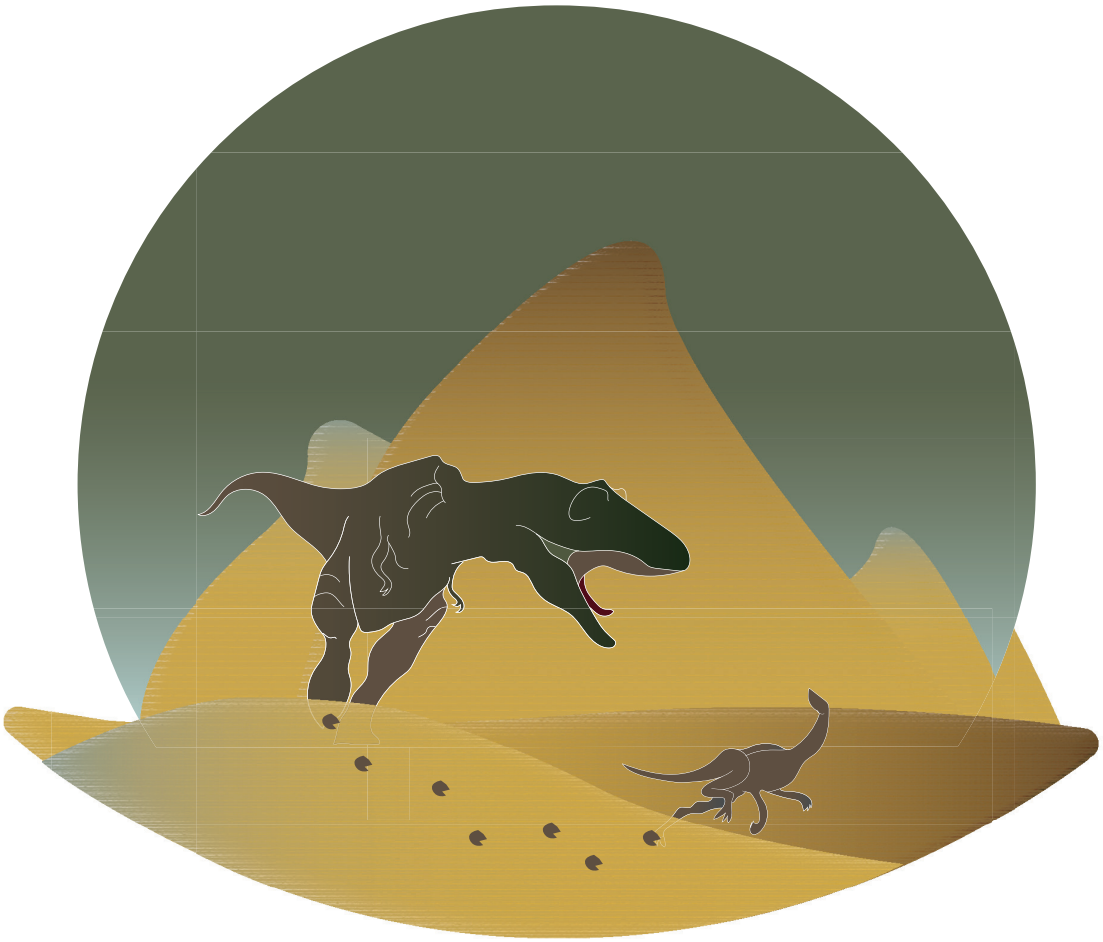

DINOSAUR DISCOVERY
Making Marks

Facilitator Booklet

Central Highlands SCIENCE CENTRE

An Australian Government Initiative

Inspiring AUSTRALIA

“Science is simply the word we use as a method of organising our curiosity.”

Tim Minchin

Central Highlands SCIENCE CENTRE

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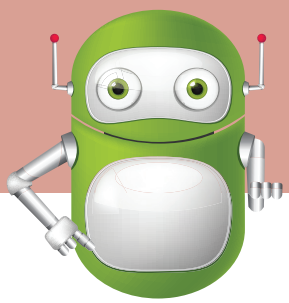
8. STEAM Concepts Table prompts
9. Print one Young Scientist Booklet for each child
10. Print, laminate and display Evaluation Poster
11. Record Evaluation responses and other feedback

Session Plan

Welcome to Science Club!

