

Modeling Thermohaline Circulation

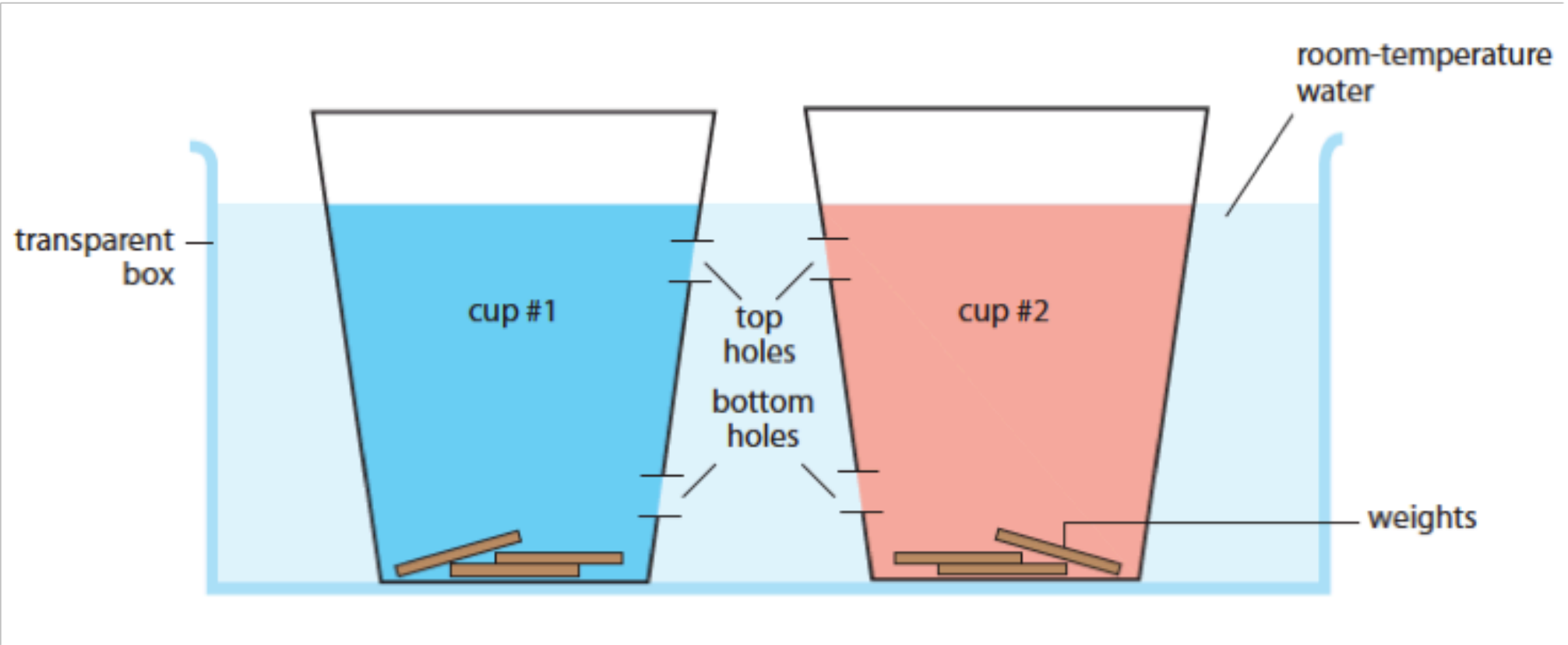
Activity Goals

- Form water layers
- Model how temperature (themo) and salinity (haline) affect the movement of water

This activity:

- Revisits density concepts
- Connects density to ocean circulation
- Utilizes a model

Thermohaline Circulation



Pop Quiz!

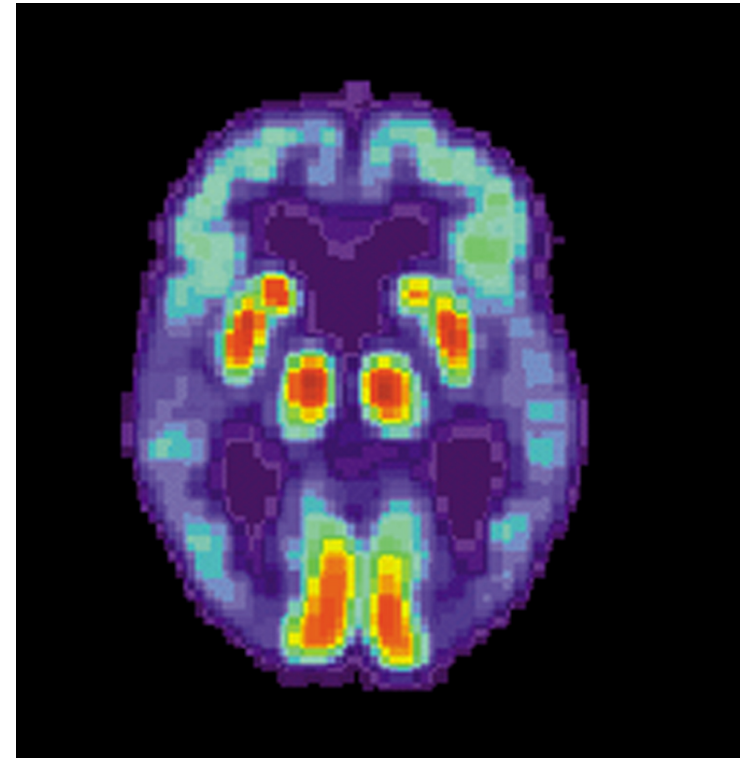
For each of the following, choose whether the statement is TRUE or FALSE and give a brief explanation of how you know. . .

