Let’s Learn About SAND

How Do You Make Glass from Sand? How Many Ways Do We Use Glass?

Learn how sand turns into glass. Discover the technique of blowing glass into objects. Explore the importance of glass in many innovations.

Materials

Jars, magnifying glass, sand, marbles, colored sand, baby food jars or spice jars, clear contact paper, glue, paper plates, paper towel and toilet paper tubes.

A more detailed list can be found on Page 2.

Standards

NCECDTL, ELOF: Goal IT -ALT 3, 4, 5, 6, 8, 9; Goal P-ATL 6, 7, 8, 9, 10, 11, 12, 13; Goal P-LC 1, 2, 3, 4, 5, 6, 7; Goal P-LIT 4, 5; Goal IT -C 1, 2, 3, 5, 6, 7, 9, 10, 12; Goal P-MATH 7, 8, 10; Goal P-SCI 1, 2, 4, 5, 6; Goal IT -PMP 1, 2, 3, 4, 5, 6, 7, 8, Goal P-PMP 2, 3; MI Standards SS 1, 3.

Model i Innovation Learning Framework

Throughout this lesson, there will be opportunities to bring in Model i’s Habits of an Innovator and Actions of Innovation.

More information on Model i can be found at: thf.org/education/teaching-innovation/modeli

Lesson Overview

<table>
<thead>
<tr>
<th>STEAM</th>
<th>ELA/LIT</th>
<th>SS/HST</th>
<th>Review &amp; Extend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore</td>
<td>Discover</td>
<td>Create</td>
<td>Inspiring Stories</td>
</tr>
<tr>
<td>Investigate how sand is turned into glass with short video clips and explain the process.</td>
<td>Search for glass marbles hidden within a pool of sand. Add a math aspect: Define a specific number of marbles to find.</td>
<td>Make colored sand and use for layered sand jars or a picture made by sprinkling colored sand on clear contact paper. Make a marble run using paper towel and toilet paper tubes and paper plates.</td>
<td>Read stories related to the learning: Artist Ted by Andrea Beaty, Maggie the Magnifying Glass by Allison Bischoff and Jessica Yaira Gordon and The Name Jar by Yangsook Choi.</td>
</tr>
<tr>
<td>How might glass be used at home?</td>
<td>Stay Curious, Uncover</td>
<td>Design, Uncover</td>
<td>Collaborate, Be Empathetic</td>
</tr>
</tbody>
</table>

Stay Curious, Collaborate
Let’s Learn About SAND

Explore
Activity — Touch Exploration
- Magnifying glass
- Windows
- Mirror
- Lights
- Computer screens
- Teachers can provide as many examples of glass as possible for touch exploration

Discover
Activity — Can You Find Treasures in the Sand?
- Glass marbles
- Sand
- Containers to hold sand

Create
Pre-Project — Colored Sand
- Sand, purchased at craft/hardware store or gathered from a beach
- Strainer (to sift beach sand)
- Fabric dyes, various colors (other option: food coloring, though not as vibrant)
- Resealable plastic storage bags or plastic containers with lids
- Water

Create
Project One — Stained Glass
- Clear contact paper, cut into 8 ½- by 11-inch pieces
- Colored sand
- Masking tape
- Squeeze bottles, one for each color of sand
- Funnel

Create
Project Two — Layered Sand Jars
- Clean baby food or other small clear jars
- Plastic or paper cups
- Colored sand
- Plastic spoons
- Craft sticks

Create
Project Three — Marble Run
- Heavy-duty paper plates
- Cardboard tubes, various lengths
- Glue dots or hot glue
- Tape
- Scissors
Let’s Learn About SAND

Lesson Guide

Explore

Stay Curious, Collaborate, Uncover
How Does Sand Become Glass? .......... Page 4
How Versatile Is Glass? ............ Page 4
Activity: Touch Exploration ........ Page 4
Links & Photos ....................... Pages 5-11

Discover

Stay Curious, Uncover
Activity: Can You Find Treasures in the Sand? ......................... Page 12

Artifact of the Day

Learn from Failure
Glass House at Menlo Park ....................... Page 13
Links & Photos ....................... Pages 14-16

Create

Design, Uncover
How Do We Get Different Colors of Glass?
Pre-Project: Colored Sand ........ Page 17
Project 1: Stained Glass ............ Page 18
Project 2: Layered Sand Jars ... Page 19
What Games Can We Play with Glass?
Project 3: Marble Run ............... Page 20

Innovating Learning

Explore

Collaborate, Be Empathetic
Read Stories to Inspire Your Students ....................... Page 21

Review & Extend

Stay Curious, Collaborate
Ask Students Specific and Open-Ended Questions .......... Page 22
Family Connection ....................... Page 23
Coloring Sheet ....................... Page 24

thf.org/innovationlearning | 3
Let’s Learn About
SAND

Explore

How Does Sand Become Glass?
Explain to students that heating sand to extremely high temperatures melts it, just as heating sugar melts it, and it becomes a liquid that can be turned into many useful and beautiful items.

