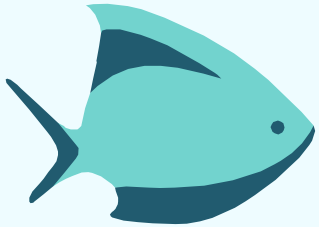
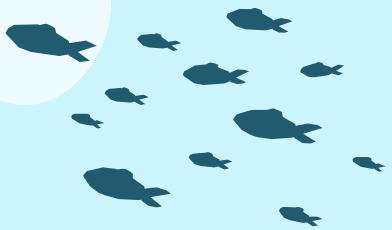
Scientific Modeling





Session 1

What will we do in the class?

- Solve a scientific mystery about why fish are dying in a local pond
- Use evidence like reports to help us solve the mystery
- Revise a model to represent your explanations about the phenomenon
- You are helping us with research

What will we do today?

1. Talk about scientific modeling
2. Learn about the mystery and the people involved
3. Look at a scientific model to help guide the investigation
4. Look at MEME, some software we made to help us study science

What is a scientific model?

Questions...

- Can you give an example?
- So, what is a scientific model?

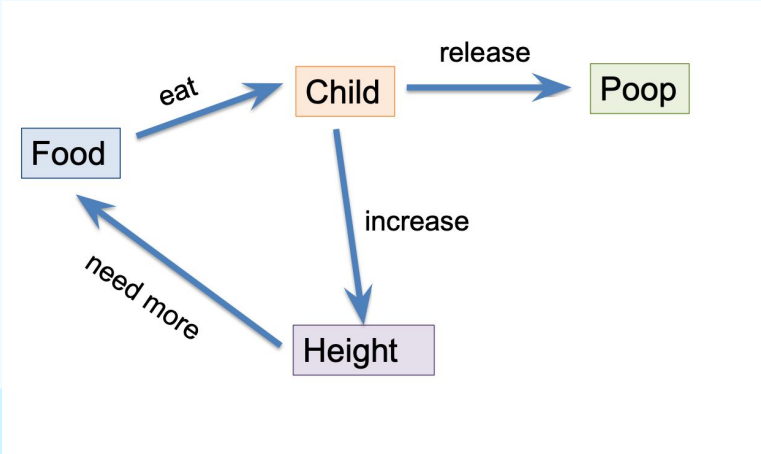
Scientific models

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)**

There was a huge … scientists developed two models of why … r? Why?

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)

Model A: Food … od Poisoning

Bacteria that cause fo… e food poisoning were in fresh meat th… ce that was sold in restaurants in the city.

↓

The restaurants did not cook the meat long enough to kill all the bacteria.

↓

People who got sick ordered and ate dishes with this meat. The bacteria got into their digestive system.

↓

They got sick from these bacteria in their digestive system.

People who got sick ordered and ate dishes with this lettuce in them.

↓

The bacteria got into their digestive system.

↓

They got sick from these bacteria in their digestive system.

Evidence 1: All of the people who got sick had eaten lettuce.

Which of these

nsform into frogs?

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)

