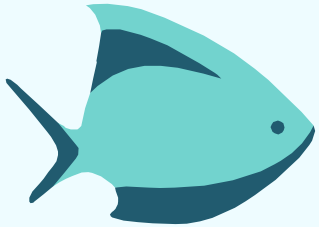
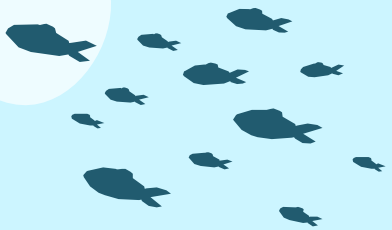
Scientific Modeling





Session 2

What will we do today?

1. Recap – scientific models & criteria
2. Update from Fresh Perspectives- new evidence!
3. Use MEME to look at evidence and revise the model
4. Learn how to make a good comment
5. Gallery walk

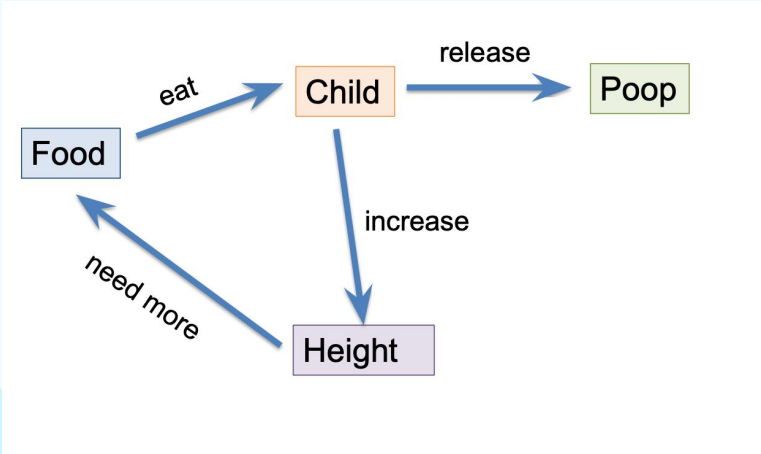
Recap: Scientific models

Scientific models represent (show) how something in the world works. They help scientists ***explain*** and ***predict*** how something works.

For example, a model of how a child grows:

- ***Explains***: how a child grows
- ***Predict***: what a child needs to grow

Models are **simplifications**.



Criteria for Good Models

To solve this mystery, we need to make a model that shows what happened and why.

- To do that, we need some criteria that will help us make and evaluate good models.
- Criteria are *standards* that scientists use to judge good scientific models.

Examples of criteria for good models are:

a) **Supported by evidence (no contradictory evidence)**
b) **Shows all steps in process**
c) **Understandable**
d) **Consistent (doesn't contradict itself)**

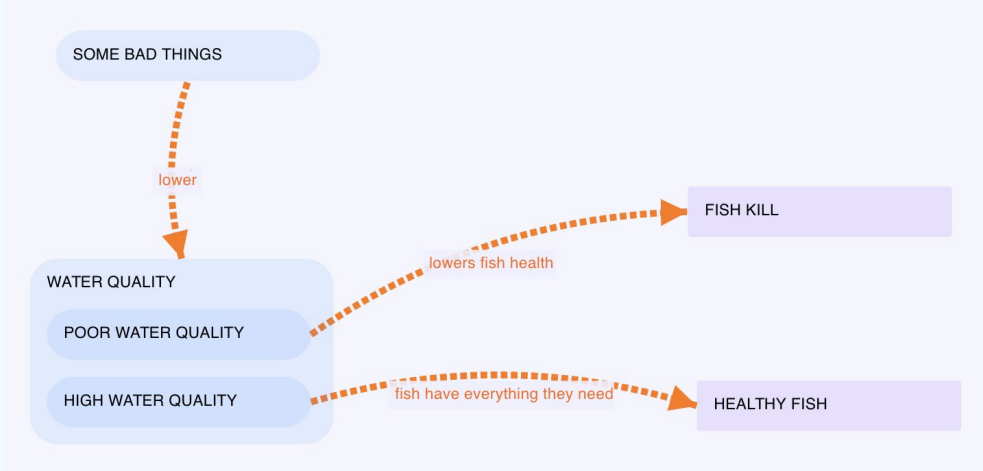
FRESH Perspectives

a F.R.E.S.H. Org Publication

We added some evidence into MEME based on your questions.