Continue this conversation by watching the following videos that show how sand is turned into glass and the tools that are used.

Glass Blowing Excerpt
vimeo.com/384028403/14aae307d5

How Versatile Is Glass?
*This section of the lesson focuses on the difference between decorative and useful glass.*

Glass has been useful in our homes and businesses. Use the following pages to show pictures of the Glass Shop, glassblowing and examples of decorative and useful glass, including examples for home canning: Ball Canning Jars, 1920-30.

Activity

Touch Exploration
Discover all the glass items found in the classroom. Ask students to describe the differences in color, size, texture and purpose for these glass objects.

Common Glass Objects
- Magnifying glass
- Windows
- Phone screen
- Mirror
- Lights
- Computer screen

Conclude this part of the lesson by asking students how they use glass in their home.

Links and photos for this section are on Pages 5-11.

Model i Innovation Learning Framework

Stay Curious, Collaborate, Uncover
- Ask questions like what, why, how.
- Talk about helping, working together.
- What do you see (characteristics, properties)? What problems does this material help us solve?
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Explore — Links

Glass Shop at Greenfield Village, 1930

thf.org/collections-and-research/digital-collections/artifact/17931
Let’s Learn About
SAND

Glassblower in Greenfield Village, 1953

thf.org/collections-and-research/digital-collections/artifact/345246
Let’s Learn About

SAND

Glassblower in Greenfield Village, 1970
thf.org/collections-and-research/digital-collections/artifact/345245
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SAND

Glassblower in Greenfield Village, 1981
thf.org/collections-and-research/digital-collections/artifact/345242
Let’s Learn About

SAND

Miniature Glass Figure, Turtle, 1955-1985
thf.org/collections-and-research/digital-collections/artifact/318056

Additional Resources

Figure, Mouse, 1955-1985
thf.org/collections-and-research/digital-collections/artifact/318076

Sculpture, “Mandarin,” 1992
thf.org/collections-and-research/digital-collections/artifact/409713
Let’s Learn About

SAND

Explore — Links

Vase, 1962

thf.org/collections-and-research/digital-collections/artifact/425965
Let’s Learn About SAND

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SAND

Explore — Links

Ball Canning Jars, 1920-30

Additional Resources

Jar, circa 1920

thf.org/collections-and-research/digital-collections/artifact/356883

Jar, circa 1930

thf.org/collections-and-research/digital-collections/artifact/244273
Let’s Learn About
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Discover

Activity
Can You Find Treasures in the Sand?

- Search for glass marbles hidden within a pool of sand.
- Add a math aspect: Define a specific number of marbles to find.
- Help each other find all the marbles.
- Activity can take place indoors or out.

Materials

- Glass marbles
- Sand
- Containers to hold sand

Model i Innovation Learning Framework

Stay Curious, Uncover

- Ask questions like what, why, how.
- What do you see (characteristics, properties)? What problems does this material help us solve?
Let’s Learn About SAND

Artifact of the Day

Establish Context
Introduce Thomas Edison through explanation or by reading the following stories:

6-8 Target Age
Thomas Edison and His Bright Idea
by Patricia Brennan Demuth

Thomas Edison
by Elizabeth MacLeod

6-12 Target Age
When Thomas Edison Fed Someone Worms
by Mark Weakland

What Is the Glass House at Edison’s Menlo Park Complex?
Teachers can show pictures of Thomas Edison’s Menlo Park Complex and his glassblowing building and explain that Edison and his team needed glass not just for his famous light bulb experiments but also for laboratory equipment used in their discovery processes. This building was originally used as a photographic studio and drafting office before it became Edison’s glassblowing building.

Links and photos for this section are on Pages 14-16.

Model i Innovation Learning Framework
Learn from Failure
• Talk about “trying again,” what’s another way to...

thf.org/innovationlearning | 13
Let’s Learn About SAND

Artifact of the Day — Links

Glass House at Edison's Menlo Park Complex, 1878
thf.org/collections-and-research/digital-collections/artifact/20224

Additional Resources
Menlo Park Laboratory
thf.org/collections-and-research/digital-collections/artifact/179489
Let’s Learn About SAND
Artifact of the Day — Links

Replica of Edison's 1879 Light Bulb
thf.org/collections-and-research/digital-collections/artifact/282211
Let’s Learn About
SAND
Artifact of the Day — Links

Edison Bamboo Filament Lamp, 1880
thf.org/collections-and-research/digital-collections/artifact/10019
Pre-Project: Colored Sand

Materials

- Sand, purchased at craft/hardware store or gathered from a beach
- Strainer (to sift beach sand)
- Fabric dyes, various colors (other option: food coloring, though not as vibrant)
- Resealable plastic storage bags or plastic containers with lids
- Water

Instructions

1. If using beach sand, sift to filter out undesirable elements.

2. Divide sand into separate plastic containers with lids or storage bags. Note: Storage bags will require less cleanup and reduce additional mess during the stirring process.

