

WORKSHOP PLAN:

Pewter Moulding and Casting



WORKSHOP PLAN: PEWTER CASTING (MAKING A TWO-PART SAND MOULD)

Artist and Engineer [Sophie Huckfield](#) has designed this workshop plan to support teachers to teach sand moulding and pewter casting with students at Key Stage 3 and above. As an extension activity, Sophie explains how to use alginate to safely create moulds from pupil's hands.

Sophie has a background in model making and engineering. Her practice is a response to the material world and employs traditional and experimental modes of production to create sculpture, functional objects and writings, which explore our relationship to materials and objects, specifically tools, machines and technologies.

PUPILS WILL LEARN:

The basic principles of moulding and casting by creating a mould from two casting rings and kinetic sand; about low and high melting temperatures; specialist metalwork vocabulary; design processes, and making a unique 'maker's mark'. In the extension activities there is the opportunity to learn about body casting with alginate and plaster.

We'd love to see the results of your workshop! Share your images with [@craftscounciluk](#) on Twitter and [@craftscouncil](#) on Instagram using [#MakeYourFuture](#)

MATERIALS/EQUIPMENT REQUIRED— SEE STOCKISTS ON PAGE 22

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|--|---|
| -Pewter (A bar cut into pieces— weighing around 40g but doesn't need to be exact, alternatively pewter shots or beads) | -Objects to press into the sand |
| -Heat gun | -Personal protective equipment (gloves and goggles) |
| -Sand (kinetic sand or oil sand) | -Mallet or flathead hammer |
| -Round moulds (wooden/metal tubes cut down to length) | -A metal ruler or metal spatula |
| -A metal pan or flat bottomed ladle | -Needle files |
| -Modelling/sculpting tools | -Masking tape |
| | -7mm drill bits |

GETTING STARTED: PREPARING FOR THE WORKSHOP

MATERIALS TO PREPARE IN ADVANCE

THINGS TO THINK THROUGH

ALTERNATIVES

Casting rings are used in jewellery-making to produce a metal casting. They are either one or two 'rings' or circular tubes of metal (or another material such as wood) which are used to form the wall of the mould. Essentially they act as a container for the sand.

Students can either create a one part or two part mould depending on how many casting rings there are.

Think about the size of the objects that students will be casting—the smaller the objects, the more manageable and inexpensive the process.

Casting rings can be expensive to buy or difficult to make without the right equipment.

A much cheaper alternative is a cat food or tuna can with both the ends removed with a tin can opener. A steel cupcake baking tray would also work adequately for a one-part mould.

Casting sand: When creating a mould you must use a casting sand. This is a sand with an added agent such as oil.

You can use a professional casting sand—which had oils added to it in order to maintain the impression.

HEALTH AND SAFETY: You cannot use wet sand. The water and molten metal react together causing the metal to spit and explode in a wet mould.

In my demonstration, I am using kinetic sand. Kinetic sand is coated in silicone oil, meaning the sand will hold its shape when modelled—the ideal alternative to expensive casting sand.

Objects to press into the sand to create a design to cast.

I asked students to bring in a small object. For this example it needs to be around the size of a £2 coin or smaller, but this depends on the size of the mould. Having a range of objects available for students to experiment with is very useful. I brought a range of small objects including engineers' stamps, buttons, nuts and screws, small chains and sculpting tools to draw in the sand with.

Ideally you need to be able to press the object into the sand easily. It will be more difficult to create the mould if the object has 'undercuts'—this refers to a feature that cannot be moulded using only a single pull mould.

WORKSHOP PLAN: PEWTER CASTING (MAKING A TWO-PART SAND MOULD)

STEP PROCESS

Fill your casting rings.

