Module 4.3

Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems?

CT Science Framework Topics

Science Content Standard 4.3	*CMT Expected Performances*
1. Water is continuously moving between Earth's surface and the atmosphere in a process called the water cycle. Water evaporates from the surface of the earth, rises into the air and cools, condenses, collects in clouds, and falls again to the surface as precipitation. The energy that causes the water cycle comes from the sun. 2. Most precipitation that falls to Earth goes directly into oceans. Some precipitation falls on land and accumulates in lakes and ponds or moves across the land. Rain or snowmelt in high elevations flows downhill in many streams which collect in lower elevations to form a river that flows downhill to an ocean. 3. Water moving across the earth in streams and rivers pushes along soil and breaks down pieces of rock in a process called erosion. The moving water carries away rock and soil from some areas and deposits them in other areas, creating new landforms or changing the course of a stream or river. 4. The amount of erosion in an area, and the type of earth material that is moved, are affected by the amount of moving water, the speed of the moving water, and by how much vegetation covers the area. 5. Rivers carve out valleys as they move between mountains or hills. The speed of the river's flow depends on the slope of the land. The speed of the river's flow affects the shape of the river's course (straight or meandering), the shape of the valleys it carves (u-shaped or v-shaped) and the amount of earth material that is pushed along or left behind in floodplains and deltas. 6. Water moving in ocean waves carries sand, shells and debris away from some coastal areas and deposits them in new areas, changing the shape of the coastline. 7. Erosion is constantly reshaping the earth's land surface. Sometimes the effects of erosion are immediate (for example, a flash flood or a hurricane) and sometimes the effects of erosion take a long time (for example, the changing course of a river or the carving of the Grand Canyon).	**B 12.** Describe how the sun's energy impacts the water cycle. Lesson 4.3.1 Evaporation Lesson 4.3.2 Condensation Lesson 4.3.3 Precipitation **B 13.** Describe the role of water in erosion and river formation. Lesson 4.3.4 Groundwater Lesson 4.3.5 Moving Water Lesson 4.3.6 Soil Erosion Lesson 4.3.7 Deposition **OPTIONAL STC KIT: LAND/WATER**

NH-Greater New Haven Science Collaborative in Earth & Physical Science

Module 4.3 Energy in the Earth's Systems

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Glossary

Absorption
Cloud – water droplets present in the atmosphere
Condensation – the process by which a gas is turned into a liquid – it involves the loss of energy
Convection
Delta
Erosion
Evaporation – the process by which a liquid is turned into a gas – it involves the addition of energy
Floodplain
Humidity – the amount of water vapor in the air
Hypothesis
Precipitation – liquid or frozen water that falls to the Earth's surface from clouds
Rain – precipitation in the form of liquid water
Snow – precipitation in the form of frozen water
Sublimation
Sun
Transpiration
Valley
Water cycle
Water vapor – water in the form of a gas

Inquiry Lesson 4.3.1 Evaporation

Content Standard	Expected Performance
♦ Water is continuously moving between Earth's surface and the atmosphere in a process called the water cycle. Water evaporates from the surface of the earth, rises into the air and cools, condenses, collects in clouds, and falls again to the surface as precipitation. The energy that causes the water cycle comes from the sun.	**B 12.** Describe how the sun's energy impacts the water cycle. Lesson 4.3.1 Evaporation

Science Materials: Smooth slate tiles, dish sponges (the ones with varying size holes in them), water

Student Handout 4.3.1 – Clouds

Vocabulary: Water vapor, evaporation, condensation, cloud

Inquiry: In this exercise, students will investigate the process of evaporation and the role it plays in the larger water cycle of the Earth.

Procedures and Directions: Review the concepts covered in the literacy handouts.

Science Concepts: The water cycle is one of the most important global cycles. The water cycle unites the solid Earth, the atmosphere, and the oceans. Every living thing is part of the water cycle. When the Earth first formed there was no water on the planet – it was too hot. Over time, as the Earth cooled, water present in the atmosphere as water vapor (from the outgassing of volcanoes and from meteorites) cooled enough to form water droplets which rained down upon the Earth. This water accumulated in low spots on the Earth and formed the Earth's first rivers, lakes, and oceans. The main driving force behind evaporation is heat energy from the Sun. Thus, places receiving a large amount of solar energy – e.g. sub-tropical regions & deserts – will have some of the highest evaporation rates on the Earth.

Student Exercise 4.3.1 Where Did the Water Go?

Purpose: To investigate how heat from the Sun (solar energy) drives the Earth's water cycle.

