

RESOURCE LIBRARY
ACTIVITY : 2 HRS

Seeing Nature's Slow Motion

The class will compete to create ice sculptures and use a camera phone or tablet with a time-lapse application to record and then play back at fast speed these sculptures melting.

GRADES

3 - 5

SUBJECTS

Arts and Music, Filmmaking

CONTENTS

1 Video, 2 PDFs

OVERVIEW

The class will compete to create ice sculptures and use a camera phone or tablet with a time-lapse application to record and then play back at fast speed these sculptures melting.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/seeing-natures-slow-motion/>

Program



DIRECTIONS

1. Activate prior knowledge

Lead students in a discussion about what it means to see something with the "naked eye." Ask for volunteers to name some things that happen too slowly to see clearly with the naked eye –or for which their movement is subtle. Students might list any or all of the following, or come up with ideas not listed here:

- the life cycle of a plant or animal
- the rising and setting of the sun or moon
- the decomposition of food or animals
- a building under construction

Ask students if they can think of a way to "speed up" any of those events so that we could view them easily. (Accept any ideas.)

2. Introduce the time-lapse photography technique

Tell students that time-lapse photography is a technique where you shoot the same subject over a period of time, and then play back at regular speed, effectively speeding up time. Play the clip "Too Slow to See" from the *Mysteries of the Unseen World* film. Write the term *time-lapse photography* on the board and ask volunteers to describe how it works, based on what they learned in the video. Explain that in the next activity they will be taking a closer look at how this technology lets us understand things in the natural world that happen too slowly for the naked eye to see.

3. Prepare the class for the activity

Explain to students that they will work in groups that will compete in an ice sculpture building competition. Follow these guidelines:

- Each group will assemble a five- to six-cube sculpture in any design they choose.
- They can create a simple tower, a recognizable figure (e.g., a man or robot, a house), or any design they choose.
- They can add decorations like feathers, ribbons, or construction paper designs to make the sculptures unique.
- The important goal of the activity is to create an ice sculpture that melts more slowly than their competitors' ice sculptures.

Discuss how time-lapse photography will help the class record the ice sculptures as they melt:

Write the terms *capture interval*, *frequency*, and *frames per second* on the board, and introduce the technique in the following way:

- *The time-lapse application I have downloaded on my [cellphone/tablet] will take a picture of each of your ice sculptures at a pre-determined capture interval as they melt. Then we will play the pictures back at a much faster rate to create a video of them melting at an increased speed.*
- *Ask: How often do you think we should capture an image, so that some amount of melting occurs since the last picture, but not too much? Consider how small the ice sculptures are and how warm the room is [or outside temperature, if desired]. (Use the time you determined in your test run to guide this discussion.)*
- *Ask: For what length of time should we run our photo capture? Or: How long do you think it will take the ice sculptures to melt—if not completely, then enough to show which group wins? (Allow any suggestions, but gauge this for yourself based on your test of the activity.)*
- *At the end of our video capture time, we have to use the app to set the number of frames per second in our playback. Do you think we should play it back in regular time or speed up the playback? Why?*

(NOTE: The video will be most helpful if played back in regular time.)

(NOTE: If you wish to make a more polished video, Lapse It also provides tools for trimming your video and adding music; however, this isn't necessary for the experiment.)

Have groups plan their ice sculptures. Separate students into groups of three to four students in each group. Allow a few minutes for groups to discuss their designs. Ask students to consider the following:

- Whether they will create an abstract sculpture, a tower, or a recognizable figure.
- How they will hold the ice cubes together. (Discuss how salt might work to make a solid hold.)
- How they will decorate the sculpture to make it different from everyone else's. (Every group member must contribute something to the model.)

Allow time for groups to create their ice sculptures. Distribute the bowls of ice cubes and cardboard lids or trays lined with construction paper. Remind groups that sculptures can contain no more than six ice cubes. Allow groups 15 to 25 minutes to construct their ice sculptures. This involves:

- stacking the cubes in the pre-designed configuration,
- ensuring that it stands solidly without falling (salt sprinkled between cubes helps to ensure good connections), and
- adding decorations or embellishments to make the sculptures unique, and so on.

Have them place their finished sculpture inside the cardboard lids or on the tray lined with construction paper.

- **IMPORTANT:** If it's warm inside, move the completed sculptures into a freezer as quickly as possible to keep them frozen until you are ready to begin the time-lapse video capture.