Dinosaur Discovery: Making Marks



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Introduction

- The following activities are designed for 6-12 year old children.
- We recommend that each group is between 16-20 children, with two facilitators (or one facilitator and a volunteer, such as a high school student).
- Each session is of one to one and half hours duration.
- The facilitator's role is not one of teaching per se, but facilitating children's natural curiosity about the world around them and to **engage/excite** them with the STEM concept being presented.
- Each child gets to **explore** the **STEAM** concepts by experimentation and may take home their 'Young Scientist Booklet', so they may replicate the experiments at home.
- Table prompts are on the back page of the facilitator's booklet, we recommend that these are cut out, laminated and put on the tables (or under the clear plastic covers on the tables) to prompt discussion and to **explain** and **extend** the **STEAM** concepts to young scientists.
- Facilitators may **evaluate** the session by means of an evaluation poster (to be laminated) as provided (children can tick the emoticons as they leave the room).
- **Safety note:** the experiments are intended to be performed under adult supervision. Appropriate and reasonable caution is recommended when activities use items that could be of risk, including but not limited to, sharp scissors, hot glue, batteries, small items that could be a choking hazard. If you are unsure about the safety of age appropriateness of the experiments please consult your child's doctor.
- Experiment 1, Traces in the Mud explores mould and cast fossils impressions are mould fossils, and can include footprints, plants, seashells, skin, or bones – anything where the original organism is gone and all that remains is the shape it left.
- Experiment 2, Tracks in the Sand explores dinosaur footprints from Lark Quarry, Queensland. Children will try three different types of 'soil' – sand, flour and sandy flour, to find out which one makes better footprints. The footprints will be covered in sugar, and then washed away.

S T E A M

- **S** – Question like a Scientist
- **T** – Design like a Technologist
- **E** – Build like an Engineer
- **A** – Create like an Artist
- **M** – Deduce like a Mathematician

Session Information
Dinosaur Discovery: Making Marks

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Session Information

Background

Conditions need to be just right to preserve fossils. In this experiment, children will try three different types of materials to form and study dinosaur footprints / tracks.

The fossilised dinosaur tracks at Lark Quarry, Queensland, were formed in fine-grain silt or clay. In a space the size of a tennis court there are over 3000 footprints preserved in the surface. They were later covered with sand, which became sandstone. Footprints, and other trace fossils (which record traces of a creature, not its body), reveal a lot about an animal's behaviour. Animal tracks can be used to follow an animal as it moves through its habitat.

Lark Quarry is believed to have once been a stream leading into a lake. When the footprints were made, the water level was low. Dinosaurs walked across the half-dried mud and left tracks. Later, the lake rose gently and covered the tracks with sand. Over time, the tracks were buried and turned into rock. From the shape, direction, and how deep they are, scientists can predict what type of dinosaur made them and how fast it was going. Some scientists have interpreted Lark Quarry as a dinosaur stampede. They see from a large carnivorous therapod going around six kilometres per hour. Small plant-eating ornithopods were there too, and could run at up to 30 kilometres per hour. The therapod may have startled a group of dinosaurs on the edge of a lake, and they all ran away. Other scientists think the large dinosaur could have been a herbivore, such as Muttaburrasaurus, because the tracks didn't appear to have claw marks where a therapod would have them. The large footprints have smaller tracks over the top of them. They suggest the tracks were happened over a few hours or days, not as a stampede. Whatever happened at Lark Quarry 95 million years ago is a mystery that interests scientists to this day (so far, the stampede theory is the most accepted).