Materials: For each group – one wet sponge

- one smooth slate tile
- one flashlight or other light source
- pencil
- paper

Methods:

1. Place the slate tile in front of you on the desk.
2. Using the sponge, carefully wet the entire surface of the tile.
3. Observe the water on the tile – write down your observations in the boxes marked 0 Minutes.
4. Turn on the flashlight and shine it on a part of the wet tile.
5. After five minutes have passed observe what is happening to the water on the tile beneath the flashlight beam. Write down your observations on the data sheet.
6. Look at the part of the tile not lit up by the flashlight. Observe what has happened to the water on that side of the tile. Write down your observations on the data sheet.
7. Wait another five minutes and observe what has happened to the water on the tile under the light. Write down your observations.
8. Check on the unlit side of the tile. Observe what has happened to the water on the tile. Write down your observations on the data sheet.
9. Turn off the flashlight.

Data Sheet:

Treatment	0 Minutes	5 Minutes	10 Minutes
Light			
No Light			

Discussion

1. What differences, if any, did you notice between the part of the tile that was lit by the flashlight and the part of the tile that was not lit by the flashlight? _____

2. Based on your laboratory observations, what role do you think the Sun plays in the evaporation of water from the Earth? _____

Conclusion (Based on your observations, make a statement about the relationship between temperature and the evaporation of water.)

Inquiry Lesson 4.3.2 Condensation

Content Standard	Expected Performance
♦ Water is continuously moving between Earth's surface and the atmosphere in a process called the water cycle. Water evaporates from the surface of the earth, rises into the air and cools, condenses, collects in clouds, and falls again to the surface as precipitation. The energy that causes the water cycle comes from the sun.	**B 12.** Describe how the sun's energy impacts the water cycle. Lesson 4.3.2 Condensation

Science Materials: Glass jar with metal cover, ice cubes, paper towels

Student Handout 4.3.1 – Clouds

Vocabulary: Water vapor, evaporation, condensation, cloud

Inquiry: In this exercise, students will investigate the process of condensation and the role it plays in cloud formation and in the Earth's water cycle.

Procedures and Directions: Review the concepts covered in the literacy handouts.

Science Concepts: As gaseous water molecules rises in the atmosphere they encounters cooler air than at the Earth's surface. The water molecules lose energy and slow down. They are no longer moving rapidly enough to stay in a gaseous state. Instead, they change state to a liquid. Scientists call this process condensation. When enough condensed water vapor accumulates in one spot in the atmosphere, that part of the air becomes saturated with water vapor – meaning, it cannot hold any more water. The water then falls back to the Earth, in the form of rain – or, if it is cold enough, sleet or snow.

Student Experiment 4.3.2 Where Does the Water Come From?

Purpose: To investigate how temperature affects the condensation of water vapor.

Materials: For each group – one glass jar with metal cover

- Ice cubes
- pencil
- paper towels
- paper

Methods:

1. Observe the outside of the glass jar – write down your observations.
2. Place three ice cubes in a glass jar and cover the jar.
3. Wipe the outside of the jar dry with a paper towel.
4. Observe the outside of the jar – write down your observations on your data sheet.
5. Wait 5 minutes and observe the outside of the jar. Write down your observations on your data sheet.
6. Wipe the outside of the jar dry with a paper towel again.
7. Carefully pick up the jar and exhale on it. What do you observe on the outside of the jar? Write your observations down on your data sheet.
8. Wipe the outside of your jar dry.

Data Sheet:

Condition	Observations
No Ice in Jar	
3 Ice Cubes on Inside of Jar	
Exhaled on Outside of Jar	

Discussion:

1. Did any conditions produce the same effect? Which ones? _____

2. Did any conditions produce different effects? Which ones? _____

3. What do you think caused the differences you observed?

Conclusion: (Based on your observations, make a statement about the relationship between temperature and water vapor condensation.)

Inquiry Lesson 4.3.3 Precipitation

Content Standard	Expected Performance
♦ Water is continuously moving between Earth's surface and the atmosphere in a process called the water cycle. Water evaporates from the surface of the earth, rises into the air and cools, condenses, collects in clouds, and falls again to the surface as precipitation. The energy that causes the water cycle comes from the sun.	**B 12.** Describe how the sun's energy impacts the water cycle. Lesson 4.3.3 Precipitation

Science Materials: glass jars with metal covers, sponges, water, plastic cups marked in milliliters, pencils, paper

Student Handout 4.3.3 – Precipitation

Vocabulary: Water vapor, evaporation, condensation, precipitation, rain, sleet, snow, hail, saturation, humidity

Inquiry: In this exercise, students will investigate the processes of evaporation, condensation, and precipitation and their role in the larger water cycle of the Earth.