3. Add water to the sand to help evenly distribute the dye when added. Damp consistency is best; avoid soaking. Sand that is too wet will take longer to dry.

4. Pour dye into container of sand and mix. Dye may need to be added several times to reach desired color. The sand will dry lighter. NOTE: Be cautious while handling dyes as they may stain skin, clothing or furniture.

5. Mix the dye and sand together thoroughly. If using storage bags, seal tightly and massage sand until color is consistent throughout. Set aside for at least an hour to allow sand to soak up all dye.

6. Pour out any excess water.

7. Spread damp sand on a plate or flat surface and allow to dry, preferably in a sunny place, for a few hours. Option: Sand can be baked to help speed the drying process. Place sand in a baking pan and bake at 200 degrees F for 15 minutes. Be sure to remove sand from oven while still damp and let dry naturally overnight.

8. Once completely dry, package sand for storage in bags or containers with sealed lids.

This colored sand will be used for Projects 1 and 2.
Let’s Learn About
SAND

Create — How Do We Get Different Colors of Glass?

Project 1: Stained Glass

Materials

• Clear contact paper, cut into 8 ½- by 11-inch pieces
• Colored sand
• Masking tape
• Squeeze bottles, one for each color of sand created
• Funnel

Instructions

1. Put a small amount of each color of sand into a squeeze bottle using a funnel.
2. Roll pieces of masking tape into balls and attach to each corner of the smooth side of the contact paper. Stick to table to lay flat.
3. Each student should have a sheet of contact paper, tacky side up.
4. Allow each student to create their own picture by squeezing a small amount of sand onto their tacky paper.
5. When their paper is covered, dump excess sand into a bowl. Excess sand can be put into a squeeze bottle as rainbow sand.

Model I Innovation Learning Framework

Design, Uncover

• Make, build and create.
• What do you see (characteristics, properties)? What problems does this material help us solve?

Create — How Do We Get Different Colors of Glass?
Let’s Learn About SAND

Create — How Do We Get Different Colors of Glass?

**Project 2: Layered Sand Jars**

**Materials**
- Clean baby food or other small clear jars
- Plastic or paper cups
- Colored sand
- Plastic spoons
- Craft sticks

**Instructions**
1. Fill cups about ½ full of various colors of sand.
2. Pour or spoon colored sand into jars in layers.
3. Use craft sticks to push sand against the insides of the jars to create designs.

**Model i Innovation Learning Framework**

**Design, Uncover**
- Make, build and create.
- What do you see (characteristics, properties)? What problems does this material help us solve?

Create — How Do We Get Different Colors of Glass?
Let’s Learn About SAND

Create — What Games Can We Play with Glass?

Project 3: Marble Run

Materials

• Heavy-duty paper plates
• Cardboard tubes, various lengths
• Glue dots or hot glue
• Tape
• Scissors

Instructions

1. For the track: At the base of the curve, cut the curved outer edge from several heavy-duty paper plates.
2. Cut the curves into sections of various lengths.
3. Overlap the lengths and tape the ends together to form a long, spiraling and twisting track.
4. For the track supports: Cut cardboard tubes into graduated lengths to create the supports. Each support should be approximately a half-inch taller than the previous support.
5. Starting at the low end, glue the track to the supports, using hot glue or glue dots to allow repositioning.

Model i Innovation Learning Framework

Design, Uncover

• Make, build and create.
• What do you see (characteristics, properties)? What problems does this material help us solve?

Create — What Games Can We Play with Glass?
Let’s Learn About
SAND
Innovating Stories

Read Stories to Inspire Your Students

*Artist Ted*
by Andrea Beaty

*The Name Jar*
by Yangsook Choi

*Maggie the Magnifying Glass*
by Allison Bischoff and Jessica Yaira Gordon

Model i Innovation Learning Framework

Collaborate, Be Empathetic

- Talk about helping, working together.
- How did the characters in the stories feel? How might it make others feel?
Ask Students Specific and Open-Ended Questions

- What other things do you think could be made with glass?
- What other games could we make up to play with marbles?
- How would your life be different without light bulbs?
- How did Edison and his workers feel when their experiments didn’t work? What did they do?

Family Connection

Send the worksheet on Page 23 home with students to be completed at the end of the lesson.

Coloring Sheet

Have students color the picture on Page 24 as a part of the lesson, or send it home to be colored.

Model i Innovation Learning Framework

Stay Curious, Collaborate

- Ask questions like what, why, how.
- Talk about helping, working together.
Take the Learning Home

We are learning how sand is turned into glass and about the many ways we use glass every day.

Please take your student on a scavenger hunt through your home and neighborhood to see what glass items you can find. What are some of these things? Have them draw what they find.

These are some of the stories related to our learning. You might enjoy reading them with your student.

- The Sandcastle That Lola Built by Megan Maynor
- Sea Glass Summer by Heidi Jardine Stoddart
- Pete the Cat and His Magic Sunglasses by Kimberly and James Dean
Let’s Learn About SAND

Coloring Sheet

Glass House at Menlo Park