Please evaluate the evidence, revise the model, and make sure the model meets the criteria.

If you have new questions and requests for evidence let us know!



Evidence - Water quality report

Water Quality Report

FRESH Org hired scientists to check the water quality in the pond. Water quality is measured by several factors, such as the amount of dissolved oxygen, bacteria levels, the amount of salt, or the amount of particle material in the water. In some bodies of water, the concentration of microscopic algae and quantities of pesticides, herbicides, heavy metals, and other contaminants may also be measured to determine water quality. The scientists took samples from all the different areas of Blue Pond and tested the water for dangerous levels of substances, such as viruses, poisons, or pesticides. The table shows the results of the water quality check:

Water Quality Tests	Dangerous Levels in Blue Pond
Fish viruses	Negative
Harmful bacteria	Negative
Microscopic trash	Negative
Pesticides	Negative
Poisons	Negative
Harmful waste	Negative

Evidence - Dissolved oxygen in tanks

Dissolved Oxygen in Tanks

The FRESH Org team knows that fish, like all living things, need oxygen. They breathe oxygen that is dissolved in the water through their gills. They wondered whether the problem in the pond had to do with the amount of oxygen in the water, and so asked some scientists to do an experiment to see how much dissolved oxygen fish need to be healthy.

The scientists set up an experiment to test how the amount of dissolved oxygen affects fish health. They set up 3 large tanks, each with a different amount of dissolved oxygen. They then placed the same number of fish (of the same type and size) in each tank and measured how fast they swam.

When fish are healthy, they swim around actively. When fish are not healthy, they experience physical stress and slow down or stop swimming.

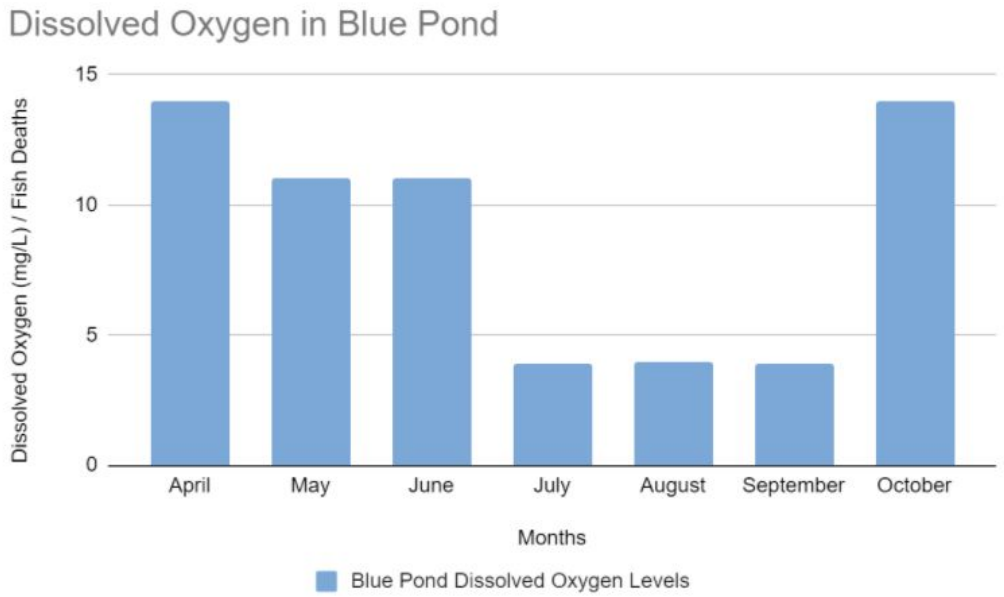
Amount of dissolved oxygen in the tank water	Fish Health
Tank 1: Low amount of Oxygen (5 mg/l)	Really unhealthy, some look like they will die soon
Tank 2: Medium amount of Oxygen (7 mg/l)	Somewhat unhealthy, some seem like they might be sick
Tank 3: High amount of Oxygen (10 mg/l)	Normal health, fish are swimming energetically

Scientists did not study tanks under 5 mg/l of oxygen because they were worried that the fish would all die.

