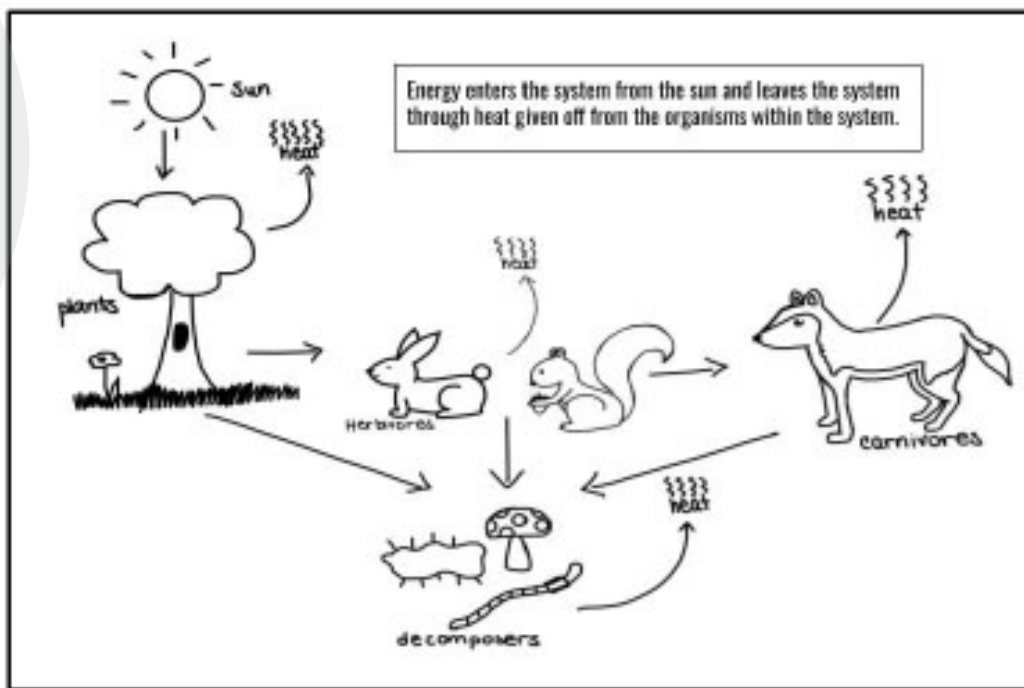


Self-Sustaining Ecosystem in a Jar!

This activity was created by Alora.

Have you ever wanted a pet but worried you wouldn't be able to take proper care of it? Worry no more! You can create your own living ecosystem at home by following the directions below.

An ecosystem is a collection of organisms and materials, biotic and abiotic, that exist together and benefit from each other. Ecosystems can be many different sizes and can exist in just about any climate you can think of on Earth. The coolest thing about ecosystems is the fact that energy and matter are conserved within it: this means that energy gets transferred and transformed throughout the system, and matter gets recycled as well. An example of this process would be the plants in an ecosystem absorbing sunlight and using it in photosynthesis to create their own energy. This energy is then transformed when the plant is consumed by a herbivore and produces energy for that organism. The energy continues to be transferred through the food chain, which looks something like this:

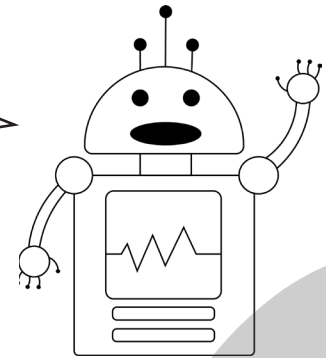


The conservation of matter also occurs throughout this cycle because the waste decomposers produce is critical to the proliferation of healthy plants. It's also important to note that the flow of energy through the system is one-way or unidirectional.

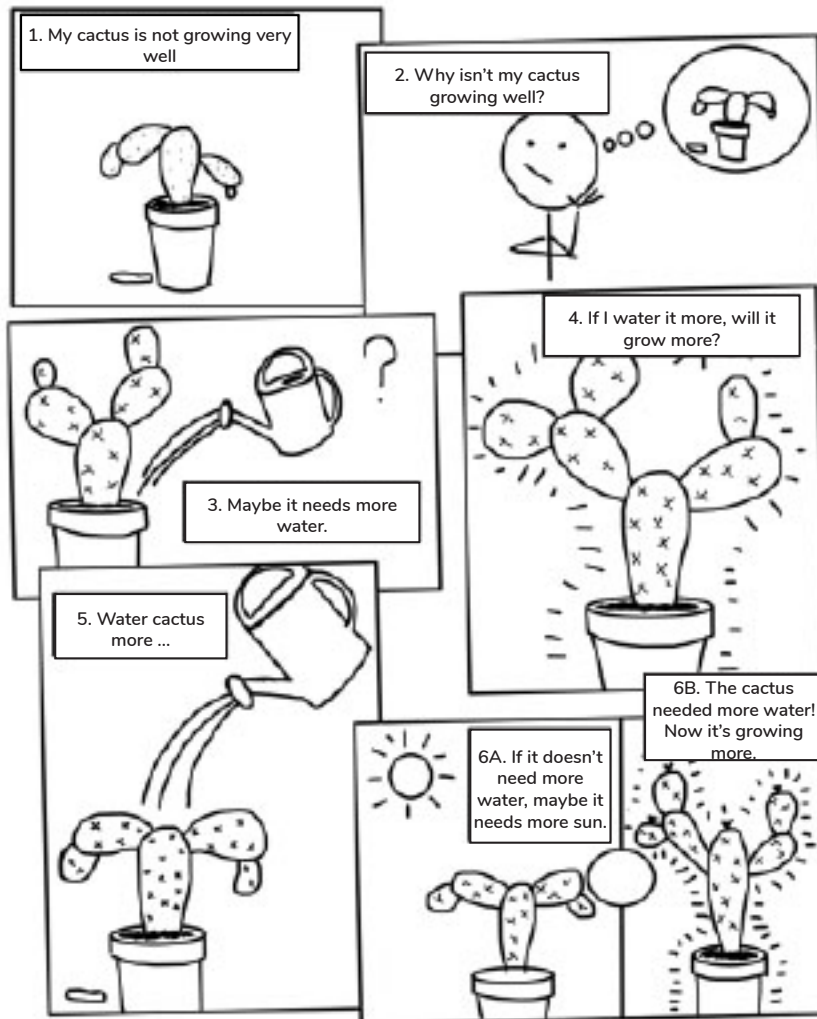
Typically, the more biodiverse an ecosystem is, the more resilient it is to any changes or disruptive events that may occur.

