Education and Research: Testing Hypotheses

Collecting and Comparing Microplastics on the Gulf Coast; Pensacola Beach, Carpenters Creek, a Local Water Fountain and a Garden Hose.

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Summary

This investigation will focus on the impact microplastics are making on the Gulf Coast. Water and sediment/sand samples will be collected at specific locations along the Gulf Coast and analyzed for microfibers, micro-fragments, and microbeads. Students will be comparing the amount of microplastics in each location, the type of microplastics in each location, and the areas that might be impacted due to different factors (location, season, currents, tourism). Data will be collected at the following points:

- Surface of the water at 0.5 meter of depth

Skills that will be developed in this activity will be water sampling skills, using a filtration system at the University of West Florida (UWF), partnering with scientists, using a microscope, observing, analyzing data, graphing data, interpreting data, measuring, planning, and critically thinking.

[TAGS: water sampling, microplastics, graphing, abiotic factors]

Key Concepts

HS-LS2-4, LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved.

HS-LS2-3. LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.

MP.2, HS-ESS2-2

HSN.Q.A.1, Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN.Q.A.3, Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Objectives

Students will:

- ***Create a hypothesis*** to predict what they expect to find in their investigation
- ***Observe*** the areas they will be sampling to make visual notes of any noticeable human impacts
- ***Observe*** the area for visual notes of the natural environment
- ***Identify and compare*** types of microplastics collected from the various locations
- ***Record data*** from microplastics counted in each sand/sediment/water sample
- ***Demonstrate understanding*** of creating graphs to display data
- ***Communicate results*** to peers and publish findings in youth poster sessions

Materials

- Data sheet
- 12 1/2 L water sampling bottles
- Field microscopes
- Compound Microscope
- University of West Florida Lab- filtration system
- notebook
- Water sampling tools - thermometer, salinity
- Computer
- Final poster
- Gridded Filter

Procedure

1. Show the students the microplastics powerpoint of UWF scientist Dr. Alexis Janosik. inform them of the substances that contain microplastics.
2. **Water Collection:** Take one of the .5 L bottles and remove the top. Holding the bottle on the side, collect a water sample at the surface until the water bottle is full. Replace the

cap. Label the bottle "Water sample at surface, (Pensacola Beach, Carpenters Creek, Fountain, Garden) Date, Time ." Repeat 3 times for each location.

3. On **data sheet** record, general location, GPS coordinates, temperature, salinity
4. Field trip to UWF lab. Review lab safety. Filter the water samples and observe under microscope.
5. Count total plastics
    a. Using reference sheet try to differentiate between fiber, micro-fragments and microbeads
6. Discuss observations recorded on data sheets, create graphs comparing locations.
7. Create a scientific poster to communicate science.
8. Share poster at international science conference and UWF Scientists

Data Sheet

Sample Location	Microfibers	Micro-fragments	Microbeads	GPS	Temp	Salinity	Notes Observations
Area 1 (Creek) Sam.1							
Area 1 (Creek) Sam.2							
Area 1 (Creek) Sam.3							
Area 2 (Creek) Sam.1							
Area 2 (Creek) Sam.2							
Area 2 (Creek) Sam.3							
Area 3 (Creek) Sam.1							
Area 3 (Creek) Sam. 2							
Area (Creek) Sam.3							
Pensacola Beach Sam. 1							
Pensacola Beach							

Sam.2							
Pensacola Beach Sam. 3							
Garden Sam.1							
Garden Sam.2							
Garden Sam.3							

Assessment

- **Performance**—Students will actively collect and analyze water samples, utilize a college lab to filter water, make observations utilizing a microscope, create a scientific poster, create an elevator speech.
- **Product**—Students will create a scientific poster and present their research at an international science conference. Their products will include but not limited too water quality, microplastic graphs and an action plan to avoid using plastics. Reuse Reduce Recyle, Refuse to use plastics.

Additional Resources:

Links to purchase lab equipment/materials to make your own filter:

- Pyrex® Glass Filtering Flask, Heavy-Walled, with Side Tubulation, 1,000 mL (Item # 726390 Carolina Biological)
- Hand-Operated Vacuum Pump with Gauge, (Item # 752813, Carolina Biological)
- Advantec MFS 43301030 Model KP47H Vacuum 47 mm Size Filter Holder, Funnel, Base, Polysulfone (Part Number 43301030, Amazon)
- Whatman 7141-104 Sterile MCE Gridded Filter w/Pads, 0.45 um, 47 mm; 100/Pk (Part Number 7141-104, Amazon)
- PetriStickers, 32-Square Grid, 3", Pack of 36 (Item # 703442, Carolina Biological)

Extensions

Soil/sand samples - analyzed for plastics
Partner with other schools along the Gulf Coast or world duplicating this project and sharing information.