Pop Quiz!

For each of the following, choose whether the statement is TRUE or FALSE and give a brief explanation of how you know. . .

TRUE or FALSE

You only use 10% of your brain.



http://commons.wikimedia.org/wiki/File:PET_Alzheimer.jpg

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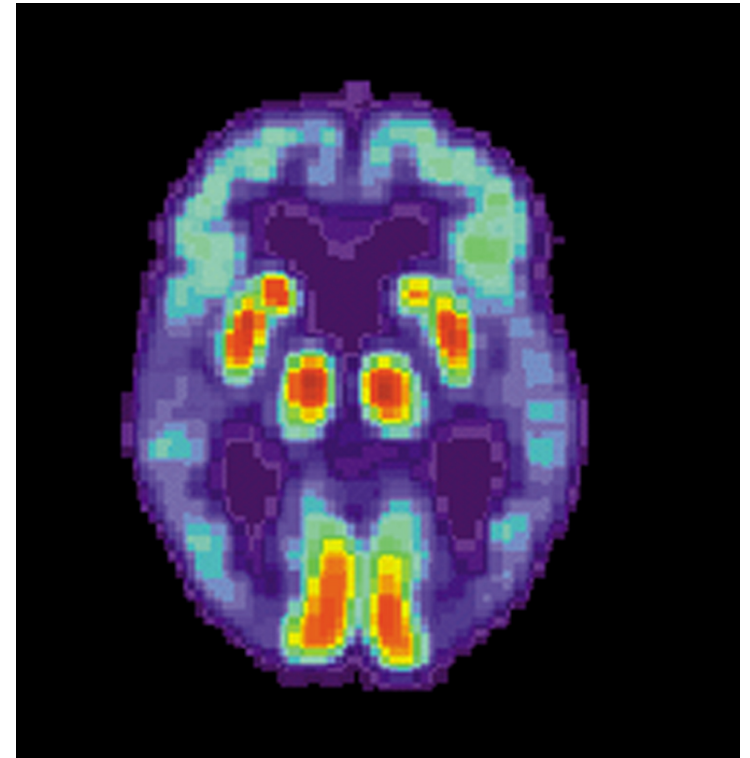
For each of the following, choose whether the statement is TRUE or FALSE and give a brief explanation of how you know. . .

FALSE

You only use 10% of your brain.

FACT: You use most of your brain, most of the time.

<http://www.scientificamerican.com/article.cfm?id=people-only-use-10-percent-of-brain>



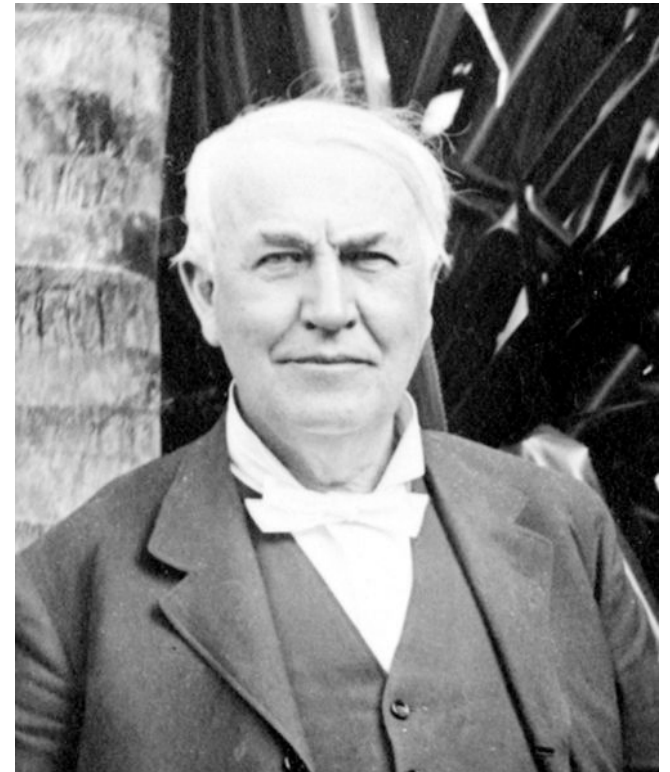
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TRUE or FALSE

Thomas Edison invented the light bulb.



