KINDERGARTEN
EARTH AND SPACE SCIENCES

Activities to spark curiosity and introduce students to Australian Curriculum Earth Science topics covered in later years.

PALMS
PRIMARY AUSTRALIAN LITERACY MATHEMATICS AND SCIENCE

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EARTH SCIENCE WESTERN AUSTRALIA

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KINDERGARTEN- TEACHER INTRODUCTION

The Primary Australian Literacy Mathematics & Science (PALMS) Program aims to enrich and support the teaching of earth science from Kindergarten to Year 6 across Australia. This will be achieved by providing, within the mandated Earth and Space Science curriculum, hands-on activities integrating aspects of Chemical Sciences, Physical Sciences and Biological Sciences as well as relevant components of English, Mathematics and other subjects into teaching packages.

These teaching packages will be made available at www.palms.edu.au.

Earth and Space Sciences

As there is no mandated curriculum for science in Kindergarten, this package is an overview covering a wide range of topics that students will cover in subsequent years. The main focus of the Earth and Space Sciences package is to enthuse and excite students, sparking their curiosity for this important topic. The package also aims to develop students' scientific literacy and investigation skills, using their senses to explore the world around them.

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Handling Rocks - Teacher Notes

Handling rocks is a great way for students to discover concepts such as texture, colour, shape and size. A collection of rocks is relatively easy to find from your local area (remembering that nothing should be taken from national parks) or at hardware stores and gardening suppliers. Where possible, it is best to try and include raw, unpolished rock samples to show the students how the rocks exist in nature.

Students can explore:

- Textures- rough/smooth, shiny/dull, coarse/fine
- Size – big/small (put in order biggest to smallest), heavy/light (discuss with students how the biggest rocks may not be the heaviest)

- Colours – streak (by rubbing some rocks on the unglazed back of a ceramic tile, minerals in the rock will leave a coloured streak on the tile. This may be an interesting art project also).
- Shape – smooth/angular, uneven/round (may be useful to have some rocks in the collection that are cut into other shapes (e.g. paving stones can be cubes or rectangles)
- Buoyancy – sink/float. Pieces of pumice will float, due to the lack of connectivity of the holes in the rock (and its light weight). This is a unique property of pumice, due to bubbles of gas becoming trapped in the lava that cools quickly to form the rock when it is blasted out of volcanoes.
  Note: Some of the pumice sold as a way to treat rough skin is not natural pumice and will not float.

Pet Rocks - Teacher Notes

Using bags of large river pebbles available from hardware stores or garden suppliers, students can make pet rocks. These rocks can be decorated using paint or plasticine, some googly eyes and perhaps textas.

As well as being a creative activity, the rocks can be used for telling stories, counting practice, making shapes and other mathematics activities.

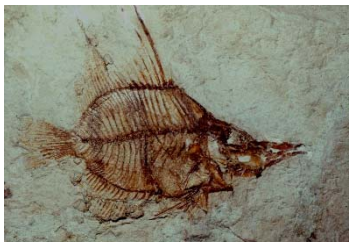
More activity ideas for the pet rocks can be found in the PALMS Pre-Primary package.

Fossil Tales - Teacher Notes

There are many great books, both fiction and non-fiction, about fossils and dinosaur bones - a brief list is shown below:

- Fossils Tell Stories by Yu-ri Kim / Australian Geographic (ISBN: 9781742458267)
- Return of the Dinosaurs by Bronwyn Houston (ISBN: 9781925360370) – a great story based in Broome where dinosaur footprints are preserved in the rocks.
- Stone Girl Bone Girl: The Story of Mary Anning of Lyme Regis by Laurence Anholt (ISBN: 9781845077006) – the story of the little girl who discovered a lot of dinosaur fossils near her home.
- Digging up Dinosaurs by Aliki (ISBN: 9780064450782)
- Fossils Tell of Long Ago by Aliki (ISBN: 9780062382078)
- How the Dinosaur Got to the Museum by Jessie Hartland (Illustrations) (ISBN: 1609050908)

After being inspired by these stories, students may like to come up with their own dinosaur names. The 'non-dinosaur' stories are also a great way to illustrate to students that not all fossils are dinosaur bones and that plants can also be fossilised.