4. Conduct the melting competition

When you're ready to begin the melting competition, line up the group sculptures on the table that you have prepared for the time-lapse activity, making sure all sculptures can be seen in the viewfinder, and start the time-lapse app.

It may take 20 minutes to one hour for the ice sculptures to melt, depending on the ambient temperature and whether they are sitting in sunlight. Decide whether you want to see a complete meltdown, enough of a melt so that you can easily determine which sculpture "won" and which "lost" the competition, or just until you see one lose its shape. Use the wait time as you like, for example:

- Continue with regular classes.
- Ask students to write short stories about their ice creations.
- Watch time-lapse photography videos from National Geographic (see the Resources section).

When at least one ice sculpture has melted (or when you feel enough changes have occurred to make an informative video), follow this procedure:

- Stop the app.
- Use the tools of the app to output a video running the still images at regular video speeds. (After testing your playback in the app, you can render it in MOV, MP4, or FLV to save it to your computer for playback, if you don't have the means to project directly from the phone or tablet.)
- Project the video for the class to view, playing it two or three times to ensure everyone understands what happened to all sculptures during the melting process.

5. Discuss what was observed

Use the following guided questions or your own discussion starters to debrief students about the experiment. Ask:

- *Which ice sculpture melted the fastest? What made that sculpture melt faster than the others?* (The ice cubes were packed together more closely; the sculpture was smaller/contained fewer cubes; the shapes of the cubes were different, etc.)
- *Which melted most slowly? What made it last longer than the others?* (The ice cubes were not packed together as closely as the others; the sculpture was larger/contained more cubes; the shapes of the cubes were different, etc.)
- *How does time-lapse photography work?* (The app captured a series of still pictures at regular intervals. Then a video was created of these images, playing them back at “regular” speeds.)
- *Other than being fun to watch, why is time-lapse photography useful? What makes it a good tool for science?* (The goal of science is to explain the world. Techniques like time-lapse photography help us to observe things that happen too slowly for the human eye to easily understand.)

6. Assign flipbook activity

Distribute the Time-Lapse Flipbook handout, the sticky note pads, and pencils, and have students complete the work described on the handout independently. This activity (especially the essay question at the end) can serve as a grade for your science or art curricula or as an informal post-assessment for the activity.

Tip

Depending on the maturity of your students, you may wish to place the photography setup in an inaccessible area of the room to make sure students don't accidentally bump into the camera or ice sculptures during the video capture.

Tip

Take some time to play with Lapse It or other time-lapse photography apps, as well as uploading and projecting the videos, to ensure this part of the activity goes smoothly.

Tip

Try the activity ahead of time to test how different shapes of cubes and sculptures and the ambient temperature in your classroom affect the melting rate, as these elements are different in different settings. This information will help you determine the capture and playback rates on the Frame It app.

Informal Assessment

Use the "Time-Lapse Flipbook" activity and essay question as the assessment of this activity.

Extending the Learning

Use time-lapse photography to record other too-slow-to-perceive natural movements, such as clouds or the moon moving across the sky, raisins absorbing water in a glass, a snowman melting, and so on.

OBJECTIVES

Subjects & Disciplines

- Arts and Music
 - **Storytelling**
 - Filmmaking

Learning Objectives

Students will:

- list things in the natural world that happen too slowly for the human eye to capture for processing
- describe how time-lapse photography works
- explain why it is valuable to use techniques like time-lapse photography to understand actions that happen too slowly for the human eye to perceive

Teaching Approach

- Learning-for-use

Teaching Methods

- Cooperative learning
- Discussions
- Hands-on learning

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
 - Information, Media, and Technology Skills
 - Information, Communications, and Technology Literacy
 - Media Literacy
 - Learning and Innovation Skills
 - Communication and Collaboration
- Critical Thinking Skills
 - Analyzing
 - Applying
 - Creating
 - Understanding

National Standards, Principles, and Practices

NATIONAL SCIENCE EDUCATION STANDARDS

- (5-8) Standard A-1:

Abilities necessary to do scientific inquiry

- (5-8) Standard E-1:

Abilities of technological design

- (5-8) Standard E-2:

Understandings about science and technology

- **(K-4) Standard A-1:**

Abilities necessary to do scientific inquiry

- **(K-4) Standard E-1:**

Abilities of technological design

- **(K-4) Standard E-2:**

Understanding about science and technology

ISTE STANDARDS FOR STUDENTS (ISTE STANDARDS*S)

