5E Lesson Plan

Center: The River Center

Program Name: Sea Urchin Lab

Date Offered: Year-round

Subject / Grade level: Science / K-1

Materials:

Teacher

Warm water
1/3 cup of salt
Blue food coloring
Container
Paint brushes
Book about ocean animals, adaptations, or senses

Student

White paper
Crayons
Pencils

Benchmark:

SC.K.L.14.3, SC.K.N.1.1, SC.K.N.1.2, SC.K.N.1.3, SC.K.N.1.4, SC.K.N.1.5, SC.1.L.14.1, SC.1.L.17.1, SC.1.N.1.1, SC.1.N.1.2, SC.1.N.1.3, SC.1.N.1.4, LAFS.K.SL.1.1, LAFS.K.SL.2.5, LAFS.1.SL.1.1, LAFS.1.SL.2.5, MAFS.K.MD.1.2, MAFS.K.G.2.5

Vocabulary:

River, estuary, ocean, radial symmetry, experiment, observation, Phylum, Echinodermata, spines, tube feet, invertebrate, exoskeleton, camouflage, sea urchin, regenerate, brackish water, saltwater, freshwater, seagrass, variegated, habitat, microhabitat, organism

Lesson Target:

I can explain the core concepts of the scientific method.
I can do observation driven experiments.
I can explain how sea urchins survive in their environment.
I can compare aquatic species and their adaptations.

Differentiation strategies to meet diverse learner needs:

- Hands-on instruction
- Tutor/Peer Buddy activities
- Use of visuals
- Hands-on activities
- Modification of text or curriculum
- Relate topics to everyday life

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Background:
You could call sea urchins the porcupines of the sea. Like a porcupine's quills, sea urchins count on their spines to deter hungry predators from making them a snack. You can pick up most sea urchins without getting harmed, except for the long-spined sea urchin found in south Florida.

Sea urchins belong to the phylum Echinodermata which is the same group as sea stars, sand dollars, and sea cucumbers. Although difficult to see through all the spines, sea urchins also have a hard-outer body like that of its relatives. Their exoskeleton, called a test, is made up of ten fused plates that encircle the sea urchin like the slices of an orange. Every other section has holes through which the sea urchin can extend its tubed feet. These feet are controlled by a water vascular system. By changing the amount of water inside, the animal can extend or contract the feet to move about. Sea stars move around the same way.

Sea urchins eat using a structure called Aristotle's lantern. It is made up of five hard plates that come together like a beak. They use their beak-like mouth to scrape rocks clean of algae. This scraping can wear down the plates therefore sea urchin teeth continually replace worn-down ones. Their mouth is located on the underside of their body, while their anus is located at the top of the animal.

Engage: (activity to be completed prior to River Center field trip)

1. Read books about ocean animals, adaptations, or senses.
2. Select a site on your schoolyard with many similar microhabitats.
3. Discuss with the students that they will use their senses to perceive the environment and become aware that the way humans see the environment differs from the way other animals perceive the environment.
4. Review the five senses with your students. Ask students to give examples of how the information we perceive using our senses helps us survive in the world (smelling smoke alerts us of fire, hearing thunder alerts us of lightening, etc.)

Engagement Activity:

1. Have the students sit in small groups around your chosen site. Ask them to use their senses to make as many observations as they can. Allow 2-3 minutes of silence to complete this observation activity.
2. Next, have the students sit away from the site and have them share their observations with the teacher and their small group (what they smell, saw, heard, etc.). Then, ask them what their observations told them about the conditions (ex. Would they want to be there on a hot sunny day? A rainy day? A cold windy day? Why or why not?)
3. Have the student turn back around and re-observe the site, see if new observations occur.
4. Each student will role-play as an organism.
5. Each student should describe to their small group what it would be like to be their “organism”, how does it move, find food and water, avoids danger, etc. Encourage students to act out their role and view the environment from the perspective of their role-playing organism.

Engagement Reflection:

1. Ask individual students to describe what the environment was like from their organism’s perspective.
2. Conduct a whole-class discussion comparing and contrasting the perspectives of the different organisms even though they live in the same place. Be sure to stress that different people might have different perceptions based on their own observations, but there is no right and wrong.

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Explore: (activity to be completed during River Center visit with staff)

1. Welcome, introduction to the River Center, overview of today's field trip, and safety/rules talk
2. Divide the students into 2 groups to rotate through 3 different activities
    a. Lovin' the Loxahatchee River Tour–focusing on animal adaptations and habitats.
    b. Sea Urchin Lab hands-on activity (See below)
    c. Water resources and conservation discussion–Where does our water comes from? How do we use water? Where it goes once it is down the drain?
3. Touch tank demonstration

Explain: (activity to be completed during River Center visit with staff)

1. Students with participate in an activity to learn how sea urchins survive in their environment, comparing them to other echinoderms and aquatic species. Students will also understand the adaptations necessary for sea urchins to survive. They will also be introduced to the scientific method.
2. Students will be divided into teams of 4 or 5, one group per table with a bowl of saltwater, a variegated sea urchin, paper/worksheets, and pencils.
3. Students will be scientists making predictions, performing experiments, making observations, recording their findings, and sharing their findings with other teams.

Elaborate: (activity to be completed after River Center field trip)
Have your students draw an ocean scene using crayons on white paper. Combine one cup warm water, 1/3 cup of table salt, and blue food coloring. Have children use the solution to paint a wash over the completed drawings. The water will evaporate, leaving a blue background and sparkly salt crystals.

Evaluate:

1. Participation in the activity.
2. Grade assessment in the Engage and Elaborate lessons.
3. Choose an animal that you saw at the River Center to be your "organism."
    a. What would it be like to be your "organism"?
    b. How do you move, find food and water, avoid danger, etc.?
    c. Act out your organism's behavior.

Making STEM Connections:
Science: See standards above.
Technology: See activity below.
Engineering: See activity below.
Mathematics: See standards above.

Do some research on Florida coral reefs, seagrass, mangroves, and other habitats that sea urchins can live in. Once they have completed their research have them choose a habitat and create a piece of art, paper slide show, puppet show, movie, poem, or other art of their choice to represent their chosen habitat. Once the habitats are complete have the students explain why they chose that habitat for their echinoderms.

OR…

Assign an Echinoderm (sea urchin, sea star, sea cucumber, sand dollar, sea biscuit, etc.) for each student and design and build their animal in its habitat. They can use Playdough, Legos, construction paper, or other design materials. They can use the worksheet from the field trip as a guide.

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Making Loxahatchee River District Connections:

- Water supply – Poor water quality and harm echinoderms or their food supply and habitat.
- Solid waste – Marine debris is harmful to sea urchins and sea cucumbers. Many are detritus eaters where they consume any items, including marine debris, found on the bottom of the ocean, reef, or estuary.

Making River Center Exhibit Connections:

- Touch tank demonstration