Fossils are formed when an organism dies and falls to the ground, sea floor or other location where they can be buried quickly, either under sediments (broken rock material - such as in a swamp or lake) or under volcanic ash.

Fossils may also be formed if an imprint of an organism is left in sediments such as mud or silt.

The fleshy parts of the organism rot away. The remaining hard parts (shells, bones or exo-skeletons) will gradually be replaced by minerals dissolved in local groundwater, which fills tiny spaces in bones or shells. With more time these minerals and sediments will change into rock, and fossils will be formed.

If the fossils have not been destroyed by other geological processes they may become discoverable by people today, through uplift and erosion, bringing them to the surface.

Fossil Kits - Teacher Notes

Kits containing replica and real fossils are available to borrow from Earth Science Western Australia (ESWA) for periods of two weeks. The kits cannot be posted and must be picked up in person from the ESWA office in Kensington. Some kits are located at schools in regional towns and a few metropolitan hubs also (contact the schools to arrange borrowing these). Check our website for details of kit locations and contact details to borrow the kits: http://www.earthsciencewa.com.au/course/view.php?id=17

These kits can be used to illustrate to students that fossils are not always dinosaurs and are in fact it is more common to find fossilised sea creatures or part there of (e.g. shark teeth).

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Fake Fossils - Teacher Notes

Fake fossils can be made by using plasticine and plaster of Paris. Start by pressing textured objects into plasticine (shells, figurines and leaves with prominent features work well) to make a mould. Remove the object from the plasticine mould carefully.

It helps to spray the objects with a light coating of oil to ensure they can be removed from the plasticine easily.

Plaster of Paris can then be poured into the moulds and left to set hard (will be hard to touch in about 20 minutes but usually takes a few hours to completely harden). Peel off the plasticine mould to reveal the fake fossil.

If you'd rather not use plaster, students can perhaps press playdough into their moulds that could be baked or left to harden. Another alternative is to use air-dry clay that will set hard. Either get students to imprint objects into the clay or even construct their own fossils.

Budding Palaeontologists - Teacher Notes

Objects such as dinosaur figurines can be buried in the sand pit or a tray of sand for budding palaeontologists to find using trowels and brushes. This may be another activity that can be done with the fake fossils that students make.

Real fossilised dinosaur eggs

Replica dinosaur eggs can be made using mixtures of ingredients such as sand, salt, coffee grounds and flour (there are plenty of methods available on the internet). The dry ingredients are mixed then dampened and moulded around objects. They may take several days to dry but they can then be broken open (the most fun part!) to discover the object inside. The 'eggs' will set quite hard so mini-hammers may be needed to open them.

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Budding Palaeontologists – Teacher Notes

1. Make a mixture of the dry ingredients. The mixture pictured contains equal parts flour, sand and coffee grounds, and ½ half as much salt.

2. Add water and mix until the mixture holds together when squeezed (the more water you add, the longer they'll take to dry).

3. Mould some of the wet mixture around your dinosaur or object that's being encased.

4. Place in a tray in a warm place to dry, turning the 'eggs' over every day.

5. Wait a few days and crack open with a hammer to reveal what's inside!

Budding Palaeontologists – Teacher Notes

Another way to discover 'fossils' and add a bit of chemistry to your lesson is to hide plastic dinosaurs, crystals or rocks, in balls of bicarbonate soda. Add water to bicarbonate soda to make a paste then mould this around the objects being 'buried'.

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Budding Palaeontologists - Teacher Notes

The balls can be dissolved using vinegar from a dropper or for a more spectacular event, try placing them in clear container filled with vinegar (can get messy!). You may like to make them egg-shaped and food colouring can also be added to the bicarbonate soda for effect.

