

gr 2

## Bookmaking: The Science & Properties of Matter





gr 2

# Bookmaking: The Science & Properties of Matter

side x side

## UNIT OVERVIEW

Students will use scientific observation, non-fiction research and writing, and a range of art processes to learn about the properties of matter. Their drawings, Suminagashi prints, arrays, and collages will culminate in a handmade book. They will learn about similarities between science and art through vocabulary, observation, and recording of information.

## BIG IDEA

Drawing and mixed media art processes can help us better understand scientific concepts.

## LEARNING GOALS

*Students will understand:*

- How to read research and record data.
- How to use drawing and mixed media art processes to understand science concepts.
- How to use nonfiction writing to describe art processes.
- How observational drawing helps identify and describe new scientific concepts.
- How to observe, research, and share detailed understanding of properties of matter.

**GRADE LEVEL:** Second Grade

**ART FORMS:** Mixed Media  
Bookmaking, Drawing, Collage,  
Watercolor, Ink Printing

**INTEGRATED SUBJECTS:** Life  
Science and Literacy

## Project Kick-off:

The unit will begin with a presentation by the teaching artist illustrating the similarities between science and art in nonfiction writing, documentation and labeling, research, and presentation. Students will learn about book arts and see examples of information organized from the tiniest book to large-format books. The teaching artist will share a collection of objects and describe characteristics, properties, and states of matter.

Timeframe: 1 hour

## Lesson 1: States of Matter

Students will learn about the states of matter: solid, liquid, gas. They will research characteristics of **solid** matter (for example: rigid, transparent, flexible, smooth, sharp) and create observational drawings of objects with similar characteristics in their Project Journals, a Side x Side tool for arts-based research: 1 hour

## Lesson 2: Properties of Matter

Students will explore how matter properties determine their use. They will choose materials to create a “monster” collage, describing similarities between properties of matter and character traits, giving the monster a name, and listing the properties included: 1 hour

## Lesson 3: Liquid Properties

Students will learn how different liquids have different properties using the Suminagashi marbling method, watercolors, and salt. They will use these liquid prints and paintings for book covers and collage material: 1.5 hours

*continued...*

### Teaching Tips:

- Have mixed media resources collected, sorted, and organized before you begin the program.
- Have students bring in objects and collage materials from home.
- Have a large envelope for each student to keep objects and materials for collage/writing together.
- Have SEL handouts or social stories available for reference.
- Start each class with a brief game to review content information.

## Lesson 4: Observational Study

Using observational drawing techniques, students will examine one piece of matter from the collection of objects (shell, rubber band, rock, leaves) and learn techniques to create texture and volume on a two-dimensional surface: 1 hour

## Lesson 5: Properties Array

Students will create a scientific array attaching objects with different properties of matter to a sheet and noting its properties: 1 hour

## Lesson 6: Building Matter Books

Students will complete their books adding observational drawings, array, and matter “monster.” Visiting artist and expert Meg Christie will teach students about presentation using movement and improvisation: 1.5 hours

## Celebration of Learning

The Celebration of Learning is designed in collaboration with classroom teachers to best demonstrate learning to the larger community. Students will display their books and answer questions from viewers sharing their new expertise on the science of matter: 30 min–1 hour

### SEL LESSON CONNECTIONS

Side x Side’s model of arts integration authentically aligns with Social Emotional Learning benchmarks through three primary developmental areas: self-management, self-expression, and relationship skills. During this arts-integrated unit, students have a range of opportunities to notice and learn about themselves in new ways. Many project components involve communication and collaboration, developing a broader sense of social awareness and forging deeper relationships. Students gain valuable flexible and varied skills when approaching a core subject in a creative way. We strive to incorporate communication and community-building skills in everything we do. We use group reflection or wrap-ups at the end of each lesson to cement learning and foster continued curiosity.

All classrooms include varying learning strengths. This unit includes opportunities to strengthen fine motor skills, follow multi-step directions, practice new and core vocabulary terms, strengthen math skills through repetition, and work collaboratively with peers. Please note, the lesson plan can be adapted in multiple ways and tips for differentiating the lesson are given throughout.



gr **2**

## Bookmaking: The Science & Properties of Matter

side  
side

### LESSON 1: States of Matter

#### MATERIALS

##### Per student:

- Project Journals
- pencil and eraser

##### To share:

- matter science books
- art books with illustrations
- science websites:

#### VOCABULARY

matter, properties, characteristics, transparent, fluid, solid, observation, experiment, document

#### LEARNING GOALS

*Students will understand:*

- How to research using books, images, and websites.
- How observation is a tool for learning and discovery.
- How to use Project Journals for research and drawing.
- How vocabulary is similar between science and art.

