

## **Middle Childhood Lesson**

Can You See Me Now?

Lesson Plan by: Lisa Heaton

(Adapted from <http://thetrc.org/trc/fieldtrip/5E%20Lessons.html>)

**Lesson:** Can You See Me Now?

**Length:** 40-45 minutes

**Grade Level Intended:** Fifth Grade

**Academic Standard(s):**

- 5.3.2** Observe and describe that stars are like the sun, some being smaller, some being larger, but they are so far away that they look like points of light.

**Performance Objectives:**

- 5.3.2** Upon observing, students will be able to explain how light from stars refract to create angles of light with 90% accuracy.

**Assessment:**

- Student's journals will be collected so observations and answers to questions can be evaluated.

**Advanced Preparation by Teacher:**

**Internet Links:**

☞ Pictures from the Hubble Telescope

[http://hubblesite.org/newscenter/newsdesk/archive/releases/image\\_category/](http://hubblesite.org/newscenter/newsdesk/archive/releases/image_category/)

☞ Good explanation of how a telescope works

<http://science.howstuffworks.com/telescope1.htm>

☞ Diagram of inverted image on retina

<http://www.yorku.ca/eye/invert.htm>

**Materials:**

**Engage:** Scissors, metric ruler, pencil/pen, 3" X 5 "index card

**Explore:** Low power, over the counter reading glasses, magnifying lens, flashlight, masking tape, waxed paper, meter stick

**Elaborate:** two magnifiers-one small and one large, 2-3 flat mirrors

**Procedure:**

**Introduction/Motivation:** Have you ever gone outside at night and looked up at the stars? When you did, you noticed that there were some little tiny dots of light coming from way up in the sky. Those little dots in the sky are refracted light called stars. Let's look at some stars online.

**Step-by-Step Plan:**

**Engage:**

1. Fold the index card in half from left to right (hamburger fold).
2. With the fold facing you, measure and draw a square that is about 1.25cm on each side.
3. Cut out the square. Open the card. The resulting hole should be about 2.5 cm<sup>2</sup>.
4. Go out side and find an object. The object may be bare ground, a tree or bush, gravel, asphalt, etc. Draw a picture of your object in your journal.

5. Lay the index card on your object. Draw what you see inside the 2.5 cm<sup>2</sup>.
6. Compare the two drawings. What did the hole in the card allow you to see?

**Explore:**

1. Use the masking tape to attach the reading glasses to the edge of a table or chair so that one lens sticks out beyond the edge.
2. Set a flashlight horizontally on a table or counter. The flashlight should be about 4 m behind the lens.
3. Turn on the flashlight and point it at the lens.
4. Stand close to the lens. Hold a piece of waxed paper so that the light shines through the lens and onto the paper.
5. Slowly step backwards until you see a small image of the flashlight on the waxed paper.
6. Have a team member hold the waxed paper at this point. This is the focal point of the lens. It is normally inside the tube of the telescope.
7. Face the back side of the waxed paper and look at the image through your magnifying lens.
8. Keep looking through the magnifying lens and have your team member remove the waxed paper.
9. Draw the set-up of this activity and write your observations down in your journal.

**Explain:**

1. A telescope is a device used to magnify distant objects. Their purpose is to gather light. Most of the telescopes are either refractor telescope, which uses glass lenses or reflector telescope, which uses mirrors instead of the lenses.  
Here are some terms:
  - **refraction** – the bending of light as it passes through one substance to another.
  - **field of view** - area of the sky that can be seen through the telescope with a given eyepiece focus.
  - **focal length** - distance required by a lens or mirror to bring the light to a focus.
  - **focal point** - point at which light from a lens or mirror comes together.
  - **magnification (power)** - telescope's focal length divided by the eyepiece's focal length.
  - **objective lens** (in refractors) or **primary mirror** (in reflectors) collects lots of light from a distant object and bring that light, or image, to a point or **focus**.
  - **eyepiece lens** (ocular) takes the bright light from the focus of the objective lens or primary mirror and "spreads it out" (magnifies it) to take up a large portion of the retina.
2. To understand how telescopes work, think about the following question. Why can't you see an object that is far away? For example, why can't you read the writing on a dime when it is 55 meters (150 feet) away with your naked eyes?
3. The answer to this question that the object does not take up much space on your eye's screen (**retina**). If you want to think about it in computer terms, at 55 m (150 ft) the writing on the dime does not cover enough pixels on your

retinal screen for you to read the writing.

