Science, Technology, Engineering & Math

A Memory CAST in Time

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An Intro to Metal Casting

By Timothy O'Leary

What will you cast that will last a thousand years?

Weekly Questions and Overview

Week #1:History of Casting

- How long have humans been casting metal?
- Understand the tools we will be using
- Safety
- Intro to Casting using wax

Week #2:Aluminum Harvesting/Recycling

- How can we Recycle in casting?
- How to build a casting forge
- What is the Melting point of Aluminum?

Week #3: Aluminum Foam Casting

- What is foam casting?
- How to use play sand and foam to cast metal

Week #4: Bronze Casting

- What is CuttleBone casting?
- What is the history of bronze/bronze age?
- What

Week #5: Ring making and Lost wax casting

- What is lost wax casting?
- How to make a ring that will fit when you cast it

Week #6: Finish-up all projects

- Finish all project that did not get finished
- What have we learned
- What would you like to know more about?

Reason for Class

Reason:

Why am I teaching this class?

This class is meant to expose youth to a set of skills that are being lost in our culture. It's focus is to preserve a dying art form and educate students about the basics of casting metallurgy.

Grant Outcome:

Academic Success

- Shows a real world example of the transition of states of matter.

Improved Non-Cognitive Skills

- The transmutation of reclaimed materials into something of beauty and substance is a unique opportunity to talk about the how we as humans are in a constant state of change. Encourage the ideas of things being reborn out of stress and conflict. The student can see themselves (their real world struggles) in the material, when it changes, they grow and become confident. Life imitates art.

Vocabulary

Casting:

Casting is a manufacturing process in which a liquid material is poured into a mold, which contains a hollow cavity of the desired shape, and then allowed to harden.

Alloy:

An **alloy** is a mixture of metals or a mixture of a metal and another element.

Bronze:

Bronze is an alloy consisting primarily of copper, commonly with about 12% tin and often with the addition of other metals (such as aluminium, manganese, nickel or zinc).

Cuttlefish:

Cuttlefish are marine animals closely related to squid, octopuses, and nautiluses. Cuttlefish have a unique internal shell called the cuttlebone. Despite their name, cuttlefish are not fish but molluscs.

Crucible:

A **crucible** is a container that can withstand very high temperatures.

Tongs:

Tongs are a tool used to grip and lift objects

Crucible Furnace:

The **crucible furnace** is the oven used to heat up metals in a crucible before pouring them into a mold.

Ferrous metal:

A **ferrous metal** is a metal, including alloys, that does contains Iron

Non-ferrous metal:

A **non-ferrous metal** not contain iron. Some examples are: (Gold, Silver, Bronze, Aluminium, Copper, Lead, Nickel, Tin, Titanium and Zinc)

Vocabulary

Sprue:

A **sprue** is a channel through which metal or plastic is poured into a mold

Dross:

Dross is the impurities that form a thick sludge on the surface of molten metal. This should be skimmed off before pouring the metal into ingots or molds.

Ingot:

An **ingot** is a piece of relatively pure material, usually metal, that is cast into a shape suitable for further processing.

Native Metal:

A **native metal** is any **metal** that is found in nature in its metallic form, either pure or as an alloy, in nature.

Ore:

An **ore** is a type of rock that contains sufficient minerals with important elements including metals that can be extracted from the rock.

Career Connections

Jeweler

Foundry Worker

Investment Casting Engineer

Cultural Connections

Celtic

Bronze age

Chieftain controlled the bronze

Mixing metals and making weapons was seen as magic

Field Trip Connections

Local Foundry

Kennecott Copper Mine

Power of One Connections

Creativity

- The nature of the class is to create something of permanence out of fire and raw materials. The students will be encouraged to exercise their imagination in what they carve and cast.

Core Standard Connections

Core Standard:

Science 8th Grade Core Standard 1: *Students will understand the nature of changes in matter.*

Description:

Student will see multiple real world examples of how matter changes from solid to liquid to gas. They will understand the differences between the physical and chemical changes they are witnessing.

Week #1: History of Casting

Why was casting so important to the evolution of human society?

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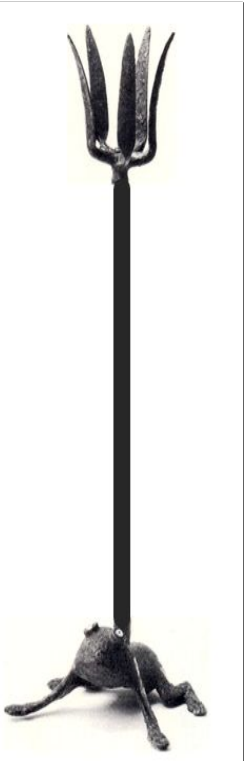


- Theorists believe that copper may have been discovered as early as **4500 B.C.** When early people lined the outer ring of their fires with rocks containing copper ore. When the fire pit was cold the next day they found droplets of solidified copper that had melted from the ore.
- Oldest know casting was dated back to **3200 B.C.** A copper frog, cast in Mesopotamia. Roughly in the vicinity of modern day Iraq.
- Before humanity learned to cast metals we hammered “native metal” into crude tools and ornamentation.

