



Ada Lace and Ham Radio Exploration Chapter 4

Objectives:

- Understand the concept of radio waves and their role in communication.
- Explore wave properties through hands-on activities.
- Analyze characters' reasoning and problem-solving skills in Ada Lace, Take Me to Your Leader.
- Develop scientific reasoning skills through written and design-based challenges.

Suggested Grade Levels:

3rd-8th Grade

Subject Areas:

- Science (Waves & Communication)
- Language Arts (Reading Comprehension & Analysis)
- Engineering & Design

Time Allotment:

- 2-3 class periods (45-60 minutes each)

Next Generation Science Standards:

- **PS4.A: Wave Properties** - Investigate the characteristics of waves and how they travel through different media.
- **PS4.C: Information Technologies and Instrumentation** - Explore how signals, including radio waves, are used for communication.
- **ETS1.A: Defining and Delimiting Engineering Problems** - Apply engineering concepts to design and evaluate communication-related tools like radio waves and shielding materials.

Background Information:

- Radio waves are a type of electromagnetic wave used in communication. In Ada Lace, Take Me to Your Leader, Ada wants to use a high-frequency radio to communicate globally. Students need to understand how different frequencies are tied to wave behavior. Students will explore wave properties and terminology to experiment with design concepts in this lesson.

Vocabulary:

- **Crest** – The highest point of a wave.
- **Trough** – The lowest point of a wave.
- **Amplitude** – The height of a wave from the resting position.
- **Frequency** – The number of waves passing a point per second.
- **Wavelength** – The distance between two crests or two troughs.
- **Electromagnetic Waves** – Waves that do not require a medium to travel.
- **High-Frequency Radio** – A type of radio wave that can travel long distances.



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Materials:

- Copies of Ada Lace, Take Me to Your Leader (1 per pupil or projection device)
- [Ada Lace, Take Me to Your Leader Part 2 of 3](#) (0:00-6:54)
- Jump ropes and slinkies for wave demonstrations
- Drawing paper and markers
- Tin foil for the design challenge
- Writing prompts for scientific reasoning

Lesson Procedures:

1. Before Reading Discussion: Exploring Wave Concepts Through Movement

- Video Introduction: Watch [Waves for Kids! \(Sound Waves, Amplitude, Wavelength, Frequency\)](#) to introduce wave properties.
- **Kinesthetic Learning:** Students act out wave properties using jump ropes or slinkies to demonstrate crest, trough, amplitude, frequency, and wavelength.
- **Scientific Drawing:** Students create labeled diagrams illustrating wave properties.
- **Discussion:** Connect wave concepts to Ada's radio and real-world communication technologies.

2. Reading Chapter 4

- **Review Chapter 3:**
 - Discuss key events leading up to Ada's interest in radio waves.
- **Read Chapter 4:**
 - Pause to discuss key moments:
 - Why is Ada hoping to get a high-frequency radio? (Talk to people around the world)
 - Examine the girls' ideas that might explain the strange voices/words. Make your own suggestions.
 - Why is Ada sad? (She wants to share the fun with her friend)
 - Page 39 - Explain "vivid imagination." (Things in your mind seem very real)
 - Page 40 - Simile: "He was beginning to sound like her third parent." Explain meaning.
 - What is the point of Nina's tinfoil hat? (Keep out bad energy)
 - At first, Nina was nervous about the babies. How does Ada fix that? (Tells her they are kittens)
 - Predict: What do you think is happening with the voice that says "Take me to your leader"? (Milton)
 - Offer the clues that helped Ada figure out the answer. (Clear signal is close, recognized the voice, window)
 - Why do you think he is doing that? (Answers vary)

3. Testing Tin Foil Hats: Engineering & Critical Thinking

- **Written Response Challenge:** Students evaluate the effectiveness of wearing a tin foil hat using scientific reasoning.
- **Design Challenge:** Students create and test their own tin foil hat designs.
- **Bulletin Board Showcase:** Display student designs and written responses together.

Differentiated Instruction:

- **Visual Learners:** Create a labeled diagram illustrating wave properties (crest, trough, amplitude, frequency, wavelength) with color-coded definitions.



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- **Auditory Learners:** Engage in a guided discussion where students predict and analyze Ada's reasoning in Chapter 4, emphasizing key vocabulary through verbal repetition.
- **Kinesthetic Learners:** Use jump ropes to physically demonstrate wave motion, having students create crests and troughs to model amplitude and frequency.
- **ESL Students:** Provide a picture-supported vocabulary sheet with simple definitions and real-world examples for terms like "wave," "frequency," and "radio."
- **At-risk Students:** Complete a teacher made graphic organizer to help break down Ada's problem-solving steps, connecting key moments in the story to real-life radio communication.
- **Advanced Learners:** Challenge students to design and explain a simple radio communication system, considering how waves travel and how signals can be improved or disrupted.

Extensions:

- Invite an amateur radio operator to demonstrate ham radio communication.
- Conduct an experiment testing how different materials (foil, fabric, paper) affect radio signals.
- Research the three levels of ham radio licenses—**Technician, General, and Extra**—and create a visual chart comparing their privileges, frequencies, and real-world applications. Discover how real-life radio operators communicate using high-frequency radios. Connect your enhanced understanding to Ada's wish to use high-frequency radio and communicate globally.