

Images From Space

Teacher Information

Background:

Students will demonstrate how spacecraft with electronic cameras create images of objects in space by changing the light collected from a space object into numbers, sending the numbers to Earth, and changing the numbers back into an image of the object.

Key Concepts:

1. Astronomical spacecraft gather information in picture form by collecting and analyzing light.
2. Light information can be changed into numerical form, transmitted, and then changed back into an image.
3. A clearer image can be produced if more detailed information is collected and transmitted.

Materials

- transparent grid
- picture
- paper grid
- pencil

Procedures:

1. Have students work with partner and designate Student A and Student B.
2. Copy page 4.16 and cut it along the dotted line. Make one copy of the grid on an overhead transparency for each Student B. Also, make one copy of the picture on standard white copy paper for each Student B. Make one copy of the grid for each Student A.
3. Explain that each student B represents the electronic camera which will send information about an object in space to Student A. Student A will then decode the information into an image.
4. Distribute the transparent grids and pictures to each Student B, telling them not to show the picture to their partner. Give each Student A a paper grid.

Extensions:

Repeat this activity using squares _ the size of the original grid. Remember, increasing the number of squares will require more class time.

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Teacher Information (Continued)

Answer Key for Student Questions:

1. Why is the image drawn by Student A not as clear as the original picture?
Student B did not give Student A enough information to make an exact copy of the picture. If a square had 2 shades, Student A was given a shade in between.
2. How would you change the grid to make a more detailed picture?
The image created with this activity is a crude representation of the original picture. The reason for this is that the initial grid contains only 164 squares. If there were more squares, each square would be smaller and the image would show finer detail.

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Student Sheet

You will demonstrate how spacecraft with electronic cameras create images of objects in space by changing the light collected from a space object into numbers, sending the numbers to Earth, then changing the numbers back into an image of the object.

Objective

Students will learn about how a spacecraft transmits images to Earth from space..

Materials (per group of two students):

transparent grid
picture
paper grid
pencil

Procedures:

1. Each team will have the assignment of transmitting and decoding a picture by using a gray scale and a grid pattern. Student A is the Image Decoder; Student B is the Electronic Camera.
2. Student B obtains a picture with a gray scale printed beside it and a transparent grid from the teacher. Student A receives a paper grid.
3. Student B places the grid over the picture, determines the brightness of square one by comparing it to the gray scale. He or she “transmits” the information to Student A. If a square covers an area of the picture that is both light and dark, Student B should estimate its total brightness and assign an intermediate value to the square. Note: Use the letters and numbers on two sides of the grid to help Student A find the location of each square to be shaded.
4. Student A shades the first square according to the number transmitted by Student B. Continue until the entire image is transmitted.
5. When Student A has completed decoding the image, both students compare the result to the original image.

Questions:

1. Why is the image drawn by Student A not as clear as the original picture?

2. How would you change the grid to make a more detailed picture?

Images From Space

Images from Space Picture

0	1	2	3	4	5	6	7	8	9	10



