Objective

Main Goal:

Students will understand that water quality can be evaluated quantitatively using many parameters including conductivity.

Subsidiary Goals:

Students will understand that water quality differs depending on environmental conditions and human activities that may affect it.

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conditions. Salt pollution can be a direct problem for humans when drinking water supplies have levels of salt over 0.5 ppt. Streams with high salinity may be unsuitable for agricultural or industrial use.

Total dissolved solids (TDS) is defined as the quantity of dissolved material in water (Reed, 2017). For bodies of freshwater in nature, it depends mainly on the rocks and soils that come into contact with the water and dissolve into the water. Measuring the total dissolved solids in water can tell us about its quality. For instance, water that flows through limestone and gypsum dissolves calcium, carbonate, and sulfate, resulting in high levels of total dissolved solids.

Many minerals are required to support living organisms in waterways and benefit human health in certain levels in our drinking water. However, some dissolved solids are considered pollutants because they are toxic to living organisms including humans or the chemicals are too abundant in waterways and so they become toxic.

A convenient way to measure TDS is to test the conductivity of the sample. Conductivity is a measure of the ability of water to pass an electrical current and is affected by the presence of dissolved solids (Reed, 2017). As the level of dissolved solid materials rises, the conductivity value will also increase. Water with very little dissolved material will produce a low conductivity value. Discharges to water can change the conductivity. A failing sewage system could raise the conductivity because of the presence of chloride, phosphate, and nitrate. A farm nearby that applies chemicals to its fields or wastewater emitted from a factory could increase conductivity. An oil spill would lower the conductivity because oil does not conduct electrical current very well.

Conductivity is measured in microsiemens per centimeter, µs/cm (Reed, 2017). Ultra pure water has a conductivity close to zero, generally less than 1 µs/cm because in theory no other substances have been dissolved in it (Adum, 2015)

Materials	Four white or transparent cups of containers to hold water samples Tap water Sugar, salt, and/or powdered spices

Alternative Options

To be used if the above supplies are not available.

Sample 1: Mix 1 teaspoon of sugar into 8 ounces of tap water until dissolved.

Sample 2: Mix 1 tablespoon of sugar into 8 ounces of tap water until dissolved.

Sample 3: Fill a glass with 8 ounces of tap water.

Sample 1: Mix ½ teaspoon of salt into 8 ounces of tap water until dissolved.

Sample 2: Mix 2 teaspoons of salt into 8 ounces of tap water until dissolved.

Sample 3: 8 ounces of tap water.

References

Adum, A. (2015, February 23). *Understanding Water Conductivity*. Analytical Technology, Inc. https://www.analyticaltechnology.com/analyticaltechnology/gas-water-monitors/blog.aspx?ID=1106&Title=Understanding%20Water%20Conductivity

Reed, A. (2017). *Lesson 5: Water Conductivity and Total Dissolved Solids Water Quality Sampling - PDF Free Download*. https://docplayer.net/20986389-Lesson-5-water-conductivity-and-total-dissolved-solids-water-quality-sampling.html