



An Innovative Web-based Survey for Establishing Core-Learning Goals for All Ocean Environmental and Science students



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Rationale:

The ocean and environmental science education (OESE) communities are struggling to embrace NRC guidelines and recommendations for infusing inquiry-based learning into our classrooms. At the same time, the community must embrace state and national science standards. OESE curricula vary tremendously, and furthermore are in flux, making it difficult to reach a consensus on the key concepts to be conveyed. This lack of consensus impedes efforts to define what constitutes strong OESE, erodes efforts to implement OESE in various settings (perceived as “weak”), and makes it difficult to develop science standards based on OESE. Based on community input, our goal was to define fundamental science concepts that can be revisited by students at various educational levels (K-16 and beyond) with age and developmentally appropriate activities, examples, and detail. Students gain a deep understanding of science concepts when they approach the concepts from various perspectives, revisit the concepts at increasingly sophisticated levels, and are presented many examples of the same concepts (Donovan, Bransford, and Pellegrino (Eds), 1999. How People Learn, National Academy Press).

OESE is often organized around subject area (observation: most environmental science texts include 26 +/- 2 chapters) rather than a small number of central concepts. Our hypothesis is that the OESE community can agree on a limited number of “key concepts” (<15) that define good OESE curriculum and standards.

Round 1:

- 38 Responses
- 308 individual concepts
- 4 independent approaches
 - Organize all 308 concepts into categories
 - Rank concepts by order listed
 - Formulate overarching themes (5-6 Mega-concepts)
 - Declarative statements
- Consensus on 8 Key concepts
- Development of Round 2



Key Concepts:

I.) WAYS OF KNOWING

(Scientific Method, Observations, Technology, Informatics, Habits of Mind, Faith)

“Reflection on how we know what we believe will help our understanding”

II.) HUMAN INTERACTIONS

(Sustainability, Environmental Ethics, Environmental Justice, World Views, Environmental Policy and Management, Human Health)

“Currently, the human species is significantly affecting earth systems, but has the ability to choose its relationship with the environment”

III.) ECOSYSTEMS

(Biological Communities, Population Ecology, Habitats)

“The survival and health of individuals and groups of organisms are intimately coupled to their environment”

IV.) EARTH SYSTEM SCIENCE

(System Properties, Oceanography, Atmospheric Science, Earth Science)

“The Earth as a whole acts as a complex set of interacting systems with emergent properties”

V.) EVOLUTION-BIODIVERSITY

(Species Diversity, Natural Selection, Biogeography)

“Evolution explains both the unity and diversity of life”

VI.) ENERGY FLOW AND TRANSFORMATION

(Forms of Energy, Thermodynamics, Conservation of Energy, Energy Use, Motion)

“Energy transformations drive physical, chemical, and biological processes. Total energy is conserved and flows to more diffuse forms”

VII.) CONSERVATION OF MASS

(Input/Output Models, Elemental Cycles, Hydrological Cycle, Stoichiometry, Equilibrium)

“Mass is conserved as it is transferred from one pool to another”

VIII.) SPATIO-TEMPORAL RELATIONSHIPS

(Geospatial Position, Mapping, Historical Trends, Coordinate Systems)

“Choosing the appropriate reference frame is the key to understanding one’s environment.”

Methods:

- Two rounds of web-based survey
- Open-ended questions about concepts in Round 1
- Independent analysis of results (4 scientists)
- Consensus on Key Concepts
- Seek adjustments and community consensus of Concepts in Round 2
- Write declarative statements about each Concept
- Disseminate Results
- Seek activities for all educational levels that build on Key Concepts (Round 3—This poster)
- Establish Concept Map for progressive OESE education (Future)

Round 2:

- 39 respondents
- Overall good agreement
- Many responses are based on traditional disciplines
- Concepts ranked by community response
- Few minority respondents
- Adjust Concepts/sub-categories
- Form Declarative Statements
- Present at ASLO
- Seek Feedback through experiential interactions



Experience our Survey NOW!!

Round 1: <http://www.surveymonkey.com/s.asp?u=18508146732>

Round 2: <http://www.surveymonkey.com/s.asp?u=81402164931>

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