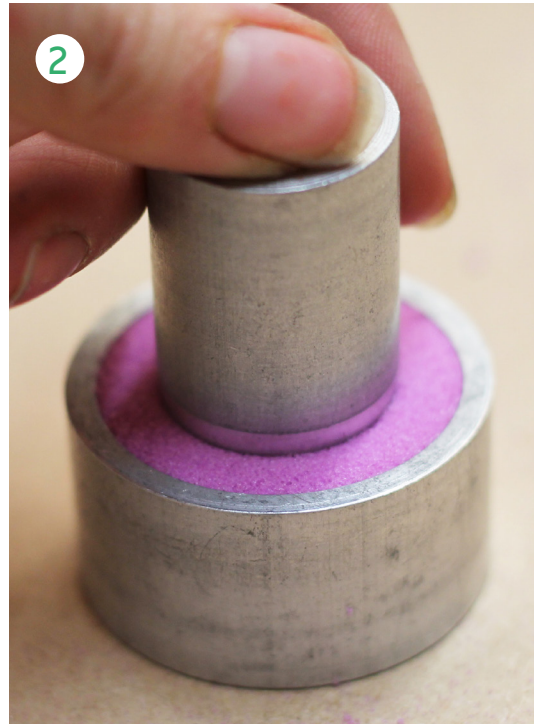
Take your two casting rings and fill with sand. Ensure the sand is packed tightly enough so that it doesn't fall through the other end.— You can use a mallet to make sure it is packed tightly. Try to overfill the casting ring with sand and then use a metal spatula or ruler to scrape the top so you have a flat, even surface to work from.



WORKSHOP PLAN: PEWTER CASTING (MAKING A TWO-PART SAND MOULD)

STEP PROCESS

Prepare your mould. Once you have filled both rings with sand and scraped them flat, put one of the rings to one side. Next you can focus on creating your design. Here I have created a specific tool to make an initial impression in the sand—in this case a metal bar with a flat end that creates a circular recess. I press the round tool into the sand to the depth of a pound coin (around 5-8mm, but this entirely depends on what design you want to create). Try to keep your impression as central as possible in the casting ring— this is important in a two-part mould. You must ensure that the circular surface is uniform and not broken around the edges. After I have made the circular impression, I press into the recessed circle to create my design.



TO NOTE

You don't need to create a circular impression but it can be useful for uniformity and to create a better casting.

WORKSHOP PLAN: PEWTER CASTING (MAKING A TWO-PART SAND MOULD)

STEP PROCESS

Make your design. There are many methods you can use to create your design. In this example I have used a range of objects such as buttons, screws and nuts to create interesting impressions. I also used engineer's stamps to press letters into the sand. Encourage students to bring in their own object to press into the sand, but you must ensure that it is an appropriate size for the mould and that it doesn't have any undercuts.

Remember to remove the items after you impress in the sand— a good method for removing without avoid spoiling your design is to lift the mould and gently turn it upside down (this is why you need to ensure the sand it packed tightly so it doesn't fall out when you lift the mould). Alternatively, use dental tools to carefully extract the object. An alternative to using found objects would be to sculpt your design in a clay which can be hardened (such as kiln fired clay, air drying clay, milliput or polymer clay), or carving it in a hard wax. You can then use this model to create an impression in the sand.



WORKSHOP PLAN: PEWTER CASTING (MAKING A TWO-PART SAND MOULD)

STEP PROCESS

Make your design. Continued from above.



TO NOTE

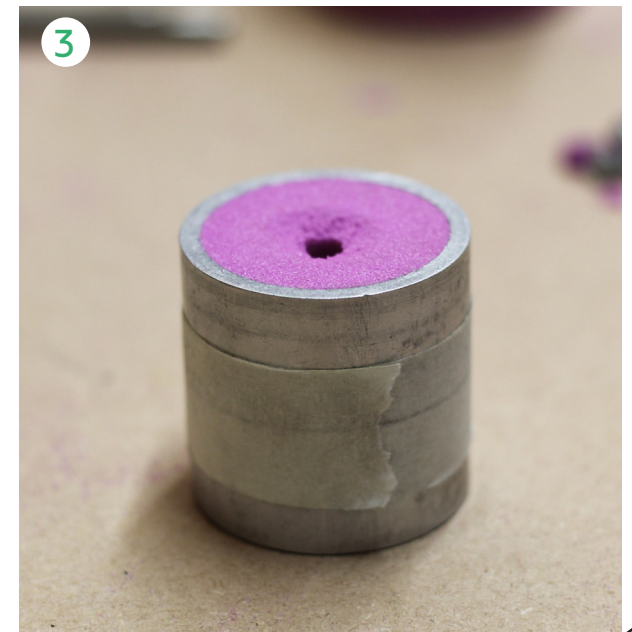
It is important to not be too precious over your design— they are easy to remake or start over. Encourage students to keep remaking the mould if they are not completely happy— the beauty of sand casting is that you can keep reusing the sand and re-melting the pewter! With each casting you will perfect your process and learn more through repeating and tweaking the moulding process.

