SHADOW PLAY SHAPES

Experiment Objective:
To learn geometric shapes and gain knowledge about shadow formation.

Transdisciplinary Theme:
Ways of Expressing Ourselves

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INQUIRY CYCLE

TUNING IN

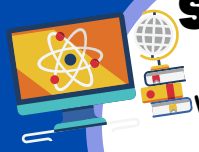
Let's Spark Curiosity

FINDING OUT

Let's Start Exploring! / Video

SORTING OUT

What Should Little Scientists Explore?



GOING FURTHER

For the Inquisitive Minds, Scientific Explanation, What Else Can We Do?

MAKING CONCLUSIONS

What Did We Discover / Activity Pages / Exit Card

TAKING ACTION

Question of the day?

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SHADOW PLAY

Let's Spark Curiosity

Before the activity, the poster of "Mimic the Shadow" is hung to the classroom. Ask students the following questions:

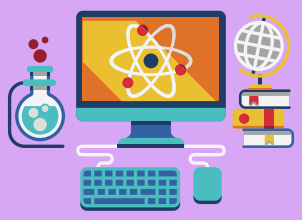
- Have you ever seen your own shadow?
- Have you noticed the shadows of trees, houses, and cars while walking on the street on a sunny day. How are these shadows formed?

Shadows are formed in places where light does not pass, creating dark areas in the shape of objects. For example, when walking on a sunny day, you can see your shadow on the ground. Sometimes your shadow follows you from behind, and sometimes it can be in front, to the right, or to the left. Pay attention to your shadow while you are walking on a sunny day. Let's see either you follow your shadow or your shadow follows you." is asked. Ask students to take out and examine the activity materials.

Let's Start Exploring!

Watch the activity video by pausing Check the contents of the set before starting the activity. Perform all steps of opening and unpacking the set simultaneously with the students.

Watch the video by pausing!



Set Content

- ☐ Shadow model templates
- ☐ Tongs to join the joints of our shadow
- ☐ Sticks to move our shadows
- ☐ "Which One is the Shadow?" activity sheet page
- ☐ "Heysem" scientist card
- ☐ "Imitate the Shadow!" poster

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How Do We Do It?

1. First, let's remove all the pieces from the template.
2. Okay, now let's connect all the joints with pins.
3. This step is a bit tricky, so be patient. Pass it through the hole and spread both ends of the pin. That's it.
4. Bravo, genius! You've connected all the joints, hahaha.
5. Now, let's create a shadow by attaching our stick to our pieces.
6. You can see its reflection on the wall where the light shines from behind.
7. You can divide into groups and stage your story using the Shadow Play screen your teachers received.

What Little Scientists Should Explore?

Ask students the following questions:

- Is the length of our shadow the same at different times of the day?
- Are the shapes of objects the same as the shapes of their shadows?

How Is Shadow Form?

Were you followed by your shadow, or have you followed your shadow? A shadow is formed because the light travels in a straight line. It can be seen that there is no shadow on cloudy days. If you stand with your back to the sun, you absolutely see your shadow. Shadows are formed when a material or object that does not allow light to pass through (opaque) blocks the path of the light rays.

The object that does not allow light to pass through is called opaque. Our body is also opaque. Light creates a dark area because it cannot pass through the body. Light rays that pass near our body create a frame for the shadow, and our shadow forms. The shadow of an object resembles itself, so that our shape is formed like our body shape.

Shadows are not formed by just sunlight. In a dimly lit environment, shadows of objects can also be formed by light reflected from a lamp.

Why is the length of the shadow different at different times of the day?

As the Earth rotates on its axis, the rays of sunlight hit the Earth at different angles, sometimes directly and sometimes obliquely. If we stay in the same place throughout the day, we will notice that our shadow does not form at noon, and that the length of the shadow changes before and after noon. The movement of the light source or the object can change the position of the shadows

What are the shapes of shadows?

We have said that the shapes of shadows are the same as the shape of the object. These shapes can sometimes be made up of geometric shapes such as a square, triangle, or circle.

So, what are these geometric shapes?

Geometric shapes have edges and corners. Geometric shapes are named according to their shape and the number of their edges.
For example, a triangle has three edges and three corners. A rectangle and a square have four edges and four corners. The sides of a square are all equal, while in a rectangle, two sides are equal. A circle, on the other hand, has no corners or edges.
When these geometric shapes are combined, they can resemble certain objects. For example, if we place a triangle on top of a circle, what do you think it looks like? And what does it resemble if we place a triangle on top of a square?

Scientific Explanation for the Curious Ones

Following questions will be directed to students:

- Can you give examples of geometric shapes which you see around you?
- Where are the shadows used?

Explain that all the solid objects around us have a specific shape. Objects can be two-dimensional, such as squares, rectangles, and circles, or three-dimensional, such as rectangular prisms, cylinders, and spheres. These geometric shapes appear in most objects we see, such as credit cards, coins, rings, picture frames, windows, tall buildings, flowerpots, toy trains, and balloons.

