

# TEACHER WORKBOOK

# Teaching **CLAY** in the **CLASSROOM**

The hands-on companion to the  
**TEACHING CLAY IN THE CLASSROOM**  
video series

Written by Jeni Hansen Gard  
Illustrated by Gunyoung Kim

## **INCLUDED INSIDE:**

1. Understanding Clay
2. Storage, Shelving, & Safety
3. Tools
4. Equipment
5. Kilns & Cones
6. The Firing Process
7. Worksheets & Forms
8. Building Techniques
9. Decorating Techniques
10. Artist Inspiration

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550 Polaris Parkway, Suite 510  
Westerville, OH 43082

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ISBN: 978-1-57498-389-0 (Paperback)

ISBN: 978-1-57498-598-6 (PDF)

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Publisher: Bill Janeri

Design and Production: Melissa Bury

Editor: Ash Neukamm

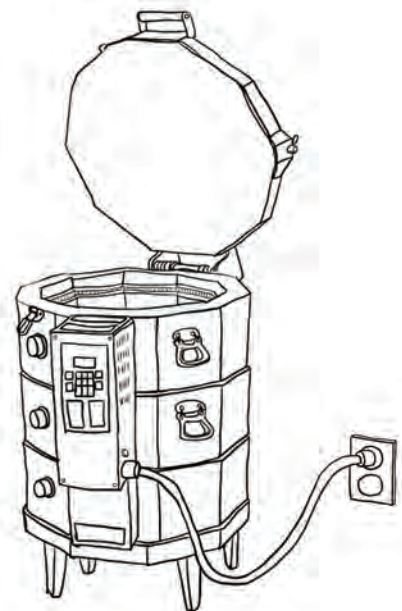
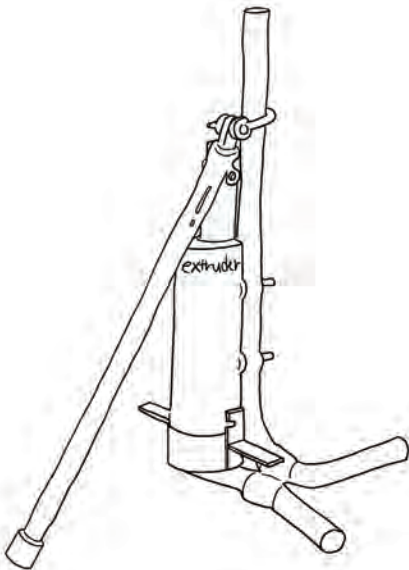
Associate Editor: Jennifer Poellot Harnetty

Cover images: Tools by Gunyoung Kim

Printed in the USA

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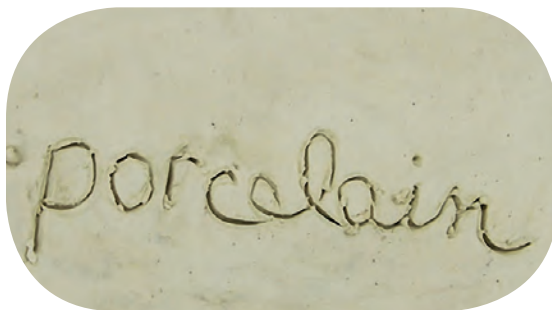
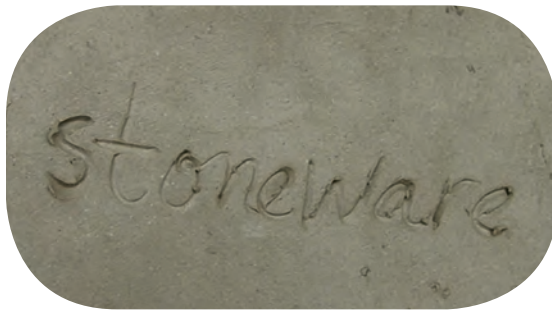
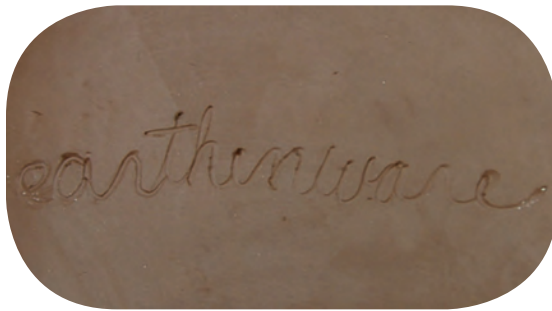
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## An Introduction to Clay

