WVPT Virginia's Public Television	**All We Need Is a Yellow Submarine!** Melody Moats Highland County Public Schools	SVTC edtech

Topic: ocean life, pressure, salinity, temperature, science, oceans

Overview

This lesson will introduce students to the physical characteristics of the ocean through video and web sources. At the end of the lesson students will be able to explain differences in salinity, temperature, pressure, and life in the different levels of the ocean and how the ocean has been explored.

Grades 3-5

Time Allotment

Two 40-minute periods and two 30-minute computer lab periods

Learning Objectives

On completion of this lesson students will be able to:

- Compare the salinity of the ocean at the surface and bottom
- Describe how the pressure changes as depth increases
- Discuss how man has been able to explore the ocean
- Plan and create, in collaborative groups, a travel brochure that summarizes material from the lesson
- Research information using websites

This lesson addresses Va. Science SOLs 4.5, 5.6, Computer/Technology SOLs 5.2, 5.4, English SOLs 5.4, 5.6, 5.7, 5.8.

Media Components

- TV with remote control
- Computer with projection device
- Computers with Internet connection
- Video Clips: All obtained from web at: http://va.unitedstreaming.com.
  Destination Space. United Learning, 2000. 14 Dec. 2004. Segment: Space-What's Coming Next? (01:26).
  GeoScientists: Diving Deep. United Learning, 1999. 14 Dec. 2004. Segments: Journey to the Bottom (01:08)and Full Speed Ahead: Diving in the Submersible (03:01).
  Oceans: Earth's Last Frontier. Rainbow Educational Media, 1995. 14 Dec. 2004. Segments: Salt Water (02:11) and Benthos, Nekton, Plankton (03:41).
  Ocean's Alive: The Deep. Environmental Media, 1990. 14 Dec. 2004. Segments: Welcome to the Ocean Floor (01:05) and Exploring the Depths (03:34). **Note:** If the teacher wants to download the clips in the order used, check the lesson to determine the order.
- Websites for use as reinforcement:
  The Sea www.seasky.org/sea.html
  NOAA's Ark www.photolib.noaa.gov/nurp

Materials and Student Handouts

- Temperature Activity: ice cubes, 2 battery jars, salt, thermometer, stirring rod (1 set of materials for teacher demonstration)
- Salinity Activity (Floating the potato): 2 quart jars of water a little less than half full, 8 tablespoons of salt, food coloring, teaspoon, potato slice (1 set of materials for groups of 3)
- Chart paper or chalkboard space
- Construction paper 11x 18 (1 for each group of 3)
- Grading rubric for brochure (attached – 1 for each group of 3)
- Student Handouts: (all attached)
  Oceans Travel Brochure Note Taking and Planning Sheet (individual)
  Salinity Activity Sheet (1 for each group of 3)
  Website Sheet (individual)
  Making a Travel Brochure (1 for each group of 3)

Teacher Preparations

- Bookmark or PortaPortal websites:
  The Sea www.seasky.org/sea.html
  NOAA's Ark www.photolib.noaa.gov/nurp
- Photocopy student handouts
- Organize students into cooperative groups of 3
- Download video clips
- Organize materials for activities in advance
- Test website
- Have disks for each cooperative group to store projects

Introductory Activities

Day 1

1. Focus: Today we are going to talk about being an explorer, discovering new things, going where man has never gone before. Can you think of any people who would be considered an explorer? Why?

Space – is it man's final frontier? Are there places on Earth that man hasn't explored? What about the ocean? Let's travel with the astronauts and look at this video and think of ways that exploring space might be like exploring the ocean.

Play: video clip from United Streaming program Destination Space: Space – What's Coming Next? (01:26)

Pause/Stop: at the end of the clip.

Follow-up: Now let's find out about the things that man must overcome to travel into space. What makes us want to travel into outer space? How might space travel be like ocean exploration?

2. Focus: We have talked about how space and ocean travel might be alike.
How is exploring space different from exploring the ocean?

Play: video clip from United Streaming program GeoScientists: Diving – Journey to the Bottom (01:08)
Pause/Stop: at the end of the clip.
Follow-up: Let's think about traveling into outer space and the depths of the ocean. Let's brainstorm ways that these adventures would be alike and how they would be different.
(Use the chalkboard to list ideas. Make sure they have "human destiny to explore, adventure, to see the view, dangerous, to seek fortunes, search for answers, solve mysteries, develop new technologies." These are from video clips,)
Let's use our ideas to make a Venn diagram. We will use our ideas and organize them into the three sections in our overlapping circles. Look at the things that ocean and space travel have in common. Let's have an adventure and discover why the ocean still has places that have not been explored, places still to be discovered. What makes it so challenging?