4. When you combine the objective lens or primary mirror with the eyepiece, you have a telescope. Again, the basic idea is to collect lots of light to form a bright image inside the telescope, and then use something like a magnifying glass to magnify (enlarge) that bright image so that it takes up a lot of space on your retina. This is the same principle that a magnifying glass (lens) uses; it takes a small image on the paper and spreads it out over the retina of your eye so that it looks big.

**Elaborate:**

1. Try to make your telescope more powerful.
2. Try creating a telescope by using two magnifying lenses. One magnifier lens should be larger than the other. Compare and contrast this telescope to the first one you made.
3. Try to construct a reflecting telescope by using mirror. Compare this telescope to any previous ones you made.

**Evaluate:**

1. In your model telescope, what does the flashlight represent?
2. What are some of the limitations of your model telescope?
3. What kind of information can scientists get from looking into space with telescopes?
4. How do the two lenses of a refracting telescope work? Be specific about the position of the object.
5. In the Engage activity, you narrowed your field of view. Explain what this means. Give a difference you noticed by narrowing your field of view.
6. After that is complete, students will draw a picture of a home for an animal.

**Closing:** Today we learned a lot about light, and how our eyes perceive light. We got to do a lot with groups and using a lot of materials and tools to explore how light works and how we use it. Now that we have all of this information, we can better understand the process that light goes through before it gets to our eyes.

**Adaptations/Enrichment:**

For students with visual impairments, larger materials could be provided or an aide could be used. For enrichment, students could type their answers on the computer before being submitted.

**Self-Reflection:** Did the students learn from this activity? Did they understand the concept of refraction? Were the student's answers logical?

MC Lesson Plan	1 point	2 points	3 points	4 points	SCORE
Manchester College lesson plan format	Plan does not contain all required sections of lesson plan.	Plan contains all required sections of lesson plan.	Plan contains all required sections of lesson plan including Bloom and Gardner references.	Plan is thorough and contains all required sections of lesson plan including Bloom and Gardner references.	3
Thorough, purposeful, engaging content	Lesson plan lacks detail, engaging opportunities, and purpose.	Lesson plan lacks purpose and engaging opportunities, but detail is sufficient.	Lesson plan is engaging for learners, contains sufficient detail and purpose for teacher who designed the plan to implement it effectively.	Lesson plan engages learners, demonstrates purpose clearly, has sufficient enough detail for a substitute teacher to teach the lesson effectively.	4
Academic standards and behavioral objectives	Lesson plan is not based on applicable academic standards and/or behavioral objectives are not written correctly.	Lesson plan is based on academic standards without clear linkage to correctly written behavioral objectives.	Lesson plan is based on applicable academic standards and behavioral objectives that are correctly written.	Lesson plan is based in applicable academic standards that are clearly linked to well-written behavioral objectives.	3
5E Format	5E format is incomplete.	5E format is attempted, but not complete.	Lesson plan is satisfactorily written in the 5E format for the middle childhood stage.	Lesson plan is exceptionally written in the 5E format for the middle childhood stage.	4

Spelling and Grammar	Lesson plan contains more than 5 spelling and/or grammar errors.	Lesson plan contains 3-4 spelling and/or grammar errors.	Lesson plan contains 1-2 spelling and/or grammar errors.	Lesson plan contains no spelling and/or grammar errors.	4
TOTAL:					18/20

COMMENTS: Yes, you have done well with the 5E format Lisa! Very thorough lesson :)