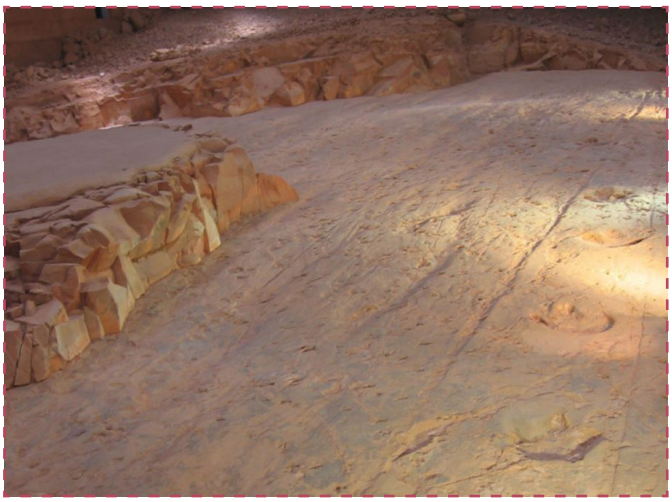
In the Traces in the Mud and Tracks in the Sand experiments, children will make moulds of plants and shells (body fossils), and tracks (trace fossils). A mould is an impression of an object, or a negative image. You can compare this to a cake tin, or an ice cube tray, or a jelly mould. You can make a cast by pouring something into a mould, and letting it set. A cast of these household objects would be cake, ice cubes and jelly. Impressions from Lark Quarry are also known as mould fossils. The organism that left the fossils is gone, but has left behind an indentation that is preserved. An impression could be a footprint, or a plant that was pressed into the ground, left an image, and then rotted away. Seashells, trilobites, and dinosaur feathers or bones can also leave behind mould fossils. A mould fossil can be filled by hard material to create a cast. Some cast fossils are made naturally, when the organism dissolves away and the space is filled with minerals.

Scientists make casts of fossils with silicone rubber or plaster. Plaster casts are used to study fossils, or to create replicas to display in a Museum. Some real fossils are delicate, and may be damaged by moisture in the air, vibrations, or changes in temperature. Having a replica means that the real fossil can be stored in a safe place. Casts also help us see details differently, because the colour of the original rock, or shadows makes these hard to see.

Dinosaurs didn't only leave tracks and bones behind; they also left fossil eggs and fossil poo (coprolites).

Refer to Experiment Run Sheet 1/2 for tools and materials needed for both experiments.

Adult supervision is required for this experiment. Wear safety glasses and dust masks (to avoid breathing in plaster dust). Plaster gets warm as it sets and usually takes several hours to fully dry.



Experiment Notes and Resources
Dinosaur Discovery: Making Marks

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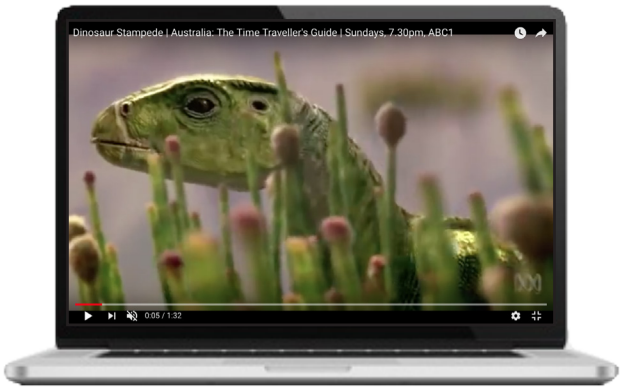
Please click on the image, the underlined hyperlink OR scan the QR code to access the online video.

Resources and Video Links

Introductory Video 1 of 2

Video from the ABC introduces the dinosaur stampede at Lark Quarry.

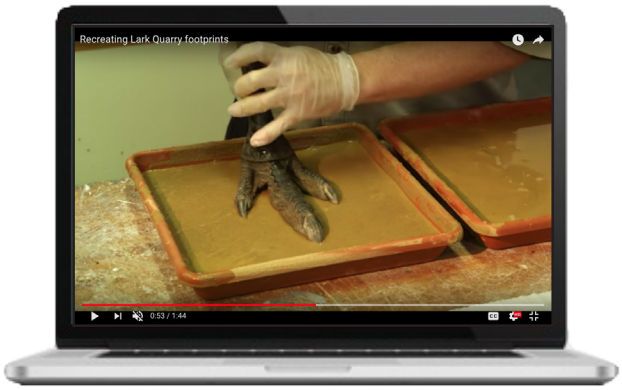
https://www.youtube.com/watch?v=jRWFXr60kUk



Introductory Video 2 of 2

Video from Queensland Museum shows a palaeontologist recreating dinosaur footprints using mixtures of mud. A good time to show this would be after the first half of the activity.

https://www.youtube.com/watch?v=whGwvnlnmTI&t=25s



How to do Experiment 1 of 2

Traces in the Mud

How to do Experiment 2 of 2

Tracks in the Sand

Clipboard: Facilitator's run sheet 1/3

Dinosaur Discovery: Making Marks

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Facilitator Run Sheet

Before the Session:

If you are able to, plan an information session with your fellow facilitators/volunteers and run through the experiments together, this will make the session flow more smoothly on the day. At the very least make sure everyone has watched the video links.