Procedures and Directions: Review the concepts covered in the previous two exercises and in the literacy handouts.

Science Concepts: Water constantly cycles on the Earth. The primary processes involved in the water cycles are evaporation, condensation and precipitation. The heat energy for these processes comes directly and indirectly from the Sun. Humidity is the measure of the amount of water vapor in the atmosphere. A humidity reading of 100 % means that the air packet has become saturated with water. When something becomes saturated it means that it cannot hold anymore. Therefore, saturated air cannot hold any more water vapor. When air becomes saturated with respect to water vapor, the air cannot hold any more water and it begins to rain (or snow, if the air temperature is cold enough).

Student Experiment 4.3.3 Why Isn't It Raining In Here?

Purpose: To investigate how air saturation relates to precipitation.

Materials: For each group – one glass jar with metal cover

- Sponge
- Water
- Plastic cup marked in milliliters
- pencil
- paper

Methods:

1. Place the dry sponge on top of the open jar. Observe how much water is present in the jar. Observe how wet the sponge is. Write down your observations.
2. Fill the cup with water up to the 100 ml mark.
3. Carefully pour 10 ml of water onto the sponge. Wait 1 minute. Observe how much water is present in the jar. Observe how wet the sponge appears. Write down your observations.
4. Carefully pour another 10 ml of water onto the sponge. Wait 1 minute. Observe how much water is present in the jar. Observe how wet the sponge appears. Write down your observations.
5. Repeat Step 4 until it begins to consistently "rain" in your jar.
6. Note how much water is left in the plastic cup. Write the amount down on your data sheet.

Data Sheet:

Amount of Water Poured Onto Sponge	**Observations**
O ml	
10 ml	
20 ml	
30 ml	
40 ml	
50 ml	
60 ml	
70 ml	
80 ml	
90 ml	
100 ml	

Discussion:

1. How much water did it take before you sponge “cloud” started to rain ? _____

2. If the sponge represents the atmosphere and the water represents water vapor present in the atmosphere, what is the relationships between the amount of water vapor in the atmosphere and precipitation?_____

Conclusion: (Based on your observations, make a statement about the relationship between air saturation and precipitation.)

Inquiry Lesson 4.3.4 Groundwater

Content Standard	Expected Performance
♦ Most precipitation that falls to Earth goes directly into oceans. Some precipitation falls on land and accumulates in lakes and ponds or moves across the land. Rain or snowmelt in high elevations flows downhill in many streams which collect in lower elevations to form a river that flows downhill to an ocean. ♦ Water moving across the earth in streams and rivers pushes along soil and breaks down pieces of rock in a process called erosion. The moving water carries away rock and soil from some areas and deposits them in other areas, creating new landforms or changing the course of a stream or river. ♦ The amount of erosion in an area, and the type of earth material that is moved, are affected by the amount of moving water, the speed of the moving water, and by how much vegetation covers the area. ♦ Rivers carve out valleys as they move between mountains or hills. The speed of the river's flow depends on the slope of the land. The speed of the river's flow affects the shape of the river's course (straight or meandering), the shape of the valleys it carves (u-shaped or v-shaped) and the amount of earth material that is pushed along or left behind in floodplains and deltas. ♦ Water moving in ocean waves carries sand, shells and debris away from some coastal areas and deposits them in new areas, changing the shape of the coastline. ♦ Erosion is constantly reshaping the earth's land surface. Sometimes the effects of erosion are immediate (for example, a flash flood or a hurricane) and sometimes the effects of erosion take a long time (for example, the changing course of a river or the carving of the Grand Canyon).	**B 13.** Describe the role of water in erosion and river formation. Lesson 4.3.4 Groundwater

Science Materials: Stream table kit (plastic container, plastic cup, different soil materials, lid, gloves, funnel), damp play sand, funnels, blue-colored water (made from food coloring), spray bottles filled with orange colored water, pencils, paper

Student Handout 4.3.4 Groundwater

Vocabulary: Groundwater, water table, artesian spring

Inquiry: In this exercise, students will investigate the processes of groundwater formation and flow and their relationships to the Earth's water cycle.

Procedures and Directions: Review the concepts covered in the previous inquiry experiments and in the literacy handout for today's lesson.