WORKSHOP PLAN: PEWTER CASTING (MAKING A TWO-PART SAND MOULD)

STEP PROCESS

Make the sprue. Put your design to one side. Take your second casting ring— this ring will be used to create a 'sprue'. In casting, a sprue is the passage through which a molten material is introduced into a mould. It also refers to the excess material which solidifies in the sprue passage. In sand casting, the sprue is formed using a dowel, which is removed from the sand to make the hole into which the metal is poured. In this example I have used a 7mm drill bit.

I roughly locate the centre of the mould (this is why it is important to ensure the design on the first casting ring is also central), take the drill and rotate it slowly clockwise through the sand in the second casting ring to form a neat hole. Try to ensure the sand on the bottom of the mould is neat and uniform. When you are happy with the hole take a sculpting tool and gently carve a shallow recess around the edge of the hole— this recess will make the metal pouring process easier (only add a recess to the top end of the mould). Once this is complete take the second ring with the hole and place it on top of the first ring, ensuring the second ring sits flat on top. Tape the two rings together with masking tape to ensure that they will not move in the metal pouring stage.



WORKSHOP PLAN: PEWTER CASTING (MAKING A TWO-PART SAND MOULD)

STEP PROCESS

Melt the pewter.

For the metal casting, saw off a section of pewter. In this example I have cut off around 40g, although how much you need depends upon your design. In casting it is better to have too much pewter than too little. If you do not have access to a decent hack saw, I would highly recommend buying pewter in bead form and weighing it out— it will save you a lot of time and energy!

For my 'crucible', I am using a small steel frying pan to melt the pewter. Ideally you should use a flat bottomed stainless steel ladle. Using a heat gun, apply heat to the pewter— ensure it is not too close (around 100mm away) or else it will 'burn' the metal. In the melting process, the pewter will move through various colour changes before it reaches its melting point. Often it develops a skin on its surface before it becomes liquid enough to pour. Avoid boiling the metal. Once it takes on the silvery appearance of mercury, it is ready to pour. Being quick is critical at this stage, as the metal will immediately begin to solidify once it is removed from the heat source. Carefully pour the pewter into the mould, trying not to over pour the metal.

HEALTH AND SAFETY: As with all casting, it is important to think about safety. Wear protective eyewear, place the mould on a fire-safe surface, ensure the area is well ventilated, and have a fire extinguisher nearby.



WORKSHOP PLAN: PEWTER CASTING (MAKING A TWO-PART SAND MOULD)

STEP PROCESS

De-mould
your cast.

Leave the mould for around 20-30 minutes to cool down. When de-moulding, remove the masking tape and separate the casting rings. Excavate the casting from the sand using your fingers or a tool. Clean up the casting using a tooth brush or wire brush. Once you have removed the majority of the sand you can wash off the excess sand. If the piece has any sharp edges, use a needle file to finish and neaten up. If you are not happy with the final result you can easily recreate your mould and remelt the pewter to perfect your moulding and casting process. In this example, the casting will be used as a stamp for clay, so the sprue acts as a handle. However, if you do not want to have a sprue on your design you can remove it with a hacksaw, then file and sand the back. Alternatively, you can create a one-part mould, as shown below.