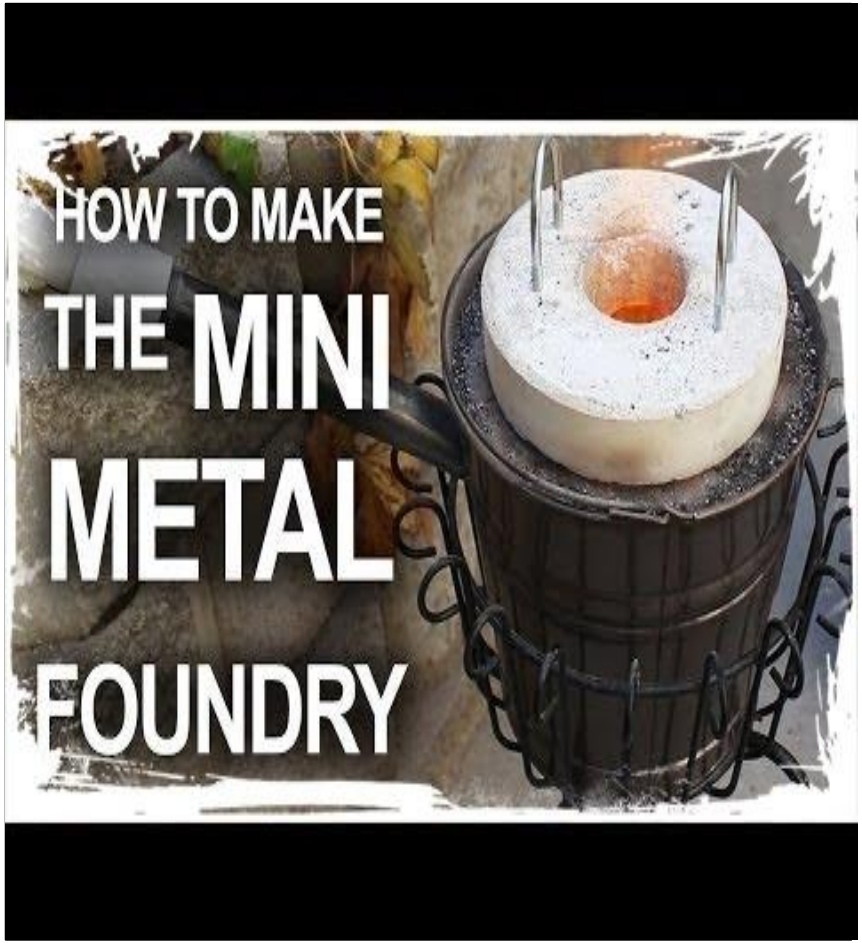
(Use this slide to add content to build background knowledge...basic definitions or open ended question that will help generate conversation regarding the content for this class period)

(Enter Video Clip Here)

Wax casting in clay

(Enter Video Clip Here)