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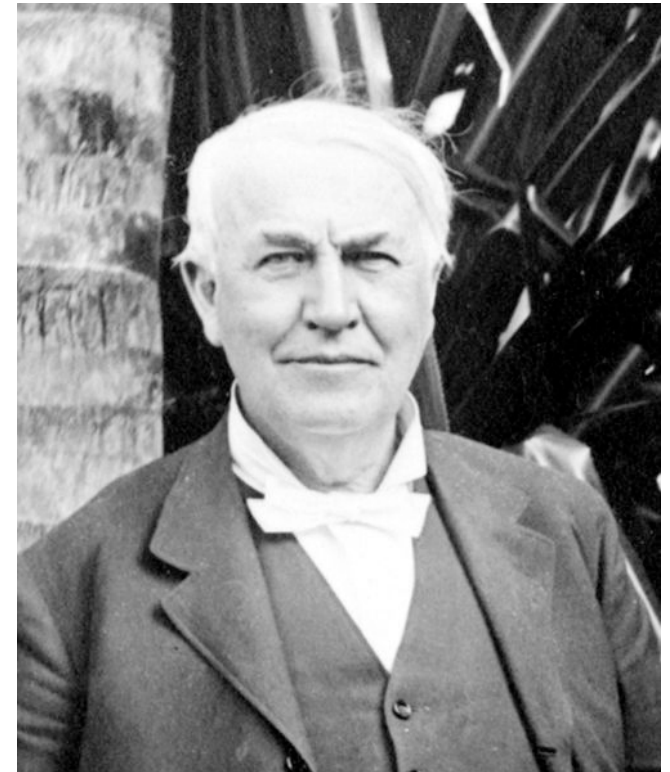
Pop Quiz!

For each of the following, choose whether the statement is TRUE or FALSE and give a brief explanation of how you know. . .

FALSE

Thomas Edison invented the light bulb.

FACT: Humphry Davy invented the first electric light in 1809.



<http://inventors.about.com/library/inventors/blight2.htm>

http://commons.wikimedia.org/wiki/File:Edison-at_home_in_Ft._Myers_Florida_1914_detail_LC-LC-USZ62-131044_.tiff_adjusted.jpg

Pop Quiz!

For each of the following, choose whether the statement is TRUE or FALSE and give a brief explanation of how you know. . .

TRUE or FALSE

It takes seven years to digest gum when you swallow it.



<http://www.flickr.com/photos/msittig/5901055699/sizes/m/in/photostream/>

Pop Quiz!

For each of the following, choose whether the statement is TRUE or FALSE and give a brief explanation of how you know. . .

FALSE

It takes seven years to digest gum when you swallow it.

FACT: Swallowed gum may linger in your digestive tract for a week.



<http://www.flickr.com/photos/msittig/5901055699/sizes/m/in/photostream/>

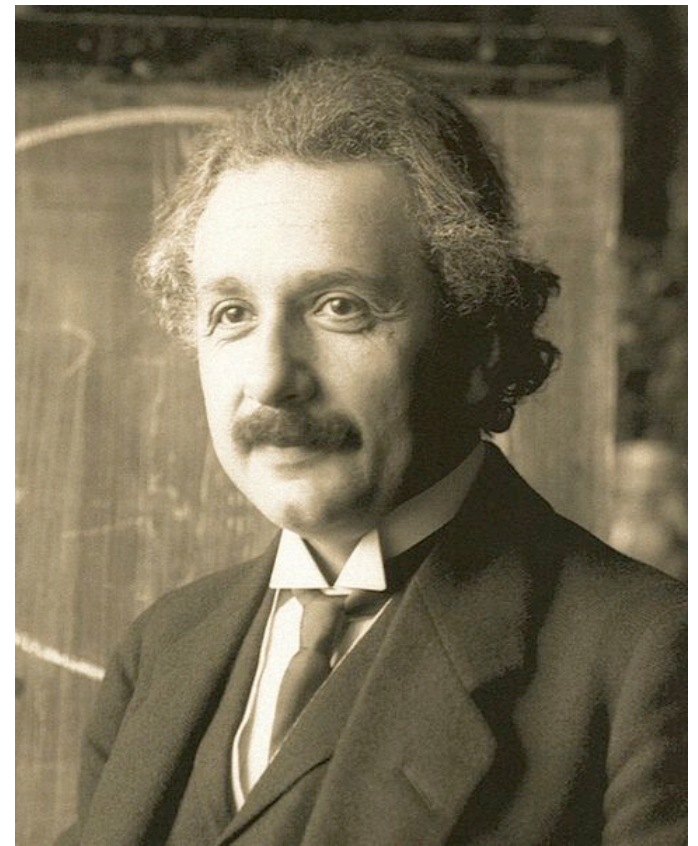
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TRUE or FALSE

Einstein failed high school math.



