A NEW FIELD · LESSON GENERATOR

From staff-room *waste* to a classroom tile.

A biomaterial lesson generated around spent coffee grounds, sized to a KS3 double lesson and mapped to the science and D&T schemes of work.

KS3 · YEARS 7–9 | 75 MIN | SCIENCE · D&T | ≈ 8P / PUPIL

01
Find a material.
Spent staff-room grounds.

02
Generate a pack.
Recipe, plan, handout.

03
Run the lesson.
Ten-min cook, press, dry.

04
Take it home.
One tile per pupil.

01

A tile of bioplastic, pressed from the grounds your *staff room* throws out.

Pupils turn used coffee grounds into a rigid, patterned tile using agar, a seaweed-derived polysaccharide, as a natural binder. Ten minutes of active cook; a fifteen-minute press; a tile each, dried overnight.

YOUR PUPILS WILL

01 Describe how agar, a polysaccharide from red seaweed, forms a gel on cooling and acts as a natural bioplastic binder.

02 Explain why industrial food waste, such as spent coffee grounds, is an attractive feedstock for new materials, and name one limitation.

03 Follow a heat-and-mix method safely under supervision, measuring and recording quantities accurately.

04 Design and press a surface pattern on their tile using found or chosen objects, and justify one design decision.

05 Compare two properties of their finished tile with a conventional ceramic or plastic tile of the same size.

A dried tile, ready to take home.

KEY STAGE	DURATION
KS3	75 min
COST / PUPIL	**YIELD**
≈ 8p	30 tiles

02

Primary fit in *science.* Strong hooks across D&T, art, geography and PSHE.

Every pack comes with a curriculum map. Place this lesson where it best serves your scheme of work; the generator will rewrite the emphasis to match.

Science

PRIMARY FIT

KS3 chemistry: states of matter, mixtures, polymers, materials. Agar is a tangible model of a polysaccharide. Pupils watch a sol-to-gel transition on the bench.

Design and Technology

STRONG

KS3 DT: materials properties, sustainability, iterative prototyping. Pupils make pattern choices, then test their tile against a ceramic.

Art

SUPPORTING

Pattern, surface, embossing, pigment from a natural source. Pressings from leaves, stamps or found objects.

Geography

SUPPORTING

Supply chains, coffee as a globally traded commodity, urban waste streams. A short reading on spent-grounds recovery in UK cities is included.

PSHE · Enrichment

OPTIONAL

Consumer habits, resource cycles, circular design. Discussion hooks pupils usually open themselves.

03

Coffee-ground *bio-tile.*

Yields ten 10 cm tiles. Enough for a class of thirty in groups of three. Times and quantities scale cleanly in the generator.

INGREDIENTS

200 ml	**Water**	Kettle-boiled, just off the boil.
2 tbsp	**Agar-agar powder**	Red-seaweed polysaccharide; sets the gel.
1 tbsp	**Food-grade glycerine**	Plasticiser; keeps the tile flexible.
1 tsp	**White vinegar**	Lowers pH; improves the gel.
4 tbsp	**Used coffee grounds**	Dried overnight on a tray.
optional	**Leaves, stamps, bolts**	For pressing surface pattern.

Agar at 90°C, before the grounds go in.

SOURCING THE GROUNDS

Leave a labelled tub in the staff room. Over one week the average school generates 2–3 kg of spent grounds, easily enough for a class of thirty.

THE CHEMISTRY, IN ONE BREATH

Agar is made of long chains of sugars that, when heated in water, unravel and slide past each other as a liquid. As the mixture cools back to room temperature the chains grip onto one another again, trapping the water and the coffee grounds inside a loose mesh. That mesh, once dried, is the tile.

03

Method, for you and the pupils.*method,*

Teacher holds the hob. Pupils measure, pour and press. Ten minutes active cook, fifteen-minute press, tiles dry overnight.

01	**Dry the grounds.** The day before, spread used grounds on a tray in a warm place. They should crumble cleanly between finger and thumb.	5 MIN · DAY BEFORE
02	**Measure into bowls.** Pupils, in groups of three, measure agar, glycerine and vinegar into their own bowls. Grounds in a separate tub.	5 MIN · PUPILS
03	**Heat the water.** Teacher only. Bring 200 ml of water to a simmer on a hob or induction ring. Reduce to a low simmer before adding anything.	3 MIN · TEACHER
04	**Whisk in the agar.** Sprinkle agar onto the water and whisk continuously until the mixture goes clear. Keep it moving. Agar lumps quickly.	4 MIN · TEACHER
05	**Add glycerine and vinegar.** Stir in glycerine and vinegar. The mixture will thicken noticeably. Keep heating gently for one minute, then remove from heat.	2 MIN · TEACHER
06	**Fold in the grounds.** Stir in four tablespoons of dried grounds until evenly dispersed. The mixture should look like a thick, speckled pudding.	2 MIN · TOGETHER
07	**Pour into moulds.** Pour, still warm, into silicone tile moulds or onto greaseproof paper cut into 10 cm squares. Thickness around 5 mm.	4 MIN · PUPILS
08	**Press the pattern.** While warm, pupils press their chosen objects into the surface. Leaves, bolts, stamps, Lego bricks all work well.	6 MIN · PUPILS
09	**Cool and settle.** Tiles sit undisturbed on the bench. Surface firms enough to handle within 30 minutes. The tile is not fully dry yet.	30 MIN · REST
10	**Dry overnight.** Store tiles on a drying rack in a warm dry spot for 24–48 hours. They lose about 60% of their weight as water evaporates.	24–48 H · DRY