WORKSHOP PLAN: PEWTER CASTING (MAKING A TWO-PART SAND MOULD)

STEP	PROCESS
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De-mould your cast.	Continued from above.
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WORKSHOP PLAN: PEWTER CASTING (MAKING A ONE-PART SAND MOULD)

EXTENSIONS

A one-part mould. Repeat the steps as above but ignore the steps for the second casting ring.



WORKSHOP PLAN: PEWTER CASTING (MAKING A ONE-PART AND TWO-PART SAND MOULD)

CULMINATION

This workshop was about students creating their own individual 'maker's mark'. The students cast a pewter stamp to 'sign' the work they make in clay. Following the pewter casting we used air drying clay to create a handle for their stamp—the handle took the impression of each maker's hand so that the handle was unique to them.



REFLECTIONS: PEWTER CASTING (MAKING A ONE-PART AND TWO-PART SAND MOULD)

Use this section to record your reflections on the workshop after you've delivered it.

WHAT WENT
WELL?

WHAT WAS
CHALLENGING?

WHAT EVIDENCE DO
YOU HAVE?

Record observations,
conversations or quotes from
students. Have learning
outcomes been achieved?

WHAT DO YOU NEED
TO CHANGE OR
PREPARE FOR NEXT
TIME?

EXTENSION ACTIVITIES: CASTING WITH ALGINATE AND PLASTER

MATERIAL/ EQUIPMENT	WHAT IS IT?	WHERE IS IT USED?	HOW TO USE IT?
Alginate	Alginate is an extremely safe mould making material made from various food grade chemicals including seaweed.	It is used in a variety of industries ranging from dentistry (usually to create a mould of the mouth for braces) to the prosthetics industry (to create the mould for prosthetic limbs). It is also used in stage make-up and prosthetics for film and TV.	<p>When alginate sets, it forms into a flexible solid similar to rubber or cheese.</p> <p>The alginate powder is mixed with plain water to form a thick liquid. It can be as thin as pancake batter or as thick as cream cheese depending on the type of mould you want to make.</p> <p>This liquid is applied to the skin and in a few minutes the alginate sets to a rubbery consistency. Alginate is hypo-allergenic and does not heat up or stick to the skin. When the alginate is removed from the skin the surface of the alginate captures every detail of the surface of the skin right down to the fingerprint, to form a mould.</p> <p>The mould is often sacrificial as it is delicate and tears easily. As the water dissipates from the alginate mould it shrinks so it is only possible to produce one cast from the alginate.</p>

EXTENSION ACTIVITIES: CASTING WITH ALGinate AND PLASTER

MATERIAL/ EQUIPMENT

WHAT IS IT?

WHERE IS IT USED?

HOW TO USE IT?

Plaster (also known as plaster of Paris)

This is a white powder composed of either gypsum, lime, or cement, but all work in a similar way. Plaster is an extremely useful and versatile material and if used correctly and safely it can produce excellent results. The plaster is manufactured as a dry powder and is mixed with water to form a stiff but workable paste. The reaction with water liberates heat through crystallization and the hydrated plaster then solidifies.

Plaster is a material which has been used for hundreds of years in various industries. It is a common sculptural material, and is used to create plaster busts and wall frescos; it is commonly used to make moulds for slipware pottery and ceramics, and is also used in orthopaedics and the building trade.

Different plasters are mixed to different powder to water ratios— each plaster will have instructions provided.

When the alginate has set, pour the liquid plaster directly into the mould and wait for the plaster to harden— this will create the ‘master’ cast.

HEALTH AND SAFETY: NEVER let plaster set directly onto the skin. When plaster sets it creates an exothermic reaction, meaning that it releases heat. Letting plaster set on or around any part of the body can cause severe burns. Using alginate allows us to create mould of the body safely, as alginate does not release heat as it sets.

Wear a mask when working with dry plaster to prevent inhalation of the calcium sulphate or impurities which may be present in the powder. Wear rubber gloves when working with plaster of Paris and avoid situations where your skin might be in contact with the plaster. Do not wash Plaster of Paris down the drain, since the plaster can set in the plumbing.