http://commons.wikimedia.org/wiki/File:Einstein1921_by_F_Schmutzer_2.jpg

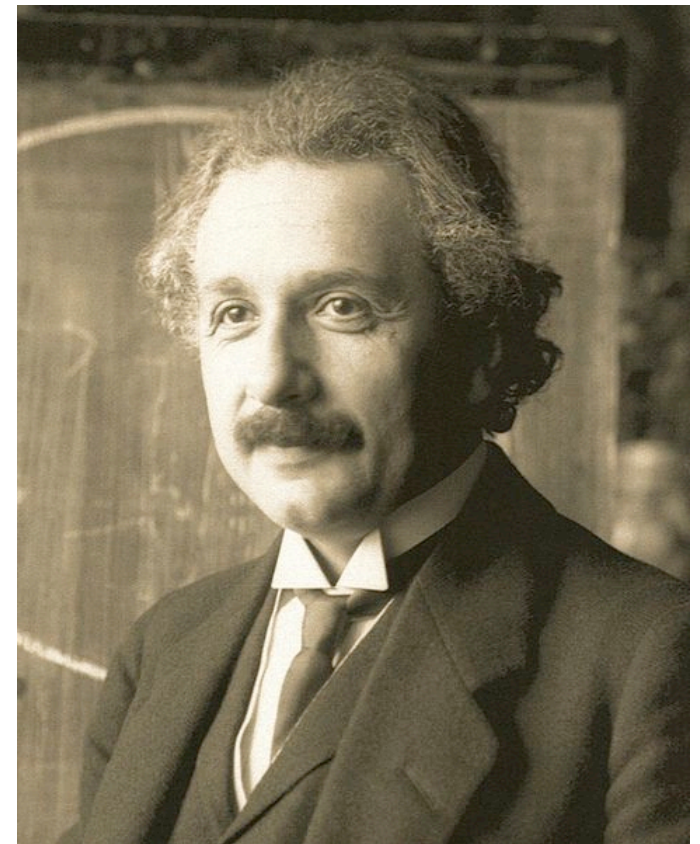
Pop Quiz!

For each of the following, choose whether the statement is TRUE or FALSE and give a brief explanation of how you know. . .

FALSE

Einstein failed high school math.

FACT: Einstein never failed math.
By age 15, he had mastered calculus.

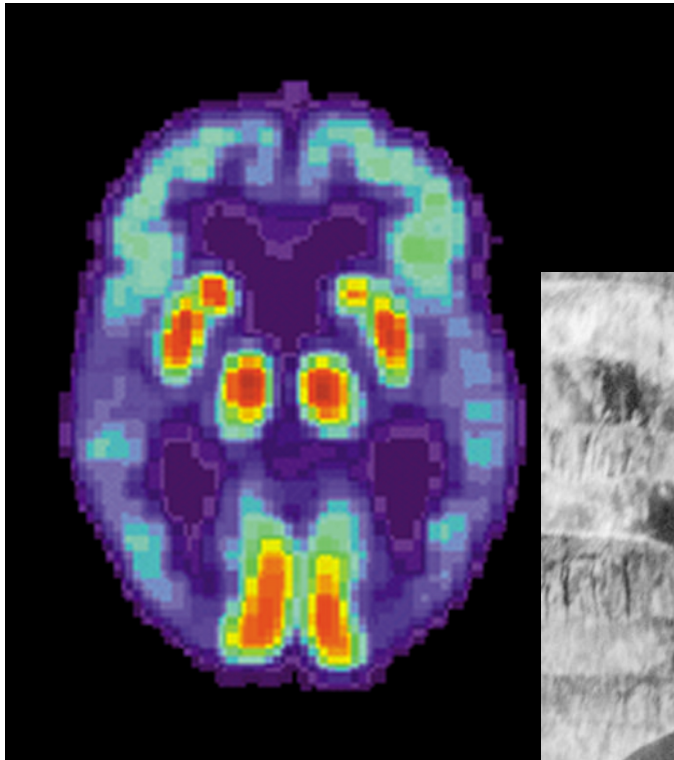


http://www.time.com/time/specials/packages/article/0,28804,1936731_1936743_1936758,00.html

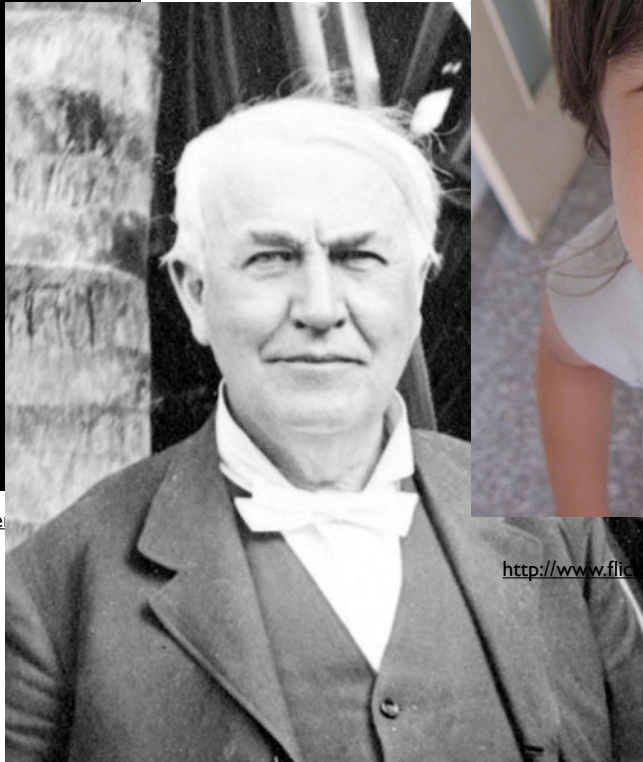
http://commons.wikimedia.org/wiki/File:Einstein1921_by_F_Schmutzer_2.jpg

Pop Quiz!

