

Culturally Responsive STEM Lesson Plan:



Properties of Matter through a Multicultural Lens

Lesson Objectives:

- Be able to define physical properties of matter
- Classify and compare substances based on their physical properties
- Explain that these properties are independent of the amount of the sample
- Understand that everyone has a unique identity and cultural background, and brings with them unique cultural values, traditions, and customs
- Identify cultural artifacts that are significant to your own family, what those artifacts are made of, and how the main chemical compound or elements of the chosen artifact is classified based on its physical properties

Next Generation Science Standard:

SC.8.P.8.4 Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.

STEM Rationale for Lesson:

- Students will understand the value of connecting their personal heritage and artifacts derived from their ancestral past to the study of matter and physical properties that define substances.

Culturally responsive connection:

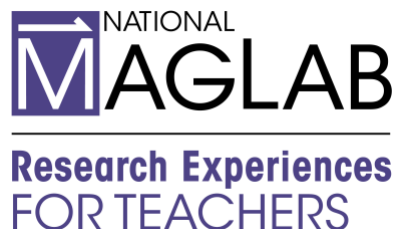
- Students will understand the importance of honoring their cultural heritage and sharing their unique identities with their peers.
- Students will understand the importance of diversity among their peers, and the value of learning from each other to better understand our culturally rich school community.

Materials Needed:

Provided by Teacher:

1. Computers with internet access
2. One artifact that represents the teacher's cultural background
3. Various different measurement tools (1 per group of 4 students) such as:
 - a. Triple beam balances
 - b. Rulers
 - c. Graduated cylinders
 - d. Beakers with water
 - e. Magnets

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Provided by Students:

1. 1 artifact that is important to their family and best represents their cultural heritage

*****Be sure to explain to students in advance of the lesson, that a cultural artifact is an item that reveals valuable information about the society that made or used it. Also, communicate with parents about this project in advance, so that they can support their child in the selection of an artifact that represents their family culture.**

Activate Prior Knowledge:

1. Students should know that matter is anything that has mass and takes up space.
 2. Students should be able to provide examples of matter and non-matter.
 3. Students should know that mass is the amount of matter in an object, and volume is the amount of space an object / substance occupies.
 4. Students should know how to use a triple beam balance to measure mass, and a graduated cylinder to measure the volume of irregularly shaped objects through water displacement.
 5. Students should know that a cultural artifact is something that represents one's cultural values, heritage, customs, and traditions.
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Lesson Introduction:

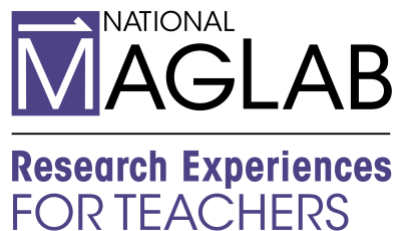
1. Hold up the artifact you brought in to represent your cultural background.
 2. Ask the students to make a list in their science journal of key characteristics one could measure about that object, and to write a description of what importance they think the object might have.
 3. Ask students to share out loud properties that could be measured about the object. Record what they share on chart paper that will be displayed throughout the lesson.
 4. Ask students to share out loud what they think is significant about the object. Ask them to also share objects / artifacts that are important to their family.
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Lesson Activity:

Part 1: Teacher Explicit Instruction

1. Explain to students that they will be exploring the physical properties of their artifact and creating a presentation of their choice to present to the class about their artifact according to Appendix A: Properties of a Cultural Artifact Project Guidelines and Grading Criteria.
2. Share the following slideshow with students to review what each property is and how it is measured. <https://docs.google.com/presentation/d/e/2PACX-1vRtKjdteojLvvs0cE8wApS3YIQpmHzeOV3qqoDREyIHSae8aiftJrtixXU9uvF8eMTwa--->

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[46J10D01/pub?start=false&loop=false&delayms=3000](https://www.nsl.gov/46J10D01/pub?start=false&loop=false&delayms=3000), or, if you are unable to access the slideshow, post the following information on the board:

Properties of Matter -characteristics used to identify a substance

- Melting point: the temperature at which a substance changes from a solid to a liquid.
 - Boiling point: the temperature at which a substance changes from a liquid to a gas.
 - Density: the degree of compactness of a substance.
 - Solubility: the ability of a substance to dissolve in water.
 - Magnetism: the ability of a substance to attract or repel other objects.
 - Ductility: the ability of a metal substance to be stretched into a thin wire.
 - Malleability: the ability of a substance to be molded or shaped.
 - Viscosity: a measure of a liquid's resistance to flow.
3. Have students create a concept map in their science notebooks of each property & drawings to illustrate what they mean.

Part 2: Student Exploration

1. Allow students to use various tools to measure properties of their artifact: density, magnetism, solubility, etc....
2. Support students in researching properties on the internet of their artifact that they could not measure with tools.
3. Remind students of the importance of explaining the cultural significance of their artifact in their presentation. This should include important details as outlined in the project guidelines.
4. Once students have obtained all important research information, they can make a presentation of their choice of their artifact. This can be a Google Slide, a poster, an Adobe Spark movie, or any other format of their choice that you approve.
5. Give students ample class time to create their presentations. You can allow them to finish their project at home in order to present them in the next class.

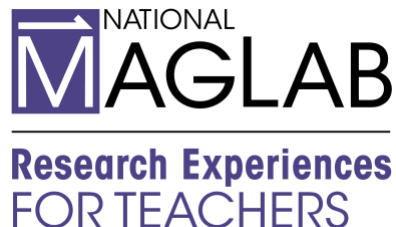
Lesson Assessment:

1. In the next class have each student present their artifact presentation. To maintain engagement of all students, you can have them complete the Properties of Matter Artifact Projects Chart found in Appendix B.
2. Use the project guidelines to score each project out of 100 points.

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Appendix A: Properties of a Cultural Artifact Project Guidelines and Grading Criteria

Project Guidelines:

You should have brought in an artifact that represents your cultural heritage. You will use the tools in class, and the internet to research and determine key physical properties of your artifact, or the materials that make up your artifact. You will then create a presentation through a medium of your choice to share physical properties and the cultural significance of your artifact with the class. What to include in your presentation:

1. Name of your artifact (5 points)
2. A picture or visual representation of what it looks like (10 points)
3. A list of elements or compounds that make up your artifact (10 points)
4. Key physical properties of your artifact:
 - a. Density (10 points)
 - b. Is it magnetic or not? (5 points)
 - c. Is it a good conductor of electricity? (5 points)
 - d. Is it a good conductor of heat? (5 points)
 - e. Is it soluble in water? (5 points)
 - f. What is its melting point? (5 points)
 - g. What is its boiling point? (5 points)
 - h. Is it malleable? (5 points)
 - i. Any other important properties
5. A description of the cultural significance of this object to your family (be sure to include if the object originates from a different country, where the materials it is made with come from, what it is used for, and why it is important in your culture). (20 points)
6. Organization, creativity, and presentation (10 points)

Total Possible Score: 100 points