#### Timeframe: 1 hour

Review states of matter (solid, liquid, gas) and the difference between states and physical properties. Students will begin observational research to identify **solid** matter and describe the characteristics (for example: rigid, transparent, flexible, smooth, sharp) and create observational drawings of objects with similar characteristics in their Project Journals.

#### INSTRUCTIONS

### Step 1: Introduction

Begin by listing “critical questions” about matter on a white board: What is matter and how can we tell? Does it change, and if so, how? What is the difference between properties and states of matter? What are the similarities between science and art? What is an experiment, an observation, documentation? What is the difference between a sketch and a drawing? How do artists conduct observation and research? Discuss similarities between science and art by showing examples of documentation (art books and science journals), labeling (museum and specimens), and experiments (in the studio and in the lab).

### Step 2: Noticing

Show images/videos of natural materials and begin listing what students notice. Consider using a tool like Visual Thinking Strategies (see lesson extensions) to engage students in close looking. Create a list of vocabulary words on the white board.

#### Teaching Tip:

Have students start with researching one object as a group. Then have the group draw the object in their Project Journals and make a list of properties on the board. Then move on to the next piece of matter together.

### Teaching Tips:

- Set up stations for three objects and have students work through sketching them at their own pace.
- Assign groups of students to become an expert on one object. Students then share what they have learned with the class.

## Step 3: Observational Sketching

Using their Project Journals, have students find a solid object of matter in the room to observe and sketch. Remind them this is an observational sketch. They are looking for details, not refining a drawing. Pair students to share their sketches and the characteristics of their object.



### Extra Time?

- Students who finish early can write the critical questions from the board into their journals, adding more questions they may have.
- Students may choose more than one object to sketch.

### Next Steps:

- Discuss any new questions about matter that students have.
- Describe how they will be using different pieces of matter to make a collage during the next lesson.

gr 2

## Bookmaking: The Science & Properties of Matter



### LESSON 2: Properties of Matter

#### MATERIALS

##### Per student:

- card stock
- pencils and erasers

##### To share:

- trays of **solid** matter material
- sharpies
- trays of extras (ribbons, button, sequins)
- glue sticks and liquid glue
- art books with collage examples

#### VOCABULARY

solid, properties, characteristics, rough, rigid, fluid, solid, flexible, smooth, angular, design, collage, texture, frame

#### LEARNING GOALS:

*Students will understand:*

- How to describe properties of matter.
- How to create a collage using a variety of materials with different properties.
- How to use vocabulary to describe characteristics of their matter monster.
- How vocabulary is similar between science and art.

#### Timeframe: 1 hour

Students will explore how matter properties determine their use. They will choose materials to create a “monster” collage, describing similarities between properties of matter and character traits, giving it a name, and listing the properties included.

#### INSTRUCTIONS

### Step 1: Introduction

Have trays of **solid** collage materials/matter out for this session. Begin with a brief review of vocabulary and matter. Discuss similarities and differences in collage materials; rough, smooth, sharp, angular. How do the materials fit together? Introduce art vocabulary and demonstrate how to design a collage.

### Step 2: Monster Challenge

Describe the “Monster Challenge.” Have each student create a collage monster with at least a body and head on a piece of heavyweight paper. Have them leave room at the bottom of the paper for a monster name and list of matter materials. Using design techniques, students will select pieces of matter from the trays and begin organizing them into a monster. Provide glue sticks and liquid glue for each table.

#### Teaching Tips:

- Have students start with one piece of matter and explore how to create a monster around it.
- Set up three or four stations for materials and have students select one piece of matter from each. Create a monster with the few pieces selected.
- Have collage books available for ideas.



## SEL SKILL: SELF-AWARENESS

is the ability to accurately recognize one's emotions and thoughts and their influence on behavior. Bookmaking requires planning, organizing, and understanding one's strengths. Setting goals while blending content with drawing and design builds content knowledge and self-confidence.



## Step 3: Details

Once students have glued down their matter pieces, they can add details with sharpie or additional small materials. Next they should name their monster and write the properties of the matter they used on the card.



### Extra Time?

- Students who finish early may help a peer.
- Students who finish early can add any new vocabulary words to the ongoing list on the board.

