed within existing education networks (ocean, Earth, space, geography)

**ORION Recommendations**

- Establish an education and communications coordination office
- Engage in a national network of state-based Ocean/Earth/Space Alliances that encompass undergraduate education, K-12 educator networks and local communities
IOOS Recommendations
❖ Support data and learning materials/resources
   ➢ Establish an information translation and story development capability
   ➢ Establish an education data and protocols working group
   ➢ Provide a clearinghouse for sharing of data, learning resources, and education tools
   ➢ Provide a help desk for assistance in access to resources

ORION Recommendations
❖ Establish a data management and content translation facility
❖ Library of background materials (resources) for educators
Workshop Recommendations

**IOOS Recommendations**

❖ Engage all Americans in ocean careers
  ➢ Develop materials and programs to attract, nurture, develop and retain under-represented groups
  ➢ Develop awareness and knowledge of careers

❖ Workforce (post-secondary)
  ➢ Assess IOOS workforce needs—in-depth needs analysis & assessment
  ➢ Develop and deploy curricula aligned with workforce needs
  ➢ Engage professional societies to sponsor & develop professional certification programs
  ➢ Work with the Department of Labor to develop and adopt occupational classifications

**ORION Recommendations**

❖ Promote the development and diversity of the ocean-related workforce
  ➢ Technology education address gatekeeper skills (e.g., math)
  ➢ Careers—Provide career information; address gender, disability and diversity; humanize/personalize; promote emerging ocean technologies
  ➢ Provide gender/diversity/disability neutral case studies and examples
  ➢ Use technology to engage youth; BS/MS interdisciplinary programs
Workshop Recommendations

IOOS Recommendations
❖ Create learning materials for Informal, Formal and Post-Secondary education
  ➢ Incorporate key messages and themes
  ➢ Customize for under-represented groups
  ➢ Incorporate National Science Education Standards
  ➢ Sequence development of learning materials, and articulate with age groups, audiences, and education areas to reinforce learning

ORION Recommendations
❖ Create learning materials for Informal and Formal education
  ➢ Exhibits (permanent and traveling) and programs with authentic artifacts or hands-on, scale models
  ➢ Use multiple media—Weather Channel, Discovery Channel, etc
  ➢ Enlist the power of the community—engage communities in observatory science
  ➢ Hands-on/problem-based learning (inquiry skills)
# Workshop Recommendations

## IOOS

### Recommendations

- Education represented in the governance of the IOOS
- Plan for IOOS associated education
  - Perform an audience analysis and needs assessment for education
  - Develop strategy for development and implementation of education; measurable goals and objectives
- Convey Key Messages and Themes
  - Create key messages and themes that constituent networks endorse and use
  - Develop awareness among educators about education network and available learning resources

## ORION

### Recommendations

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Workshop Recommendations

IOOS Recommendations
❖

ORION Recommendations
❖ Establish an education research center in interdisciplinary science
  ➢ Pedagogy and learning for students and educators (K-16)
  ➢ Model for NSES in *Science as Inquiry, and Unifying Concepts and Processes Standard* (evidence, models, measurement, change, constancy, systems, etc.)
Recommended Education Topics

ORION

Education Themes
❖ Exploration and discovery
❖ Response to episodic or continual events that are driven by natural or anthropogenic forces
❖ Life forms/habitats
❖ Dynamic system—changes in many dimensions and scales
❖ Technology innovations/innovators
❖ Relevance to cultural, societal, human issues/stories
Recommended Education Topics

ORION

Education Activities
❖ Citizen science projects
  ➢ Adults, children, communities
  ➢ Collect or analyze existing data
  ➢ Sister schools/communities or partner sites
  ➢ Adopt-a-buoy, array, glider, AUV, tagged animal
  ➢ Summer camps/youth experiences
  ➢ Promote, develop, train, support Ocean GLOBE effort… major focus
❖ Internships—Teachers at sea; Students (H.S. undergrad, grad)
❖ Student experiment/instrument
❖ Mentoring—students, educators (teachers, museum staff, youth leaders)
❖ Simulation—modeling—prediction
  ➢ Games (e.g., sim-city)
IOOS Phased Plan

Phase I
Establish IOOS Allied Education Community
1. Create an education network with regional sites and a coordinating office; build from existing sites
2. Carry out in-depth needs assessment and analysis for formal, informal and workforce education
3. Create and deploy, key messages and themes
4. Participate in IOOS planning and design, especially information issues for education
5. Build local education-leader experts who use IOOS information assets & highlight careers; support and sustain the network and community
6. Craft education strategy and detailed implementation plan

Phase II
Sustain and Expand the Community
1. Create an information translation and story development capability based on IOOS information
2. Share data, tools and products, and provide a helpdesk for educators
3. Create learning materials that utilize products of (1) in many learning venues that support local education and workforce initiatives
4. Create post-secondary curricula that address the identified workforce needs
5. Develop and deploy programs to attract, nurture, develop & retain under-represented groups
6. Build awareness of IOOS and related learning resources among industry and educators

Phase III
Deepen the Workforce Reach of the Network
1. Engage professional societies to develop professional certifications
2. Address occupational classifications for ocean science/technology careers
3. Track demographic changes and incorporate into reassessment of needs
4. Expand awareness and knowledge of careers allied with IOOS
5. Work toward creation of rewards for all who engage in education and communications
6. Continue to build community by supporting and developing the professional practice of educators in all environments

Initiated in years
Phase I ~1-3
Phase II ~3-7
Phase III ~7-10 from start
Immediate Next Steps (IOOS)

❖ Identify the sequence of efforts in the critical path to achieve goals (Phase I through Phase III)
  ➢ Workforce needs analysis and assessment
  ➢ Formal/Informal needs analysis and assessment

❖ Invigorate special interest groups formed at workshop that address critical path elements and can be accomplished within existing resources
  ➢ Develop key messages and themes for IOOS education
  ➢ Develop and shape workforce recommendations
  ➢ Focus on building capacity to use satellite remote sensing in IOOS education
  ➢ Identify website best practices, and assessment and evaluation guidelines

❖ Undergo a prioritization and budgeting for each phase of IOOS plan with the IOOS federal partners’ education programs and their education practitioners
  ➢ Identify lead and participating agencies for each