Teacher:

Class: 2nd grade

Duration: 1 class period

Course Unit:

Lesson Title: Optical Illusions and Thaumatropes

LESSON OVERVIEW

Optical illusions use light, color, and pattern to create visual experiences that trick the viewer's brain into perceiving images differently from their presence or behavior in reality. This is the result of a scientific principle called "persistence of vision." The thaumatrope, meaning "wonder turner" in Greek, is a nineteenth-century animation toy that uses motion to blend two images together to create an optical illusion. In this lesson, students will learn about optical illusions by creating their own thaumatrope toys.

STANDARDS

Tennessee State Standards

Visual Art—Grade 2

1.1 Use tools and media consistently in a safe and responsible manner.
1.2 Demonstrate an understanding of a variety of techniques.
1.4 Recognize and demonstrate levels of craftsmanship.
2.3 Understand and apply purpose in art.
2.4 Understand and apply context in art.
5.1 Analyze the characteristics and merits of the student's own work.
5.2 Analyze the characteristics and merits of others' work.

Science—Grade 2

GLE 0207.T/E.2 Apply engineering design and creative thinking to solve practical problems.

Common Core Connections for Integrated Subjects—Language Arts, Writing, Speaking & Listening

CCSS.ELA-Literacy.W.2.8 Recall information from experiences or gather information from provided sources to answer a question.
CCSS.ELA-Literacy.SL.2.1a Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
CCSS.ELA-Literacy.SL.2.1b Build on others' talk in conversations by linking their comments to the remarks of others.

OBJECTIVES

1. Students will be able to define *optical illusion* and *persistence of vision*.
2. Students will construct a thaumatrope.
3. Students will be able to identify the parts of the body used to view an optical illusion.

ASSESSMENT/EVALUATION

1. The teacher will walk around the room to observe the students' work habits during the activity and note how they follow instructions.
2. The students will trade thaumatrope toys with partners and observe various optical designs in motion.
3. The students will complete a written response in which they identify the parts of the body used to view an optical illusion and apply definitions.

MATERIALS

Per classroom:

- A PC-to-projector connection
- 1 premade thaumatrope

Per table:

- 2 circle template sheets (see the last page of this document; copy onto heavy paper if possible)
- 1 roll of tape
- 1 container of crayons, markers, or colored pencils per table

Per student:

- 1 small art journal *or* several sheets of paper
- 1 pencil
- 1 pair of scissors
- 1 straw

ACTIVATING STRATEGY

1. Show the "Creating a Thaumatrope" episode of *ArtQuest: Art Is All Around You*.
2. Ask 1–2 students to explain what a thaumatrope is in their own words.
3. Share this quote from *Eye Openers* on how the **thaumatrope** uses motion to blend two separate images together to create an optical illusion: "Your eyes take in information from the world around you in the form of light. That information is then sent to the brain, which makes sense of what your eyes are seeing. . . . Sometimes your eyes see things that your brain doesn't understand. These are optical illusions—pictures that play tricks on your eyes and confuse your brain."
4. Ask the students to think about their favorite cartoon or animated motion picture. Allow 1–2 students to tell the rest of the class what their favorites are. Explain that these animations are a series of separate optical illusions flashed on a screen at high speed.
5. To introduce the scientific principle of "persistence of vision," show a premade thaumatrope to the class. Point to the first image, and then point to the second image. Then, twist the straw between your hands to reveal the illusion.
6. [Say:] **Persistence of vision** is used to make motion pictures and animations, as well as thaumatropes. The pictures move so quickly that the eyes and the brain don't have time to see the individual images. Instead, they perceive 1 single image.