Science Concepts: The water cycle is one of the most important global cycles. Up until now the lessons have focused on the processes governing water transfer between the Earth's surface and the atmosphere. Another extremely important part of the water cycle, however, occurs far away from the atmosphere – it occurs beneath the ground. A portion of all the water that falls to the Earth as precipitation or is present in rivers, lakes, and oceans enters into the ground through soils and cracks in rocks. This water moves through the spaces between sediments and travels underground, sometimes accumulating in underground streams and rivers. All groundwater eventually finds its way into lakes, rivers, and, ultimately, oceans. Groundwater is very important – it provides drinking water for the majority of people on the Earth!

Student Experiment 4.3.4. Vanishing Water ?

Purpose: To investigate how groundwater forms and where it flows.

Materials: For each group – one stream table kit (plastic container, plastic cup, different soil materials, lid, gloves, funnel)

- Damp Sand
- One funnel
- Blue colored water (made from food coloring)
- Spray bottle filled with yellow colored water
- pencil
- paper

Methods:

1. Place newspaper on your work surface. Put on a pair of plastic gloves.
2. Fill ¾ of the plastic container with sand.
3. Push the sand towards one end of the plastic container, forming a large sand wedge. The other end of the plastic container should not have any sand in it.
4. Carefully pour 1 cup of clear water into the end of the plastic container without any sand in it.
5. Gently and evenly spray the surface of the sand five times with water from the spray bottle – observe what happens to the sand surface. Write down your observations in you Stream Table Data Notebook or on your data sheet.
6. Repeat Step 5.
7. Gently and carefully insert a funnel three inches down into the sandy sediments, about 5 inches from the top of the sand wedge.
8. Carefully pour ½ cup of blue colored water into the funnel. Observe the surface of the sediments. Write down your observations. Observe the water at the end of the container. Write down your observations.
9. After five minutes have passed, repeat Step 8.

Discussion:

1. Where did the water that you sprayed on the sand go? What observations helped you to see this? _____

2. Did any of the yellow sprayed water reach the pond at the bottom of the container? Why or why not? _____

3. Where did the blue water go? Did you observe anything that helped you to know this? _____

4. Did any of the blue water reach the pond at the bottom of the container? Why or why not? _____

Conclusion: (Based on your observations, make a statement about groundwater formation and movement.) _____

Inquiry Lesson 4.3.5 Moving Water

Content Standard	Expected Performance
♦ Most precipitation that falls to Earth goes directly into oceans. Some precipitation falls on land and accumulates in lakes and ponds or moves across the land. Rain or snowmelt in high elevations flows downhill in many streams which collect in lower elevations to form a river that flows downhill to an ocean. ♦ Water moving across the earth in streams and rivers pushes along soil and breaks down pieces of rock in a process called erosion. The moving water carries away rock and soil from some areas and deposits them in other areas, creating new landforms or changing the course of a stream or river. ♦ The amount of erosion in an area, and the type of earth material that is moved, are affected by the amount of moving water, the speed of the moving water, and by how much vegetation covers the area. ♦ Rivers carve out valleys as they move between mountains or hills. The speed of the river's flow depends on the slope of the land. The speed of the river's flow affects the shape of the river's course (straight or meandering), the shape of the valleys it carves (u-shaped or v-shaped) and the amount of earth material that is pushed along or left behind in floodplains and deltas. ♦ Water moving in ocean waves carries sand, shells and debris away from some coastal areas and deposits them in new areas, changing the shape of the coastline. ♦ Erosion is constantly reshaping the earth's land surface. Sometimes the effects of erosion are immediate (for example, a flash flood or a hurricane) and sometimes the effects of erosion take a long time (for example, the changing course of a river or the carving of the Grand Canyon).	**B 13.** Describe the role of water in erosion and river formation. Lesson 4.3.5 River Formation

Science Materials:

Student Handout 4.3.5 – Streams & Rivers

Vocabulary:

Inquiry: In this exercise, students will investigate the process of river formation and its relationship to the other parts of the water cycle.

Procedures and Directions: Review the concepts covered in the previous exercises and the literacy handouts.

Science Concepts: Water is an extremely powerful force. While one individual water droplet may not appear very strong, moving water has the ability to literally move mountains. Once precipitation reaches the Earth's surface, it usually does

not stay in one place. A significant amount of it flows over the Earth's surface – as streams and rivers. Moving water is very powerful. The energy contained in moving water can be harnessed and used for good, such as for generating electricity or running water wheels.

Student Experiment 4.3.5. Stream & River Formation

Purpose: To investigate how rivers form and how they flow.