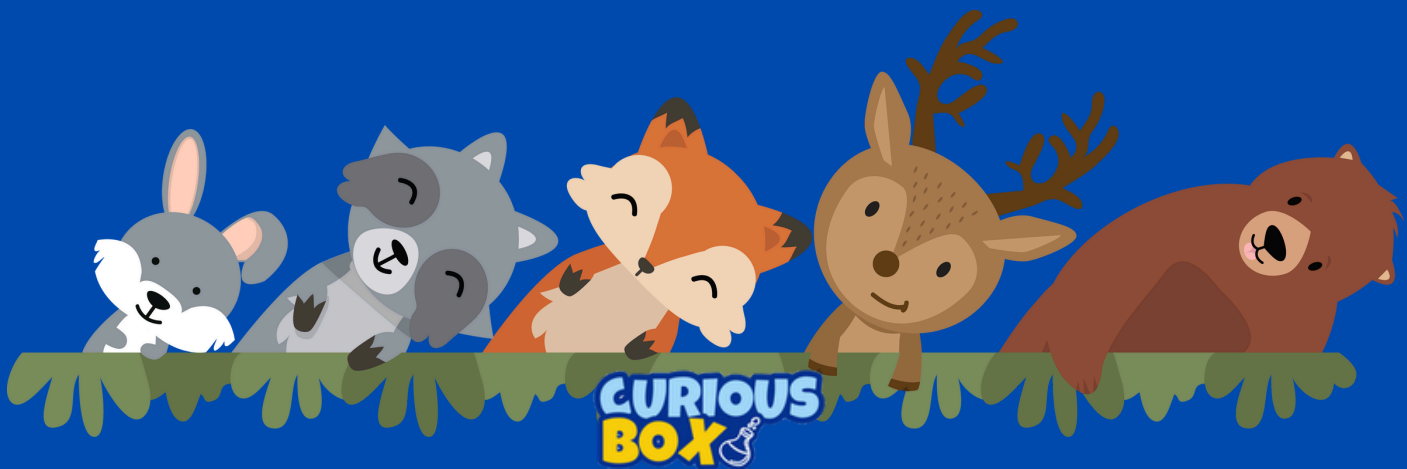
Shadow Formation (Full and Half Shadow)

Explain that when light encounters an opaque object, it cannot pass through it. This creates a dark region behind the object, called a shadow. Light from a source strikes an object and creates a shadow behind the object, and this type of shadow is called Full Shadow. If the object is close to the light source , the shadow will be large. Among two light rays coming from different distances, the shadow formed by the light source closer to the object will be light, while the shadow formed by the farther light source will be darker.The dark one is called a full shadow, and the light one is called a half-shadow. Shadows are formed opposite of the light source.

Where Are The Shadows Used?
Shadows are also used in fields such as visual arts and architecture. In artworks like paintings, sculptures, or photographs, shadows can be used to emphasize the dimensions or depth of the piece. Additionally, in theatrical performances involving hand and finger movements, shadows are used. The audience follows the story by watching the shadows formed on the screen. Hacivat and Karagöz are examples of traditional Turkish shadow plays. Today, the characters of Hacivat and Karagöz meet the audience through live performances on theater stages, festivals, and various show venues.

What Else Can We Do?

Dear Teacher,
You explored the formation of shadows by playing shadow games with our little scientists and learned to name the shapes. You can ask your students to go outside and examine their own shadows under the Sun. In addition to this, you can complete the "Animal Binoculars" activity with your students.



Animal Binoculars

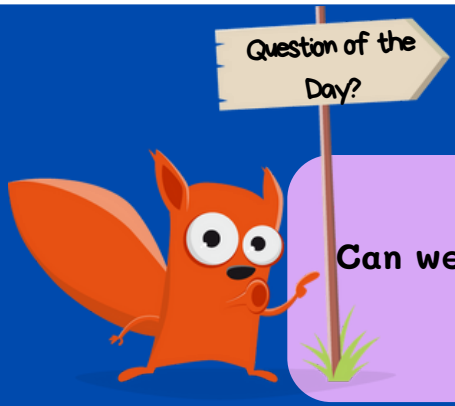
Materials;

- Cardboard rolls or toilet paper rolls
- Scissors
- Phone light
- Transparent tape
- A plain white wall or floor
- Printed animal silhouettes

1. Cut out animal silhouettes, and cut the desired animal silhouettes along the edge with the help of scissors.
2. Cut pieces of tape to stick on the ends of the rolls.
3. Attach animal silhouettes to the tape in the middle of the rolls.
4. Stick the bands with animal silhouettes on the mouths of the rolls.
5. Shine the light from the other end while pointing at the wall, and observe..
6. Students identify which animal each shadow represents.

What Did We Discover? / Exit Card

Little Scientists, today we explored geometric shapes and their shadows. Wasn't it fun to play with shadows? You can create stories with different objects on your curtain, and can play them." is said.
Ask students to complete the "Which One is the Shadow?" and "Draw the Shadows" pages from the activity sheets. The Heysem scientist card is read.



Can we see our shadow when we go outside at 12:00 PM?

Exit Card

Did exploring have fun? Draw!

How did this event make you feel? Draw!

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