INSTRUCTIONS

1. Prior to class, set up this activity by placing the template sheets, tape, and containers of crayons, markers, or colored pencils at each table.
2. At the start of class, each student should pick up their journal (or several sheets of paper) and a pencil before taking their seat.
3. Brainstorm ideas for possible thaumatropes with the students. Some examples: a bird in a cage, a frog on a lily pad, a fish in a bowl, a bird in a nest, a butterfly in a jar.
4. Tell students to sketch 2 pictures in pencil, labeling one as the front of their thaumatrope design and the other as the back.
5. Next, tell them to draw their two images on the circle template sheet, in pencil, putting the "front" image on one circle and the "back" image on the other. These images should be centered within the circles.
6. Have the students hold their drawings up to the light to make sure that the fronts and backs line up correctly when the template sheet is folded vertically. Help students make adjustments to their drawings to ensure proper alignment.
7. Tell students to use the colored pencils, crayons, or markers to color in the images. While the students color, hand out scissors and straws.
8. When all students have completed coloring their pictures, demonstrate how to cut out circles from the template sheet. Direct the students to cut out their 2 circles in a safe and responsible manner.
9. When all students have finished cutting out their circles, demonstrate how to attach the straw to the 2 circles. Students will tape the straw to the bottom of one circle and tape the other circle to the other side. The images should be facing outward.
10. Students will hold the straw between their hands and rub their hands to see their thaumatropes in motion. Walk around the class to assess progress, provide positive feedback and affirmation, and assist students who may be having trouble.
11. Encourage students to experiment by spinning their thaumatropes at different speeds. [Say:] The motion of your hands spins the thaumatrope, creating an optical illusion. If you spin it fast, the illusion is strong. If you spin it more slowly, you may see both images instead of one.
12. To clean up:
    a. Students will put coloring materials back into the containers.
    b. One student will collect paper scraps at each table into a trash can.
    c. One student will collect the scissors from each table.
13. Students will return to their seats with their journals (or sketches), pencils, and thaumatropes.

ALTERNATE/EXTRA ACTIVITIES

- Students can change the illusions created by adding to the drawings or going over lines to make them bolder.
- The teacher may show images and videos of optical illusions (see under Extended Learning).
- Students with special needs or motor impairment may use premade thaumatrope designs. The teacher should provide adaptive scissors and coloring tools if available, and help with the hands-on experience.

CLOSURE

1. Ask students to identify the parts of the body used to view an optical illusion in a few sentences in their journals or on a sheet of paper. Have students apply the terms *optical illusion* and *persistence of vision* to their explanations.
2. Students will trade thaumatrope toys with a partner, observe their designs in motion, and discuss them. [Ask:] How is your thaumatrope different from your partner's? Is it a successful illusion? Why or why not?

CROSS-CURRICULAR CONNECTIONS

- Language Arts
- Science

EXTENDED LEARNING

Activities:

- Canada Science and Technology Museum, "The Thaumatrope: An Optical-Illusion Toy," cstmuseum.techno-science.ca
- Lou Coakley, "Who Ever Heard of Red Shamrocks" lesson plan, kinderart.com
- Ruth Hayes, "Thaumatropes," randommotion.com
- Museum of Vision, *Eye Openers: Exploring Optical Illusions*, museumofvision.org
- PBS Kids, "Motion Picture," pbs.org
- Sciphile, "The Thaumatrope" lesson plan, sciphile.org

Video:

- Gregory Barsamian, *Feral Font* (1996; available at gregorybarsamian.com)
- Frist Center for the Visual Arts, "Creating a Thaumatrope,"*ArtQuest: Art Is All Around You* (2014; available at fristkids.org)

Webpages:

- National Institute of Environmental Health Sciences, "Illusions," kids.niehs.nih.gov
- Optical Society, "Optical Illusions," optics4kids.org

For additional lesson plans and activities, visit us at fristkids.org. This lesson plan was created by an art education student in the Frist Center for the Visual Arts' Teaching Assistant Program under the guidance of education department staff and/or a mentor teacher. The Teaching Assistant Program is designed to introduce participants to museum education by providing unique teaching experiences in an informal learning environment. For more information about this program or other educational opportunities offered by the Frist Center, please visit fristcenter.org.