Learning Activities

1. Focus: To explore the ocean, scientists must understand the things that make the ocean special. Let's discover the physical characteristics of the ocean. We are going on a trip to the bottom of the ocean, in our imaginations! At the end of our voyage of discovery, we are going to create a travel brochure to teach others. The sheet I am going to give you has a place for you the take notes on each topic. Remember, you don't need to worry about complete sentences when you take notes. (Hand out **Oceans Travel Brochure and Planning Sheet).** Now let's begin our journey. Get ready to dive!
Let's learn what explorers need to know about the ocean to make our trip possible. We will be talking about the physical characteristics of the ocean – temperature, salinity, and pressure.
Activity: (Have students watch while teacher demonstrates the following activity. Have a battery jar filled with water, ice cubes, and stirring rod. Use a thermometer and add salt until the temperature gets below 32 degrees Fahrenheit. Have another container with just ice cubes.)
Why is the ice cube frozen and not the water? At what temperature does water freeze? What is the temperature of the ice cube? Can you predict the temperature of the water in the jar? Let's read the thermometer. Do you think that adding salt has changed the water? Has anyone been to the ocean? What does the water taste like?
Follow-up: Water at the bottom of the ocean may be colder than 32 degrees Fahrenheit without freezing. Why is it so cold? (lack of sunlight and salinity)

2. **Focus:** How did the ocean get to be so salty?
Play: video clip from United Streaming program Oceans: Earth's Last Frontier – Salt Water (02:11).
Pause/Stop: at the end of the clip.
Follow-up: Where is the ocean the saltiest?
3. Focus: We are going to do an experiment to see what happens to the salt water in the ocean.

Activity: Give groups of three the following materials: two clear containers a little less than half full, disposable cups with about 8 tablespoons of salt each, food coloring, potato slice, teaspoon, tablespoon, and Salinity Activity Student handout. Have one student mix 8 tablespoons of salt in one container and stir. Another student will mix a few drops of food color in the other. The next student will SLOWLY pour the colored water into the salt water, by pouring it over the spoon. The waters should not mix if poured slowly. Place a slice of potato into the container with all the water.
Follow-up: What happened to the slice of potato? Using this information, predict where you think the saltiest water is in the ocean. Let's sum up what we learned in the video and our experiment.
(Make sure that students' answers include: ocean water contains salt, rain water washes the salt from the land into the ocean, the ocean is getting saltier because of evaporation, ocean animals have adapted to the salt water, and the heavier salt water sinks to the bottom. Write these on the chalkboard and make sure students are recording information on notesheets.)

4. Focus: The last thing that we need to understand about the ocean is how the depth of the water affects the pressure. All of that water pressing on us! Can man alone just explore the ocean?
Play/Resume: play video clip from United Streaming program GeoScientists: Diving Deep– Full Speed Ahead: Diving in the Submersible (03:01).
Pause/Stop: at the end of the clip.
Follow-up: What is the bottom of the ocean like? What does man need to be able to explore the bottom?
To sum it up, as depth increases, water pressure increases. At the ocean's surface, the water pressure is 0 lbs per square inch and at the bottom can reach more than 14,000 lbs per square inch. Underwater submersibles must be specially constructed to not be crushed by the pressure.

DAY 2-Have students get their planning and note sheet.
1. Focus: The first explorers must have thought that monsters lived in the ocean because they were not able to see under the water the way we are today. What are some organisms that live under the water? Where do these organisms live? How have the physical characteristics of the ocean affected where marine organisms can live? Welcome to the ocean floor!
Play: video clip from United Streaming program Ocean's Alive: Welcome to the Ocean Floor (01:05).
Pause/Stop: at the end of the clip.
Follow-up: What did you see in the clip? Name some organisms. How do characteristics of the ocean determine which organisms live in which part of the ocean?

2. Focus: How could we categorize the organisms that live in the ocean?
Play: video clip from United Streaming program Oceans: Earth's Last Frontier –

Benthos, Nekton, Plankton (03:41)
Pause/Stop: at the end of the clip.
Follow-up: Let's review. Benthos – plants and animals that live on the ocean floor, and do not swim. Nekton – all creatures that swim, includes invertebrates such as squids, octopuses, all kinds of fish, and mammals such as porpoises and whales. Plankton – includes organisms that float on or near the surface and drift with currents, phytoplankton is plantlike organisms that make their own food and 80% of Earth's oxygen, zooplankton is animal-like, young larvae forms.

3. Focus: Let's dive! Look for examples of benthos, nekton, and plankton. We will make 3 categories on the chalkboard and record what we see in each category.
Play: video clip from United Streaming program Ocean's Alive: Exploring the Depths (03:34).
Pause when students see an organism. Record their ideas and continue the clip.
Follow-up: Raise your hand if you can add anything to our categories. Ocean animals have adaptations that allow them to live in these different areas.

Culminating Activities

Day 3 - Organize the room into groups of three.
1. Focus: We are heading back to the surface. What information did you bring back from our dive? Let's take a quick quiz to refresh our memory.
Activity: Ask the following questions: Why does the ocean bottom not freeze? (Because salt and pressure lowers the freezing point.) What is salinity? (The amount of salt found in the water.) Where did the salt in the ocean come from? (Rain washed the salt from the land into the rivers which emptied into the ocean.) Why does man need special equipment to explore the ocean? (Crushing pressure of the water, lack of light as you travel deeper, cold temperatures, no oxygen.) What are the three groups of organisms that live in the ocean? (Benthos, nekton, and plankton.)
Follow-up: Make sure answers to questions are correct and complete.