### Next Steps:

Once students have created their matter monsters, set them aside to dry. Discuss the next lesson plan. The class will be divided into groups to work with the Teaching Artist on Suminagashi printmaking.

gr 2

## Bookmaking: The Science & Properties of Matter



### LESSON 3: Liquid Properties

#### MATERIALS

##### Per student:

- watercolor paper
- pencils and erasers

##### To share:

- salt
- watercolor pencils
- Suminagashi printing trays
- books for reference

#### VOCABULARY

Suminagashi, states of matter, liquid, weight, viscosity, thick, gelatin, dissolve, concentrated, “pull,” marbling, dry brushing, saturation

#### LEARNING GOALS:

*Students will understand:*

- How to describe changing states of matter.
- How the process of Suminagashi printing works.
- How to use vocabulary to describe states of matter.
- How vocabulary is similar between science (states of matter) and art (dissolve, fluid).

#### Timeframe: 1.5 hours

Students will learn how different liquids have different properties using the Suminagashi marbling method, watercolors, and salt. They will use these liquid prints and paintings for book covers and collage material.

#### INSTRUCTIONS

### Step 1: Introduction

Review vocabulary words and states of matter. How does matter change? Begin with brainstorming “states of matter” (solid, liquid, gas). Make a list of adjectives describing the states of matter (hard, wet, invisible). Make a list of events that change matter from one state to another (heat, pressure, decomposition). Describe how you will research and observe changing states of matter during printmaking and watercoloring. Explain how the prints and paintings will be used for the book cover.

### Step 2: Suminagashi Ink

Discuss the history of Suminagashi printing. Show examples of the process and application of printed papers. Describe the properties of Suminagashi ink using unit vocabulary (liquid, weight, viscosity). Demonstrate how the two materials combine (ie., ink floats on water).

#### Teaching Tips:

- Have students work in pairs with watercolors and salt.
- Use observational drawing with watercolor pencils. Then apply salt and water to the image.
- Have Suminagashi print books available for ideas.
- Include a brief movement activity allowing each student an opportunity to demonstrate a change of matter.

**SEL SKILL:  
SELF-MANAGEMENT**

is the ability to regulate one's emotions, thoughts, and behaviors effectively in different situations. Printmaking requires following step by step instructions, careful listening, body control, and impulse management. Students can link content and self expression through process; liquids resisting each other, color choices, "pulling" paper print.

## Step 3: Watercolor Pencils and Salt

Discuss the properties of salt and show how salt changes state when used with watercolors. Demonstrate techniques for using watercolor pencils and how melting salt influences the color pattern on paper.

## Step 4: Smock Time!

Have students take turns at the Suminagashi printing station while other students work with watercolor pencils and salt. Be sure to write names of students on the back of paper before printing and painting!

### Next Steps:

Once students have created their Suminagashi prints and watercolors, set them aside to dry. Students can check back and see how drying affects color and salt patterns. Review changing states of matter, observation, and research. Give a brief overview of the next lesson in which students will focus on observational drawing.



gr 2

# Bookmaking: The Science & Properties of Matter

## LESSON 4: Observational Study

### MATERIALS

#### Per student:

- drawing paper
- pencils and erasers

#### To share:

- magnifying glasses and microscopes
- Sharpies (fine point)
- gel pens
- colored pencils
- books for reference

### VOCABULARY

magnification, texture, rigid, flexible, hollow, rough, fine, thick, shading, stippling

### LEARNING GOALS

*Students will understand:*

- How artists and scientists use similar processes for observation, recording, and research.
- How to draw with detail and magnification.
- How scientific drawings teach us about the natural world.
- How to use vocabulary to describe properties of matter.
- How vocabulary and illustration are similar between science and art.

### Timeframe: 1 hour

Using observational drawing techniques, students will examine one piece of matter from the collection of objects (shell, rubber band, rock, leaves) and learn techniques to create texture and volume on a two-dimensional surface.

### INSTRUCTIONS

## Step 1: Introduction

Review matter and properties. Discuss how scientists and artists record information. Show examples of detailed drawings and diagrams that use close-up sections (DaVinci's journals are a good example). Show examples of how artists use this method of observational drawing. Demonstrate how to use magnifying glasses and microscopes to look closely. Describe the connection of these tools to modern technology. How do these drawings teach us about matter and our natural world?

## Step 2: Observational Drawing

Have students choose an object to investigate and observe. Give time for using magnifying glass and microscopes. Have students work on observational drawings with pencil on drawing paper. Demonstrate how to use circles for detailed sections.



