5E Lesson Plan (NGSS)

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| **Teacher:**  |
| **Date:** |
| **Subject / grade level:** Science, Grade 8, Lesson # |
| **Topic:** What Blocks Radio Waves  |
| **Materials:**Computer, COSMOS Technology Toolkit, Walkie-Talkies, sound maker, paper bags, rubber gloves, dark colored plastic 2-liter bottles, aluminum foil, cardboard box, copper fabric, handouts   |
| **Essential Question(s):** How has technology changed the way we communicate?   |
| **New York State P-12 Science Learning Standards (NGSS):** MS-PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

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| **Science & Engineering Practices (SEPs)** | **Disciplinary Core Ideas (DCIs)** | **Crosscutting Concepts (CCs)** |
| **Developing and Using Models**Modeling in 6–8 builds on K–5 and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. **Obtaining, Evaluating, and Communicating Information**Obtaining, evaluating, and communicating information in 6-8 builds on K-5 and progresses to evaluating the merit and validity of ideas and methods. | **PS4.A: Wave Properties**A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)**PS4.C: Information Technologies and Instrumentation**Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3) | **Patterns**Graphs and charts can be used toidentify patterns in data (MS-PS4-1) **Influence of Science, Engineering, and Technology on Society and the Natural World**Technologies extend the measurement, exploration, modeling, and computationalcapacity of scientific investigations (MS-PS4-3) **Science is a Human Endeavor**Advances in technology influence the progress of science and science has influenced advances in technology (MS-PS4-3)  |

**Common Core State Standards (CCSS):****SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text or prepared information on the same topic.  |
| **Lesson Topic:** What Blocks Radio Waves **Learning Target:** I will: * Perform an experiment to show which materials can block or interfere with radio waves
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| **Differentiation strategies to meet diverse learner needs:*** **Bodily kinesthetic learners** - Local and Express demonstration hands-on activity
* **Audio and Visual learners** – Slide show, Visual representation of activity using computer, transmitter and receiver, The observations/data collected throughout the activity
* **ELL/Low reader** - Guided notes printed for those who require them
* **Technology**- Utilizing COSMOS Technology Tool Kit
* **Extended time** for those who require it
* **Small groups** according to levels, behavioral needs, and activity requirements
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| **ENGAGEMENT** 1. Discussion Question(s)
* How come your cell phones don’t work when they are in the subway train?
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| **EXPLORATION** 1. Students will view a short slide show to introduce the lesson. Materials & equipment are set up on student’s desks. Students are in small groups & will assign roles to each other for the activity, e.g. note taker, reader etc. One student will read out loud from the handout and the group will perform the activity.
2. Activity:
3. Teacher will supervise students as they perform the activity on the COSMOS Technology Toolkit.
4. Students will perform the following activities: **Part 1)** Students will cover the antenna on the receiver Toolkit with the 4 medium paper bags and observe whether it is still able to receive the radio signal. They will record their observations in the table entitled “Part 1: Using COSMOS Toolkit”. Repeat the procedure using the *rubber gloves*, *dark colored two-liter plastic bottles*, and *aluminum foil* respectively and record your results in the table entitled “Part 1: Using COSMOS Toolkit”.
5. **Part 2)** Students will now use the walkie-talkies. They will identify 1 of the walkie-talkies as the transmitter. Tape down the “push-to-talk” button so that it is always transmitting. Turn the sound maker on and tape it to the transmitting walkie-talkie. Ensure that the receiver walkie-talkie is receiving the signal.
6. Place the transmitting walkie-talkie & sound maker into the 4 medium paper bags and wrap it up in it. Observe whether the receiver walkie-talkie is still able to receive the radio signal. Record your observations in the table entitled “Part 2: Using COSMOS Toolkit”
7. Repeat procedure #3 using the *rubber gloves*, *dark colored two-liter plastic bottles*, and *aluminum foil* respectively and record your results in the table entitled “Part 2: Using COSMOS Toolkit”.
8. Students will draw a graph of the different times it took for each transmission on their handout. 3) Students will then answer questions that follow their activity.
9. **Part 3) [Cardboard box & copper fabric with walkie-talkie]** Students will cover the entire outside of the cardboard box with copper fabric – making it, in effect a **copper box**. They will put the box on its side. Place the transmitting walkie-talkie & sound maker inside the box facing the opening direction and turn on the sound maker. Place the receiver behind the copper box and observe whether or not it is receiving the signal from the transmitting walkie-talkie. Record your results in the table entitled “Part 3: Using Copper Box”
10. Students will then answer the questions that follow on their handout.
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| **EXPLANATION**After students complete their experiment there will be a discussion/share-out with their observations and comments about their activities - facilitated by the teacher. Analyzing information collected on their handout and identifying any errors that may have been made and correct them. *Vocabulary words*: radio waves, electromagnetic spectrum, Faraday cage.   |
| **ELABORATION**Students will extend their knowledge of materials that block radio waves by discussing the following question: Why has it become necessary for people to protect their electronic devices from radio wave transmissions?  |
| **EVALUATION** 1. Teacher Observation
2. Correctly following procedures
3. Students complete the questions on their handouts
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| **HOMEWORK** In 1 paragraph to explain what a Faraday Cage is?  |