

Types of Materials

Lesson 1 (50 minutes)

Why is it that some materials conduct electricity while others do not?

Investigative Phenomenon

Students will investigate why certain materials conduct electricity while others do not. Students will then use this information to make a prediction as to which materials should be used when building a working circuit.

Big Science Ideas

- Conductors are materials that can conduct energy (electricity, heat, etc.). This happens because conductors have electrons that can move freely throughout the material.
- Insulators are materials that can not conduct energy. This happens because electrons cannot move freely through these materials.

FOR STUDENTS

Lesson Question

Why is it that some materials can conduct electricity while others cannot?

Success Criteria:

- ☐ I can create and use a conductivity meter to determine whether or not a material can conduct electricity.
- ☐ I can explain why certain materials can conduct electricity while others do not.

[Teacher Slides](#)

[Teacher Video](#)

[Student Worksheet](#)

[Student Warm Up](#)

[Student Notes Handout](#)

[Student Notes Handout \(with answers\)](#)

[Teacher Answers \(to activity 4\)](#)

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Sequence of student experiences			
Timeframe		Student groupings and Instructional Practices	Materials
Launch	5 minutes	Individual	• Micro:bits ◦ 1 micro:bit for every pair of students • Various items around the room ◦ Students will be asked to pull out 3 random items from their backpack to use during activity 3 • Alligator clips • Aluminum foil • Chromebooks or laptops ◦ 1 chromebook or laptop for every pair of students, so that students can access the MakeCode webpage.
Explore	15 minutes	Student partner teams • A/B Partners	
Explain	10 minutes	Whole Class	
Apply	15 minutes	Individual students Group of 4	

This lesson addresses the following standards....	
HS-PS2-6 : Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.	
Science and Engineering Practice(s)	• SEP 8: Obtaining, Evaluating and Communicating Information
Crosscutting Concept(s)	• CCC 6: Structure and Function
Disciplinary Core Idea(s)	• PS2.B: Types of Interactions

See the [language scaffolds](#) at the end of the lesson for more information.

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Launch: 10 minutes

Activity 1: Warm Up

Students are asked to access their prior knowledge by filling out a google form. On the google form, students answer one SEL question and one prior knowledge question.

Explore: 25 minutes

Activity 2: Mini Lab

Students will be asked to use their coding skills to create a conductivity meter using the micro:bit. They will then use this conductivity meter to test whether or not various objects from their backpacks will conduct electricity. Finally, students will attempt to explain why the objects behaved the way they did.

Explain: 25 minutes

Activity 3: Notes

Students complete “fill in the blank” notes with the teacher. After their notes have been taken and the vocabulary has been given, students are asked to use the new vocabulary terms to explain why they would choose a particular material to build a circuit over another.

Apply: 15 minutes

Activity 4: CAST Practice

Students answer a set of multiplication choice questions that were designed to mimic the questions on the CAST. Students should answer these questions in “think-pair-share” style, meaning students should be given about 10 minutes to complete the questions individually, then they should be given 5 minutes to discuss their answers as a group. [Questions taken from Inner Orbit.](#)

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Language Supports and Scaffolds	
Vocabulary	As some students naturally use these words during exploration or while discussing add them to a co-created chart that is accessible over the unit: Conductor, insulator, semiconductor Do not pre-teach these words, as exploration & experience lead to context which helps the vocabulary 'stick' because the word now has meaning.
Science Language Routines	A/B partners To improve equity of voice, students are assigned the role of "A" or "B" and time is made for both partners to speak, listen, question, and reflect. Consider being strategic pairing...allowing for student choices and for strengths/areas of need. Strategically Assigned Roles To improve equity of voice, each group member has an assigned or chosen role. See sample roles below: o Sample roles: recorder (writes for the group), reporter (speaks for the group), summarizer (listens and sums up), and questioner (listens and clarifies or pushes thinking). Discussion Games In the middle of notes, ask students to play a game (i.e. nose goes, rock paper scissors, etc.). You can then decide whether the winner or the loser of the game will be asked to speak. Ex: Teacher says: "WHAT DID I JUST SAY??? LET'S PAUSE! Turn to the person next to you and challenge them to a SINGLE ROUND of rock paper scissors!"

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	*students then play rock paper scissors. Teacher says: "If you've lost the game, you must now summarize what I said right before we played this game." *sometimes it is helpful to give students a visual (i.e. explain the picture we drew here).
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