All of these urban myths are False!



http://commons.wikimedia.org/wiki/File:PET_Alzheim



<http://www.flickr.com/photos/msittig/5901055699/sizes/m/in/photostream/>



Kids on Love

What is the proper age to get married?

“No age is good to get married at. You got to be a fool to get married.” (Freddie, 6)

What do most people do on a date?

“Dates are for having fun and people should use them to get to know each other. Even boys have something to say if you listen long enough.” (Lynnette, 8)

Why love happens between two people...

“No one is sure why it happens, but I heard it has something to do with how you smell. That’s why perfume and deodorant are so popular.” (Jan, 9)

Misconceptions - Alternative Conceptions

Prior Knowledge

- Misinformation (Pop Quiz)
- Prior learning in conflict (Private Universe)

Why do we care about misconceptions?

- Misconceptions can impede learning
- Students generally unaware that their conceptions are incorrect
- Misconceptions can be entrenched & difficult to correct
- Learning entails replacing or reorganizing knowledge
- Conceptual change needs to happen to replace misconceptions

Complexity of learning

Blank Slates

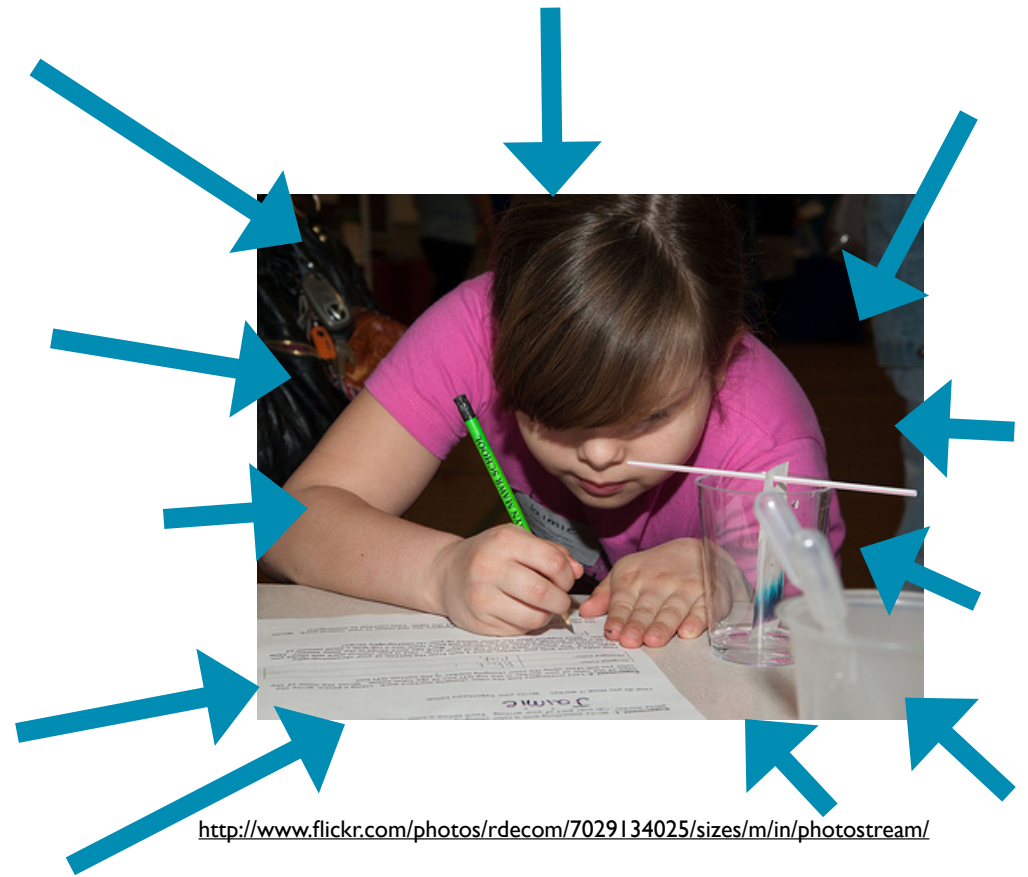
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Clever Minds