Materials: For each group – one stream table kit (plastic container, plastic cup, different soil materials, lid, gloves, funnel)

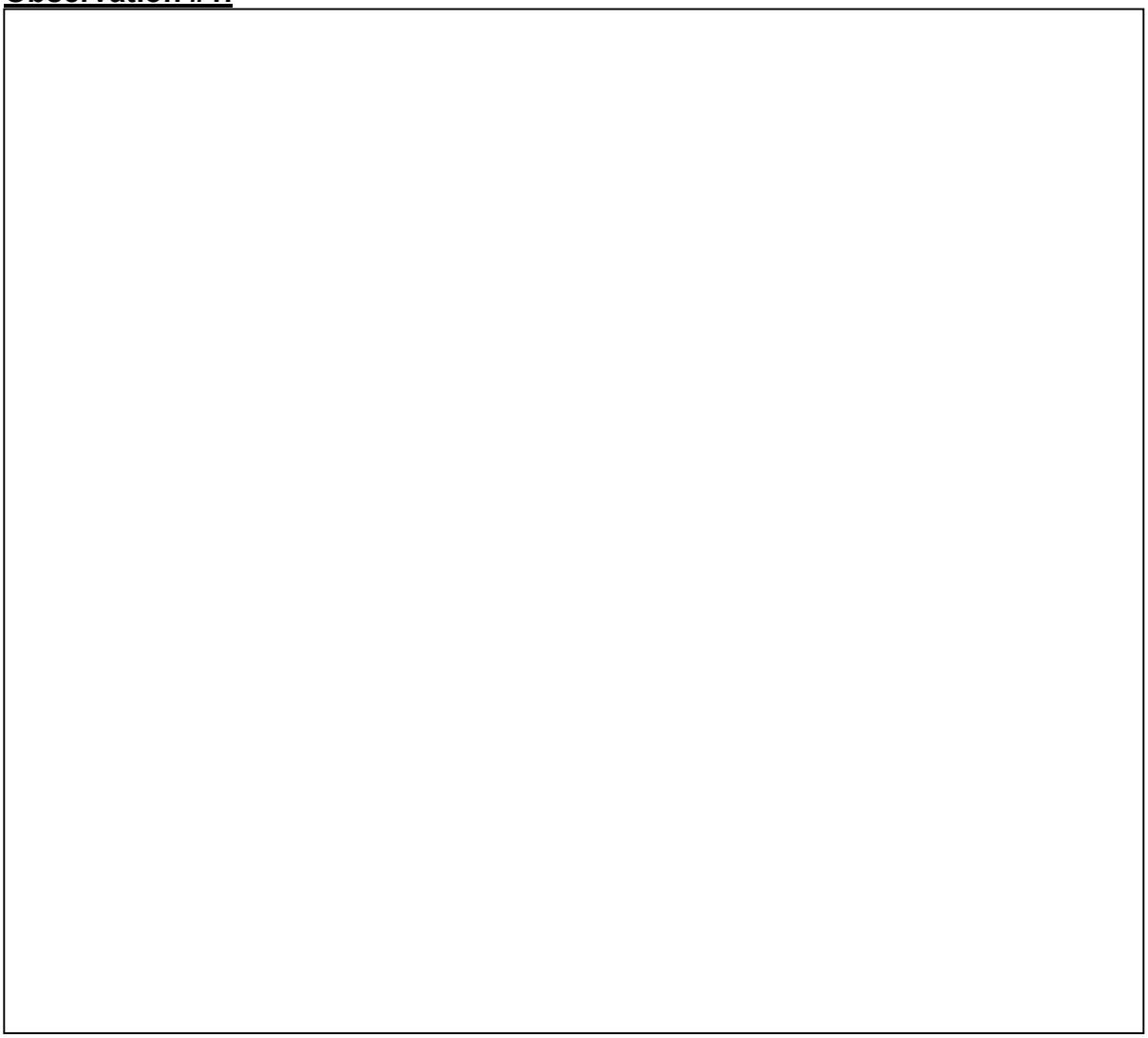
- Damp Sand
- One plastic cup with 3 holes evenly spaced along one side of the bottom of the cup
- One plastic cup without any holes in it
- Red colored water (made from food coloring)
- Blue colored water
- pencil
- paper

Methods:

1. Place newspaper on your work surface. Put on a pair of plastic gloves.
2. Fill ¾ of the plastic container with sand.
3. Push the sand towards one end of the plastic container, forming a large sand wedge with a very gentle slope. The other end of the plastic container should not have any sand in it.
4. Carefully pour 1 cup of blue water into the end of the plastic container without any sand in it.
5. Measure out one cupful of red water into the cup without the holes. Set it aside.
6. Gently and carefully place the cup with the holes in it on the edge of the container above the sand wedge (see diagram). Make sure that the 3 holes are lined up above the sand.
7. With one student holding the 3-hole cup in place, another group member needs to carefully pour the cup of red water into the plastic cup with the holes in it. All group members should observe what happens to the water as it trickles out of the 3-hole cup.
8. Sketch what happens to the water on the data sheet labeled Observation #1.
9. Observe what happens to the blue water at the end of the container. Write down what you see on the data sheet.
10. Wait four minutes after your last observation, then repeat Steps 5-9, sketching your results in the data sheets labeled Observation #2.
11. Carefully sketch the path of your stream onto your data sheet in the box labeled Observation #3.