Making Tracks - Teacher Notes

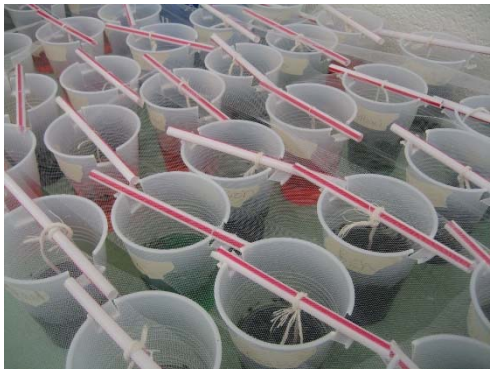
A fun activity is to make some dinosaur tracks in damp sand using feet cut out of heavy card or wood. You could extend this activity to make casts of the tracks (like palaeontologists would) using plaster of Paris.

There are dinosaur tracks preserved in the rock at Gantheaume Point in Broome and also in other areas around the world. These trackways have assisted scientists in understanding more about dinosaur movement and behaviour.

Crystal Construction - Teacher Notes

Minerals are naturally occurring crystalline substances and these crystals have many interesting shapes. Students can easily make their own crystals using some common household chemicals.

One method for making crystals is to use a saturated solution of sugar or salt. Saturated solutions are made by adding solid substances (in this case sugar or salt) to hot water until no more of the solid will dissolve. As the solution cools and the water evaporates, crystals will start to form. You can get the crystals to form on lengths of string or wool (the rougher the texture, the better the crystals can 'grip' on) by dangling them in the saturated solution. You could also use pipe cleaners, pop sticks or satay sticks. To help the crystals start forming, you may need to use a seed crystal which is simply prepared by moistening your string or stick and dipping it in some dry sugar or salt crystals. Food colouring can be added to the solution to create different coloured crystals also.



Salt and sugar crystals can take several days to form, however, you can grow crystals in a few hours using Epsom salts. You would again start with a saturated solution. These crystals can be grown on string, wool or sticks also or will also start growing in a jar of the saturated solution as it cools. You could also try pouring some of the saturated solution onto a piece of kitchen sponge as the larger surface area of the sponge helps the crystals to form more quickly and they are a little easier to handle. Epsom salts are safe for students to touch, however, it is not recommended students consume

them. They don't taste particularly nice and, if they are eaten, they may have a laxative effect.

The best tip for crystal growing is the longer the solution takes to cool and evaporate, the larger your crystals will grow. Your patience in leaving crystals undisturbed in a warm spot such as a sunny windowsill will pay off!

Gold Rush - Teacher Notes

A fun, but definitely outdoor activity, for warmer months is to get students panning for gold. You can paint some small rocks gold and scatter them in a large tray of sand or even a sand table if you have one available. Add some water to simulate a river and give the students some round shallow dishes (even plastic plates with sloped sides would work) to use as pans.

The action of panning can be a little tricky so it should be demonstrated first and it's likely that students will get wet but they'll certainly have lots of fun! To start panning, students scoop their pans into the sand at the bottom of the tray, collecting a small amount. They then shake their pans as the 'gold' is dense and this shaking will cause it to sink to the bottom of the pan. Student tip the pan forward at an angle of about 40° and dip the pan in and out of the water a few times. This will remove some of the sand. Using a swirling motion and keeping a little bit of water in the pan, if they have picked up any of the gold pebbles, they should now start to see them in the bottom of their pan. It may take several attempts to find 'gold' depending on how many pebbles you have added.

Making Sediments & Rocks – Teacher Notes

The natural processes of weathering and erosion break down rocks and transport the sediments that are formed. These sediments may make up part of soils or go on to form new sedimentary rocks. Students are perhaps unaware of what makes up soil and you can get them to make their own sediments from rocks.