<http://www.flickr.com/photos/rdecom/7029138039/sizes/m/in/photostream/>

Funnel Model



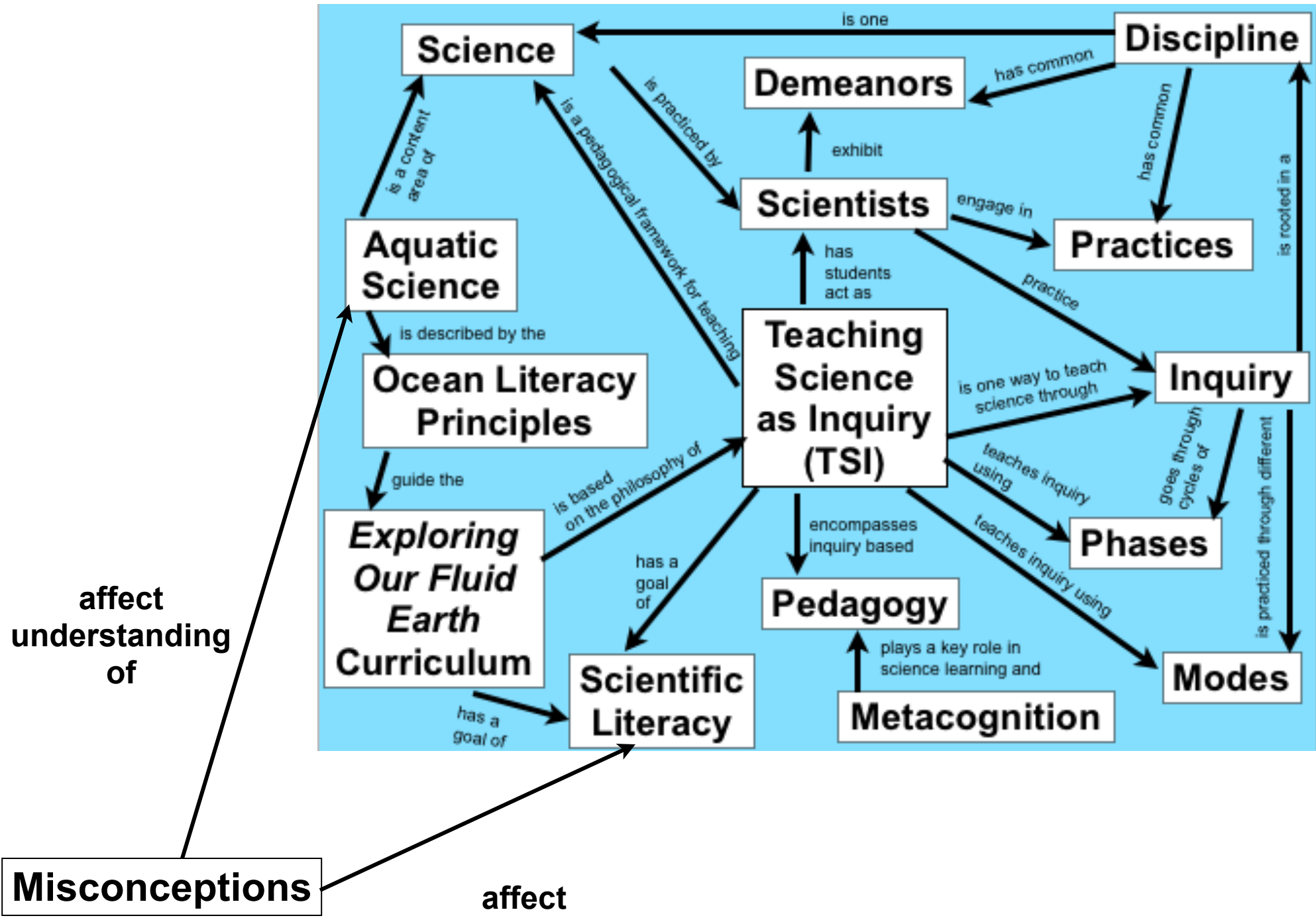
<http://www.flickr.com/photos/rdecom/7029134025/sizes/m/in/photostream/>

v.

Constructivism

What can we do about misconceptions?

- Create student **conflict** through recognition of **anomalies**
- Construct and use **models**
- **Diversify** instruction
- Raise student **metacognition** and reflection