Data:

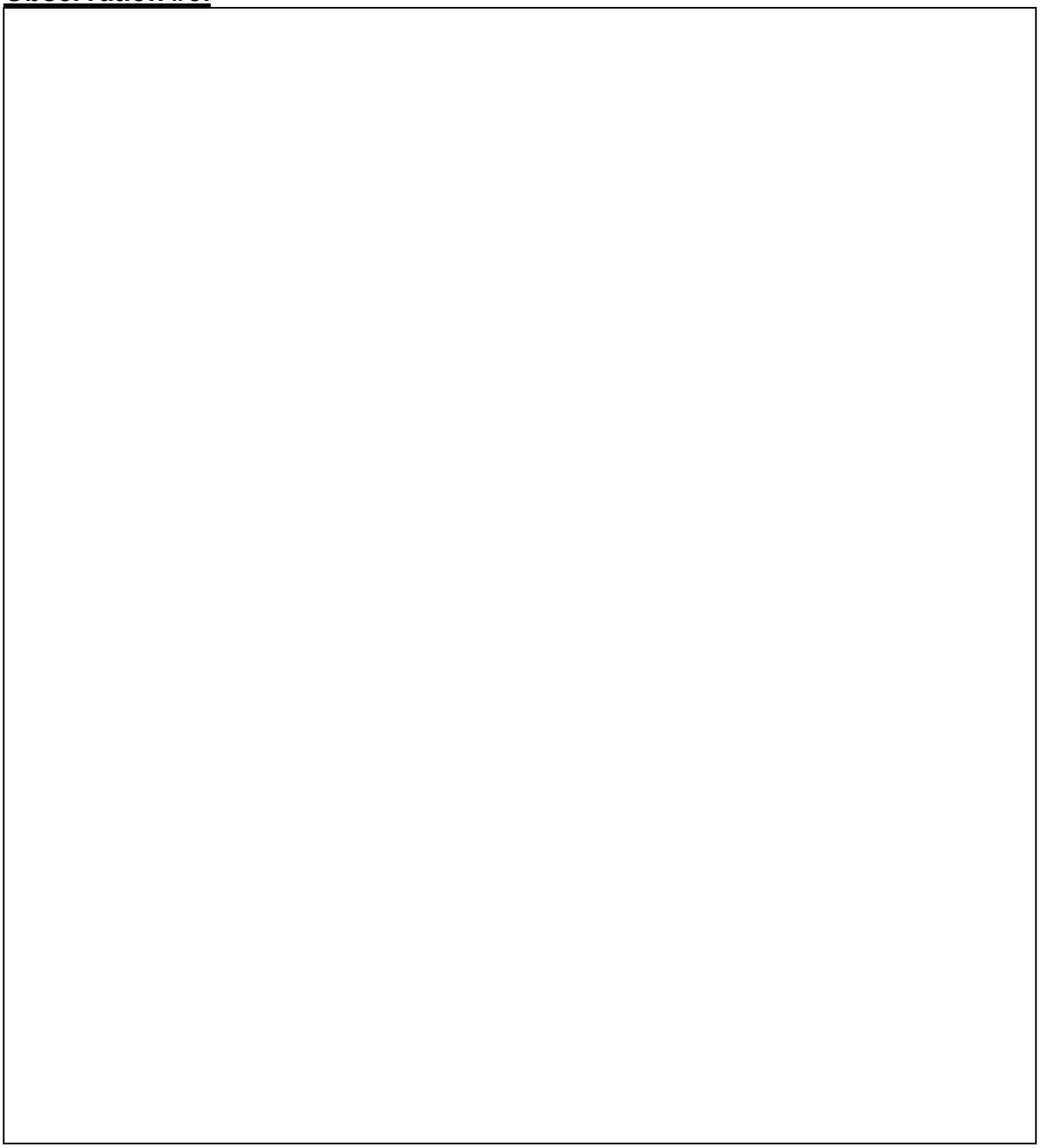
Observation #1.



Water Observation Notes:

Observation #2.

Observation #3.



