



Call Me... Maybe?

Physical Science



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Grade Level	9th Grade
Subject	Science
Course	Physical Science

Essential Question

How dangerous are electromagnetic waves to humans? Should we be concerned with the new technological advances of today?

Summary

In this lesson, students will evaluate and argue the benefits and drawbacks of the use of different types of radiations for technological advances. By the end of this lesson, students will be able to evaluate published works' validity on technology associated with human health. This is a multimodality lesson, which means it includes face-to-face, online, and hybrid versions of the lesson. The attachments also include a downloadable Common Cartridge file, which can be imported into a Learning Management System (LMS) such as Canvas or eKadence. The cartridge includes interactive student activities and teacher's notes.

Snapshot

Engage

Students create a claim and argue opposing viewpoints.

Explore

Students read an article on gamma rays and create a superhero based on the advantages and disadvantages of a particular ray.

Explain

Students read an article about the electromagnetic spectrum and identify key components of electromagnetic radiation (EMR).

Extend

Students explore the job of a Director of Medical Imaging in relation to electromagnetic radiation.

Evaluate

Students assess their level of understanding and determine the validity of published work on electromagnetic radiation in association with human health.

Standards

Oklahoma Academic Standards (Physical Science)

PS.PS4.4 : Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

PS.PS4.4.1: When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat).

PS.PS4.4.2: Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells.

PS.PS4.4.3: Photoelectric materials emit electrons when they absorb light of high enough frequency.

Attachments

- [CER—Call Me Maybe - Spanish.docx](#)
- [CER—Call Me Maybe - Spanish.pdf](#)
- [CER—Call Me Maybe.docx](#)
- [CER—Call Me Maybe.pdf](#)
- [Choose Your Superhero Online—Call Me Maybe - Spanish.docx](#)
- [Choose Your Superhero Online—Call Me Maybe - Spanish.pdf](#)
- [Choose Your Superhero Online—Call Me Maybe.docx](#)
- [Choose Your Superhero Online—Call Me Maybe.pdf](#)
- [Common Cartridge—Call Me Maybe.zip](#)
- [Electromagnetic Radiation Notes—Call Me Maybe - Spanish.docx](#)
- [Electromagnetic Radiation Notes—Call Me Maybe - Spanish.pdf](#)
- [Electromagnetic Radiation Notes—Call Me Maybe.docx](#)
- [Electromagnetic Radiation Notes—Call Me Maybe.pdf](#)
- [Electromagnetic Radiation Superheros Instructions—Call Me Maybe - Spanish.docx](#)
- [Electromagnetic Radiation Superheros Instructions—Call Me Maybe - Spanish.pdf](#)
- [Electromagnetic Radiation Superheros Instructions—Call Me Maybe.docx](#)
- [Electromagnetic Radiation Superheros Instructions—Call Me Maybe.pdf](#)
- [Lesson Slides—Call Me Maybe.pptx](#)

Materials

- Set-up that allows videos and PowerPoints to be played for everyone to view
- Lesson Slides (attached)
- C.E.R. (attached, one per student)
- Electromagnetic Radiation Superheroes Instructions (attached, one per student)
- Electromagnetic Radiation Notes (attached, one per student)

30 minutes

Engage

Use the attached **Lesson Slides** to follow along with the lesson. Begin with **slide 3**. Briefly, read aloud the essential questions: *How dangerous are electromagnetic waves to humans? Should we be concerned with the new technological advances of today?* Then, move to **slide 4** and read the objectives.

Go to **slide 5**, invite students to participate in the [C.E.R.T.I.fy Your Thinking](#) strategy. Make copies of the **C.E.R.** template. Have them create a claim to the following prompt: *Do you believe the radiation emitted by cell phones can cause harm to the human body?* After they have made their claim, direct them to research 3 points evidence to support their claim and site where they got their evidence.

Once they have made their claim and collected their evidence, split the room into two sections, and have students move to the side of "does cause harm" or "does not cause harm." Next, have them debate over the topic. Rules for a debate are listed below. After the debate have students return to their seat to come up with their comprehensive reasoning.

Teacher's Note

It is always good to begin a class discussion with the rules of how the debate will be conducted:

1. Pick a side to start the discussion (typically start with the side that has the minority)
2. Have one person from that group respond with *one* evidence that supports their claim.
3. Next, give an individual on the other side time to give a rebuttal with their evidence.
4. Take turns back and forth for about 5-10 rounds
5. Ask the groups if there is anyone who would like to switch sides based on the evidence they have heard.
6. Next give each group 30 seconds to discuss a final summary to why their side is correct.
7. Finally, have a spokesperson share their group's final statement.

