



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

ACT College and Career Readiness Standards - Science (6-12)

IOD303: Find basic information in text that describes a complex data presentation

IOD403: Translate information into a table, graph, or diagram

EMI201: Find basic information in a model (conceptual)

EMI301: Identify implications in a model

EMI401: Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text

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

- Common cartridge (attached)
- Set-up that allows videos and PowerPoints to be played for everyone to view
- Lesson Slides (attached)
- Certify Your Thinking (attached, one per student)
- Electromagnetic Radiation Superheroes Instructions (attached, one per student)
- K.I.M.S. Electromagnetic Radiation Chart (attached, one per student)

20 minutes

Engage(Online)

Students will review the essential questions: *How dangerous are electromagnetic waves to humans? Should we be concerned with the new technological advances of today?* Next, invite students to participate in your Learning Management System's LMS Discussion board to complete the [C.E.R.T.I.fy Your Thinking strategy](#). Have students write their claim and provide three points of evidence to the following prompt:

Do you believe the radiation emitted by cell phones can cause harm to the human body?

Have students respond to 2 peer discussion posts that are opposite to their point of view. After students have responded, have them return to their post, read the responses, and add their comprehensive reasoning to their post.

Teacher's Note

If completing on their own- monitor students' posts and allow students at least 24 hours to make their initial post and respond to their classmates.

To help students develop their own opinions and to allow for student discourse, it is recommended that you update the discussion options to allow for threaded replies and to hide previous discussion posts prior to posting.

For information about facilitating an effective online discussion, visit [K20 Center's best practices for facilitating online discussions](#).

40 minutes

Explore (Face to Face)

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**. Place students into groups of seven and have them divide out the seven rays. Each group member will:

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 the superheroes, have students review each other's superheroes and organize their group's superheroes from **least (longer wavelength) to most harmful (shorter wavelength)**.

The seven rays students will illustrate are:

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

Optional Drawing Tools

Students can create their superheroes using any of these tools:

- A sheet of paper and take a picture to upload
- Microsoft PowerPoint
- [A Web Whiteboard](#) (For instructions on how to use A Web Whiteboard, view the K20 Center's [Intro to A Web Whiteboard](#) video.)
- Google Drawings
- Any other drawing tech tool that will display their original work.

20 minutes

Explain(Online)

Inform students will then do a storytelling of their illustration using [Screencastify](#). The screencast needs to be 1-2 minutes long. Students define their ray and discuss what represents the advantage and disadvantage of the ray in their image. Students will then post it into the discussion board for other students to do a [Gallery Walk](#) to review other rays from outside their group, and makes corrections to their **Electromagnetic Radiation Notes** handout if needed. Next, 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, save and submit their notes.

20 minutes

Extend (Face to Face)

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](https://www.youtube.com/watch?v=7kW5Lb89nqU) 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](https://www.mentimeter.com/), you will need to visit the site and create an account (or login) and create two open-ended questions in advance. For further instructions on how to create your own Mentimeter, see the K20 Center's [Mentimeter](https://www.k20center.org/tech-tools/mentimeter/) Tech Tool resource. Prepare the questions below.

1. Do you believe that we have become more dependent on the technology that surrounds us every day?
2. Is it adding value to our lives physically, mentally, and emotionally? If so, how?

25 minutes

Evaluate (Online)

Invite learners to complete the [Fist to Five](#) strategy to help them self evaluate their mastery of the objective using the drop down menu in your LMS's quizzes.

Objective statements are:

1. I can evaluate and defend claims regarding the impact of cell phones.
2. I can correctly identify the advantages and disadvantages of different types of radiations.
3. Longer wavelengths are absorbed as heat.
4. I understand that different waves have different energies that can impact human health.

Continuing in your LMS's quizzes invite students to read the Electro Schematics's [Mobile Cell Phone Radiation article](#) and watch Veritasium's "[Do Cell Phones Cause Brain Tumors?](#)" video. In the quiz have students answer the following question from the engage with 1-2 paragraphs:

- *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?*
- *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?*

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/>
- Cottonbro. (2020, June 2). *Photo Of Person Holding Smartphone*. Pexel. <https://images.pexels.com/photos/4631067/pexels-photo-4631067.jpeg?auto=compress&cs=tinysrgb&dpr=3&h=750&w=1260>.
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- Mohan Kumar, D. (2014, January 05). *Mobile cell phone radiation*. <https://www.electroschematics.com/mobile-phone-radiation/>
- Veritasium. (2015, February 03). Do cell phones cause brain tumors? YouTube. <https://www.youtube.com/watch?v=wU5XkhUGzBs>