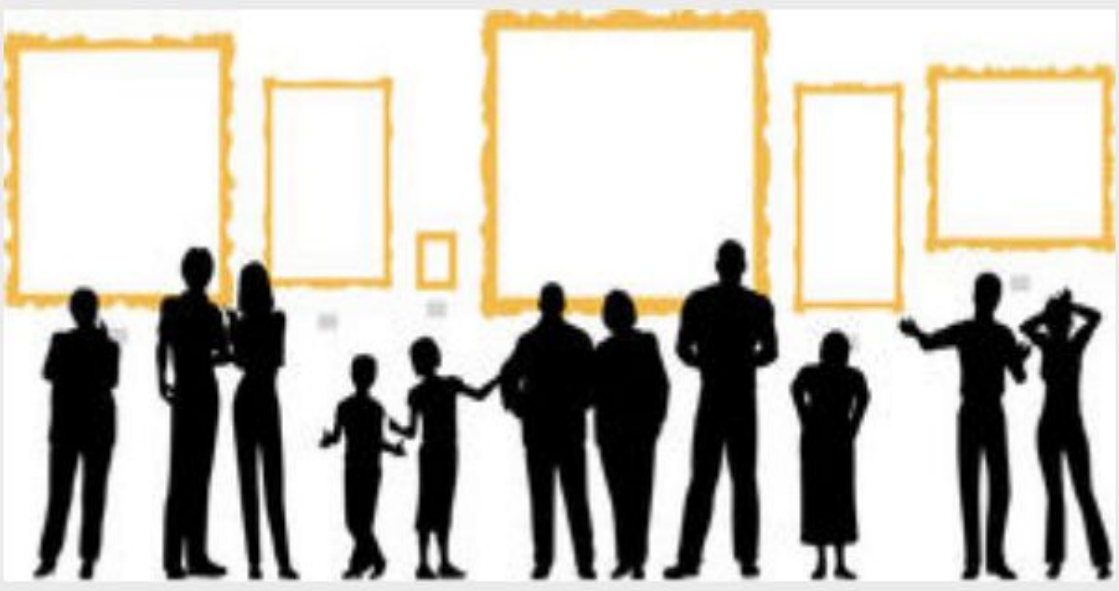
Evidence -Dissolved oxygen in Blue Pond

Dissolved Oxygen in Blue Pond

The FRESH Org panel hired scientists to measure the amount of dissolved oxygen in Blue Pond once a month from April to October. The graph below shows the amount of dissolved oxygen in Blue Pond during those months:



Gallery Walk



- During a gallery walk you will get to view other groups' models.
- You can be helpful by leaving comments on their model.
- This means we can learn and help each other learn also.

Criteria List

a) Supported by evidence (no contradictory evidence)

b) Shows all steps in process

c) Understandable

d) Consistent (doesn't contradict itself)

Gallery Walk Comments

Let's talk about how to make a good comment.

Which comment is the most helpful?

a) Your model is awful!
b) You are missing steps in the process.
c) You are missing a step between algae and algal bloom.

