<table>
<thead>
<tr>
<th>Title:</th>
<th>Please, pass the salt!</th>
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<tbody>
<tr>
<td>Topic:</td>
<td>The influence of water</td>
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| Standard & Benchmarks: | **Standard 4 - Ecological Systems**—Understand the locations and characteristics of marine ecosystems  
**Benchmark: MS 4.5:** Explain how chemical factors (pH, salinity, dissolved O2, nutrients) affect the distribution of life in the ocean.  
**I can statement:** I can explain how marine species distribute themselves based upon the ocean’s chemical factors (e.g., pH, salinity, dissolved O2, nutrients). |
| Outcome:    | Create an abiotic factors cube game. |
| Time Recommended: | 30 minutes for WebQuest  
Out of class activity (or technology lab time) for completion of cube |
| Materials needed: | **Materials** – cube template and examples format sheet  
**Skills** – critical thinking, organizing, analyzing, questioning  
**Equipment (beside computer)** – none |
| Vocabulary: Hawaiian vocabulary and pronunciations: | **Abiotic** - none  
**Biotic** - none |
| Options:    | **Answer Key:** |
| Additional Information: | **ABIOTIC FACTORS:** |
|             | 1. What is meant by the term abiotic factor?  
Abiotic factors are the non-living factors in an ecosystem that affect the survival of organisms in that ecosystem. |
|             | 2. What are some examples of abiotic factors?  
They include: water availability, sunlight, temperature range, substrate, geographical terrain, oxygen availability, exposure, salinity, dissolved nutrients, and ocean currents. |
|             | 0. How is pollution a factor at Makapu’u Beach on Oahu, Hawaii?  
Pollution is the key negative environmental interaction factor at Makapu’u Beach. Here the strand line is composed of many different fragments of plastics. Big to small, these plastic waste products are a real threat to our ecosystem. |
|             | **CHEMICAL FACTORS:** |
1. **Why is it important to know about ocean chemistry?**
   The chemical properties of the ocean are important to understand because the marine environment supports the greatest abundance of life on earth. This life is largely made up of the same chemicals that comprise the ocean—water and salts.

2. **What are some important chemical properties of the ocean?**
   They include: pH, salinity, dissolved oxygen, and nutrients. **Abiotic:** temperature and light.

3. **How might one chemical factor affect the marine species in Hawaii?**
   Carbon dioxide is a greenhouse gas, which occurs in the atmosphere. It contributes to global warming and is beginning to show an impact on the planet. Sea levels and surface temperatures are rising, ice is melting, and weather patterns are changing. Rising surface temperatures cause corals to expel the symbiotic algae needed for their survival resulting in coral bleaching. These are problems that could easily imbalance the ocean’s chemistry and disrupt important biological processes such as food webs and wide-scale marine life productivity.

**Lakes Versus Oceans:**

1. **What is the main chemical factor that differentiates oceans from lakes?**
   The saltiness of the ocean is more understandable when compared with the salt content of a fresh-water lake. For example, when 1 cubic foot of sea water evaporates it yields about 2.2 pounds of salt, but 1 cubic foot of fresh water from Lake Michigan contains only one one-hundredth (0.01) of a pound of salt, or about one sixth of an ounce. Thus, seawater is 220 times saltier than the fresh lake water.

2. **Why is the ocean salty?**
   The ocean is salty because of the gradual concentration of dissolved chemicals eroded from the Earth’s crust and washed into the sea. Solid and gaseous ejections from volcanoes, suspended particles swept to the ocean from the land by onshore winds, and materials dissolved from sediments deposited on the ocean floor have also contributed. Salinity is increased by evaporation or by freezing of sea ice and it is decreased as a result of rainfall, runoff, or the melting of ice.

**Species Distribution:**

1. **What is species distribution?**
   Species distribution is the manner in which groups of species are spread out. The distribution of species into clumped, uniform, or random depends on different abiotic and biotic factors. Any non-living chemical or physical factor in the environment is considered an
abiotic factor. There are three main types of abiotic factors: climatic factors consist of sunlight, atmosphere, humidity, temperature, and salinity.

2. How might the various chemical and abiotic factors affect species distribution in the ocean?
Animals and plants living in surface waters have access to high nutrient levels, increased temperatures, reduced pressure, and more light. This creates more dense species distribution. The deep-sea creatures that must live in highly pressurized, cold, dark waters with scarce nutrients are far less numerous in distributions. There is a direct correlation between physical factors affecting chemical factors, and therefore, affecting species distribution.

3. Is salt a major chemical factor in species distribution in the ocean?
Yes! The average salinity of seawater is about 35 parts per thousand which stays relatively constant throughout the ocean varying between 33 and 37 parts per thousand depending on how much freshwater is present. Most marine life depends on this consistency, as their bodies cannot adapt to significant changes in the salinity of their environment. The oceans are a salty place but not uniformly so. This creates a challenge for marine organisms that swim through different areas to deal with differing levels of salinity in their surrounding environment.