

Waves and Electromagnetic Radiation

Quest Kick-Off

Teaching Strategies and Answers *Design to Stop a Thief* (Digital Activity)



Hit the Target!

Your security company has been approached by the director of a local museum. She wants your company to design an optical security system to protect a gemstone exhibition. Before the museum director will hire your company, she wants to see a demonstration of your expertise.

Your group will apply what you learn about the behavior of waves to use lenses and mirrors to direct a beam of light from a flashlight around an obstacle so that it hits a target. Here are the criteria and constraints for your task:

- You must use at least one lens.
- You must use at least two mirrors.
- You must develop a solution in which the light travels no more than 1.5 meters total.
- You must use a flashlight as the source of light.



Students are introduced to a scenario in which they will use different materials to make light go in different directions.

Teaching Tips Students may or may not have experience with lenses and mirrors. Have a few lens stands and mirror stands on display in the class so that students can see what they are and think about how to incorporate them into their models.

Teaching with Technology Ask students to share their experiences with security systems. Topics could include home security systems, airport security, security cameras, metal detectors, and security sensors at retail stores. Students can also contrast their real world experiences with security systems they see in movies and the ease with which the heroes or villains bypass such systems.

Best Practices In this STEMQuest, students will probably figure out the purpose of the mirrors quickly, as the concept of reflecting light is one they are likely familiar with. However, students may need assistance realizing that the purpose of the lenses is to focus the light to keep it from getting too diffuse.

Continued

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Integrating Instructional Strategies

Next Gen Science

SEP Developing and Using a Model If students do not understand how to use the diagram on the third screen of the activity, ask them to reproduce the model on a piece of paper and then add items to the drawing that might represent a possible solution to the problem.

CCC Energy and Matter The graphic organizer in the activity is a good introductory activity to the Quest as well as to the unit on waves and light as a whole. Try to get as many students in the class to participate in sharing their knowledge and questions as possible.

Answers

1. Accept all reasonable responses. Answers should reflect the information provided on the second screen of this activity.
2. Accept all reasonable responses. Ideas should include a method of using a model to figure out a solution to the problem.