

# Thaumatrope

Help students learn concepts of science, and art as they build a device that can create an optical illusion through persistence of vision.

## Prepare the material station

### Necessary materials

Food stick  
Sign pens  
A4 paper  
Masking Tape  
Scissors

### Optional materials

Thread  
Rubber bands

*Note: Underlined materials are to be shared among the students*

## Curiosity

Get students curious about the activity they are going to do. You can ask them questions to make them think about optical illusion. An example is given below:

Show them the classic rubber pencil trick.

*"Do you know what is happening here?"*

*[Some students will talk about optical illusion]*

*What other optical illusions do you know of?"*

Demonstrate a few models of thaumatrope. Being able to see a working model adds to their excitement, and having multiple models makes it less likely that they will copy a specific model.

## Activity

### Scaffolding

Help students get ideas to get started. Asking leading questions helps.

- What kind of optical illusion would you like to try?
- How will your thaumatrope work?

### Experimentation

Ask questions to encourage experimentation among students.

- Can we use letters to create illusions instead of pictures?
- What other ways might there be of rotating the thaumatrope?
- Complete the sentence: I wonder what happens if \_\_\_\_\_

Encourage students to spot problems with their thaumatrope and solve them.

## Suggestions for the facilitator

We found these insights and tips to be helpful while facilitating this session.

- Students often try to make complex projects and end up frustrated when things don't go as planned. It's always better to start with simple ideas and test them often.
- It's necessary to align the images with each other to see the animation properly. Students often draw without considering this factor.
- The images on both sides of the thaumatrope need to be proportional in size. Students often tend to draw images of disproportionate sizes when drawing on the same paper.

## Thinking

### Reflection

Ask questions to help students reflect on their learning.

- What insights did you get in the process of making your thaumatrope?
- What challenges did you face while making? How did you overcome them?
- Complete these sentences:
  - Two things I learnt are \_\_\_\_\_
  - I used to think \_\_\_\_\_ and I now think \_\_\_\_\_
  - The most interesting part for me was \_\_\_\_\_ because \_\_\_\_\_

### Think like a ...

Ask thought provoking questions to make students think from the perspective of a professional

#### Think like a scientist

- Why do we see the animation at high speeds but not at slow rotations?

#### Think like an engineer

- What is the minimum number of rotations per second needed to see the animation?

### Concepts and skills

Some concepts and skills students explore in this lesson are:

- **Persistence of vision**  
Human eye retains images for around 0.1 seconds. Images that are seen within that interval are overlapped and we see the illusion of animation.

## Sample lesson plans

### 1. A 60 minute class

#### Learning Objectives

To get students to experience the play based learning approach through creating an optical illusion. The emphasis is on letting them enjoy the process of making and scientific investigation.

## Classroom context

This sample lesson is designed for grade 9 students. The time available for the class is 60 minutes.

## Lesson Flow

### Curiosity (5/5 mins)

Ask students if they have watched animations or optical illusions. Ask them to name their favorites. Question them if they know the basic principle behind such things. Tell them that in this session they'll explore this phenomenon and create some fun things in the process.

### Activity (45/50 mins)

#### Building the prototype

Hand them the materials. Ask them to go through the student guide and make a rough prototype. Give them 10 minutes for this activity.

#### Testing

Ask students to play with their first draft of thaumatrope and note the things that went according to plan, and things that weren't expected. Tell them to take note of their insights and implement them in building the new draft.

#### Discussion

Have a brief discussion on the insights students gained by testing the first draft so that the ideas can be shared among all the students.

#### Building the final draft

Give students 15 minutes to build their final draft. Once done, ask them to share with their neighbors and play with each other's thaumatropes. Encourage them to exchange feedback on each other's work and discuss the science behind the working of thaumatrope.

### Thinking (10/60 mins)

Use structures or questions to get students to reflect on their learning experience.

- What might be causing us to see the animation or illusion?
- What new questions do you now have?
- Complete the sentence: Two things I learnt are \_\_\_\_\_

## 2. Two 45 minutes classes

### Learning Objectives

To get students to experience the learning through play approach by making a thaumatrope and playing with the optical illusion. The emphasis is on getting them to think about the science behind this phenomenon.

## Classroom context

This sample lesson is designed for grade 7 students. The time available is two 45 minute classes, not necessarily consecutive.

## Lesson Flow

### Class I

#### Curiosity (10/10 mins)

Show them the classic rubber pencil trick. Ask what has happened. *Did the pencil actually bend? Then why did it seem like it was wobbly?*

Have students discuss this. Let them try the trick if they want to. Use this discussion to connect to optical illusions. Inform that in this lesson they will build something cool to create optical illusions.

#### Activity (30/40 mins)

##### Building

Ask students to go through the student guide and build the first draft of their thaumatropes. Give them 15 minutes for this.

##### Testing and feedback

Ask students to share their work with their neighbors. Encourage them to exchange feedback.

##### Discussion

Have a discussion on the insights they gained through the process of creating and testing their thaumatropes.

#### Thinking (5/45 mins)

Ask questions and provide structures to support students' thinking as they reflect on the learning experience.

- What challenges did you face while building your thaumatrope? How did you overcome them?
- How did feedback help you and your friends?

### Class II

#### Recalling (5/5 mins)

Ask students to sit in the same group as in the previous class because they will be continuing the work on thaumatrope. Ask them to pair with their group member and talk about the activity they did in the last class and recall the things they learnt.

#### Activity (30/35 mins)

##### Building

Ask students to think about the designs for their thaumatrope. Let them get the materials they need and work. Give them 15 minutes to build.

**Gallery walk**

Ask students to leave their thaumatropes on the desks and walk around to other groups and play with their work. Give them 10 minutes for this. After they return to their seats, ask them to share about the works they found interesting.

**Sharing**

Encourage students to think of the questions they want to ask each other based on the works they saw. If there are a few questions, you can do an open discussion and if there are many questions you can split them into groups and they can discuss their questions there.

**Thinking (10/45 mins)**

Ask questions and provide structures to support students' thinking as they reflect on the learning experience.

- What new questions do you now have?
- Complete the sentence: Two things I learnt are\_\_\_\_\_