## SEL SKILL: SELF-AWARENESS

is the ability to accurately recognize one's emotions and thoughts and their influence on behavior. Bookmaking requires planning, organizing, and understanding one's strengths. Setting goals while blending content with drawing and design builds content knowledge and self-confidence.

## Teaching Tips:

- Have students work in pairs with one object.
- Set up tables with two or three specific objects. Allow students to rotate through tables to observe many objects before picking one.
- Use a large hole punch to create circles for detailed/close-up sections.

## Step 3: Sharpie and Label

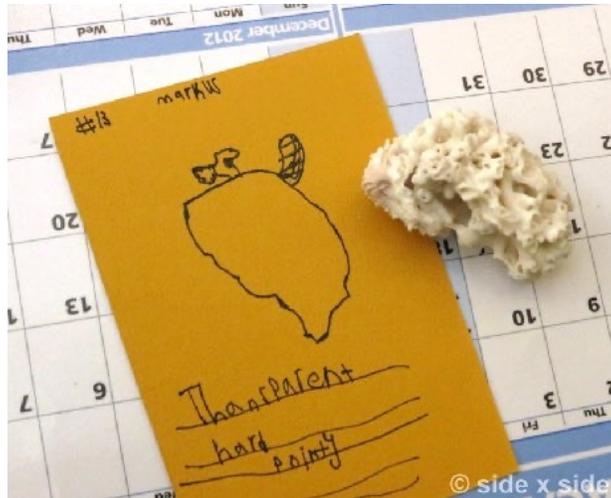
When students are finished, have them go over their drawings with fine point Sharpies and erase pencil lines. Have students label their drawings with characteristics and titles of objects.

## Step 4 (optional): Add Color

Students can add color to their drawings using gel pens or colored pencils.

## Next Steps

If time permits, have students share their drawings, noting the similarities between art and science processes. Discuss how they will be using similar skills in the next lesson.





## LESSON 5: Properties Array

### MATERIALS

#### Per student:

- card stock
- pencils and erasers

#### To share:

- trays of matter objects
- Sharpies
- glue, double-sided tape
- books for reference

### VOCABULARY

array, collection, diagram, chart, color wheel

### LEARNING GOALS

*Students will understand:*

- How a scientific array demonstrates multiple pieces of information in an organized way.
- How artists use different tools to organize information like, color wheels to explain colors.
- How different matter may have similar properties.
- How to use vocabulary to describe properties of matter.

### Timeframe: 1 hour

Students will create a scientific array attaching objects with different properties of matter to a sheet and noting its properties.

## INSTRUCTIONS

### Step 1: Introduction

Review matter and properties. Discuss how scientists record and illustrate information. Show an example of a [scientific array](#) and draw a diagram of how students' arrays will be laid out. Discuss vocabulary words and show how an array is similar to how an artist shows colors palettes, or displays a collection in a museum.

### Step 2: Choose Objects

Have students look closely at matter objects (on trays) and choose 8-10 different pieces with ideally 8-10 different properties. (Choose what number fits best for size of material/card.)

### Step 3: Attach & Label

Have students glue their objects to the card and label each piece with its characteristic properties. They can begin in pencil, then go over the pencil with Sharpie.

### Teaching Tips:

- Have students work in pairs and create two arrays.
- Have students create a more descriptive, detailed array with 2-4 objects.
- Have students find matter objects with matching properties.

### Next Steps

This will be the last component of their book on matter. Discuss next steps of presenting their work to an audience.



gr **2**

## Bookmaking: The Science & Properties of Matter

### LESSON 6: Building Matter Books

#### MATERIALS

##### Per student:

- glue sticks
- pencils and erasers

##### To share:

- glue
- Sharpies
- double-sided tape
- heavy card stock or small envelopes
- exemplar for reference
- books for reference

#### VOCABULARY

presentation, scientist, collection, museum, project, assertive, clear voice, expert

#### LEARNING GOALS

*Students will understand:*

- How a scientist and an artist collect and display research and artwork.
- How to present work in clear and assertive ways.
- How to describe the properties of matter through words and visual work.

#### Timeframe: 1.5 hours

Students will complete their books with printed or painted covers, adding observational drawings, array, and matter monster. Visiting artist and expert Meg Christie will teach students about presentation using movement and improvisation.

