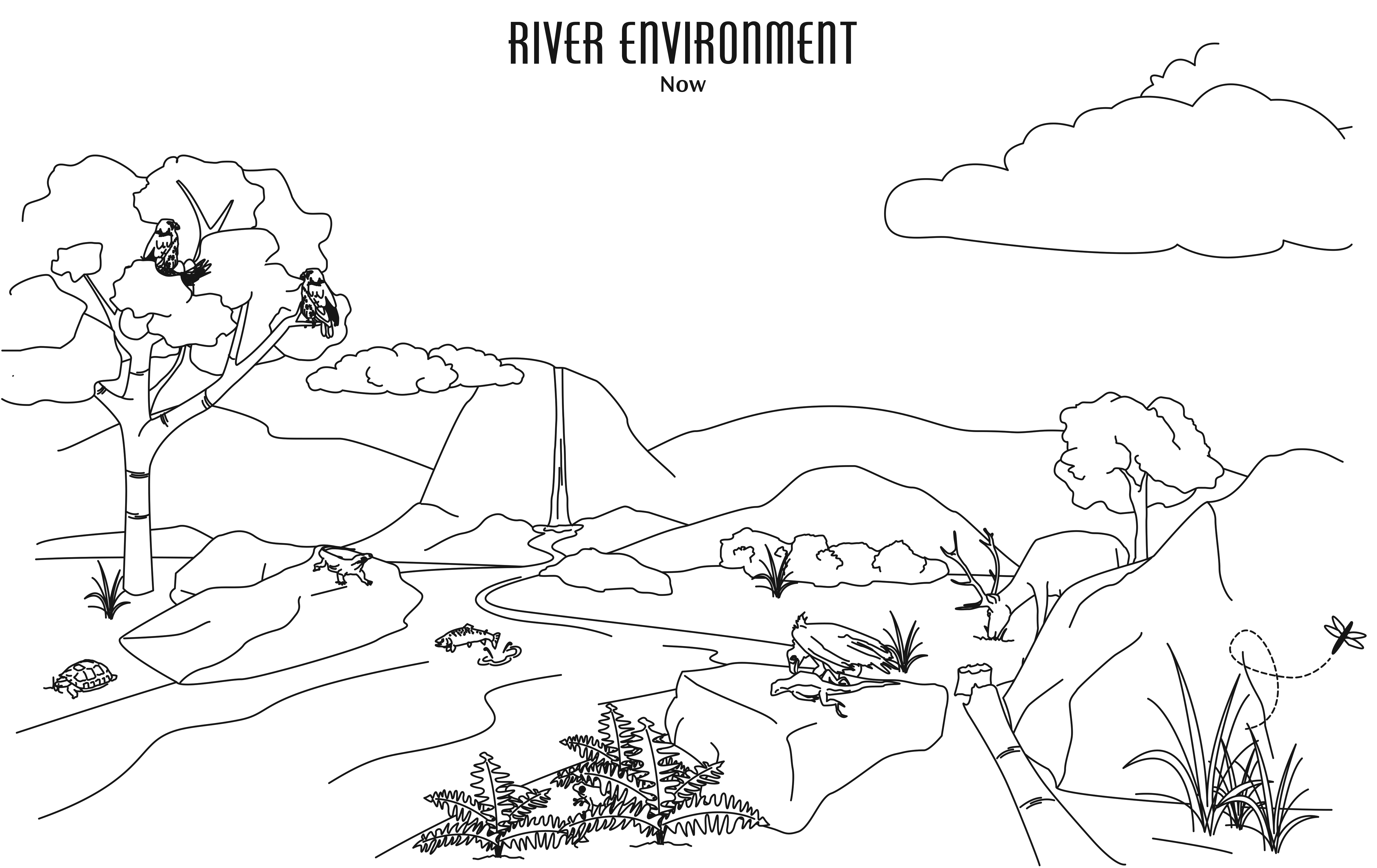
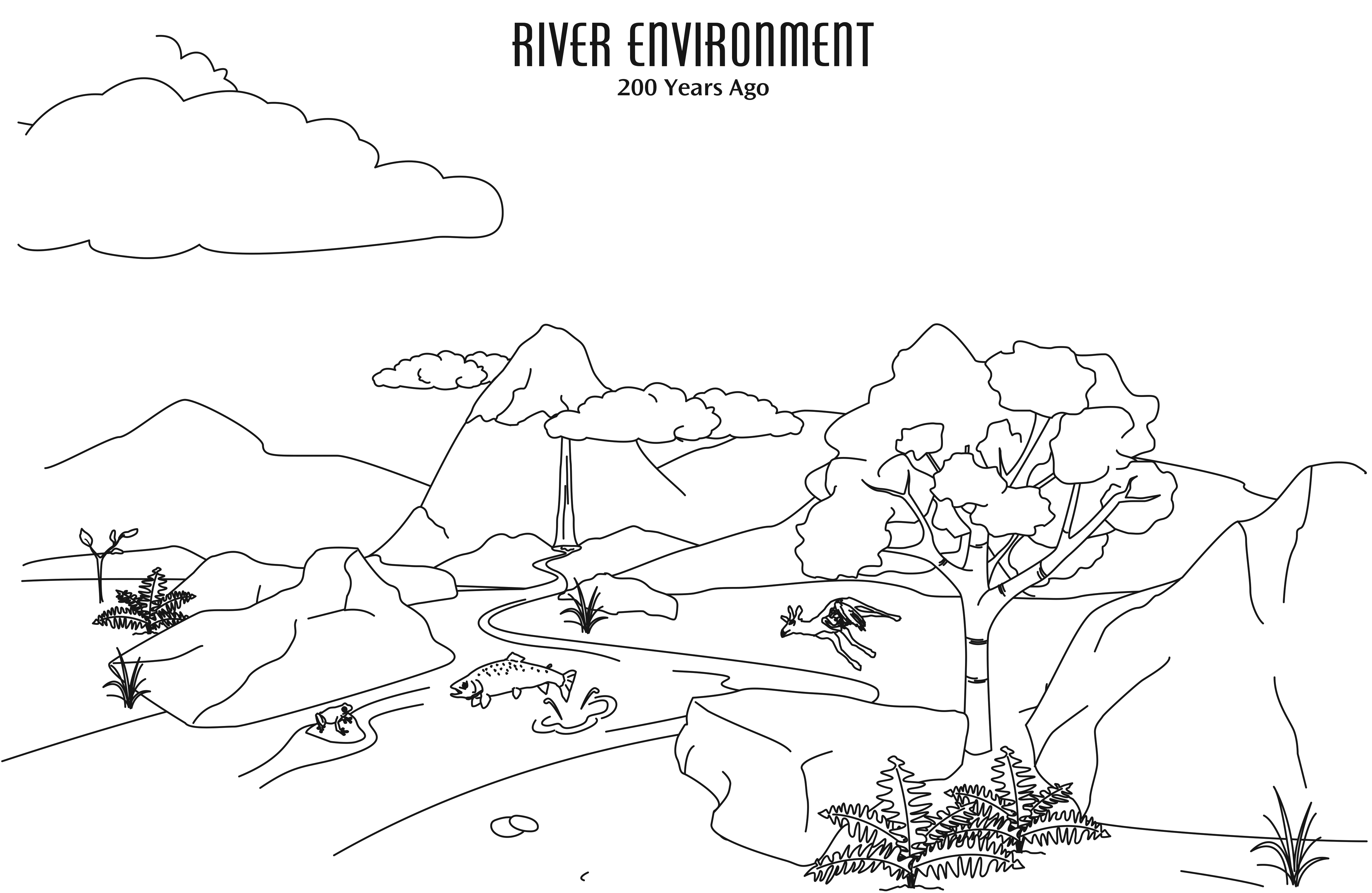
**Unit Essential Question:** *How does energy and matter flow within natural and designed ecosystems?*

