

Kombucha Creators!

Years 3 – 6 – Technologies



(Design Technologies; Yrs 3 & 4, ACTDEK010)

Recognise the role of people in design and technologies occupations and explore factors, including sustainability that impact on the design of products, services and environments to meet community needs

(Design Technologies; Yrs 3 & 4, ACTDEK011)

Investigate how forces and the properties of materials affect the behaviour of a product or system

(Design Technologies; Yrs 3 & 4, ACTDEK012)

Investigate food and fibre production and food technologies used in modern and traditional societies

(Design Technologies; Yrs 3 & 4, ACTDEK013)

Investigate the suitability of materials, systems, components, tools and equipment for a range of purposes

(Design Technologies; Yrs 3 & 4, ACTDEP014)

Critique needs or opportunities for designing and explore and test a variety of materials, components, tools and equipment and the techniques needed to produce designed solutions

(Design Technologies; Yrs 5 & 6, ACTDEK021)

Investigate how and why food and fibre are produced in managed environments and prepared to enable people to grow and be healthy

(Design Technologies; Yrs 5 & 6, ACTDEK023)

Investigate characteristics and properties of a range of materials, systems, components, tools and equipment and evaluate the impact of their use

(Design Technologies; Yrs 5 & 6, ACTDEP024)

Critique needs or opportunities for designing, and investigate materials, components, tools, equipment and processes to achieve intended designed solutions

Kombucha Creators!

Exploring kombucha's potential as a sustainable design material.

Slippery, leathery, squishy and similar to the slime lots of kids love to make, kombucha's appeal goes far beyond hipster hydration. It's even being seriously considered for a range of high-tech, sustainable uses, from clothes to wound care. Time to ferment some design ideas!

Equipment:

A box of plain black tea bags

A source of boiling water (make the tea in advance and let it cool)

2kg bag of plain white sugar

Heat proof jugs such as Pyrex or a stainless steel saucepan to start the tea

A heat proof large spoon

A metric measuring cup

A kombucha starter (also called SCOBY or mother) and some liquid

Scissors

Plastic takeaway containers with lids – one per student

An awl or hole punch to punch holes in the lids

Waterproof marker pens

(optional) a pH testing kit

Duration:

30 minutes to start off, several very short sessions to feed the kombucha, and a full session or sessions two weeks later to experiment with the SCOBY as a design material

Location:

A wet area, kitchen, or outdoor classroom

Notes:

Getting started

🎧 Listen to **Nomcast Episode 5 – Funky Foods: flavours and functionality from fabulous fermentation**



Tip

'How on earth do I get a kombucha SCOBY or mother?'

It's actually easier than you think. Many bottles of commercially available kombucha in glass will form a mother if you pour their contents into a wide-mouthed glass vessel and leave it to sit on the benchtop for a couple of weeks (cover with cheese cloth). Otherwise, fermenters are usually happy to share. Go on Facebook, look for a 'fermenters group'. There should be one in your state. Place a post asking if someone will give you a mother or mail you a SCOBY taped tightly in a zip-lock bag. As long as you feed it within 5 days, SCOBY's your uncle, so if you keep it from leaking, a SCOBY can definitely go through the post in an ordinary sized envelope!

"If you saw a SCOBY on a beach you'd probably think it was a deadly jellyfish."

– Nomcast Episode 5

What does it look like?



- If you haven't made kombucha before, resources online will help you see the variety in growth habit and feel confident that what you are growing looks about right!
- ◇ What does a healthy SCOBY look like?
<https://www.culturesforhealth.com/learn/kombucha/what-healthy-sco-by-look-like-kombucha/>

Before the class

- To avoid having boiling water in class, make the tea in advance. You're making a bulk batch! Here's how:
 - ◇ Grab a large heat-proof container (or two) such as glass jugs or a stainless steel sauce pan (don't use reactive metal saucepans such as aluminium).
 - ◇ Remove the paper tags from a bunch of tea bags (if they have tags).
 - ◇ Roughly measure the volume of your vessel and add 6 black tea bags per 1 litre of water, e.g. 12 tea bags in a 2L Pyrex jug or 18 teabags in a 3L saucepan).
 - ◇ Fill up with boiling water. Add 1/2 cup of white sugar to each litre of hot tea. Stir well until the sugar has dissolved.
 - ◇ Leave somewhere safe to cool. They do not need to go in the fridge.
- Students are going to grow their own small batch of kombucha in takeaway containers. You'll need to figure out where these boxes will live while they are growing kombucha (1-2 weeks). They do not need light so they can be stacked in a plastic storage box. But don't close the top completely – they need air to breathe, like all living things. Keep them under 30 degrees and above 10 degrees. Students will need to access and feed them every 3 days for about 2 weeks.

During the class

- Ask students if anyone knows what kombucha is.
- Show them a cup of the cold black tea you made earlier.
- Let them sniff it and tell you what they think it is. (Don't put this sample into the kombucha as it might be contaminated through handling.)
- Tell the class how you made it – 6 black tea bags and 1/2 cup sugar to each litre of boiling water.
- We add the SCOBY or mother culture and we leave it to produce kombucha. We're going to grow our own.

Needs of life

- ❓ Discuss what bacteria need to survive and have the class select from this list on the board:
 - ◇ light
 - ◇ air
 - ◇ a food source
 - ◇ water
 - ◇ earth
 - ◇ rotting vegetable matter
 - ◇ acidity
 - ◇ alkalinity
 - ◇ a sterile environment
 - ◇ no oxygen
 - ◇ heat
 - ◇ oxygen
- What did students choose? Why?
- ❓ Discuss whether a SCOBY is a plant or an animal. What do students think?
- Explain that a SCOBY is actually neither a plant nor an animal. It's a symbiotic colony of bacteria and yeasts (Symbiotic Colony of Bacteria and Yeasts = SCOBY).
- This means that the bacteria and the yeasts in a SCOBY feed each other and they depend on each other in order to survive.