#### INSTRUCTIONS

### Step 1: Introduction

Review each art component and make connections again to matter and properties. Have students share one or two things they learned about matter and art making. Show an example of a book and illustrate how to put the pages together with their writing samples in a way that describes/teaches/informs.

### Step 2: Presentation Practice

Describe how students will present their books. (In this lesson, visitors stopped by each desk and asked students questions about their books). Introduce [teaching artist](#) and improvisational artist Meg Christie, and discuss how presentation can be fun, artistic, and helpful in teaching others what they learned.

### Step 3: Improv Games

Meg Christie will lead games encouraging speaking and presenting skills. This can include name games with movement, partner sharing, discussing voice, and projection.



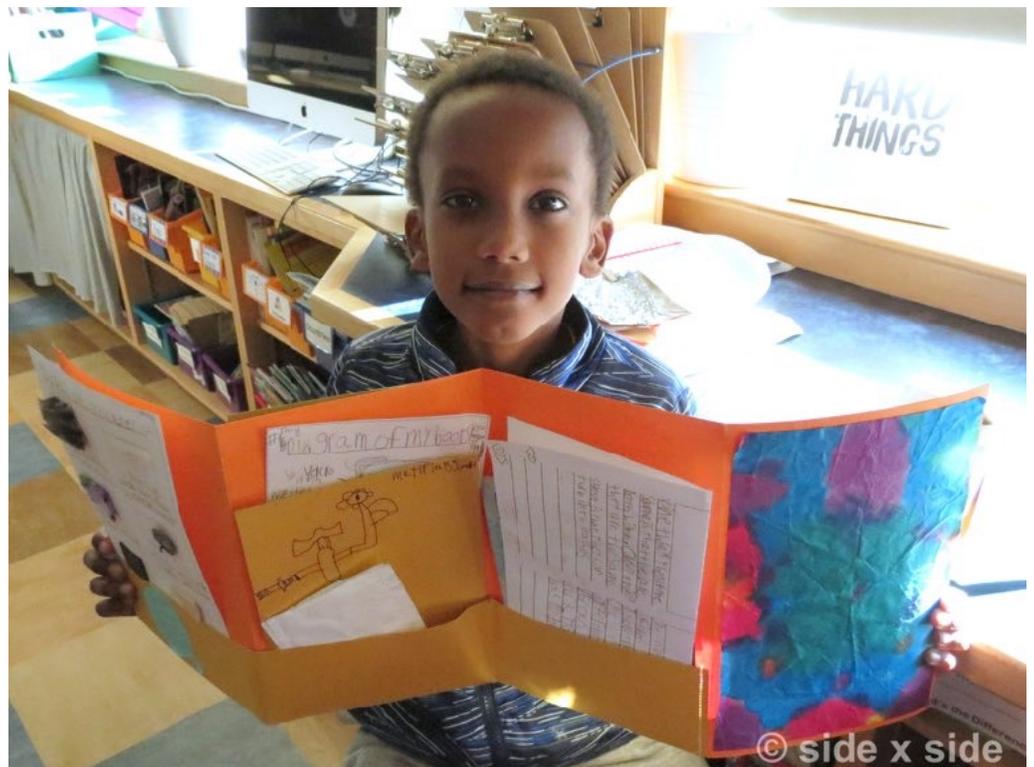
### Teaching Tips:

- Have prints and watercolors precut to fold over as cover.
- Have students create an About the Author page.
- Have students work in pairs to review their books.
- Have students practice presenting their matter books in small groups.



## Step 4: Compile Books

After games and presentation practice, have students put together their books including their scientific writing pieces. Demonstrate how to make a pocket in their book for their array and how to attach a full sheet Suminagashi print as a cover.



### Next Steps

Once students have completed their books, move on to the Celebration of Learning.

gr 2

## Bookmaking: The Science & Properties of Matter



### CELEBRATION OF LEARNING

#### MATERIALS

\*Dependent upon type of celebration

#### VOCABULARY

audience, presentation, form, display, reflection, revision, critique

#### LEARNING GOALS

*Students will understand:*

- How reflection and presentation cements learning.
- How to speak clearly and loudly in a large group setting.
- How to share knowledge of the properties of matter through visual bookmaking techniques.

#### Timeframe: 30 minutes – 1 hour

This culminating event is an important component of the unit giving students an opportunity to reflect on their success, share their knowledge, and receive positive feedback. Teaching artists and classroom teachers design this component to meet the needs of the students and school community. In this unit, students represented their books in a gallery style walk through in their classroom.