EXTRA EQUIPMENT REQUIRED

Flexible plastic bucket
Paper cups

WORKSHOP PLAN: CASTING WITH ALGINATE AND PLASTER

STEP PROCESS

Alginate Group together all the paper cups.

Mix the alginate in a mixing bowl, following the instructions and mixing ratios on the packet. Pour quickly into the paper cups and distribute to the group. It is important that you do this quickly as alginate sets rapidly. Plunge the finger you want to cast into the liquid alginate and keep as still as possible until it sets. Alginate changes colour when it sets to a dull white/grey.

When the alginate is set, wriggle the fingers carefully and pull out from the mould. Leave the alginate mould in the cup.

EXTRA EQUIPMENT REQUIRED

Flexible plastic mixing bowl

Paper cups



WORKSHOP PLAN: CASTING WITH ALGINATE AND PLASTER

STEP PROCESS

Plaster Now, using a clean mixing bowl, mix the plaster together— try to ensure it is liquid enough to pour into the alginate mould. Pour the plaster mix into the alginate mould. Leave for a couple of hours (or to ensure the cast remains intact, 24 hours).

When the plaster has set, cut the paper cut away and carefully tear away the alginate. This should reveal your plaster cast.



SUPPORTING RESOURCES: We recommend carrying out a thorough risk assessment based on your classroom space and the needs of your students. We have summarised some key hazards here.

HAZARD SUMMARY; CASTING PEWTER	RISK	SAFETY MEASURE
Using the incorrect sand	If you use wet sand. The water and molten metal react together causing the metal to spit and explode in a wet mould.	Do not use wet sand. Instead use kinetic sand. Kinetic sand is coated in silicone oil, meaning the sand will hold its shape when modelled—the ideal alternative to expensive casting sand. This is what is used in the demonstration photos.
Using pewter	A risk of metal splashes or burns. Ensuring sufficient adult supervision for students when melting the pewter.	Provide PPE: Wear protective eyewear, place the mould on a fire-safe surface, ensure the area is well ventilated, and have a fire extinguisher nearby. Wear heat resistant gloves. Ensure adequate first aid measures are in place.
Using a heat gun	A risk of burns or fire.	Provide PPE: Wear protective eyewear, place the mould on a fire-safe surface, ensure the area is well ventilated, and have a fire extinguisher nearby. Wear heat resistant gloves. Ensure adequate first aid measures are in place.
Using found metal objects	Sharp edges causing cuts.	Make sure that any sharp objects are not used. Prepare some other objects which can be used instead. Wash any small cuts with clean water and treat with a medical kit, seek medical advice.

SUPPORTING RESOURCES: We recommend carrying out a thorough risk assessment based on your classroom space and the needs of your students. We have summarised some key hazards here.

HAZARD SUMMARY; CASTING PEWTER	RISK	SAFETY MEASURE
Using plaster	<p>Plaster will cause severe burns if allowed to set against the skin so avoid setting around parts of the body.</p> <p>Avoid dust in the air.</p> <p>Plaster will cause skin to dry.</p> <p>Plaster will block the drains.</p>	<p>NEVER let plaster set directly onto the skin. When plaster sets it creates an exothermic reaction, meaning that it releases heat. Letting plaster set on or around any part of the body can cause severe burns. Using alginate allows us to create mould of the body safely, as alginate does not release heat as it sets.</p> <p>Wear a mask when working with dry plaster to prevent inhalation of the calcium sulphate or impurities which may be present in the powder. Wear rubber gloves when working with plaster and avoid situations where your skin might be in contact with the plaster. Do not wash plaster of Paris down the drain, since the plaster can set in the plumbing. Let it set and throw the left over away.</p>