Gallery Walk Comments

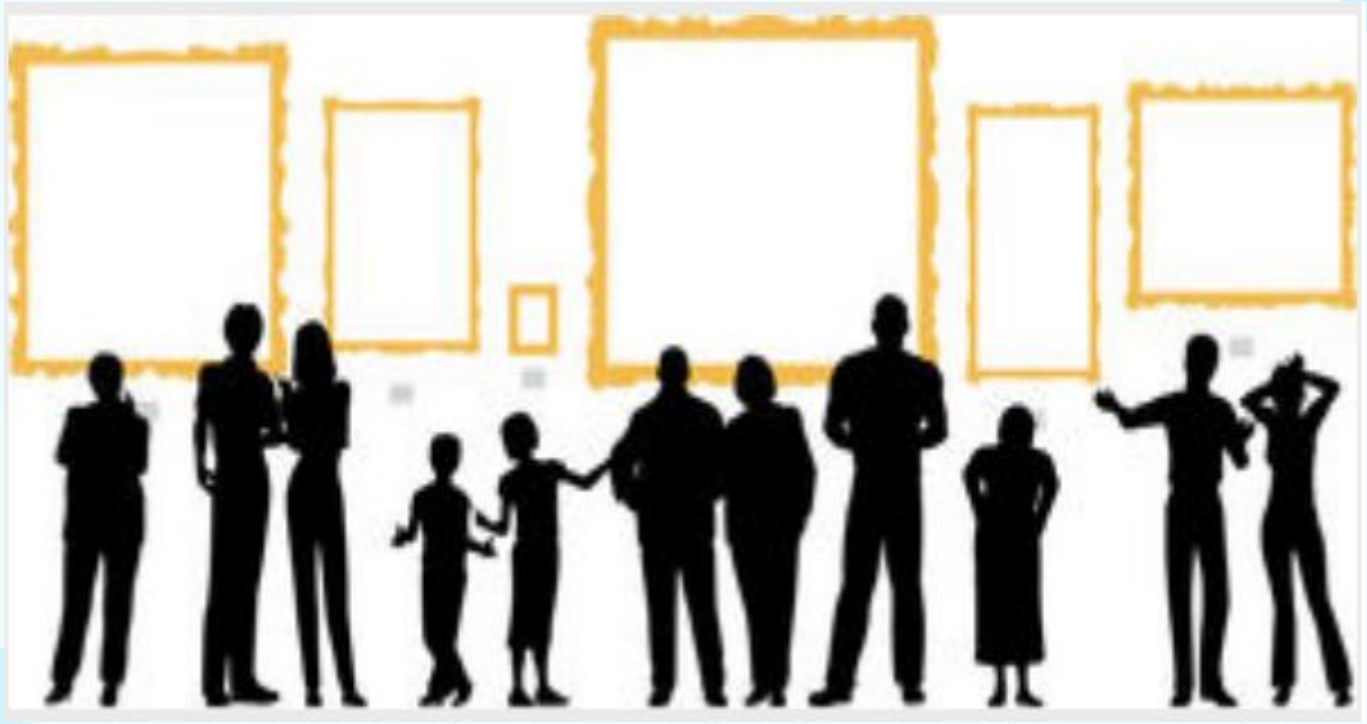
- *We really liked how thorough you were in linking your evidence to entities and providing reasons and conclusions for them!*
- *Where did you get the evidence for this number?*
- *We think your labels for your processes are really well done and clear. We were able to follow your thinking.*

Gallery Walk Comments

- *How do we know the Algal bloom uses up the air? Is there any evidence of this?*
- *We understand all of your steps and mostly how you go to them. However, if we were looking at tis for the first not understanding anything we wouldn't be entirely convinced that this model accurate because we do not see any evidence linked to any of the steps so there is no proving that this steps are actually true and this is what caused the fish kill.*

How do I make a comment on MEME?

Gallery Walk



Let’s do the gallery walk!

Discussion

- Do we need to make changes to the criteria list?
- We need to update Fresh Perspectives on what we did today. What should we tell them?
- What comments did you make to other groups?
- What questions do you still have?

Criteria List

a) Supported by evidence (no contradictory evidence)

b) Shows all steps in process

c) Understandable

d) Consistent (doesn't contradict itself)

See you next time!