**Engage**

In the last task, we saw how some matter is cycled through living parts of the environment. Today we will look at how other matter can cycle through the non-living parts of our environment, specifically through rocks!

Think back to the changes we observed in our river environment below. Find at least two changes in rock formations that occurred over 200 years (Hint: all the land in the environment is made of rock, not just the visible boulders!)



1. **Stability and Change:** In pairs,record any changes you see in rock formation below and explain why you think each change happened:
2. If you were to look at the riverbed 1 year ago instead of 200 years ago, how do you think it might look different? Draw pictures of the riverbed now, 1 year ago, and 200 years ago to show the difference.

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**Explore**

Rock is an important non-living part of our environment and when it appears to go away, as in the pictures above, it doesn’t just disappear! Earth’s matter, like rock, is cycled through the environment. Sometimes it is easier to understand and believe something once you actually see it. Today, you will be modeling how rock formation and cycling works.

**Developing and Using Models:** As a group,use the materials provided and the directions on the resource card to model the way Earth’s materials can cycle through an environment. Record observations in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Process** | **Describe the process in your own words** | **Describe the resulting “rock”** | **Discussion Questions** |
| Weathering |  |  | In real life, wind and water cause weathering and erosion. Based on what you learned in 6th grade, what energy source is ultimately responsible for weather like wind and rain? |
| Sedimentation |  |  | Here we are applying pressure with our fingers. Where do you think this pressure comes from with real rocks? |
| Deformation |  |  | Heat and pressure are very important in the rock cycle. Hypothesize: where do you think this heat comes from in real life? |
| Crystallization |  |  | How is the process of crystallization different from deformation? Which one requires more heat? |

**Stability and Change**: Return to your pictures from the *Engage* about the riverbed now, 1 year ago, and 200 years ago. The processes you just modeled are constantly happening, so why do you think you can see the effects on rocks after 200 years but not after 1 year?

**Unit Essential Question:** *How does energy and matter flow within natural and designed ecosystems?*

**Explain**

You just learned about the rock cycle, which is one way that Earth’s matter cycles through the environment. **Developing and Using Models:** Using what you learned through crayon modeling, individually make a flowchart below that shows how Earth’s matter cycles throughout the environment AND how the flow of energy drives all these processes.

* Draw and label all three types of rock and use arrows to connect them (Hint: arrows can be drawn between multiple types of rock!)
* On each arrow, write the name of the process and write captions to explain how each process works, including what kind of energy drives each process. Below is a list of terms you must include:

|  |  |  |
| --- | --- | --- |
| * Igneous Rock * Sedimentary Rock * Metamorphic Rock * Energy from Sun * Water and Wind | * Weathering * Crystallization * Sedimentation * Deformation * Pressure (from Gravity) | * Cooling * Melting * Erosion/Erodes * Heat and Pressure (from Earth’s Interior) |

**Unit Essential Question:** *How does energy and matter flow within natural and designed ecosystems?*

**Elaborate**

To help you improve your own model, let’s critique a model that has some errors. In pairs,

1. Critique: Analyze the rock cycle model provided by your teacher. Identify and discuss error(s), parts that aren’t clear, or ideas that are missing.
2. Correct: Write on the model provided to make it clearer and more accurate.
3. Clarify: Describe below how and why you corrected the model.

Now return to your own model in the *Explain* section above and make any revisions needed!

**Unit Essential Question:** *How does energy and matter flow within natural and designed ecosystems?*

**Evaluate: Connecting to the Culminating Project**

You have been asked to create a sustainable aquaponics system that mimics the properties of the river environment, including any cycling of matter that occurs through the rock cycle.

Look back at the design sketch for your aquaponics system from Task 1:

* How might cycling of matter come into play in your aquaponics system?
* Describe which process(es) of the rock cycle might occur in your aquaponics system over time.
* What will the effects be on your system?

This should be completed individually in your Project Organizer.

**Unit Essential Question:** *How does energy and matter flow within natural and designed ecosystems?*

**Reflection**

Individually reflect on Task 4, using the questions provided:

1. At the beginning of this task, you were asked to identify changes in rock formations of the river environment and make hypotheses as to why they happened. Look back at your hypotheses: after exploring the rock cycle today, how would you change or add to your response? Use evidence from the task to justify your changes or additions and record below.
2. In this task, we focused on the crosscutting concept of:
   * **Stability and Change**: Stability and change can be explained by looking at changes over time and at different scales.

Where did you see examples of **Stability and Change** in this task?

1. Now that you have learned more about how rocks also cycle matter in ecosystems, what questions do you still have?