SUPPORTING RESOURCES: GLOSSARY

MATERIAL/ PROCESS	WHAT?	WHERE?	WHY?
Mould	<p>A hollow container used to give shape to molten or hot liquid material when it cools and hardens.</p> <p>This workshop explores sand casting— an ancient form of mould making still used today. Sand casting takes place in metal foundries and is process used for making metal objects.</p>	<p>Mould making is also a profession, known as pattern making. It is used in a variety of industries, from jewellery to food, film and engineering. Most production processes involve some form of pattern making.</p>	<p>Mould making is important because it means that you can replicate and reproduce an object multiple times. The mould is created from a ‘master’— the original object which goes through many different designs and iterations until a final mould is created to put object into production. Moulds used in industry are used thousands of times.</p>
Casting	<p>A ‘cast’ is the technical term for an object created from the mould. eg a ‘bronze cast’.</p>	<p>Casting is also a profession— once the mould is created, the material needs to be poured into the mould at the correct temperature and left to set for a particular amount of time. Some moulds need to be rotated when a liquid is poured in (this usually applies to certain resins mixes).</p>	<p>A lot of the time a casting requires a clean-up or finishing and polishing when it comes out of the mould. The cast can show seam lines, which need to be removed following the casting, usually with metal files and sand paper.</p>
Crucible	<p>This is the container in which metal or other substances are melted down.</p>	<p>Crucibles are found in foundries. They are used in a variety of other industries however, such as hot glass works.</p>	<p>The crucible is usually made from a ceramic or high melting point metal as these can subjected to high temperatures.</p>

SUPPORTING RESOURCES: GLOSSARY

MATERIAL/ PROCESS	WHAT?	WHERE?	WHY?
Pewter	Pewter is a malleable alloy. It is made up of 85-99% tin and mixed with copper and antimony.	People have been using pewter for a long time— there are examples in museum collections that date back to the Ancient Egyptians. It is mainly used for decorative or domestic purposes, as it is too soft to be used for weapons.	Pewter has a low melting point— it melts around 170-230°C. Where as silver melts at 960°C, copper melts at 1085°C and gold melts at 1064° C. This makes it more accessible to use as you can easily melt it at home over a stove or using a heat gun.
Sprue	In casting, a sprue is the passage through which a molten material is introduced into a mould. It also refers to the excess material which solidifies in the sprue passage.	In sand casting, the sprue is formed by a dowel, which is removed from the sand to make the hole into which the metal is poured.	Sprues can serve as filters, as heat sinks and as feeders. For example, in bronze casting— bronze has a high shrinkage rate when cooling and the sprue can continue to supply molten metal to the casting.

SUPPORTING RESOURCES: EXTRA INFORMATION

Artists using similar processes

Max Lamb : <http://www.themethodcase.com/126-pewter-desk-casting-by-max-lamb>

Casting in Pewter Resources

There are many great Youtube instructional videos available online to see the full process:

<http://www.technologystudent.com/equip1/pewter1.htm>

<https://www.pinterest.co.uk/pin/106679084899916410/?lp=true>

SUPPORTING RESOURCES: STOCKIST LIST

MATERIAL/ EQUIPMENT	SUPPLIER	INFORMATION
Pewter	The British Pewter and Tin Mills https://www.britishtinandpewtermills.com	They sell pewter in both ingot and shot form.
Casting Sand	Albion Fire and Ice- Oil bonded sand https://albionfireandice.co.uk/products/oil-bonded-sand Kinetic Sand or 'Magic Motion Sand' Ebay Supplier: https://bit.ly/2OiyHmG	
Crucible - stainless steel ladle	Tiranti- Flat Bottomed ladle (Stainless Steel) https://tiranti.co.uk/products/flat-bottom-ladle	
Needle Files	Screwfix	
Heat Gun	Screwfix	I would recommend a 2000w Titan Heat Gun.
Milliput	Would recommend buying in bulk, ebay suppliers are the most cost effective.	It comes in a variety of colours so is worth experimenting with.
Clay and Alginate	Special Plasters, Birmingham or Tiranti, London.	
Personal Protective Equipment	Safety Glasses - The Safety Supply Company Heat Resistant Protective Gloves - Amazon/ebay	
Plaster	Special Plasters, Birmingham or and Tiranti, London.	Plaster comes in a variety of strengths, would recommend beginning with fine casting plaster and herculite plaster if you want casts which are durable.