First, you'll need some 'friable' rocks – this simply means they can be easily crumbled or broken into small particles. Readily available rocks, such as limestone or sandstone, are often quite friable. Lay down some newspaper or use a large tray and get students to rub the rocks together to break them down. If you can find some, it would be best to provide students with a range of different coloured rocks to show where different coloured soils come from. If you have problems sourcing rocks, pieces of house brick could be used as a substitute.

Once the students have made these sediments, you may like to grind them into a fine powder using a mortar and pestle, add some water and use them to paint a picture. If you have white or pale sediments, consider using black or other coloured paper.

SAFETY NOTE: Rubbing the rocks together may cause particles to flick off so it's advisable to get students to wear safety goggles and perhaps gloves due to the rough surfaces on rocks. Hands should be thoroughly washed with soap after this activity to ensure any minerals that may upset little tummies are not ingested.

Making Sediments & Rocks – Teacher Notes

One of the natural processes involved in the formation of sedimentary rocks is called cementation. This involves naturally occurring minerals acting like the cement used in construction to stick sediments (broken rock) together. You can easily make 'sandstone' using sand and an Epsom salt solution.

Make a solution by dissolving one part Epsom salts in two parts water. One-third fill a paper cup with clean sand and stir in enough Epsom salt solution to make the sand completely wet. Let the wet sand mixture sit undisturbed in a warm spot for an hour or so then carefully decant off any water that rises to the top. You may have to repeat this process several times. Keep the cup in the warm spot where it won't be disturbed for about a week, or until the sand has completely dried out. Don't cover the cup so the water can easily evaporate. When the sand is completely dry, tear away the paper cup to reveal your 'sandstone'. For added interest you may like to add in some shells or plastic toys to represent fossils that could then be excavated by the students or make some impressions or dinosaur footprints in the 'sandstone'.

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Exploration Table - Teacher Notes

An exploration table is a great way to get students thinking about earth science. Below are some suggestions for a range of objects for the students to touch, smell, listen to and look at. It is important to have the rule that students must not put any of the objects in their mouth and introduce the idea that when we are doing Science, we don't use our sense of taste. It's also important for the students to wash their hands thoroughly when they have finished exploring.

Objects you could put on the table include:

- Rocks! This could be rocks you or the students have collected, some that have been purchased, from hardware stores like Bunnings, or even some of the ones made in the exercises in this package. Egg cartons are an easy way to store a collection of small rocks.
- Crystals. These are often very shiny and pretty and will attract students' attention and can be obtained at low cost from new age type shops.
- Fossils. Some of the more common fossils can be obtained at low cost from rock and gem shops or on the internet. To preserve fossils that are to be handled a lot, you may like to coat them in a clear resin.
- Magnifying glasses to allow students to closely examine the rocks and crystals.
- Rulers and tape measures so students can compare the sizes of rocks.
- Balance scales so students can explore the weight of different rocks and come to find out that a bigger sized rock may not be heavier that a smaller sized rock.
- Shells collected from the beach and some plasticine so students can make some moulds of the shells and imprints of the rocks.

Exploration Table - Teacher Notes

- Paper and crayons or pencils so the students can make rubbings of the rocks and shells on the table. They could also draw pictures of the objects.
- Water, spray bottles and eye droppers. Students can spray or drop water on to different rocks and see how the water behaves. Does it soak in quickly? Does it run off the rock? Does the water change the colour of the rock? Does the water move all the way through the rock?
- Unglazed tiles so students can rub rocks onto them to look at the streak colour. The back of glazed tiles is also suitable.
- Volcano models. These can either be homemade (e.g. papier mâché) or purchased (some models even split in half to show inside the volcano). If your school has a 3D printer, there are some good volcano model designs that can be downloaded and printed.

What is Soil? - Teacher Notes

Soil is made up of broken pieces of rock (of a range of sizes, often referred to as sand, NOTE: sand is a specific size fraction of broken rock), humus (living or once living things also known as organic matter), air and water.