Discussion:

1.What happened to the water from the cup? _____

2. Did any of the red water reach the blue water at the bottom of the container? Why or why not?_____

3. Did the red water change the sand it was flowing over? If yes, how might this have happened? _____

4. If the red water represents a river and the blue water represents the ocean, how might a river affect the ocean? _____

5. Look carefully at your final sketch of the red river? Did the water flow in a straight line? Did it follow another pattern? What do you think caused it to flow the way it did?_____

Conclusion: (Based on your observations, make a statement about water flow, rivers, and river flow)._____

Inquiry Lesson 4.3.6 Soil Erosion

Content Standard	Expected Performance
♦ Most precipitation that falls to Earth goes directly into oceans. Some precipitation falls on land and accumulates in lakes and ponds or moves across the land. Rain or snowmelt in high elevations flows downhill in many streams which collect in lower elevations to form a river that flows downhill to an ocean. ♦ Water moving across the earth in streams and rivers pushes along soil and breaks down pieces of rock in a process called erosion. The moving water carries away rock and soil from some areas and deposits them in other areas, creating new landforms or changing the course of a stream or river. ♦ The amount of erosion in an area, and the type of earth material that is moved, are affected by the amount of moving water, the speed of the moving water, and by how much vegetation covers the area. ♦ Rivers carve out valleys as they move between mountains or hills. The speed of the river's flow depends on the slope of the land. The speed of the river's flow affects the shape of the river's course (straight or meandering), the shape of the valleys it carves (u-shaped or v-shaped) and the amount of earth material that is pushed along or left behind in floodplains and deltas. ♦ Water moving in ocean waves carries sand, shells and debris away from some coastal areas and deposits them in new areas, changing the shape of the coastline. ♦ Erosion is constantly reshaping the earth's land surface. Sometimes the effects of erosion are immediate (for example, a flash flood or a hurricane) and sometimes the effects of erosion take a long time (for example, the changing course of a river or the carving of the Grand Canyon).	**B 13.** Describe the role of water in erosion and river formation. Lesson 4.3.6 Soil Erosion

Science Materials:

Student Handout 4.3.6 – Erosion

Vocabulary:

Inquiry: In this exercise, students will investigate the process of river formation and its relationship to the other parts of the water cycle.

Procedures and Directions: Review the concepts covered in the previous exercises and the literacy handouts.

Science Concepts: Moving water is very powerful. Depending on the amount of water in motion, as well as the speed with which it is flowing, moving water can move soils, fine sediment particles, sand, rocks, and, even, boulders. Moving

water can destroy houses, farmland, dams, boats, and other things. The movement of soils and sediments by water, ice, or wind is called erosion. Erosion shapes the land around us, creating hills and valleys.

Student Experiment 4.3.6 Erosion Just Keeps Things Moving

Purpose: To investigate how moving water moves sediments.

Materials: For each group – one stream table kit (plastic container, plastic cup, different soil materials, lid, gloves, funnel)

- Damp Sand, topsoil, and gravel
- 2 cups – one with 3 holes and one without holes
- Yellow colored water (made from food coloring)
- Clear water
- pencil
- paper

Methods:

1. Place newspaper on your work surface. Put on a pair of plastic gloves.
2. Fill ¾ of the plastic container with damp sand and make a wedge as you did for the previous experiment.
3. Working with your partners, carefully place a 1" wide gravel layer across your wedge.
4. Working with your partners, carefully layer a 1" wide topsoil layer across your wedge, at least 2 " away from your gravel layer.
5. Carefully pour 1 cup of clear water into the end of the plastic container without any sand in it.
6. Measure out one cupful of yellow water into the cup without the holes. Set it aside.
7. Gently and carefully place the cup with the holes in it on the edge of the container above the sand wedge (see diagram). Make sure that the 3 holes are lined up above the sand.
8. With one student holding the 3-hole cup in place, another group member needs to carefully pour the cup of yellow water into the plastic cup with the holes in it. All group members should observe what happens to the water as it trickles out of the 3-hole cup.
9. What happens to the water as it flows over the sand? Write your observations down in the chart on the data sheet.
10. What happens to the water as it flows over the gravel? Write your observations down in the chart on the data sheet.
11. What happens to the water as it flows over the topsoil? Write your observations down in the chart on the data sheet.
12. Observe what happens to the clear water at the end of the container. Write down what you see in the chart on the data sheet.
13. Carefully sketch the path of your stream onto your data sheet in the box labeled Stream Path Observation.