2. Focus: Now we are going to use what we have learned to teach others. Dive with us!! We are going to make a Travel Brochure to teach others about the oceans. Use your Travel Brochure planner to create your sloppy copy. You will need an illustration and at least 3 pieces of information for six boxes: temperature, pressure, salinity, nekton, benthos, and plankton. You will be given construction paper to create your brochure. Use the boxes on the planner to plan everything first. Each member on your team must work on at least two boxes. You will type your information in word and draw or use clipart for the art work.
Activity: Give students a copy of student handout Making a Travel Brochure.
As reinforcement, students will use computers in the lab to add to their research. Bookmark websites www.seasky.org/sea.html and www.photolib.noaa.gov/nurp. Give students the website handout that guides students through the websites.
Day 4
Students will work in cooperative groups to create their Travel Brochure. Students will

need access to a word processing program and Internet access.
Follow-up: Allow students to share and display their finished products.

Assessment

- Travel brochures will be assessed based on a rubric (attached) for the assignment grade. Ten points will be awarded for the title, twenty points for three facts, twenty points for covering the six topics, twenty points for the illustrations, twenty points for group participation (by teacher observation), ten points for grammar and spelling.

Community Connections

- Invite a local scuba diver to the classroom.
- Invite parents and students to bring in their ocean treasures.
- Take a field trip to a museum to view an ocean exhibit.

Cross-Curricular Extensions

Technology:

- Students could create a power point presentation using the six topics as a separate slide.

Art:

- Make a hanging mobile illustrating benthos, nekton, and plankton.

Science:

- Make a timeline of ocean explorations.
- This lesson could be tied into the discovery of the Titanic.

About the Author

Melody Moats is a fifth grade teacher at Highland Elementary School in Highland County.

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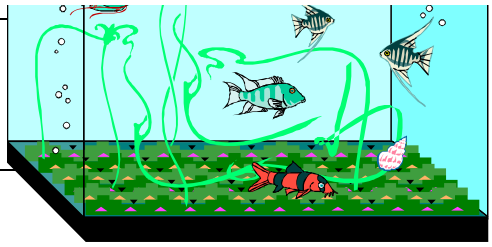

Oceans Travel Brochure

Name of the Group_____
Students in Group_____

1. Title of Brochure_____(10 Points)

2. Six Topics_____(20 Points)
   a. Temperature
   b. Salinity
   c. Pressure
   d. Nekton
   e. Benthos
   f. Plankton

3. Three Facts_____(20 Points)

4. Illustrations_____(20 Points)

5. Group Participation
   (Teacher Observation)_____(20 Points)

6. Grammar and Spelling_____(10 Points)

Total Points_____
Final Grade_____
Comments:

Oceans Travel Brochure
Note Taking and Planning Sheet
Temperature

Notes

Paragraph

Picture

Salinity

Notes

Paragraph

Picture

Pressure

Notes

Paragraph

Picture

Nekton

Notes

Paragraph

Picture

Benthos

Notes

Paragraph

Picture

Plankton

Notes

Paragraph

Picture

Dive with us!!!

Making a Travel Brochure

- Use the Travel Brochure planner to create your sloppy copy.
- You will need an illustration and at least three facts for each of the six boxes: temperature, pressure, salinity, nekton, benthos, and plankton.
- You may draw your own art work or use clipart. Paragraphs will be typed in Word. You will design your brochure on paper provided by the teacher
- Research further using the Websites: www.seasky.org/sea.html or www.photolib.noaal.gov/nurp
- Your brochure will be evaluated this way:
    1. Title
    2. Six topics
    3. Three facts each
    4. Illustrations
    5. Group participation
    6. Grammar and spelling

Salinity
Activity: Floating the potato

Materials: Two containers of water, salt, teaspoon, tablespoon, slice of potato, food coloring

Directions:

- One student will mix 8 spoonfuls of salt in one container of water. Stir completely.
- Another student will mix a few drops of food coloring in the other container of water.
- The first student will SLOWLY pour the colored water into the salt water, by pouring it over a spoon. (The waters should not mix if poured slowly.)
- Place a slice of potato into the water container and discuss what happens with your group.

Dive with us!!
Making a Travel Brochure

Websites:

- www.seasky.org/sea.html

  Select the bookmarked site above. From the main menu you may explore The Ocean Realm, Ocean Exploration, Sea Lab, and Sea Gallery. Remem ber to take your note sheet. You will have fifteen minutes at this site.

- www. photolib.noaa.gov/nurp

  At the main menu, scroll down until you see the categorie s of photoalbums that are available. Choose which album you would like to browse. Rememb er to focus on examples of benthos, nekton, and plankton. Use the back area to return to the main menu. Double clicking with the left mouse key will enlarge the p icture. You will have about 15 minutes on this site.