As mentioned above, ecosystems can vary widely in size and type, so an ecosystem can be anything from bacteria living on a doorknob to the boreal forest to some marsh water in a jar! This activity will be focusing on the latter. However, in order to make this into a real experiment, we need to follow the scientific method!

Did you know, the scientific method is used in all areas of science, even when coding for experiments that collect data? They use logic and IF/ELSE statements.



An example of the scientific method



The scientific method:

The scientific method is used universally by scientists in order to organize and complete their research.

It consists of 5 different steps plus one reflection step at the end:

1. Make an observation.
2. Ask a question.
3. Form a hypothesis/ testable explanation.
4. Make a prediction about the hypothesis.
5. Test your prediction.

Reflect on results, use these results to make new predictions and create new questions and hypotheses.

Date: _____

Name: _____

Applying the scientific method to our ecosystem in a jar!

1. Observation: Ecosystems are self-sustaining and resilient to changes.
2. What if I could replicate an ecosystem at home?
3. Form a hypothesis/ testable prediction: marshes contain stagnant water and very resilient organisms that adapt to hard environments, therefore, it would be a good ecosystem to replicate at home.
4. Make a prediction about the hypothesis: If I take samples of all the critical components of my selected environment, I should be able to successfully replicate the ecosystem at home in a closed system.
5. Test your prediction: it's very important to make lots of observations during this time.
6. Reflect on results: are there any changes I should make for when I try again?

Now it's your turn!

Steps 1 and 2 will be the same, but replicate the study at home and fill out the following blank spaces with your results and observations.

Form a hypothesis/testable prediction:

Make a prediction about the hypothesis:

Test your prediction and make observations:

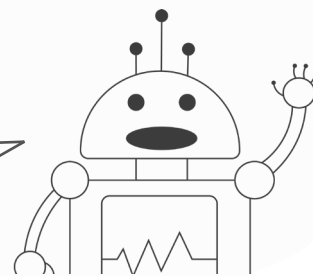
Reflect on your results, any changes you would make?:

Date: _____

Name: _____

Making a self-sustaining ecosystem - Aquatic edition

Hi! Make sure you follow the steps in order, it's just like baking; you mix the wet ingredients first then add the dry ingredients. Otherwise you can end up with a clumpy mess.



The activity can be done with different types of environments other than a marsh, as long as the ratios of materials in your homemade environment are similar to that of the original (ex. If you picked a more terrestrial environment, be sure you're not drowning it with tap water).

The reason I chose a marsh is because of the resilience of the environment: the water is typically stagnant so I wouldn't need to change it over time, and the organisms I collected are very small and thrive off of the materials I collected. The aquatic ecosystem of a riverbank would be similar and would work just as well. Marshes are wildly biodiverse and filled with little microorganisms that will thrive even in harsh conditions.

Materials:

- Large mason jar (or any other clear, long term storage container)
- Disposable water bottle
- Mud /dirt
- Aquatic plants
- Other elements of the environment (i.e. sticks, rocks...)
- Water from the selected environment
- Containers for your materials (be sure to take containers people won't be eating or drinking out of)

Procedure:

1. Locate your environment of choice to replicate the ecosystem of. Pack up your containers and water bottle for transportation of materials.
2. Collect mud/dirt, sticks, rocks, and other elements of the environment in the containers you've prepared. Don't forget the plants!
3. Fill the water bottle with water from the selected environment. (NOTE: for a marsh, you want your self-sustaining ecosystem to be mostly water)
4. Bring your materials home/ to your large mason jar. It's time to layer!
5. Place a layer of mud/dirt at the bottom of the long-term storage container.
6. Carefully place the rocks on top of the mud/dirt, so you don't break the glass container.
7. Layer the last of the mud/dirt on top.
8. Once this base of mud/dirt and rocks is complete, you can place the sticks and other stiff material in the jar.
9. Pour the water into the jar.
10. Place the aquatic plants and any other greenery you have collected for your ecosystem on top of the water, it's okay if they sink, we just want them near the top.
11. Seal the jar and allow the sediment to settle. The water will clear up as time passes.
12. Place in a sunny window or somewhere it will be exposed to lots of sunlight.
13. Enjoy your ecosystem in a jar!

Note: Be sure to let your ecosystem breathe a couple of times a day for at least 30 minutes for the first couple of weeks. This is the only upkeep it should need. For the marsh specifically, the plants will be using the sunlight to produce oxygen for the waterbugs and microorganisms within the system. The waterbugs and microorganisms will produce carbon dioxide in return for the plants. The mud will contain debris and other nutrients for the microorganisms and the plants.

The equilibrium will not occur right away, just be sure to stay patient.