Call Me... Maybe?

Physical Science

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Published by *K20 Center*

Grade Level	9th Grade
Subject	ICAP, 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

- Common Cartridge (attached)
- Choose Your Superhero (attached, one per class)
- Electromagnetic Radiation Superheroes Instructions (attached, one per student)
- Electromagnetic Radiation Notes (attached, one per student)

20 minutes

Engage

Have students 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 a discussion board (in an LMS or elsewhere) with the C.E.R.T.I.Fy Your Thinking strategy. Have students write their claim, provide three points of evidence, and give comprehensive reasoning to the following prompt:

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

Teacher's Note: Creating Discussion Posts

Give a 24-hour period for students to create an initial post. Open peer responses the following day. Make sure that students create an initial post before they see others. Monitor the discussion board.

To help students develop their own opinions and to allow for student discourse, it is recommended that you update your discussion board's 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.

After students have created their initial posts with their claim, evidence, and reasoning, have students respond to two peers' discussion posts that oppose their point of view. After students have responded, have them return to their post, read the responses, and revise their reasoning to state whether they still agree or disagree with their claim, including the justification for why.

30 minutes

Explore

Teacher's Note: Activity Prep

Before beginning the activity below, click the following link to create a class copy of the activity's sign-up sheet: Choose Your Superhero. /// Once you create a copy (select ///), keep a link to your document handy. You will distribute this link to students and turn the document into a class sign-up sheet. If you prefer, you can upload the attached version of the Choose Your Superhero sheet to Google Docs and share it with students.

If using an LMS for this activity, insert your copied link into your LMS for students to access.

Invite students to create superheroes based on the seven types of electromagnetic waves. Share your prepared Choose Your Superhero sign-up sheet with students, and have each student sign up for a superhero of their choice.

Communicate the following procedure with students. This information may be embedded in an LMS or may be shared in a virtual classroom such as Google Classroom. It is also included in the attached **Electromagnetic Radiation Superheroes Instructions** handout.

Overview:

Now that we have discussed the pros and cons of cell phones and the energy they emit, let's dive into other rays that produce energy around us. Today, we will be creating superheroes based on the seven types of electromagnetic waves. These rays can be **non-ionizing,** where they are not likely to cause significant damage to human cells, or **ionizing,** where they do cause significant damage. Your job is to choose an ionizing or non-ionizing ray and determine that ray's level of destruction by creating a superhero.

Procedure

1. Sign up for your superhero using the **Choose Your Superhero** [Instructor note: add your link here] sign-up document. There can only be three individuals per ray.
2. Create a superhero associated with your ray.
    1. Define that ray's superpower and how much energy the superpower produces.
    2. Determine how that superpower can be harmful and helpful to living organisms (animals, plants, fungi, bacteria).
3. Save, upload, and submit your drawing and write-up to be reviewed for feedback.

The seven rays students can 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 drawing tools (students will need to take a picture and upload it)
- 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

Each student should submit their drawing and write-up for you to review and give feedback.

50 minutes

Explain

After students' drawings and write-ups have been approved, invite students to do a storytelling of their illustration using Screencastify. Screencastify is a Chrome browser extension that provides options to record the screen, video, and audio.

Optional Tech Tools

Some other tech tools that can be used by students like Screencastify are Screencast-o-matic, Jing, Loom, and Zoom.

Each student's screencast needs to be 1-2 minutes long. Each student should define their ray and discuss what represents the advantage and disadvantage of the ray in their drawing. Students should post their finished screencast into the discussion board.

Once all students have posted their screencasts into the discussion board, distribute the following link to students: Electromagnetic Radiation Notes. (This link provides a separate copy to each student.) Once students have made personal copies of the handout, ask students to do a Gallery Walk and collect data from their classmates' screencasts, recording notes in the table on the top half of the handout.

Next, direct students to the CK-12 20.3 Electromagnetic Spectrum article to read. Ask students, as they read, to complete the questions at the end of their Electromagnetic Radiation Notes handout. Once finished, have students save and submit their notes.

20 minutes

Extend

The following activity can be used to add a career exploration element to this lesson.

Communicate the following procedure with students. This information may be embedded in an LMS or may be shared in a virtual classroom such as Google Classroom.

> 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.

Provide the ICAP - Call Me...Maybe? video to students. video to students:

Embedded video

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

Ask students to consider, as they watch the interview, the advantages and disadvantages they may learn about electromagnetic radiation and the type of technology that they use in Mrs. Benard's line of work. Additionally, alert students to be prepared to answer two questions posed at the end of the video.

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

Have students answer these questions and turn in their responses via your LMS or similar.

Optional: Discussion Posts

Consider creating a page within your LMS (or similar) for students to answer these questions in a discussion post. Then, have students respond to their peers' posts.

25 minutes

Evaluate

Invite learners to use a quiz page in your LMS (or a similar method) with the Fist to Five strategy to evaluate their own mastery of the objectives.

Share the following objective statements and have students rate themselves on a scale of 0-5 for each:

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. I understand that longer wavelengths are absorbed as heat.
4. I understand that different waves have different energies that can impact human health.

Using the quiz format in your LMS (or similar), invite students to read Electro Schematics's Mobile Cell Phone Radiation article and watch Veritasium's "Do Cell Phones Cause Brain Tumors?" video. Have students answer the following quiz questions with 1-2 paragraphs apiece:

- *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 still believe the resources you found as evidence to support your claim about cell phone radiation at the beginning of this lesson? Were those sources reliable 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/
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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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