Growing kombucha

- Provide students with clear takeaway containers. They use the waterproof marker pens to write their name on the bottom and on the lid of their container. Punch a hole in the lid of each container (a wide-necked hole punch or an awl should do the trick).
- Each student needs about 2cm of cold sweet tea in the bottom of their container. If you like, you can set up a wet station for this and send small groups of students to do this while the rest of the class works on the activities below.
- Use the scissors to cut up the SCOBY and drop a piece (the size of a 20c piece or larger) into every student's container. If there is no SCOBY in a container, it will not work so this step is very important. If there was any liquid with the SCOBY, tip a bit into each takeaway container.
- Pack the boxes away and leave them to work their magic.

Feeding the SCOBY

- Students are seeking to grow a sheet of SCOBY on the top of each container. To do this the kombucha must be fed every 2-3 days.
- Feed the kombucha by making sweet tea as before. It must be cooler than your blood temperature before you pour it into the containers.
- You could assign 1 or 2 students to feed all of the boxes each week. If the containers get very full you can start new containers or pour off a little of the liquid (keep the SCOBY).
- Discard any boxes that grow blue mould (this is unlikely but might happen if the takeaway container was not clean). Clean the box out and start again using some SCOBY and liquid from the rest of the class.
- Within a couple of days you should see a cloudy film appearing on the surface – this is what you want! It is not mould, it is the SCOBY sheet forming. Keep feeding.

Lexicon

Acid a substance that is corrosive or sour and has a pH of lower than 7, such as lemon juice.

Alkaline a substance that has a pH higher than 7, such as bicarbonate of soda.

Fermentation the process by which organic matter is broken down by yeasts, bacteria and microorganisms. This can be done in a controlled way to produce food products such as tea, coffee, chocolate, yoghurt and tofu.

Kombucha (kom-boo-cha) a fermented product made from black tea and sugar.

Mother the SCOBY or culture added to a mixture because it contains the bacteria and yeast we want.

SCOBY (sko-bee) the Symbiotic Colony of Bacteria and Yeasts, a SCOBY is a growth that looks like rubbery mucus at the top of a ferment that hosts the good bacteria and beneficial yeasts we are growing.

Symbiosis living things can be said to have a symbiotic relationship when they live in close proximity and depend on each other in order to both survive.



Creating with Kombucha

- After at least a week, check the kombucha boxes. How many of them have grown a skin across the whole surface of the box?
- Explore the skins:
 - ◇ How thick are they?
 - ◇ What do they feel like?
 - ◇ Are they the same texture on the top surface as on the bottom? Why might they grow like this?
 - ◇ What do they smell like?
- Students write observations describing the kombucha in their notebooks.
- Pack the boxes away and leave them to work their magic. Don't forget to feed them sweet tea every 2-3 days.

Wet and dry

- Using scissors, cut a piece off a SCOBY. Weigh it and record the weight.
- Leave it on an impermeable surface (such as a plate) to dry. Check it after 1 hour. Have students handle it and see how its properties have changed. Weigh it again and compare the weight.
- Dry a piece of SCOBY overnight and repeat the observation. Weigh it when it is fully dry and compare this to the wet weight. What percentage of the SCOBY was water when first harvested?

Kombucha is just black tea, sugar and SCOBY. Students can handle it safely and it is edible – though no-one would want to nibble the SCOBY!

Kombucha creations

Students research uses of kombucha to create eco-materials, such as kombucha leather, garden fertiliser, worm farm booster and 'living' membranes to replace plastic.

? Set design problems to them, such as:

- ◇ How would you grow a larger sheet of kombucha leather?
- ◇ How thick would a wet SCOBY need to be to create a 1mm thick dry 'leather' sheet?
- ◇ How heavy would a wet scoby jacket be?
- ◇ What would happen if you wore a kombucha leather jacket in the rain?
- ◇ How do designers 'cure' or 'set' the leather so that it stays pliable and leathery?
- ◇ How would students join multiple sheets together? (Can you sew it? Could you grow joining strips and dry them into one piece?)
- ◇ Can you weave it? If you weave it wet, does it dry into a more robust leather?
- ◇ Is kombucha leather waterproof?
- ◇ Can we make coloured SCOBY?
- ◇ Can you grow moss on kombucha leather?
- ◇ Is it true that worms in worm farms love to eat SCOBY?
- ◇ Is kombucha leather translucent?
- ◇ What plastics in our daily environment could be replaced with bio materials such as kombucha leather?
- Students choose one or two of these questions or questions of their own to research.
- Encourage hands-on experimentation and supply more cold tea and larger SCOBY growing containers as needed.



Students may come across some pretty wild health claims for kombucha. Encourage them to explore scientific reviews of kombucha's role in human health. Help them to identify authoritative websites and to spot unsubstantiated fads.

Resources

- ◇ The Conversation: What is Kombucha and Do the Health Claims Stand Up? <https://theconversation.com/what-is-kombucha-and-how-do-the-health-claims-stack-up-87180>
- ◇ How to grow leather-like material using bacteria (making kombucha leather) (video, duration 7:17): <https://youtu.be/Ds8ZFzOwGel>
- ◇ Labroots – Mushroom made – a new twist on clothing: <https://www.labroots.com/trending/earth-and-the-environment/3587/mushroom-made-twist-clothing>
- ◇ Kombucha Kamp – Five other uses for kombucha SCOBY: <https://www.kombuchakamp.com/kombucha-soby-cultures-top-5-other-uses>.