### What is Clay?

Clay is a remarkable material found all over the earth's surface. Clay is formed under the surface of the earth at the site of a parent rock, typically a feldspathic rock. This rock breaks down over time from weathering. If the clay stays at the site of the parent rock, it is considered primary clay. Primary clay is often white and holds little or no impurities. Once the clay has moved away from the parent rock, it is considered secondary clay. Secondary clay refers to clay that has been transported, which can happen naturally with the aid of wind, rivers, and glaciers. While being transported, secondary clays pick up organic materials and impurities, and are often gray or red.



### Types of Clay

Clay bodies can be broken down into three main categories: earthenware, stoneware, and porcelain. For use in the K–12 classroom, I recommend using a low-fire or a mid-range clay body. Low-fire clay is the most cost-efficient option and the lower temperature allows for a brighter color palette. You can purchase moist clay from your ceramic supplier that comes in a 50 lb. box. I recommend Amaco's White Art Clay No. 25 and Sedona Red Clay No. 67 as both are suitable for handbuilding and wheel throwing. Both should be fired to cone 05 or 1888°F (1031°C).

### Firing Ranges<sup>1</sup>

- Low-fire: cones 08–04 (1728–1945°F (942–1063°C))
- Mid-range: cones 4–7 (2124–2262°F (1162–1239°C))
- High-fire: cones 8–10 (2280–2345°F (1249–1285°C))

**Note:** Some clay manufacturers refer to mid-range as high-fire. Always check the cone and degree.

**Earthenware** is a secondary clay. It most often holds iron oxide, which gives it a reddish-brown color. It is typically used at low-fire temperatures (1728–1945°F (942–1063°C)). It is sometimes called red clay or terra cotta. Red earthenware is commonly used to make the flower pots found at garden stores. Although it does not occur naturally, there are also some manufacturers that produce white earthenware clay bodies.

**Stoneware** is composed of fire clay and ball clay, both secondary clays, as well as feldspar and silica. Typically used for high-fire, it matures between 2100–2400°F (1149–1316°C). The materials and high-firing temperature vitrify stoneware clay bodies. When vitrified, the particles fuse together and become glass-like.

**Porcelain** is a pure-white clay body composed of kaolin, a primary clay known for its translucency. It is traditionally fired to high-fire temperatures above 2300°F (1260°C). Toilets are commonly made with porcelain clay.