Brainstorm for any issues with materials or methods, and adapt as you see fit for your particular audience (in this instance 6-12 year olds). Print out the helpful resources, laminate these and have them on the tables for the children to read/and as prompts during the experiments.

1. Pre-preparation:

Work out the materials you will need for each experiment:
Number of students = N ( )
Number of groups = G ( )

Materials – Experiment #1:

- ▫ N x Young Scientist Booklets = ___
- ▫ N x 2 small plastic boxes with lids = ___
- ▫ N x 1/2 cup of salt = ___
- ▫ N x 1 cup of flour = ___
- ▫ N x Bowl = ___
- ▫ N x 2 cups water = ___
- ▫ N x Shells and leaves = ___
- ▫ N x Plaster of Paris = ___
- ▫ N x Measuring cups = ___
- ▫ N x Paper towels = ___
- ▫ N x Safety glasses = ___
- ▫ N x Dust masks = ___
- ▫ N x 1/2 tablespoon Vegatable Oil = ___
- ▫ N x Plastic dinosaurs = ___
- ▫ N x Hot glue guns = ___
- ▫ N x Hot glue sticks = ___

Materials – Experiment #2:

- ▫ N x 3 Small plastic boxes = ___
- ▫ N x Sand = ___
- ▫ N x Flour = ___
- ▫ N x Bowl = ___
- ▫ N x 1 Litre of water = ___
- ▫ N x Aquadhere glue = ___
- ▫ N x Brown sugar = ___
- ▫ N x Plastic dinosaurs = ___
- ▫ N x Measuring cup = ___

On the day:

- ▫ Ensure parent sign-in sheet is on display
- ▫ Set up tables for groups
- ▫ Make name tags for Young Scientists (YS) and Facilitators (F) and Volunteers (V)
- ▫ Meet and greet: Welcome YS, show where to sign in and put their name tag on
- ▫ Allocate YS to groups:
- ▫ Quick Health & Safety briefing (as per noted on experiment sheet)
- ▫ Set up the HOT glue gun area

Starting the experiment:

- ▫ Explain why we don't eat/drink in a science lab
- ▫ Introduce the topic: Making Marks, Lark Quarry Dinosaur Trackway
- ▫ Give children a booklet with experiment instructions

During Experiments:

- ▫ Give step by step instructions of experiment (Refer to faciltator experiment sheets for **What to Expect** and **The Science**)
- ▫ Allow each child to do the experiment

Reflection & Conclusion:

- ▫ Ask final questions to reflect on the experiments
- ▫ Finish activity
- ▫ Ask Young Scientists to tidy up
- ▫ Ensure Parents sign their children out
- ▫ Clean the room and complete closing procedure
- ▫ Ask children to make a mark on the evaluation poster as they leave, which best represents how they felt about the session.

Finally, after the session don't forget to:

- ☐ Ask Young Scientists to tidy up
- ☐ Ensure parents sign their children out
- ☐ Clean the room and complete the closing procedure
- ☐ Ask children to make a mark on the evaluation poster as they leave, which best represents how they felt about the session

Notes & Calculations

Dinosaur Discovery: Making Marks

Briefly discuss the STEAM concept behind the experiment verbally or via the YouTube links provided (explain in your own words here)

Clipboard: Facilitator's run sheet 2/3

Dinosaur Discovery: Making Marks

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Making Marks - Traces in the Mud

What to Expect

Plaster of Paris is made of fine particles and mixes with water easily. When you pour it in over the mould, it fills the impressions from the shells, leaves and dinosaur tracks. Once it dries, it is firm and solid, and you can remove the dough from it.

The Science

Plaster is used to make replicas of fossils to display in museums. Some real fossils are delicate,and they can be damaged by moisture in the air, vibrations, or changes in temperature. Having a replica for display means that the real fossil can be stored in a safe place. Casts also help us see details differently. The details in a mould may be hard to see, because of the colour of the rock, or because of shadows. Making a cast makes these details easier to see, and allow scientists to make new observations.

Traces in the Mud - Experiment #1

1. Warm up Exercise.

Go outside, find a sandbox (or some mud) allow each child to be a dinosaur, running, walking, stalking, creeping. A variation could be using a large piece of paper or cloth, and trays of paint. Children step into the paint and then put their tracks onto the paper/cloth.