Misconceptions

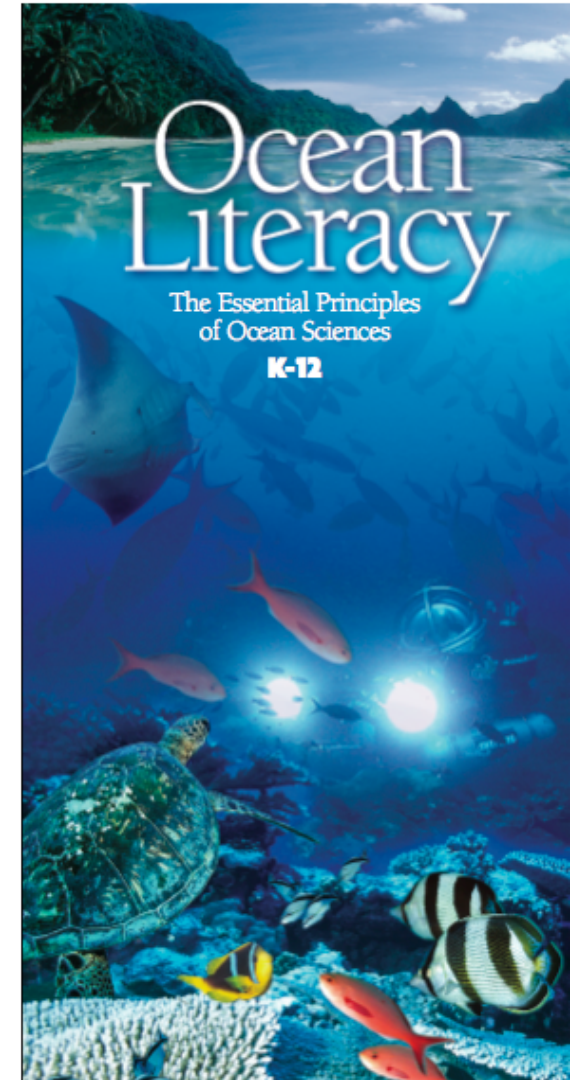
affect

affect
understanding
of

Ocean Misconceptions

Physical Aquatic Science

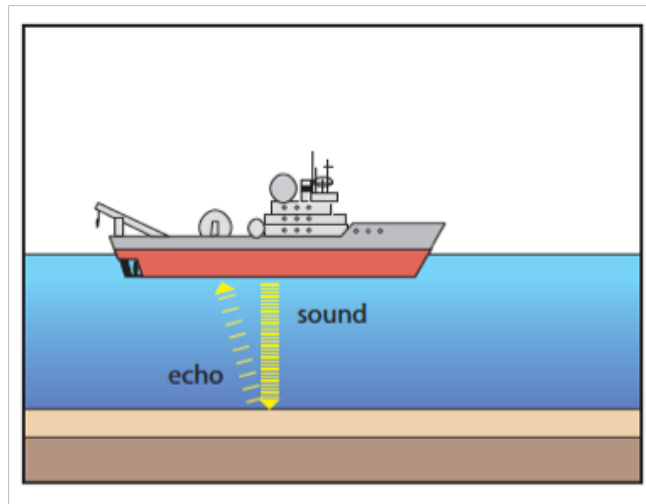
- There are many disconnected oceans
- Water in the ocean stays in one place
- Waves cause currents
- Understanding physics & chemistry are not important to understanding ocean biology
- The coast and coastlines are static and do not change over time
- The ocean is the same depth everywhere
- Islands float
- Sand is made of salt



Sonar Mapping of the Ocean Floor

Year: 1940

- **Research Goal:** Explore a never-before mapped section of the ocean floor.
 - Using new technology (**single-beam sonar**) look for prominent geologic features



- **Preliminary Data Needed:** So you can go back to funding agency and request additional money

Sonar Mapping of the Ocean Floor

Activity Goals

- Use data to generate a mapping procedure, interpret results
- Assess accuracy of investigation

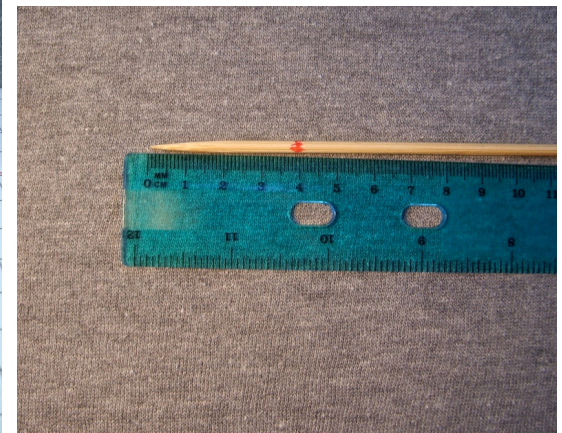
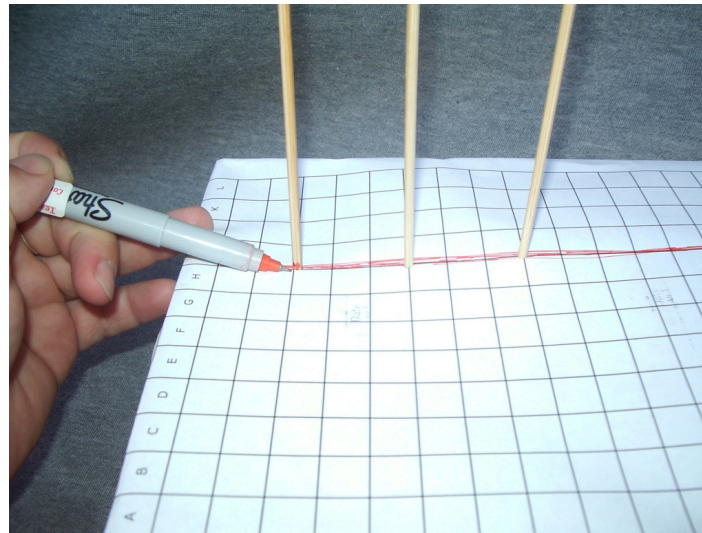
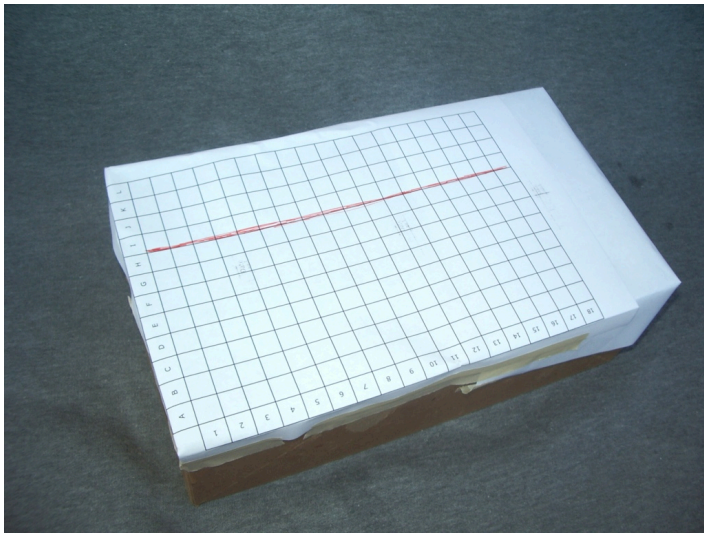
This activity:

- Recognizes science as a human endeavor grounded in history
- Engages students in the practices of science (e.g. making predictions based on evidence and learning by analysis)
- Allow modifications of procedures and hypotheses based on new information

Sonar Mapping of the Ocean Floor

Part A: Collect preliminary data so you can go back to your funding agency and request additional funds

- **Sonar:** (aka skewers) for 20 deep water soundings
- **Promising deep water research site:** aka covered box



Sonar Mapping of the Ocean Floor

Part A: Collect preliminary data so you can go back to your funding agency and request additional funds

- **Sonar:** (aka skewers) for 20 deep water soundings
- **Promising deep water research site:** aka covered box

Part B: Based on your preliminary research, your funding agency has granted you additional funds!

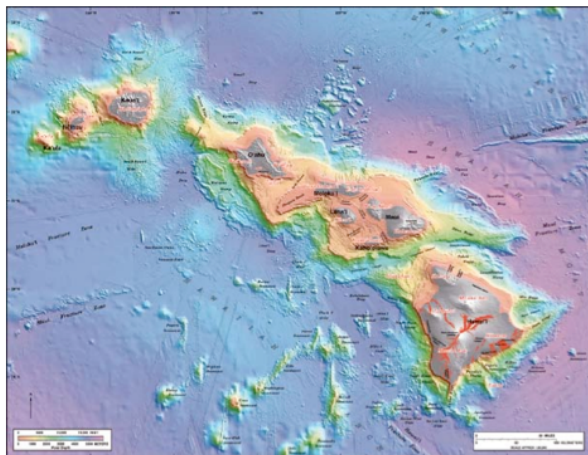
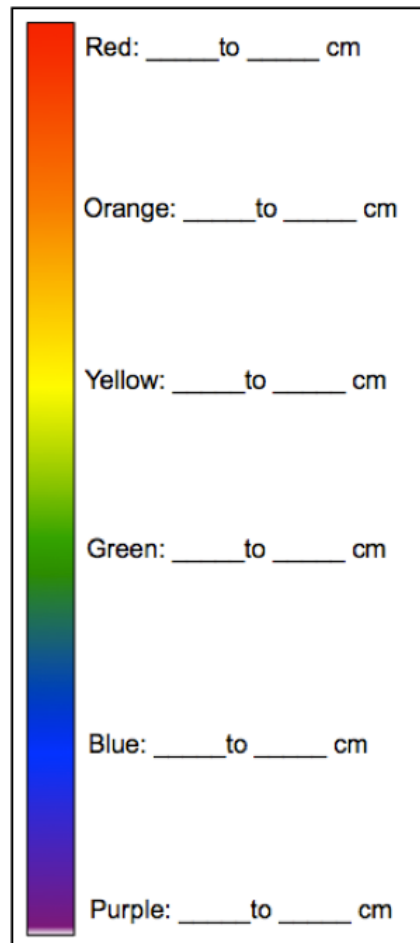
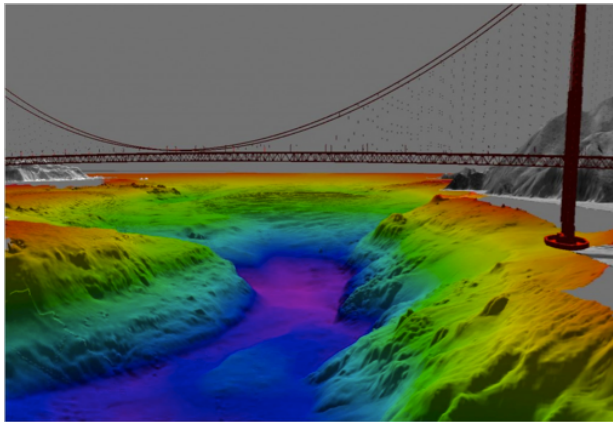
- **Develop a mapping procedure.**

Part C: Carry out your intended procedure

- **Additional Cruise:** 10 minutes

Sonar Mapping of the Ocean Floor

Color Coding



<http://soundwaves.usgs.gov/2004/01/hawaii-sea-floor.jpg>

Contour Lines