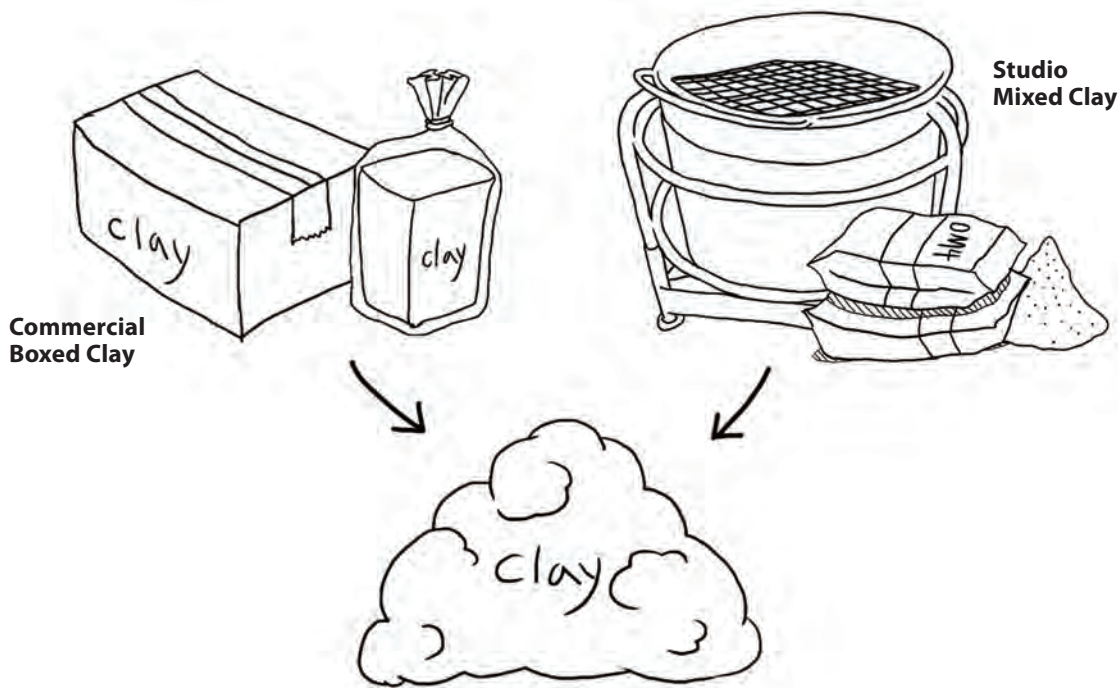
<sup>1</sup>Orton Ceramic. "Orton Cone Charts and Temperature Equivalents." [https://www.ortonceramic.com/Resources/Pyrometric\\_Cones/](https://www.ortonceramic.com/Resources/Pyrometric_Cones/).

## Commercial vs. Studio Mixed Clay

There are many different types of clays and clay bodies, and different ways to access them. A clay body is a combination of clay particles and ceramic materials in a homogeneous mixture at a workable consistency that produces a predictable firing result. Clay bodies can be found in nature but often require testing and the addition of other materials.

The easiest method, and the one that I recommend, is purchasing premixed clay from a local or regional clay supplier. Another option, common among professional ceramic artists and in some

schools, is to mix a custom clay body using dry materials and water. This method can be more cost-effective, but does require additional equipment, space, and time. You can dig your own clay if you find a natural clay deposit, such as one in the ground or creek bed that is accessible. I have been fortunate to live in places where natural clay is abundant—in Michigan I found a seam where Lake Michigan meets the land, in Ohio I found clay in my garden bed, and in Georgia there is red clay everywhere.



Whether you purchase clay or mix your own, the results will be similar. If using premixed clay, use one bag at a time, splitting it between students and make sure to keep the bag tightly closed at all times so it maintains its moisture level (and workability). I typically place a clay order at the beginning of the school year and keep it in storage until it is needed, which reduces labor and saves on delivery costs. Mixed and boxed clay does not expire or go bad, although it can dry out over time and require rehydrating and mixing (see page 4 for more information on reclaiming clay). Any unfired clay scraps can also be recycled and remixed.

Premixed clay comes in 50 lb. boxes that should be stored on a strong surface, such as the floor, a cart, or a sturdy shelving system. Stack several boxes to

optimize your storage space. It is best to keep clay from freezing. If it does freeze it is not ruined, but it will require additional wedging. Keep dry materials in a dry, secure space off the ground.

When mixing or reclaiming clay, store the clay in an airtight container or wrap it tightly in a plastic bag. If using a container, keep it on a cart to make transporting easier. Place a wet towel on top of the clay and check it often for moisture. Replace the towel as needed to avoid mold growth. If you plan to keep the clay for a long period of time, 6–12 months or longer, make clay logs that weigh about 10–20 pounds and are 4–5 inches in diameter. Wrap them in a heavy plastic trash bag, keeping it as airtight as possible. As with any clay, store it somewhere easily accessible to prevent unnecessary heavy lifting.

## Reclaiming Clay

When working with clay, it is inevitable that you will have scraps of clay, dried out pieces, or trimmings from throwing on the potter's wheel. What do you do with all the scraps of clay? If the clay is still wet and workable, wedge it and put it in a bag until it is ready to be used. If the clay is too stiff to work with but still unfired, it can be reclaimed, bringing it back to a workable con-

sistency. Reclaiming clay is an important skill because it reduces waste and clutter and saves money. The tools and materials needed for this process include: clay to be reclaimed, water, a container to hydrate the clay in, something to mix with (a stick, a drill with attachment, or even your arm/hand), a scraper, and a porous surface (cement board or plaster trough).