40 minutes

Explore

Go to **slide 6**. Students will be creating comic superheroes based on the seven types of electromagnetic waves. Make copies and pass out the **Electromagnetic Radiation Superheroes Instructions** and **Electromagnetic Radiation Notes** handout. Place students into groups of seven and have them divide out the seven rays. Each group member should:

1. Create a superhero associated with the ray that you choose.
2. Define what is that ray's superpower and how much energy the superpower produces.
3. Determine if this superpower can be harmful or helpful to living organisms (animals, plants, fungi, bacteria) and how?
4. Review all of the group's drawings and record each rays' definition, advantages, and disadvantages in the **Electromagnetic Radiation Notes** handout
5. After completion of their notes, have students organize their group's superheroes from **least (longer wavelength) to most harmful (shorter wavelength)**.

The seven rays students should illustrate are:

- **Non-ionizing**-Radio, microwave, infrared, visible light,
- **Ionizing**-UV, X-ray, Gamma

Teacher's Note

Walk around the room and monitor students as they create their superheroes. As they are arranging their superheroes do not assist them with card sorting out the spectrum other than clarifying directions.

20 minutes

Explain

Have students share out their groups' understandings of organization. Use this opportunity to address misconceptions and help students make corrections on their notes if needed. Move to **slide 7**, direct students to the [CK-12 20.3 Electromagnetic Spectrum](#) article to read. Inform students, as they read to complete the questions at the end of their **Electromagnetic Radiation Notes** handout.

Teacher's Note

Consider, after each group has shared out their notes on each ray, asking the class if that matches close to their groups definition, advantage, and disadvantage. If not, discuss the differences between groups.

20 minutes

Extend

The following activity adds a career exploration element to this lesson.

Move to **slide 8**. Inform students: "Today, we are going to learn about a profession that involves electromagnetic radiation on a daily basis. We are going to meet Mrs. Ashley Benard, a Director of Medical Imaging and Radiology Teacher." Invite students to watch the [ICAP-Electromagnetic Radiation](#) interview through YouTube. Ask students to consider, as they watch, the advantages and disadvantages they may learn about electromagnetic radiation, the type of technology discussed that they use in her line of work and be prepared to answer two questions at the end posed by Mrs. Benard.

Embedded video

<https://youtube.com/watch?v=7kW5Lb89nqU>

Optional Technology: Mentimeter

You may consider having the students place their responses to the two questions in Mentimeter.

To use [Mentimeter](#), visit the site and create an account (or log in) and create three open-ended questions in advance. For further instructions on how to create your own Mentimeter, see the K20 Center's [Mentimeter](#) Tech Tool resource. Prepare the questions below.

1. What is something you learned from watching this video that you didn't know before about careers involving electromagnetic radiation?
2. Do you believe that we have become more dependent on the technology that surrounds us every day?
3. Is it adding value to our lives physically, mentally, and emotionally? If so, how?

25 minutes

Evaluate

Go to slide 9. Invite students to complete the [Fist to Five](#) strategy to help them self-evaluate their mastery of the objectives. Complete this strategy for **slides 10-13**.

Next, move to **slide 14**. Have students recall the claim about cell phones that they made at the beginning of the lesson. Inform learners to keep their claim in mind as they view two opposing viewpoints on the topic. Have learners read the Electro Schematics's [Mobile Cell Phone Radiation article](#). Move to **slide 15** and invite students to watch Veritasium's "[Do Cell Phones Cause Brain Tumors?](#)" video. Finally, go to **slide 16** and have learners write 1-2 paragraphs answering the following questions:

1. *Does the radiation emitted by cell phones cause harm to the human body? Why or why not using evidence from the activities completed for this lesson?*
2. *Do you believe the resources you found for your C.E.R. at the beginning were reliable sources based on what you have learned? Why or why not?"*

Have students share out their thoughts.

Embedded video

<https://youtube.com/watch?v=wU5XkhUGzBs>

Resources

- C-K12 Foundation. (2012, December 14). *Electromagnetic Spectrum*. <https://www.ck12.org/book/ck-12-physical-science-for-middle-school/r1/section/20.3/>
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- Mohan Kumar, D. (2014, January 05). *Mobile cell phone radiation*. <https://www.electroschematics.com/mobile-phone-radiation/>
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