### Celebration Suggestions:

#### Create a Classroom Museum

Have students display their books on desks around the classroom. They can be museum docents sharing their books as other classes, parents, and community members visit their classroom.

#### Host an Authors' Tea

Invite students to share their books with peers in another class. Make it a special event by circulating and asking students about their work. Include refreshments!

**SEL SKILL:  
RESPONSIBLE  
DECISION-MAKING**

is the ability to make constructive and respectful choices about personal behavior and social interactions based on consideration of ethical standards, safety concerns, social norms, the realistic evaluation of consequences of various actions, and the well-being of self and others. The Celebration of Learning is an opportunity to demonstrate knowledge acquisition visually and collaboratively. It is a chance for students to work together, making strong choices to represent their creative work.

**Have a Book Tour**

Have students take their books into younger classrooms to read and share what they have learned. Reserve a place in the school where students can proudly display their books.

**Engage the Community**

Invite families, administrators, and community members in for a book share. Have students teach the guests about the bookmaking process and share facts about the properties of matter.



gr 2

## Bookmaking: The Science & Properties of Matter



### Lesson Modifications and Extensions

#### Musical Matter

Find several unusual objects and play a game similar to musical chairs passing the object. Each student, when they are holding the object, must quickly name a property related to the object and pass it on before the music stops, eliminating students as you go.



#### Matter Jacket

Fill small bags with like objects and pin on a jacket, or use a clear pocket wall organizer. For example: buttons, string, googly eyes, cotton balls, rubber bands, felt pieces, small shells, rocks. This gives students inspiration for exploring different materials and their properties.

#### Visual Thinking Strategies

"Visual Thinking Strategies" is an inquiry-based teaching method created by cognitive psychologist Abigail House and museum educator Philip Yenawine. The main aspects of VTS teaching practice include three key inquiries:

What's going on in this picture? What do you see that makes you say that? What more can we find?

[Using VTS in the Classroom](#) (article by Erin Chaparro)



#### Gallery Walk

The Celebration of Learning can be set up in the school library or open venue so viewers can see and touch the books.

### COMMON CORE STATE STANDARDS corestandards.org

**Reading Standards for Informational Text:**  
CCSS.ELA-LITERACY.RI.2.1, CCSS.ELA-LITERACY.RI.2.2

**Reading Standards for Foundational Skills:**  
CCSS.ELA-LITERACY.RF.2.2.A, CCSS.ELA-LITERACY.RF.2.3.A

**Writing:**  
CCSS.ELA-LITERACY.W.2.1, CCSS.ELA-LITERACY.W.2.2, CCSS.ELA-LITERACY.W.2.8

### 21st CENTURY STUDENT OUTCOMES p21.org

**21st Century Interdisciplinary Themes:**  
Global Awareness and Civic Literacy

**Learning and Innovation Skills:**  
Creativity and Innovation  
Critical Thinking and Problem Solving  
Communication and Collaboration

**Life And Career Skills:**  
Flexibility and Adaptability  
Initiative and Self-Direction  
Productivity and Accountability  
Leadership and Responsibility

### CASEL SOCIAL EMOTIONAL LEARNING SKILLS

SEL is an integral part of education and human development. SEL is the process through which all young people and adults acquire and apply the knowledge, skills, and attitudes to develop healthy identities, manage emotions and achieve personal and collective goals, feel and show empathy for others, establish and maintain supportive relationships, and make responsible and caring decisions. [casel.org](http://casel.org)

- Self Management
- Self-Awareness
- Relationship Skills
- Responsible Decision-Making

### NATIONAL CORE ART STANDARDS nationalcoreartsstandards.org

**Anchor Standard 1:** Generate and conceptualize artistic ideas and work. VA: Cr1.1.3a, Cr1.1.4a

**Anchor Standard 2:** Organize and develop artistic ideas and work. VA: Cr2.3.3a

**Anchor Standard 3:** Refine and complete artistic work. VA: Cr3.1.4a

**Anchor Standard 5:** Distinguish between different materials or artistic techniques for preparing artwork for presentation. VA:Pr5.1.2a, VA:Pr5.1.3a

**Anchor Standard 10:** Synthesize and relate knowledge and personal experiences to make art. VA:Cn10.1.4a

### NEXT GENERATION SCIENCE STANDARDS

**2-PS1-1.** Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.

**2-PS1-2.** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

**2-PS1-3.** Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

**2-PS1-4.** Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.