04

Two lists. One you *already have,* one the generator buys.

Prices are a recent UK sanity check, and cover several re-runs. The generator will adjust currency and vendor to match your location.

ALREADY IN THE BUILDING

Saucepan, stainless steel	1
Hob or induction ring	1
Wooden spoon or silicone whisk	1
Measuring spoons and jug	1 set
Mixing bowls, small	10
Greaseproof paper or silicone mat	1 roll
Drying rack or tray	2
Heatproof mat or board	1
Tea towels	4
Scissors	10
Found pressing objects	assorted

BOUGHT-IN · ONE-CLICK

Agar-agar powder 100 g	£4.50
Vegetable glycerine 250 ml	£3.00
White vinegar 500 ml	£1.00
Silicone tile moulds, 10 cm set of 6	£6.50
Greaseproof paper, roll 1	£1.20
Label stickers sheet of 40	£1.00

FIRST-TIME KIT TOTAL

£17.20

Yields ~40 tiles across multiple classes.
≈ 8p per pupil, once reusables are amortised.

05

Your 75 minutes, mapped *minute by minute.*

Designed for a double lesson with a five-minute changeover. Adjust to 60 or 90 minutes in the generator and the timings reshape.

TIMELINE

0 min · 15 min · 30 min · 45 min · 60 min · 75 min

0–5 min	**Arrival and framing.** Pupils in, aprons on. On the board: a jar of staff-room grounds and a finished tile from your sample batch. One opening question.
5–15 min	**Discussion and context.** Short back-and-forth on waste, coffee and materials. Introduce agar as a seaweed polymer. Read the chemistry panel aloud.
15–25 min	**Method walk-through.** Demonstrate the full method on a front bench. Pupils take a recipe card and a notebook. No hands on the ingredients yet.
25–45 min	**Making.** Pupils measure in their groups. Teacher heats and pours warm mix into each group's moulds. Groups press their pattern.
45–55 min	**Cool and clean.** Tiles rest on the side for cooling. Groups clean measuring kit, wipe stations, label and leave their tile to dry.
55–65 min	**Observation and sketch.** Pupils return to seats and complete the observation page. Sketch the tile, note colour, smell, texture, write a hypothesis.
65–75 min	**Discussion and close.** One thing pupils would change about their design, one property they want to test next lesson. Tiles stay to dry overnight.

06

Low-risk. Still *worth a read.*

A checklist you can print and pin by the hob. Adaptations follow below, each generatable as a complete alternate pack.

SAFETY

- **Hob, teacher-operated.**
  The mixture reaches ~95°C. Keep a clear radius around the hob. Pupils approach the pan only after it has been off the heat for five minutes.
- **Agar powder can be dusty.**
  Weigh with care. A pupil with a respiratory sensitivity stands back during measuring, or you swap in pre-weighed sachets.
- **Glycerine is food-grade.**
  Pupils do not taste the mixture. Hands washed after handling, before eating.
- **Hot moulds cool quickly.**
  Silicone cools safely within two minutes. Greaseproof paper is fine to handle immediately, with the tile still on it.
- **Allergy check.**
  None of the ingredients are common allergens. Check spent grounds are the staff-room standard bean, not a specialty flavoured variety.

DIFFERENTIATION AND ACCESS

Faster groups.
Run a second, smaller tile with a different ratio. Double the grounds to test how material load affects rigidity.

Slower groups.
Skip the pressing step. Focus instead on clean measurement, clean pouring and a strong written observation.

SEND adjustments.
Pre-measured ingredient bags, a printed pictogram of the recipe, and a partner on the whisk. Available in the generator's adaptation controls.

EAL adjustments.
Bilingual vocabulary card for the eight key words of the lesson. Generated on request for any target language.