Getting students to examine soil closely by touching and feeling it is one of the best ways to show them what soil is. A word of caution though – choose clean soil for the students to touch – it should not have a high amount of fertiliser, manure, compost or potting mix in it due to possible health effects. You may choose to get students to wear gloves or other protective equipment but as a minimum, hands should be washed thoroughly with soap after handling soil, especially before eating. Please rescue any bugs or worms found also and return them to a safe place after a quick look.

You may be fortunate to have a garden area where the students can dig and explore what 'treasures' they may find. If you don't have a garden suitable for digging, this can be done as an indoor activity (with lots of newspaper spread out) so students can dig through trays of soil. As they explore the soil, they could record what they find by drawing pictures of it or even making a collage by sticking the things they find on a piece of card.

What is Soil? - Teacher Notes

Whilst the air and water components are tricky to show students, the rock particles and humus can be easily separated from each other.

Add some soil to a glass jar or clear plastic container with a lid that seals well. Top the jar or container up with water and put the lid on. Give it a good shake then leave it to settle for a few minutes. You will find that you get a very visible separation of the humus and the broken rock parts of the soil. The humus portion will float to the top and the denser, heavier rock particles will sink. In between these two layers you will have water. At first the water may be a little murky as the finer particles float around but eventually the water may become completely clear.

How Does Your Garden Grow? - Teacher Notes

Students may not understand the difference between soil and sand so a good way to show them is to try growing plants in both sand and soil. Take some sand from your sand pit and also source some healthy soil with lots of humus. Then, depending on how long you'd like this activity to take, plant seeds or seedlings in pots of both sand and soil and monitor how well the seeds germinate or the seedlings grow. You could have a roster for the students to be responsible for watering the plants and for measuring the plants.

A simple way to measure the plant growth is to look at the height of the plant. This can be done by getting students to place a ruler or piece of paper next to the plant, ensuring the bottom is touching the soil, and making a mark on the ruler or paper indicating the plant height. Depending on your choice of plant, there may be little growth noticed if this is done every day so perhaps every second or third day or even once a week would suffice. The expected outcome would be that the plant in the sand would grow less than the plant in the soil, if it survives at all.

How Does Your Garden Grow? - Teacher Notes

There is a good You Tube clip available for the song 'The Farmer Plants the Seeds' and the lyrics are included below. There are also some suggested actions. The tune is based on the old song 'The Farmer in the Dell' so it has simple repetitive lyrics.
Link to video: https://www.youtube.com/watch?v=cRhGOdqWIIo
Credits:

- Song- "The Farmer Plants The Seeds" (Kids Songs with Lyrics)
- Vocals & Arrangement: Sara Diamond and Christopher Pennington
- Music Band- The Kiboomers

"THE FARMER PLANTS THE SEEDS SONG LYRICS"

The farmer plants the seeds, *[Stoop and pretend to plant seeds.]*
The farmer plants the seeds
Hi, Ho, the dairy-o, the farmer plants the seeds.

The sun comes out to shine, *[Make a large circle with arms.]*
The sun comes out to shine
Hi- Ho the dairy-o, the sun comes out to shine

The rain begins to fall, [*Hands flutter up and down.]*
The rain begins to fall
Hi Ho the dairy-o, the rain begins to fall

The seeds begin to grow, *[Stand up slowly.]*
The seeds begin to grow
Hi Ho the dairy-o, the seeds begin to grow

The vegetables are here, *[Point to ground]*
The vegetables are here
Hi ho the dairy-o, the vegetables are here

The farmer digs them up, *[Digging action]*
The farmer digs them up
Hi ho the dairy-o, the farmer digs them up

Now, it's time to eat, *[Mime eating]*
Now it's time to eat
Hi Ho the dairy-o, now it's time to eat!

Worm World - Teacher Notes

Worms are very important for healthy soils as they are one of a set of organisms that help to break down and decompose organic matter to enrich soil.

If your kindergarten doesn't already have one, you may consider starting a worm farm that the students can assist in managing. It's a great way to get rid of some vegetable and food scraps and some schools even sell the worm 'juice' produced as a gardening product to raise funds. A word of caution, worms can be affected by the warmth of human hands so please handle them as little as possible.

