Exploring Our Fluid Earth: An inquiry-based aquatic science curriculum

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- How do we define inquiry?
- Teaching Science as Inquiry (TSI) framework
- Why aquatic science context?
- Exploring Our Fluid Earth Curriculum

Science as Inquiry

- SCIENCE IS (not) INQUIRY (but it is) (National Research Council, 2011)
  - New Science Education Framework (NSEF)
  - Next Generation Science Standards (NGSS)
Practices of Science:
Things you actually do when doing science = verbs
- Asking questions
- Making observations
- Devising a testable hypothesis
- Collecting, analyzing, and interpreting data
- Constructing and critiquing arguments
- Communicating

Demeanors:
Adverbs to the practice verbs
- Responsibly
- Courteously
- Skeptically
- Respectfully
- Accurately
- Honestly
- Open-mindedly
- Evidently

- I am honestly communicating the results of my analysis.
- We are accurately collecting data by measuring sharks with our ruler.

New Science Education Framework/Next Generation Science Standards

Scientific and Engineering Practices
1. Asking Questions/Defining Problems
2. Developing/using models
3. Planning/doing investigations
4. Analyzing and interpreting data
5. Using math
6. Constructing explanations
7. Engaging in argument from evidence
8. Obtaining, evaluating, communicating, information

Core Ideas in Four Disciplines
- Physical Science
- Life Science
- Earth and Space Science
- Engineering, Technology, and the Applications of Science

Crosscutting Concepts
1. Patterns
2. Cause and effect
3. Scale, proportion, and quantity
4. Systems and system models
5. Energy and matter
6. Structure and function
7. Stability and change

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Teaching Science as Inquiry

Teaching Science as Inquiry (TSI)
- Grew out of the need to re-define inquiry

Definition of Inquiry
- No one correct way to define
- Rooted in science as a discipline
  - Authentic practice of science
  - Science practiced in many different ways

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**Diagram:**
- Teaching Science as Inquiry (TSI) diagram with elements labeled
- Practices, Demeanors, Science, Discipline, Scientific Literacy, Pedagogy, Phases, Inquiry

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Exploring Our Fluid Earth

1. Earth has one big ocean with many features.
2. The ocean and life in the ocean shape the features of the earth.
3. The ocean is a major influence on weather and climate.
4. The ocean makes Earth habitable.
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably interconnected.
7. The ocean is largely unexplored.

Aquatic Science as Context

- Science is **disciplinary**
- Aquatic science in multi- and inter-disciplinary
  - Physics
  - Chemistry
  - Biology
  - Ecology

Aquatic Science as Context

- 72% of the surface of the planet is water
- 44% of world’s population lives within 150 km of coast

TSI and NGSS

**Practices of Science**

- asking questions
- making observations
- devising a testable hypothesis
- collecting, analyzing, and interpreting data
- constructing and critiquing arguments
- communicating
- contributing to community
- teaching fellow researchers

**Scientific and Engineering Practices**

1. Asking Questions/Defining Problems
2. Developing/Using Models
3. Planning/Carrying Out Investigations
4. Analyzing and Interpreting Data
5. Using Math
6. Constructing Explanations
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating, Communicating, Information

**Ocean Literacy**

The Essential Principles of Ocean Sciences K-12

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**Thematic Units** composed of **Topics**

**Topics:** Reading intro, activity, additional content, further investigations

**Special Features:**

- Climate Connections, Compare-Connect-Contrast, Practices of Science, Scientist Profile, Traditional Ways of Knowing, Weird Science
- **Teacher Text:** Background, standards, misconceptions, prep, modifications, procedure notes, demos
- Funded by collaborative grant from **NOAA**
Development of Online Curriculum

- Based on *The Fluid Earth* and *The Living Ocean*
- Online component
  - forum for PD
  - v-bulletin
  - full website
Alignment to NGSS

Core Ideas in Four Disciplines

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Life Science
Earth and Space Science
Engineering, Technology, and the Applications of Science

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Alignment to OLPs

The Future of EOFE

- Modules are in different states of completeness
- Rollout August 2014
- [www.exploringourfluidearth.org](http://www.exploringourfluidearth.org)
- Continue to integrate into professional development
- Develop professional development specific to curriculum

Mahalo!