Galium casting in wax



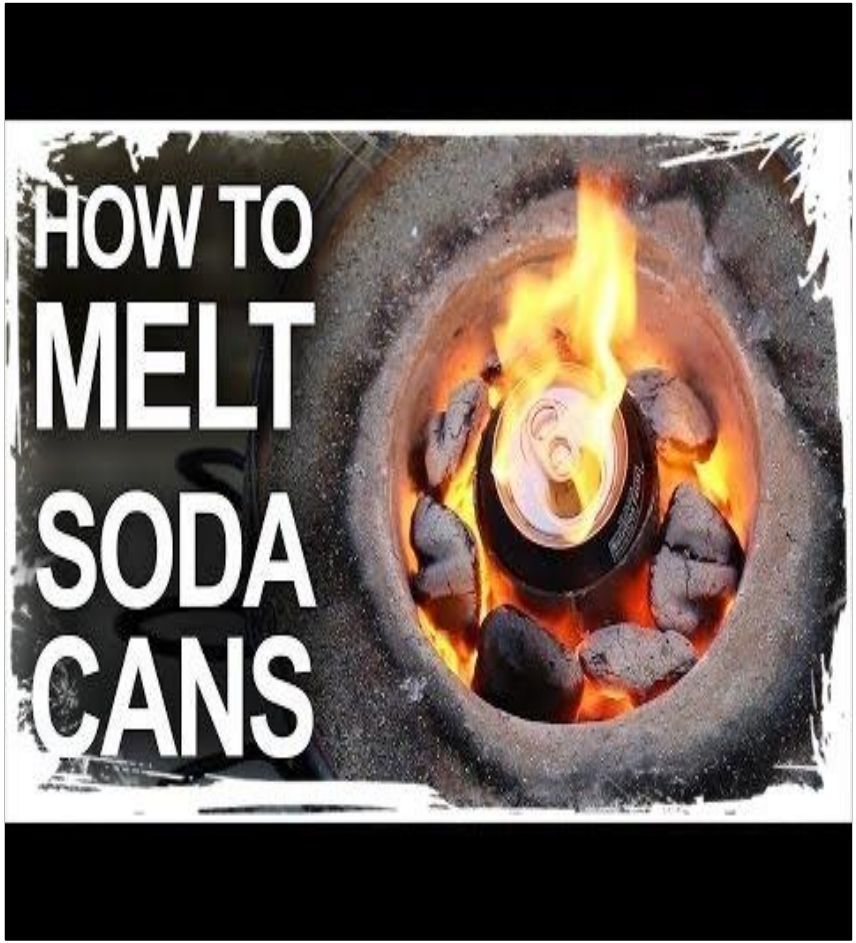
Project 2 Week 1

Building an aluminum casting furnace.

Week 1 Materials & Supplies Project 2

Week #2: Aluminum Harvesting/Recycling

(enter definitions here)



Project 1 Week 2

Rendering aluminum from soda cans

Recycling aluminium

Week 2 Materials & Supplies Project 1

Week 2 Materials & Supplies

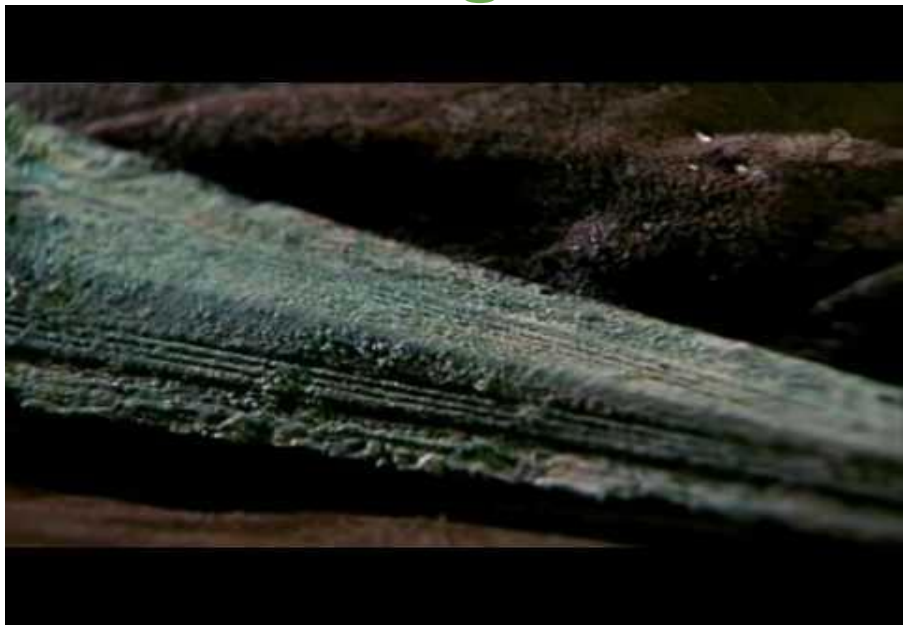
Week #3: Aluminum Foam Casting

(Add photo or video clip here)

(enter definitions here)

Week 3 Materials & Supplies

Week #4: Bronze Casting



How did the creation of this alloy change the shape of warfare in the ancient world?

Week 4 Materials & Supplies

Week #5:
Ring Making and Lost Wax Casting

(Add photo or video clip here)

(enter definitions here)

Week 5 Materials & Supplies

Week #6:
Finish-up all projects

(Add photo or video clip here)

(enter definitions here)

Week 6 Materials & Supplies

(add a question or statement here that supports your video clip)

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(add a question or statement here that supports your video clip)

(Enter Video Clip Here)

(add photos of class supplies and materials here)

(Enter Class name here) Tools

Enter photo here

Creative Challenge:

(Write one challenge for the week/class here. Duplicate this slide for each class or week. Identify ONE

challenge for each class or week)

(Enter photo/videos of student work here. Duplicate this slide as needed)

(Enter photo/videos of student work here)

Pro Tips by Liz Rich

- *(Enter your pro teaching tips here...see examples below)*
- Show video clips at the beginning of each class period
- Take video and photos of the kiddos throughout the class and add it to the presentation.
- Give kiddos a SMALL piece of paper so they can finish the project. As the class continues, gradually increase the size of paper.
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Class Evaluation

How will I know this class is successful?

Student will…(statements)

What went well?

What could have been better?

Resources:

- http://afsinc-jobs.careerwebsite.com/jobseeker/job/29789579/

Job description for what an Investment Casting Engineer is.

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