2. Building the plaster cast.

1. Make dough (cup of flour,half a cup of salt, half a cup of water and half a tablespoon of vegetable oil) - 3 minutes
2. Push dough flat into plastic box
3. Press leaves, shells, plastic dinosaurs to make moulds in the dough
4. Make plaster of Paris. **Put on safety glasses and dust mask**. 70 mL of water and 100ml plaster of Paris. Pour the Plaster of Paris into the water, and use a spoon to stir it. Try to get rid of any lumps by stirring. Be quick as it will start to harden after one minute.
5. Pour the liquid plaster of Paris over the dough with the moulds. Watch how it fills the moulds and forms a flat surface on top. (Tap the sides of the plastic box to release air bubbles).
6. Put it to one side for fifteen minutes.
7. Put a lid on the mould with the plaster of Paris, so children can take it home to dry.
8. After six hours, you can remove the cast. Turn the box upside down and pull out the plaster and dough. Remove the dough from the plaster. The plaster is a cast of the mould you made.
9. Clean up, but wait for the plaster to dry and scrape it into the bin. Do not pour down the sink, as it can clog drains.

Clipboard: Facilitator's run sheet 3/3

Dinosaur Discovery: Making Marks

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Making Marks - Lark Quarry Trackway Experiments

What to Expect

Footprints form better in flour and sandy flour, compared to sand by itself. When you wash off the sugar, the water disturbs the footprints in the sandy flour. The footprints are preserved best in flour.

The Science

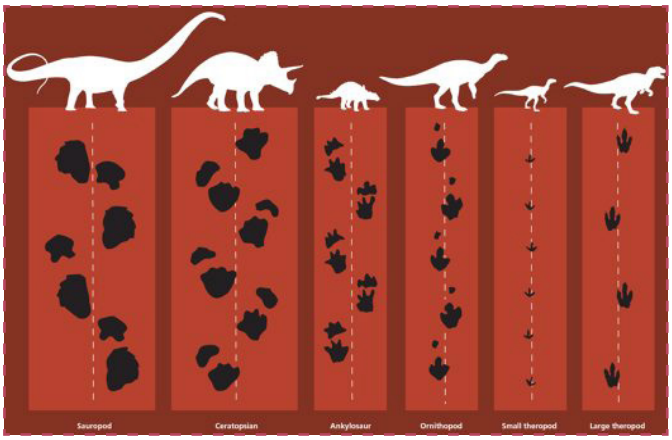
Conditions need to be just right to preserve fossils. In this experiment, children will try three different types of materials that can store footprints. Sand has larger particles and feels grainy. Flour has fine particles and feels soft. When they pour water on sand, it soaks through quickly. When they pour water on flour, it tends to stay on the tops and needs to be mixed to form a dough. This property of flour helped preserve foot prints. Dinosaur footprints at Lark Quarry, Queensland, were formed in fine-grain silt of clay. They were later covered with sand, which became sandstone. These prints, and other trace fossils (which record traces of a creature, not its body) reveal lots about dinosaur behaviour.

(Image below from Australian Museum)

Tracks in the Sand - Experiment #2

1. Form the footprint.

1. Make observations about the feel of sand and flour.
2. Make 2cm sand box (label: sand)/make 2cm flour box (label: flour)/make 2cm sand/four box (label: sandy flour)
3. **Ask children to make a prediction about which material will preserve footprints the best when it's wet. Will it be the sand, the flour, or the sandy flour?**
4. Make aquadhere (2 cups water and 1/4 cup aquadhere) and pour into each plastic box, mix well with the contents. Flatten the surface of each box.
5. Make dinosaur footprints in each box
6. **Ask children to observe the footprints in each box, what do they notice?**
7. Sprinkle each box with a layer of brown sugar. Allow the sugar to cover the footprints. Imagine that the footprints were made in wet soil, and a layer of dirt covered them up
8. **Leave the boxes to rest for twenty minutes. (choose something to do at this point)**
9. **Make a prediction, will it be the sand, the flour, or the sandy flour that preserves the footprints best?**
10. Wash the brown sugar away and see which material preserved the footprints best. Pour half a cup of water over the sugar in the sand box. Observe what happens.Repeat for the flour box, and the sandy flour box.
11. What do you observe? Which material preserved the footprints best? Take a pinch of sand and observe it. How does it feel? How big are the particles? Take a pinch of flour and observe it, then compare it with sand. What is different?