**1 Collected clay for reclaiming** Collect clay scraps in a container that can hold water (like a 5-gallon bucket). Preferably, the scraps should be bone dry because they hydrate more evenly. If clay scraps are not bone dry, let them continue to dry out.



**2 Adding water** Add enough water so that the clay scraps are completely submerged. Wait until they are fully saturated before mixing. This may be a day or a little longer.



**3 Mixing clay** Mix well using a drill with a paint-mixing attachment until the reclaim is smooth (think pudding consistency).



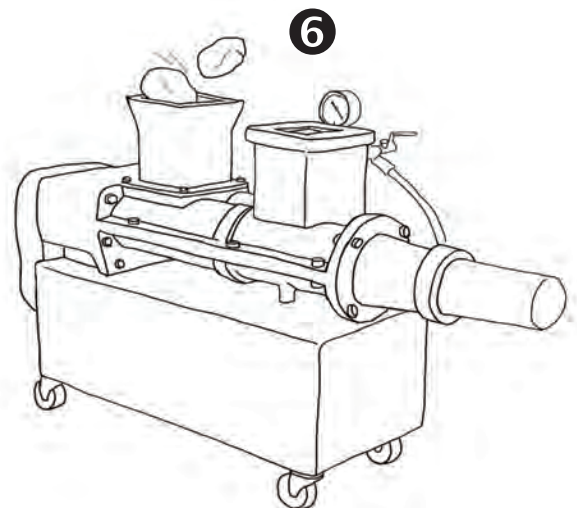
**4 Dry it out** Dry the reclaim on a porous surface. If you are using a flat porous board, such as cement board, lay the clay out evenly on its surface. Use a scraper to lift the clay and flip it over periodically so that it dries evenly. If using a plaster trough, fill the interior space with clay slop. It is a good idea to flip it occasionally, but use your hands and be cautious not to chip the plaster. Avoid getting any plaster chunks mixed in with your clay as this will cause problems during the firing.



**5 Wedge** Once the clay dries to a workable consistency, wedge it. If you are planning on pug milling the clay, this step can be omitted or reduced. Store the reclaimed clay in plastic and use it as you would any other clay.



**6 Pug** Once the clay dries to a workable consistency, send it through a pug mill (see page 24 for more information on the pug mill). Store it as you would any other clay. **Note:** If you do not have a pug mill, this step can be omitted.

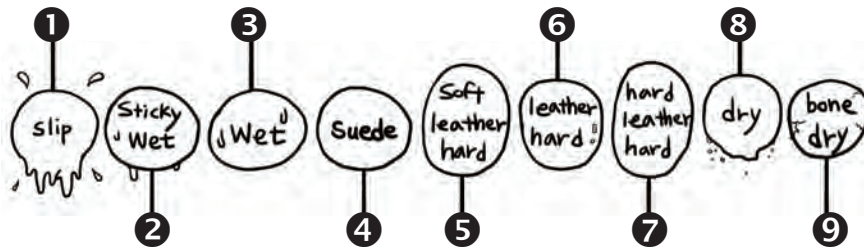


## Understanding the Stages of Clay

### Raw Clay or “Greenware”

Clay is a soft, plastic, and malleable material. It can be used to form objects in space—responding to every push and pull. Greenware is the umbrella term that encompasses all the stages of clay before it is fired for the first time.

The stages of clay range from liquid clay slip to the fragile state of bone dry. Clay should be used and treated differently during the various stages. All greenware clay can be reclaimed to bring it back to a workable state.



**1 Slip** is a liquid clay used for “slipping and scoring” and decorating. It is sometimes kept in a slop bucket for clay to be reclaimed. Because of its water content, clay slip is prone to mold growth. This is not always a bad thing, as some people believe it increases the workability of the clay, but it can be a problem for people with allergies.

**2 Sticky Wet** is a sticky clay that is a little too wet to use effectively. It literally sticks to your hands and the table. It usually needs to be dried out before it’s usable, or you can combine it with a slightly drier clay.