Model A

Eggs

↓

Tadpole

↓

Tadpole with legs

↓

Young frog

↓

Adult frog

Tadpole

↓

Young frog

↓

Adult frog

Model C

Eggs

↓

Tadpole with legs

↓

Tadpole

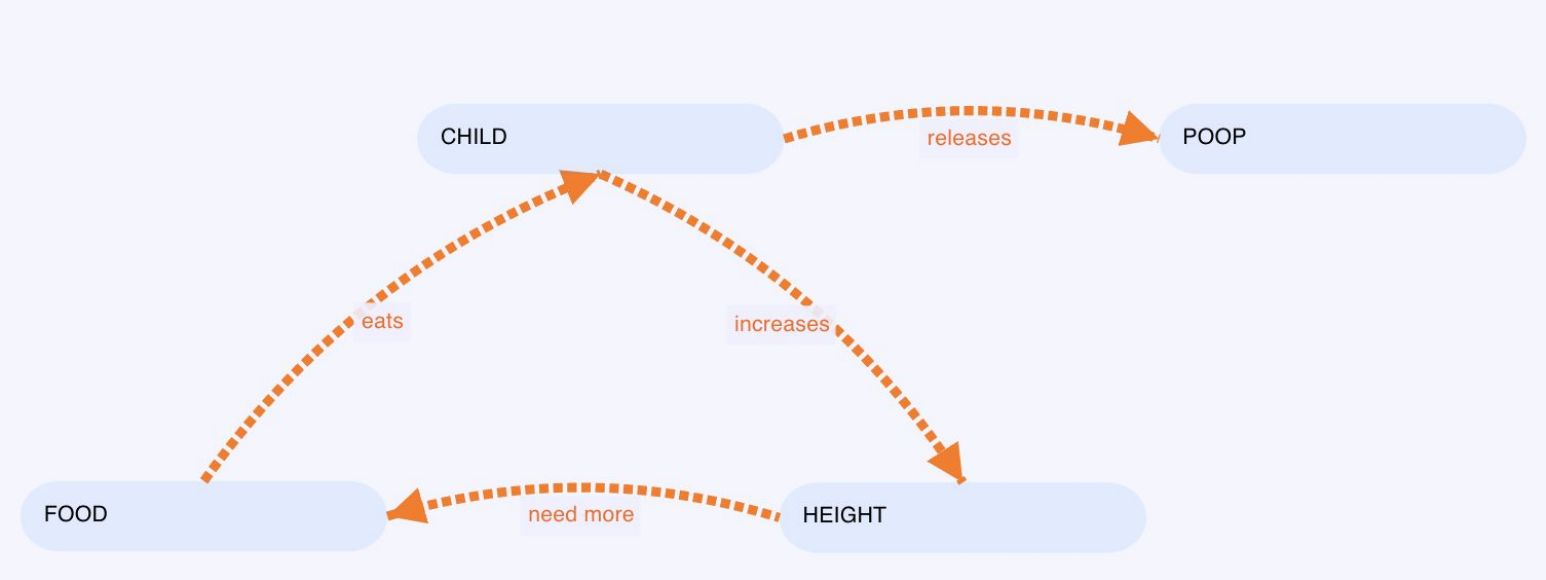
↓

Young frog

↓

Adult frog

MEME Demo



Now we will look at the evidence in MEME

The story

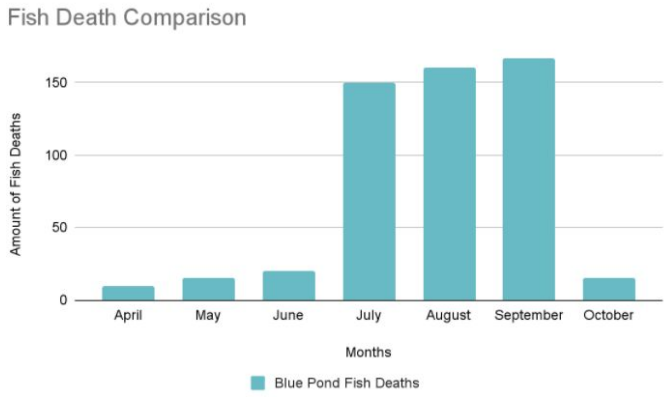
FRESH Perspectives

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

The Story

Students/Scientists, we are in need of your help! A pond here in Bloomington, Blue Pond, is experiencing major issues. In July, fish started dying in the pond. However, when the fall came around, the fish stopped dying at such high rates. The farmers from FRESH Org are worried it was something they may have done, since the pond is so close to their farms. Here is what we know so far:

- Blue Pond is home to a single species of fish, the Bluegill.
- In Blue pond, many fish died in July, and the high death rate continued through the end of September.
- During the rest of the year the death rate in both ponds was low.



