FLAGHOUSE Activity Guide

Marine Science

Physical Science Lesson Series: Series #1

OVERVIEW: Teaching Physical Education Through Science

Physical Education, in its purest form, is learning through movement. Rob Causton, physical education teacher from Oxford, NJ and a Teacher of the Year from The Institute of Marine Coastal Sciences (IMCS) from Rutgers University (NJ), has developed a program that incorporates Marine Science into physical edution activities to help enhance the success of learning. Through his diverse background as a teacher and marine biology researcher, Rob has developed a series of lesson plans that concentrate on students mastering core physical education skills with the use of marine science. These lessons add new, refreshing themes to many traditional activities and help students learn and understand many scientific facts that may have been hard for them to understand through traditional classroom lectures and experiments. These lessons can be adopted for all grade levels.

Below are a few of Rob Causton's lesson ideas.

Lesson #1–Finding the correct marine research area

• This activity is to simulate the procedure that scientists use in determining locations of hydrothermal vents. By taking samples from various locations, scientists can narrow the exploration field before using more expensive techniques for surveying. By eliminating areas that do not support further exploration, scientists can focus their funding on areas that will produce maximum results. Students also focus on communication skills, working together to solve the problem. This lesson is best taught in the convergent style of teaching.

• A grid of segmented hoops is placed on the floor. Before the class begins, a predetermined path is set up that will guide the students through the hoops. The students surround the grid and wait for their turn. If a student steps in the correct hoop, they may continue through the hoops. If a student steps in an incorrect hoop, they must exit the grid and the next student begins. Students who are observing work with the student in the grid, reminding them of the hoops that have been identified as correct. The goal is for the entire group to make it through the grid successfully. Grids can be as small or as large as you need. Students can move forward or sideways, but not diagonal.

Modifications—Students can also add movements to each hoop to increase the number of variables and the difficulty. For example, students need to move to the proper hoop by using a specific locomotor task. Hop, jump, and step are some examples that will increase the difficulty and the communication between students. Students may also be blindfolded and led through the grid by a partner or with verbal commands.

Lesson #2–Hydrothermal vent neutrally buoyant plume activity

Introduction

My scientific research experience has presented me with an opportunity to continue building Physical Education lessons that are taught in the theme of marine science. The oceanographic exploration cruise I attended in 2004 developed the hypothesis that hot water streaming from an active hydrothermal vent rises and cold water is entrained in the rising plume. This is similar to what happens over the land on a coastline. As the air heats up over the land it rises, and cool air from over the water moves in to take its place. The idea is that the same thing happens over a hydrothermal vent in the ocean. The mission of the cruise was to gather data and begin to develop a proxy measurement for the heat flux from a hydrothermal vent. We studied deep water currents and their effect on the neutrally buoyant plume from a hydrothermal vent. This is certainly a challenge for a Physical Education teacher, but I feel I have been successful in demonstrating this hypothesis to my Physical Education classes.

Procedure

Students participate in a divergent problem-solving lesson in which they use a parachute to demonstrate both the rising and neutrally buoyant plume. The problem presented to the students is that they must get the parachute from one end of the gym to the other. The rules are that the students may not move their feet while touching the parachute. After debating the best way, a period of trial and error, students find they have the most success when they raise the parachute as a group and let go simultaneously. If the wind currents

are strong enough in the gymnasium, they will move the parachute. If the currents are not that strong, students should experiment with some people holding the parachute a little longer than others, which creates a wave effect. Once the parachute comes to rest, the group moves to the new location and repeats the process until they have moved across the gymnasium.

Assessment
After students find success, discuss the procedure and why it was effective. This can be used to introduce the concept of underwater currents, or it can be used as an assessment piece if the students have a prior knowledge of vent systems. I have used this lesson with a group of teachers attending a professional development institute in marine science and they gave some very positive feedback for the lesson.

Lesson #3–Sea Anemone Tag
Background Information for Sea Anemone Tag

The Sea Anemone
• The sea anemone is considered to be the flower of the sea. Sea anemones look like plants, but they are really meat-eating animals. They come in different sizes and many different colors. These invertebrates have no skeleton at all.

• Sea anemones live attached to firm objects in the seas, usually the sea floor, rock, or coral, but they can slide around very slowly. Hermit crabs sometimes attach sea anemones to their shells for camouflage. Sea anemones spend most of their lives in one place.

• In the center of the sea anemone is their mouth. The mouth is surrounded by tentacles, which protect the anemone and catch its food. The tentacles are studded with microscopic stinging capsules (called nematocysts). In order for the sea anemone to eat, they must wait for their food to swim by. Then they sting it with their tentacles and push it into their mouth. Sea anemones are carnivores that eat fish, mussels, zooplankton (like copepods, other small crustaceans, and tiny marine larvae), and worms.

• Sea anemones are usually about 1 to 4 inches (2.5-10 cm) across, but a few grow to be 6 feet (1.8 m). There are over 1000 species of them found in coastal waters worldwide, in shallow waters (including coral reefs), and in deep oceans.

The Physics of a Fish
• The shape of the tail of a fish tail indicates how that fish moves and lives. A rounded tail or a truncated tail, like that of a killifish or minnow, is good for maneuverability and short bursts of speed. This kind of tail is commonly found on fish in coastal waters or tide pools. A forked tail like that of a striped bass is good for maneuverability and speed over longer distances. Lunate or crescent-shaped tails, like those found on a swordfish, are not good for maneuvering but allow for great speed over long distances and are usually found on fish that live in the open ocean.

• Different species of fish swim through tide pools created at low tide. They must be very careful as they move throughout the tide pool so the anemone's poison spines do not sting them.

Procedure
The purpose of this activity is for students to review the information they have learned about sea anemones, killifish, and the rocky seashore.
Objectives:

Students will...
• Review the habitat and the behavior of sea anemones.
• Discuss how small fish move around in tide pools.
• Imitate the fish and creatures that live in the tide pool.
• Demonstrate an understanding of the creatures and their behaviors by participating in a game of sea anemone tag.
• Demonstrate movements at various levels.

Equipment:
• 24 or more Styrofoam "noodles"
• An activity zone marked off with floor markers

Set up:
Six students are picked to be the sea anemones and given 4 spines (noodles). The rest of the class becomes killifish. The anemones place themselves in random order around the open space (tide pool) and stay still. They move their spines (noodles) with the flow of the water. Discuss with the students the fish formation and how they are all squared tailed fish that maneuver well but do not have speed.

The Game:
The object of the game is to have the killifish move across the tide pool without touching any of the spines of the sea anemones. If the killifish touch one of the spines, they are injected with toxins and paralyzed. The sea anemones are told to spread themselves around the tide pool (gym) in any formation. After the game is played a few times, the sea anemones may want some time to talk and develop a strategy or plan. This is encouraged in my classroom, as it is viewed as a problem-solving activity. The information about the tide pools and the creatures is needed from the classroom teacher so students can understand the game and how the information they cover in class can be carried into the gym.

Evaluation:
The game can be used as an assessment activity for students who have studied tide pools and the creatures that inhabit them. The game reviews the information covered in marine science curricula and checks to see if students understand it. Success is measured by the behavior of the killifish and the sea anemones. As long as the students follow the instructions of the teacher and behave as the creatures they represent, they will be successful.

Please direct your questions or concerns regarding this product to the appropriate office listed below between the hours of 8AM-6PM Eastern Time

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