

Communication in the Cosmos

Subject:
Science/ELA

Grade: Kindergarten
through 8th Grade

Time: 45-60 minutes

Learning Objectives:

To teach students the importance of effective communication skills, including overcoming challenges and time delays, by comparing communication on Earth and in space through a hands-on LEGO activity with a 30-second communication delay using only typed messages.

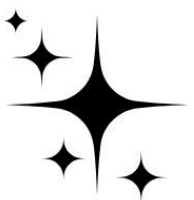
Standards and Competencies:

NGSS Elementary (K-5)

- 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

NGSS Middle School (6-8)

- MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.
- MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.



Background Knowledge:

When delving into the importance of communication on a deep space mission with students, it's crucial to emphasize the unique challenges and critical role effective communication plays in such endeavors. Deep space missions involve vast distances, resulting in significant time delays for signals to travel between spacecraft and Earth. This delay requires meticulous planning and reliable communication systems to ensure successful mission outcomes. Teachers should guide students in understanding the impact of communication delays on decision-making, problem-solving, and overall mission success. Highlighting real-life examples of space missions and exploring the technological solutions employed can provide valuable context. Emphasizing teamwork, clear protocols, and the use of advanced communication technologies fosters an appreciation for the complexities of space exploration and underscores the significance of effective communication in overcoming the challenges inherent to deep space missions.

Materials:

- Two sets of 10-15 matching LEGO bricks divided into two Ziplock bags per group
- Communication Lesson Worksheet (prepared by the teacher) - [SEEC Google Doc](#)
- Stopwatch or timer
- Computers or laptops with internet access for each group

Optional: baseplate or building mats

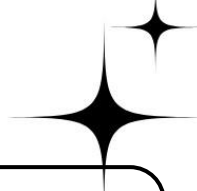
Procedure:

Introduction (5 minutes):

1. Begin by discussing the importance of communication skills in our daily lives and in unique environments, such as on Earth and in space.
2. Introduce the concept of communication challenges in space due to distance, time delays, and reliance on technology.
3. Ask the students to brainstorm and discuss the differences between communication on Earth and in space.

Activity Explanation (5 minutes):

1. Introduce the LEGO activity as a way to explore communication challenges faced by astronauts in space compared to communication on Earth.
2. Explain that students will work in pairs or small groups, with one group representing Earth and the other representing a space mission team.

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3. Emphasize that effective communication strategies, problem-solving, and adapting to constraints will be important in completing the task.

Group Formation (3 minutes):

1. Divide the students into pairs or small groups, with half of the groups representing Earth and the other half representing a space mission team.
2. Ensure each group has access to matching LEGO sets, a stopwatch or timer, computers or laptops with internet access, and the Communication Lesson Worksheet.

Activity Instructions (15 minutes):

1. Provide each group with the necessary materials, including computers or laptops.
2. Explain the task: Each group will work together to build a structure using LEGO bricks that match what Mission Control has designed.
3. The Earth group can communicate freely using typed messages on the computer.
4. The space mission team can only communicate using typed messages with a 30-second delay, simulating the time delays and constraints of space communication.
5. Midway through the activity switch roles, allowing everyone to experience both sides of the communication process.
6. As the lesson progresses plan to shorten the time delay. (Representing the spacecraft getting closer to the physical mission control.)

Building Phase with Communication Constraints (30 minutes):

1. Instruct the groups to start building based on the given instructions, considering their assigned communication constraints.
2. The Earth group can communicate freely by typing messages to each other on the computer.
3. The space mission team must rely on typed messages with a 30-second delay, simulating the communication delay experienced in space.
4. Start the stopwatch or timer and inform the space mission team that their typed messages will only be seen by the other group after a 30-second delay.
5. Circulate among the groups to observe their progress and offer guidance if necessary.

Discussion and Reflection (15 minutes):

1. Gather the students together for a whole-class discussion.
2. Ask each group to share their experiences during the activity, focusing on the challenges they faced with their assigned communication constraints.

3. Compare and contrast the communication processes and challenges between the Earth group and the space mission team, emphasizing the impact of the 30-second delay and typed messages only.
4. Discuss the importance of clear and concise communication, patience, problem-solving, and adapting to constraints in different environments.
5. Reflect on the lessons learned from the activity and how they can be applied to real-life communication scenarios.

Conclusion (5 minutes):

1. Reinforce the significance of effective communication skills in various environments, including on Earth and in space.
2. Highlight the challenges and considerations involved in communicating with a 30-second delay and the importance of adapting, being patient, and using typed messages effectively.
3. Encourage students to continue practicing and improving their communication skills, being adaptable and creative in different situations.

Assessment:

-Students write a brief reflection on the LEGO activity, discussing challenges faced and lessons learned about space communication.

- Students present their models, explaining design choices and highlighting differences between Earth and space communication.

- Participate in a group discussion, sharing experiences and providing feedback on peers' approaches to the LEGO activity.

Assessment Criteria:

Evaluation is based on understanding, creativity in model design, reflection quality, communication plan effectiveness, active group discussion participation, and clarity in concept mapping.

Additional Resources:

Extension Activities (Optional):

1. Have students research and present the challenges of communication in space missions, including time delays, reliance on technology, and language barriers.
2. Organize a debate or group discussion on the pros and cons of different communication methods in space, such as typed messages, video messaging, or virtual reality interfaces, considering the 30-second (or longer) delay and the limitations of typed messages.

**Note: The duration and complexity of the design challenge can be adjusted based on the students' age, skill level, available materials, and time constraints.