STUDENT HANDOUT

Coffee-ground *bio-tile.*

Name _____ Class _____ Date _____

WHAT WE ARE MAKING

A bioplastic tile, made from used coffee grounds and agar, a sugar-chain polymer from red seaweed. The tile is 10 cm square, 5 mm thick, and firm enough to hold once it has dried overnight.

WHAT WE ALREADY KNOW

MY HYPOTHESIS

(What do you think the tile will be like once it has dried?)

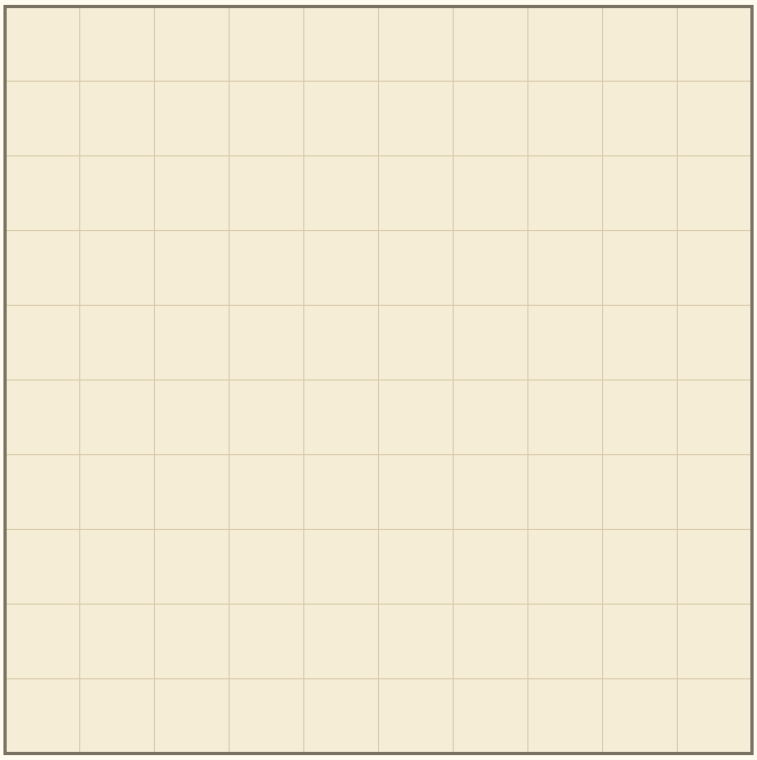
OBSERVATION · BEFORE, DURING, AFTER

IN THE PAN (HOT)	IN THE MOULD (WARM)	AFTER 24 H (DRY)

STUDENT HANDOUT

My *design.*

Sketch your tile's surface pattern inside the grid below. Label the objects you pressed. Circle the part of the design you are most pleased with.



10 cm × 10 cm · 1 square = 1 cm

TALK TO YOUR TABLE

One property you can feel.
Warm, cool, rough, smooth, flexible, stiff, heavy, light?

One property you can see.
Colour, shine, texture, pattern, transparency?

What happened to the water?
Where did it go as the tile dried?

How would you improve the tile?
More grounds? Less agar? A different binder altogether?

REFLECTION

If every staff room in the country did this, what would happen?

08

Four ways to carry the lesson into *next week.*

Each extension can be regenerated as a full follow-on pack with its own recipe, run sheet and handout. Ask for the one that fits your scheme of work.

Test it.

Drop-test, bend-test and soak-test the tile against a conventional ceramic. Data recorded on a shared class table.

KS3 SCIENCE · 60 MIN

Remake it.

Crush the failed or surplus tiles and re-cast with fresh binder. A tangible introduction to closed-loop material recovery.

KS3 D&T · 50 MIN

Map it.

Map the journey of one cup of coffee, from crop to compost, pinning five moments along the way.

KS3 GEOG · 60 MIN

Scale it.

Design a larger object built from coffee-tile modules: a wall panel, a lampshade, a bench seat. Model at a small scale.

KS3 D&T · 90 MIN

NEXT LESSON, ON DEMAND

Ask the generator. A new pack, ready in *minutes.*

Log in, tap the recipe, pick an extension, press generate. Pack, handout and shopping list written for your class.

A NEW FIELD

One lesson. *Written for you.*

This pack is one of thousands the A New Field lesson generator can produce. Hand it a found material and a class, and it returns the complete lesson: tested recipe, minute-by-minute plan, curriculum map, kit list, shopping list, safety notes, and a printable student handout.

One flat subscription, one teacher, full access. No per-lesson fees, no class-size caps, no paywalls hiding the thing you need at 10pm on Sunday.

GENERATE YOUR FIRST LESSON

anewfield kits.com

A free taster lesson is waiting on the home page. Five minutes, one pack, in your subject, written for your class.

01	02	03	04
Material in.	Generator.	Printable pack.	Lesson run.