

**COSMOS Experiment-Signal Strength**

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| **Grade: 6th** | |  | |
| **Topic:**  Relationships between independent and dependent variable within the context of Signal Strength and Distance. | | **Materials:**   * Transmission devices:   + Baby monitors, electronic car key, radio control cars, wireless microphone or walkie talkies. * COSMOS collection Database * SDR receiver (500 hz -1.7 Ghz) * Measuring tool   (ribbons cut into 5 meters each)   * Post-it Chart Paper * Markers * Graph Paper | |
| |  |  |  | | --- | --- | --- | | **Science & Engineering Practices (SEPs)**  Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to determine similarities and differences in findings. (MSESS3-2) | **Disciplinary Core Ideas (DCIs)**  ETS1.B: Developing Possible Solutions. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to MS-LS2-5)  Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them.  (HS-PS4- 5) | **Crosscutting Concepts (CCs)**  Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)  Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HSPS4-2) | | | | |
| **Math Common Core Standards:**  **6th Grade:**  **6.RP.A.1-**Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.  **6.RP.A.3-**Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.  **6.EE.9-**Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. | | | |
| **Essential Question:**  How can you represent the relationship between an electromagnetic signal and distance/location? | | | |
| **Learning Target** | Today I am doing an experiments with walkie-talkies.  So that I can determine the relationship between signal strength and distance. I know I’ve got it when I can show and describe the relationship in a table and a graph. | | |
| **Engage** | 1. Teacher and student will transmit a signal by speaking into a walkie-talkie. A screenshot of the signal will be taken to complete a See, Think, Wonder ( graphic organizer ) 2. Students engage in a see, think, wonder of the signal screenshot.    1. See: What do you notice?    2. Think: What do you think your noticing mean?    3. Wonder: Create a question that you would like to explore further based on your noticings and conjectures? 3. Discuss with the students their conjectures and wonderings. | | |
| **Explore** | 1. Explain experiment procedure.    1. Day 1-Students test signal strength in an open space    2. Day 2-Students test signal strength inside the building (one student in the classroom, one student in the hall) 2. Show students how to use the COSMOS data collection program    1. CDCP will collect and present raw data, graphical data and table data   \*Ensure that students are running the COSMOS program correctly\* | | |
| **Explain** | 1. In small groups, the students will discuss their observations, their findings, questions, multiple representations of the results and trends based on the data. 2. In a gallery walk, students will present all of their data and make connections across the different groups. They can use this space to discuss results and trends across the groups. \*Peer evaluations\* | | |
| **Extend** | * Discuss possible connections of this experiment to science concepts. * Apply this experiment to other transmission devices after the walkie-talkie modeling is conducted in class. * Students will use these extended experiments as projects to explore in their own space and time. | | |
| **Evaluate** | Find out if the students were able to accomplish the main goal/learning target/essential questions posted before the experiment started.  Present students with representations of the same data and ask them to discuss the relationships between the independent and dependent variable. | | |
| **Differentiation** | Students will be grouped heterogeneously. Each group will be expected to meet the same standards. Graphic organizers and vocabulary sheets will be available to students to use. | | |