**3 Wet** is an ideal consistency for wedging, building, and forming. It might be fresh clay from the bag, just mixed, or reclaimed. To keep clay at this consistency long term, store it in an airtight container or tightly wrapped plastic bag to maintain moisture.

**4 Suede** is an in-between stage. In this stage the clay has stiffened up, but still allows workability. This is a good stage for stamping and altering, as it is harder than wet, but softer than leather hard.

**5 Soft Leather Hard** has less moisture than the suede stage. This clay is still flexible, can hold its shape, and can

change form in this stage. This is a good stage for carving. Carving can also be done at the suede, leather hard, and hard-leather hard stages.

**6 Leather Hard** is when the clay holds its own shape and is not easily changed. Additions can be made to the surface. This is a good stage for slipping, scoring, and trimming. As the clay dries, it becomes more fragile. Prevent cracking by drying the clay slowly, which can be done under a plastic bag.

**7 Hard Leather Hard** is when the clay can no longer change shape without breaking. Additions should not be made at this time. The surface can be decorated during this stage without the risk of altering the shape.

**8 Dry** clay will begin to change color. It should be dried slowly to avoid cracking. The surface can be decorated during this stage without the risk of altering the shape.

**9 Bone Dry** is when the clay has completely changed color, is no longer cool to the touch, and is very fragile. There is little moisture left in the clay at this stage and work that is bone dry is ready to be bisque fired. Clay scraps that are bone dry are easier to reclaim.

### Slip

- liquid clay
- slipping and scoring
- decorating

### Sticky Wet

- sticky
- too wet to be used effectively when building
- dry to the wet stage or combine with stiffer clay

### Wet

- fresh from the bag
- easy to wedge
- workable
- malleable
- pinching
- coiling
- rolling slabs
- throwing

### Suede

- altering
- impressing
- slipping and scoring
- carving

### Leather Hard

- sometimes called cheese hard
- holds its shape
- slipping and scoring
- carving
- slip and underglaze decoration

### Bone Dry

- no moisture
- color change
- fragile
- shrink
- ready to bisque fire
- easy to rehydrate and reclaim
- underglaze decoration

## Bisqueware vs. Glazeware

**Bisqueware** is clay that has been fired at or above 1112°F (600°C) and goes through a chemical change to become ceramic.<sup>1</sup> It is no longer clay and cannot be rehydrated to a workable state. It is still fragile, but no longer as brittle and weak to the touch as bone dry clay. The purpose of bisque firing is to burn out carbonaceous matter and chemical water, and to strengthen the wares before glazing. The surface is open and porous, which makes work at this stage ideal for glazing.