- **Standard 3:**

Research and Information Fluency

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- For class: Computer with Internet access and connection to a projection device Mobile phone or tablet with built-in camera Cords for phone/tablet: Power cord to keep device charged during long time-lapse capture (ideal) Cord to connect device to computer to save video OR cord to connect the device directly to the projector A time-lapse photography app installed on the device (Recommended: **Lapse It**, found at: <http://www.lapseit.com/>) **Lapse It** works on both iOS and Android devices Available free (to create low res videos) or at a minimal cost for up to 1080p full HD Materials required for each group, for example: Cardboard lid or small tray lined with colored construction paper Ice cubes: a bowl or plastic bag containing six to eight ice cubes (provide a couple extra cubes to each group in case of need, although the finished sculpture must contain no more than six) If possible, you might provide cubes in different shapes: cubes, half-circles, even novelty-shaped ice cube trays are available in many department or specialty kitchen stores You can also differentiate the ice sculptures created by the groups by adding different hues of food color to the water before freezing. Decorations or embellishments to add to the sculptures, such as: Doll-size hats and scarves, etc. Ribbons, beads, feathers Small twigs or leaves Scraps of construction paper (You may also ask students to bring in materials) OPTIONAL: Table salt. A pinch of salt between two cubes helps to fuse them together and provide stability to the sculpture. But beware: too much salt will melt the cube prematurely!

- For each individual student: A pad of square sticky notes, 3 X 3 inches (the lightest color possible), at least 50 sheets each. Pencil

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, Mobile data device (smartphone or tablet), Projector

PHYSICAL SPACE

- Classroom
- Community center
- Media Center/Library

SETUP

- NOTE: This activity requires you to keep ice sculptures as frozen as possible until you are ready to videotape the melting completion. Access to a freezer with enough space to store finished artifacts is recommended.
- Try the activity ahead of time to test how different shapes of cubes and sculptures and the ambient temperature in your classroom affect the melting rate, as these elements are different in different settings. This information will help you determine the capture and playback rates on the Lapse It app.
- Take some time to play with Lapse It or other time-lapse photography apps, as well as uploading and projecting the videos, to ensure this part of the activity goes smoothly.
- Table setup for time-lapse photography:
 - Cover the table with water-proof material or place a shallow baking dish(es) to hold the cardboard lids with ice sculptures inside
 - Set up the cellphone or tablet in such a way that the app will capture all of the ice sculptures at the same time. (TIP: You might also tilt the camera so the sculptures' cardboard base is visible—this will show the melting water as it is absorbed into the cardboard lid or construction paper liner.)

GROUPING

- Large-group instruction
- Small-group work

OTHER NOTES

This activity can be completed in one class period.

BACKGROUND & VOCABULARY

Background Information

Time-lapse photography is a technique in which an image is captured at set intervals rather than continuously, as in regular video photography. When these captured images are played continuously at normal speed, time appears to be moving faster (*lapsing*). For example, an image of a scene may be captured once every second, then played back at 30 frames per second. The result is an apparent 30-times speed increase. You can use time-lapse photography to see the movement of clouds or other celestial bodies across the sky, the growth of plants, or other “slow” actions in fast time. It has become a valuable tool for scientists who are trying to explain changes that occur too fast for the human eye to capture for processing.

Some people confuse time-lapse with stop-motion photography. While time lapse is used to speed up natural events or actions that move too slowly for the naked eye to perceive, stop motion (also known as stop action or frame-by-frame) is an *animation technique* to make a manually adjusted object appear to move on its own. The object is moved in small increments between individually photographed frames, creating the illusion of movement when the series of frames is played as a continuous sequence. Cartoons such as *Gumby* and *Wallace and Grommet* are created using this technique. In this activity, students watch time-lapse photography to view their ice sculptures melting, but the Flipbook activity is a low-tech imitation of a stop-motion video.

Prior Knowledge

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
capture interval	<i>noun</i>	in photography, the space of time between image captures.
perception	<i>noun</i>	understanding or point of view.
playback speed	<i>noun</i>	the speed at which recorded sounds or pictures are heard or seen again.
time-lapse photography	<i>noun</i>	photographing of a slow and continuous process at regular intervals, for projection at a higher speed.
vision	<i>noun</i>	the ability to see.

For Further Exploration

Websites

- [National Geographic NewsWatch: Mesmerizing Timelapse Showcases Iceland's Natural Beauty](#)
- [National Geographic Video: Tidal Time Lapse](#)
- [National Geographic NewsWatch: Experience the Night Sky Like Never Before](#)
- [BBC Earth: Time Lapse Tutorial](#)

FUNDER



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