Workshop Table Prompts

Dinosaur Discovery: Making Marks

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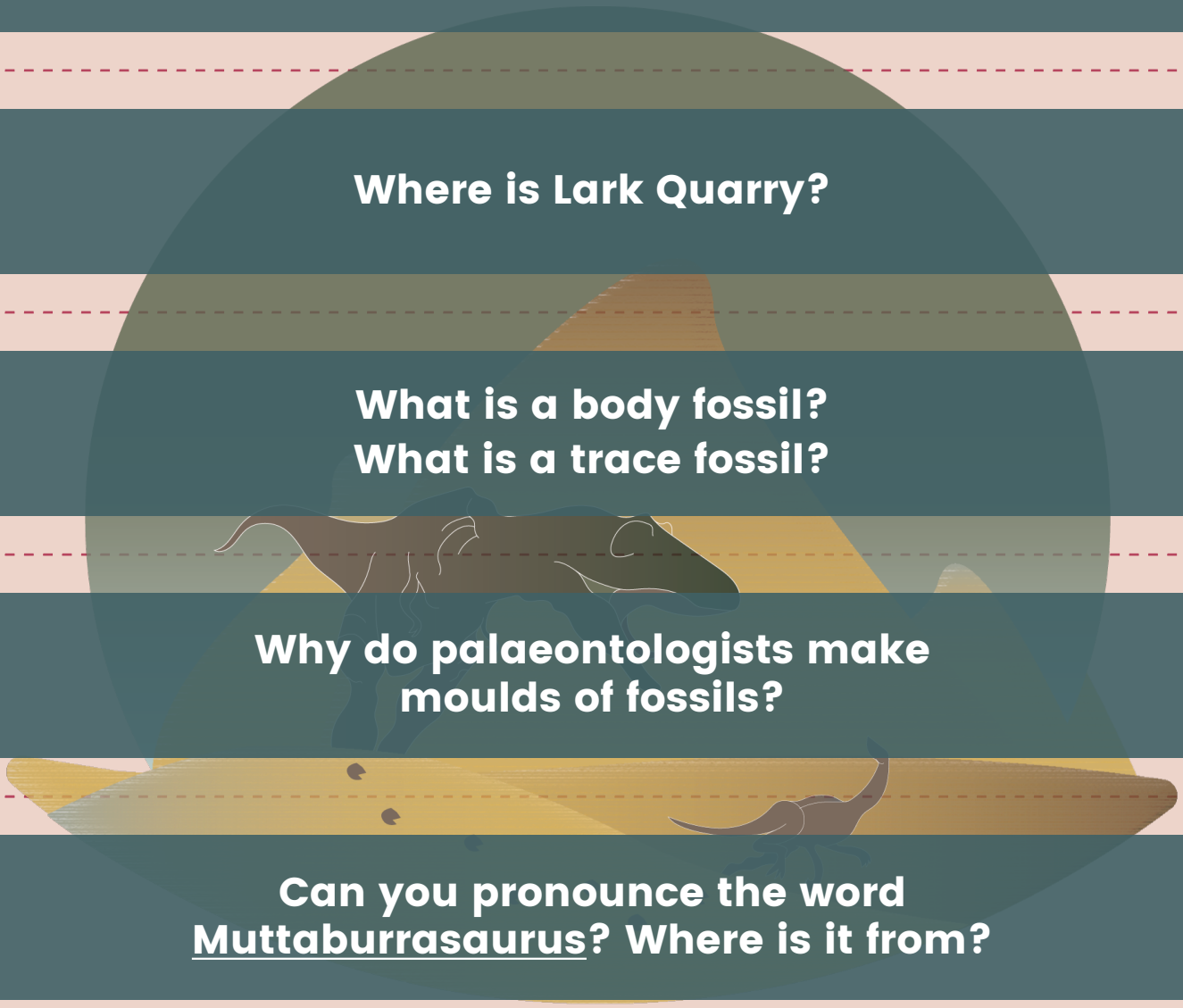
Cut and place these discussion starters around the tables.

Which materials do you think will make the best moulds?

Where is Lark Quarry?

What is a body fossil?
What is a trace fossil?



Why do palaeontologists make moulds of fossils?

Can you pronounce the word Muttaburrasaurus? Where is it from?

Why don't we eat or drink in the lab?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