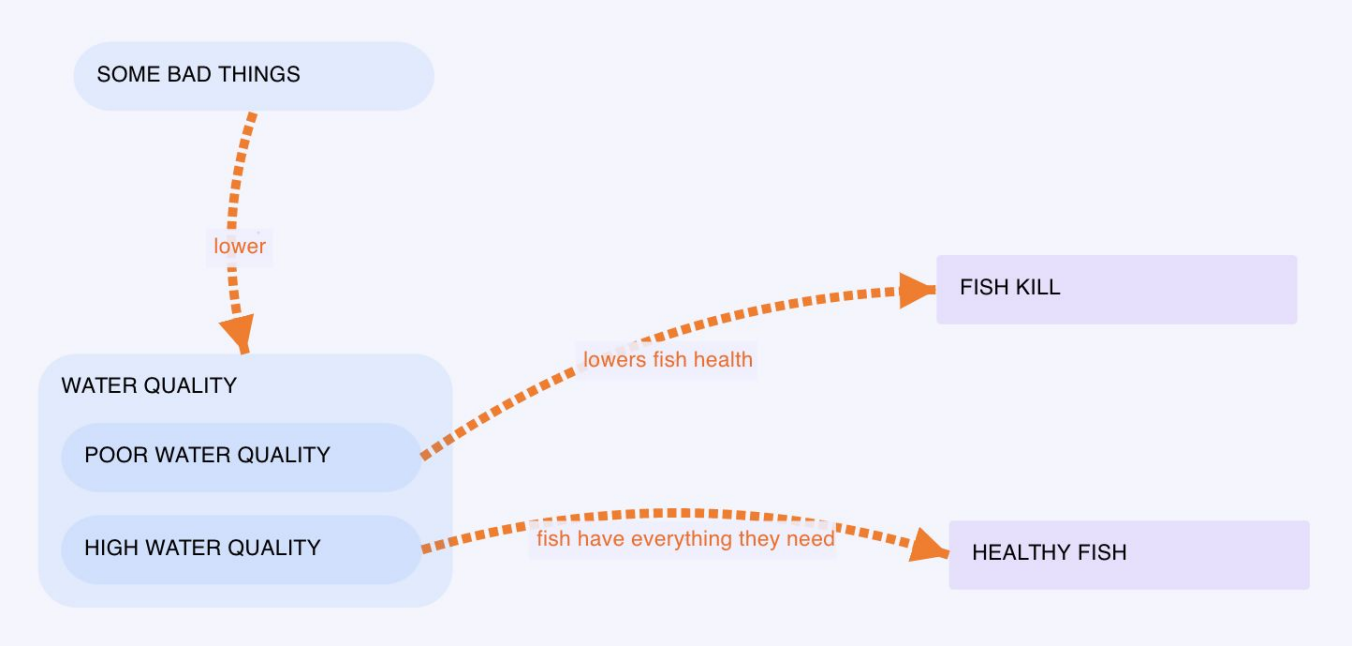
Farmer's Inventory List

The farmers at FRESH Org want to help us throughout this process. They thought it might be useful to provide a list of all the equipment and materials they use on their farms and the amount that is used on their farm. Below is the list they provided:

Product	#	Description	Month Used
Corn Pickers	2 per farm	Big machines used to pick large amounts of corn at once.	October 2021
Cultivators	2 per farm	Tool used to harvest crops out of the ground quickly and efficiently.	October 2021
Fertilizers	100 lbs/acre on each farm	Fertilizers are chemical substances supplied to the crops to increase their productivity. The fertilizers contain the essential nutrients required by the plants, including nitrogen, potassium, and phosphorus.	June 2021
Pesticides	360 ml/acre on each farm	A pesticide is any substance or mixture of substances intended for preventing or repelling any pest. Pests are organisms that cause harm to the crop plants. Agricultural pesticides are then those chemicals that are used by farmers to prevent pests from affecting the growth of crops.	June 2021
Sprayers	3 per farm	Tool used to spray pesticides across the farm.	June 2021
Tractors	3 per farm	Vehicles used to perform various duties on farms such as towing or harvesting crops.	All year

Farmer's Inventory List

Try MEME


SOME BAD THINGS
lower
WATER QUALITY
POOR WATER QUALITY
HIGH WATER QUALITY
lowers fish health
fish have everything they need
FISH KILL
HEALTHY FISH

What evidence do we want?

See you next time!