Ada Lace and Ham Radio Exploration Chapter 8

Objectives:

Students will:

- Define key terms related to space communication and technology.
- Compare and contrast student questions from an ARISS contact and a book discussion.
- Develop inquiry-based questions suitable for an ARISS conversation.
- Explore the importance of communication technology.
- Engage with real-world STEM applications through guest speakers and hands-on activities.

Suggested Grade Levels:

3rd-8th Grade

Subject Areas:

- Science (Earth and Space Science, Physical Science, Engineering)
- Technology
- Language Arts
- Mathematics
- Social Studies

Time Allotment:

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

Next Generation Science Standards:

- **3-PS2-4**: Define a simple design problem that can be solved by applying scientific ideas about magnets and electric forces.
- **3-5-ETS1-1**: Define a simple design problem reflecting a need or a want that includes criteria for success and constraints on materials, time, or cost.
- **4-PS3-4**: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
- **5-PS1-3**: Make observations and measurements to identify materials based on their properties.
- **MS-PS4-3**: Integrate qualitative scientific and technical information to support the claim that digitized signals are a reliable way to encode and transmit information.
- **MS-ETS1-1**: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution.

Background Information:

- ARISS (Amateur Radio on the International Space Station) enables students to communicate with astronauts in space.
- Ham radio is an accessible form of radio communication used for STEM learning.
- The Civil Air Patrol offers STEM kits that include space and communication technology resources.

- Resources:
  - ARISS official site
  - ARISS Live YouTube
  - Civil Air Patrol STEM Kit Program

Vocabulary:

- **Electrolysis:** Passing electricity through water to separate hydrogen and oxygen.
- **Gimbal:** A device used to keep a camera stable and prevent shaking.
- **Swarm:** A keyword used in the book to help solve the mystery of the voice.

Materials:

- Copies of *Ada Lace, Take Me to Your Leader*
- Ada Lace, Take Me to Your Leader Part 3 of 3 (5:12-End)
- Access to ARISS contact video
- Chart paper or digital collaboration tools for comparison activities
- Writing materials for student reflection and opinion pieces
- Guest speaker (local ham radio club representative)

Lesson Procedures:

1. **Before Reading Discussion**:
   - Review Chapter 7
2. **Reading Chapter 8:**
   - What is the name of the astronaut? (Sandy)
   - Define electrolysis from page 74. (Passing electricity through water to separate hydrogen and oxygen)
   - What key word from Sandy helps solve the mysterious voice? (Swarm)
   - Define gimbal from page 81. (A device that keeps a camera from shaking)
   - Evaluate the title that the author gave this book. Think of alternative title ideas.
3. **Hands-on Activities:**
   - **ARISS Contact Video Comparison:** Watch an ARISS contact video and compare the questions asked in the book to those asked in real-life ARISS contacts. Discuss similarities and differences.
   - **Class Discussion:** Examine how the astronaut's answers in the book compare to real astronaut responses.
   - **Student-Generated Questions:** Have students compile their own questions for a potential ARISS conversation.
     i. Watch an ARISS contact video, preferably one involving the class or a school contact.
     ii. Compare and contrast the questions asked in the book vs. real student inquiries.
     iii. Create a plot diagram of the story, identifying key problems and solutions.
     iv. Take the Accelerated Reader quiz (Quiz #195904).
     v. Invite a local ham radio club member to discuss amateur radio and space communication.
   - **Writing Prompts:**
     i. "I used to think... but now I know..."
     ii. "What have you learned about ham radio?"
     iii. "Why does communication technology play an important role in our world today?"
     iv. Opinion Writing: "Do you want to pursue a ham radio license? Defend your answer."

Differentiated Instruction:

a. **Visual Learners:** Use diagrams, video content, and digital comparisons.
b. **Auditory Learners:** Focus on listening to ARISS contacts and engaging with guest speakers.
c. **Kinesthetic Learners:** Hands-on activities with STEM kits and amateur radio equipment.
d. **ESL Students:** Provide translated vocabulary sheets and visual aids.
e. **At-risk Students:** Offer small group discussions and guided support for preparing questions in advance.
f. **Advanced Learners:** Encourage deeper research on amateur radio operations and satellite communication. Students may be encouraged to prepare video presentations related to their research and writing topics.

Extensions:

- Investigate the Civil Air Patrol's STEM Kit Program for hands-on learning.
- Develop a school-based amateur radio club or partner with 4H for further STEM engagement.
- Conduct a mock ARISS interview where students take turns as astronauts and radio operators.