Data Sheet:

#1. Data Chart: Sediment & Water Observations

	Water Over Sand	Water Over Gravel	Water Over Topsoil	Clear Water at Bottom of Container
My Notes				

#2. Stream Path Observation Sketch:

Discussion:

1. What happened when the water flowed over the sand? _____

2. Did any of the yellow sprayed water reach the pond at the bottom of the container? Why or why not? _____

3. Where did the blue water go? Did you observe anything that helped you to know this? _____

4. Did any of the blue water reach the pond at the bottom of the container? Why or why not? _____

Conclusion: (Based on your observations, make a statement about groundwater formation and movement.) _____

Inquiry Lesson 4.3.7 Deposition

Content Standard	Expected Performance
♦ Most precipitation that falls to Earth goes directly into oceans. Some precipitation falls on land and accumulates in lakes and ponds or moves across the land. Rain or snowmelt in high elevations flows downhill in many streams which collect in lower elevations to form a river that flows downhill to an ocean. ♦ Water moving across the earth in streams and rivers pushes along soil and breaks down pieces of rock in a process called erosion. The moving water carries away rock and soil from some areas and deposits them in other areas, creating new landforms or changing the course of a stream or river. ♦ The amount of erosion in an area, and the type of earth material that is moved, are affected by the amount of moving water, the speed of the moving water, and by how much vegetation covers the area. ♦ Rivers carve out valleys as they move between mountains or hills. The speed of the river's flow depends on the slope of the land. The speed of the river's flow affects the shape of the river's course (straight or meandering), the shape of the valleys it carves (u-shaped or v-shaped) and the amount of earth material that is pushed along or left behind in floodplains and deltas. ♦ Water moving in ocean waves carries sand, shells and debris away from some coastal areas and deposits them in new areas, changing the shape of the coastline. ♦ Erosion is constantly reshaping the earth's land surface. Sometimes the effects of erosion are immediate (for example, a flash flood or a hurricane) and sometimes the effects of erosion take a long time (for example, the changing course of a river or the carving of the Grand Canyon).	**B 13.** Describe the role of water in erosion and river formation. Lesson 4.3.7 Soil Deposition

Science Materials:

Student Handout 4.3.7 – Soil Deposition

Vocabulary:

Inquiry: In this exercise, students will investigate the process of river formation and its relationship to the other parts of the water cycle.

Procedures and Directions: Review the concepts covered in the previous exercises and the literacy handouts.

Science Concepts: Water is an extremely powerful force. While one individual water droplet may not appear very strong, moving water has the ability to literally

move mountains. Once precipitation reaches the Earth's surface, it usually does not stay in one place. A significant amount of it flows over the Earth's surface – as streams and rivers. Moving water is very powerful. Depending on the amount of water in motion, as well as the speed with which it is flowing, moving water can move soils, fine sediment particles, sand, rocks, and, even, boulders. Moving water can destroy houses, farmland, dams, boats, and other things. The energy contained in moving water, however, also can be harnessed and used for good. Moving water is used to generate electricity.

Student Experiment 4.3.7 Soil Deposition

Purpose: To investigate how rivers form and how they flow.

Materials: For each group – one stream table kit (plastic container, plastic cup, different soil materials, lid, gloves, funnel)

- Damp Sand
- One funnel
- Blue colored water (made from food coloring)
- Spray bottle filled with yellow colored water
- pencil
- paper

Methods:

1. Place newspaper on your work surface. Put on a pair of plastic gloves.
2. Fill ¾ of the plastic container with sand.
3. Push the sand towards one end of the plastic container, forming a large sand wedge. The other end of the plastic container should not have any sand in it.
4. Carefully pour 1 cup of clear water into the end of the plastic container without any sand in it.
5. Gently and evenly spray the surface of the sand five times with water from the spray bottle – observe what happens to the sand surface. Write down your observations in you Stream Table Data Notebook or on your data sheet.
6. Repeat Step 5.
7. Gently and carefully insert a funnel three inches down into the sandy sediments, about 5 inches from the top of the sand wedge.
8. Carefully pour ½ cup of blue colored water into the funnel. Observe the surface of the sediments. Write down your observations. Observe the water at the end of the container. Write down your observations.
9. After five minutes have passed, repeat Step 8.

Discussion:

1. Where did the water that you sprayed on the sand go? What observations helped you to see this? _____

2. Did any of the yellow sprayed water reach the pond at the bottom of the container? Why or why not? _____

3. Where did the blue water go? Did you observe anything that helped you to know this? _____

4. Did any of the blue water reach the pond at the bottom of the container? Why or why not? _____

Conclusion: (Based on your observations, make a statement about groundwater formation and movement.) _____