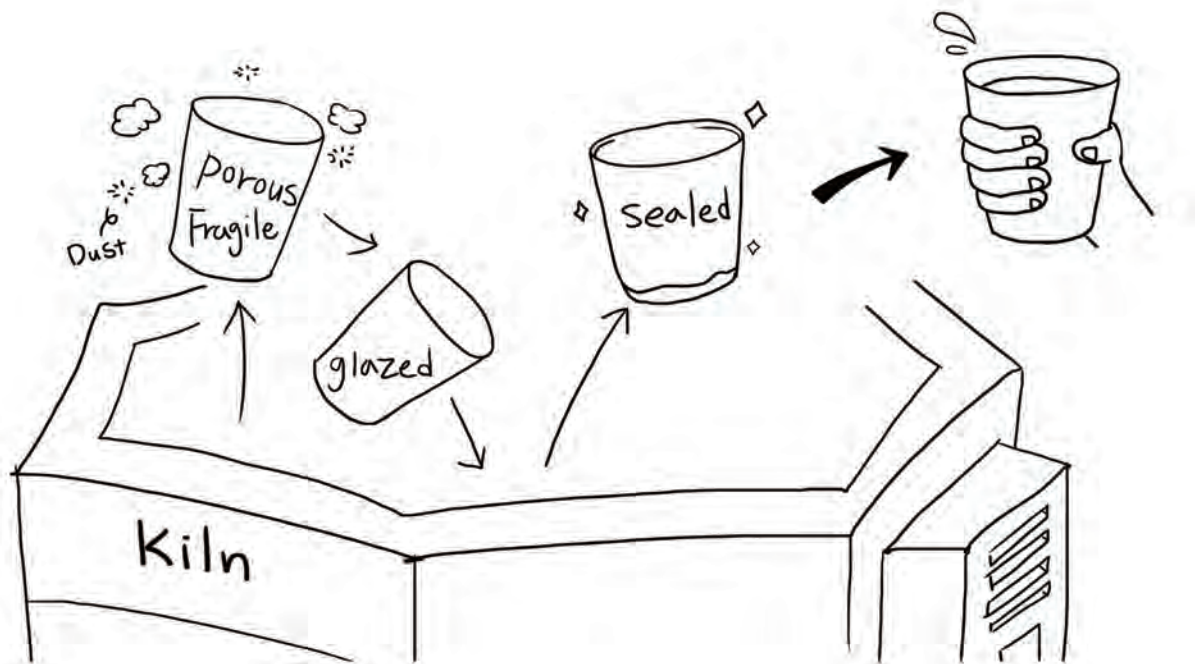
### Bisqueware

- Clay goes through a chemical change and becomes ceramic
- Can no longer be reclaimed or rehydrated
- Porous
- Underglaze decoration
- Ready to be glazed
- Handle with care
- Be cautious of the oils and dirt on hands when touching the wares
- Should be free from dust before glazing; it can be sponged or rinsed with water

**Glazeware** is non-porous and has a glass-like surface. Surfaces can be matte, satin, or glossy depending on the type of glaze applied before firing. Glazed items are ready-to-eat-off-of or drink from, as long as food-safe clays and glazes were used.

### Glazeware

- Not porous
- Ready to eat off of or drink from, as long as food-safe clays and glazes were used
- Has a glass-like surface
- Matte, satin, or glossy finishes
- Proud students
- Finished
- Additional third firings could be considered (decal, china paint, luster)



<sup>1</sup>Cushing, V. *Cushing's Handbook*, 1994, pg. 43

In this comprehensive workbook, artist and educator Jeni Hansen Gard provides an informative guide for teaching ceramics at the K–12 level. Because many K–12 art teachers have to teach this complicated subject with little or no ceramics background, this workbook gives a thorough introduction to all aspects of teaching clay in the classroom. Filled with detailed illustrations and step-by-step images, this workbook also includes helpful instructional handouts to hang in your classroom, classroom contracts for students, kiln logs for teachers, and so much more! You'll learn where clay comes from and the different firing temperatures for clay and glaze, how to build and decorate using basic and advanced techniques, how to load and fire ceramic kilns, and practical knowledge for setting up your classroom for success. The answers are here, along with resources that will assist you in putting your newfound knowledge into practice.



**Jeni Hansen Gard** grew up in a small bed and breakfast in Grand Haven, Michigan. She is an artist and teacher with an integrative art practice that focuses on using the ceramic vessel as a catalyst for bringing people together. Her community-focused approach to ceramics and education led her to become a founding member of the Socially Engaged Craft Collective, a craft and social practice organization. At the time of publication, she and her husband, fellow ceramicist, Forrest Sincoff Gard, were resident artists at the Mill Hill Community Arts Center in Macon, Georgia. They also run Gard Clay Studios, a collaborative studio for their research and where they make a line of functional wares and have a small artist

residency program. To learn more about her work, please visit [www.jenihansengard.com](http://www.jenihansengard.com).

**Gunyoung Kim** was born and raised in Seoul, South Korea. She is a figurative ceramic artist who focuses on capturing subtle expression of human emotions. Gunyoung earned her bachelor of fine arts in ceramics from Kook-Min University in Korea in 2010, and her master of fine arts from The Ohio State University in 2014. After graduate school, she completed artist residencies at Lawrence Arts Center and the Archie Bray Foundation for the Ceramic Arts. Gunyoung currently lives in Columbus, Ohio, and works as a full-time artist. To learn more about her work, please visit [www.gunyoungkim.com](http://www.gunyoungkim.com).