Further information on worms and how to construct a worm farm are in our PALMS resource for Year 2, available for free download from http://www.palms.edu.au/

Ideas for activities about worms and soils:

- Read a story about the life of worms – a quick internet search will show you there are loads of picture books about worms!
- Make worm sock puppets and put on a play.
- Examine worms closely with a magnifying glass then draw a diagram, showing the different parts of their bodies.
- Make giant worms from old tights stuffed with newspaper and tunnels for the worms (or children!) to crawl through.
- Thread ring-shaped pasta or cereal or beads onto pipe cleaners to make segmented worms.
- Worm paintings using cooked spaghetti or noodles dipped in paint.
- Cooking activities making dirt (biscuit crumbs) cupcakes with lolly worms.
- Measure the size of worms in the garden or worm farm and

make a chart.

- Ask students to think about how worms move then try it for themselves.

Water in Soil - Teacher Notes

Water is another crucial element of a healthy soil but it may be difficult for students to understand this as the water is not visible in puddles or droplets. The activity below is a good way to prove to them that there is water in soil.

Take three empty food cans, ensuring that the edges are not sharp. Fill one can to the top with clean, dry sand, a second with moist soil and keep the third can empty. Place pieces of paper across the top of the can and leave for a few hours (the paper should be touching the sand or soil). The paper above the moist soil will get wet but the others will remain dry. This demonstrates that there is water held in the spaces in soil even though the students can't see it as a liquid.

Exploration Table - Teacher's Notes

This section also lends itself to setting up an exploration table for students. Again, reinforce with the students that they should use all of their senses except taste and also that they should wash their hands with soap after touching things on the table. Any soil used should be as 'clean' as possible (don't use potting mix or soil containing animal manure).

The following are some suggestions for things to include on the table:

- Soil! Containers of soils, sand and sediments collected from different places so they are different in appearance. This may be sourced from gardens, hardware stores or landscape suppliers (see note above regarding soil safety).
- Glass jars or clear plastic containers of soil and water with tight fitting lids so the students can shake the jar, let it settle and observe the different layers that form. You may even like to add in some other objects like seeds or small pebbles (be careful the pebbles aren't large enough to break the jar when shaken).
- Magnifying glasses and open containers of soil for students to observe. Depending on how much room you have, you could also put some trays on the table so the students can tip the soil in and spread it out.
- Some plastic tweezers, pop sticks and spoons for the students to move the soils around. They may like to remove some of the twigs, seeds and other things that they can find in the soil so provide some small empty containers also.
- Funnels and different shapes and sizes of containers that students can fill with soil. Large plastic test tubes with lids (often called baby soda bottles or soda bottle preforms) are ideal.

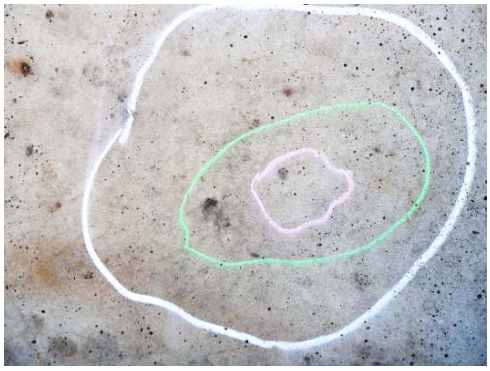
Exploration Table - Teacher's Notes

- Sieves and colanders so students can run soil through and separate out larger twigs, seeds and bark.
- Some paper and glue or sticky tape. Students could make some pictures by sticking some sand or soil onto the paper.
- Clear plastic cups of soil and jugs of water. Students can pour water onto the soil in the cup and observe how the water travels down through the soil. Perth soils can often be hydrophobic meaning that the water will not soak in easily or quickly. If you add some wetting crystals to some of the soil, students can observe the difference in the speed that the water absorbs.
- Plants in pots for students to observe over time.
- Artificial worms and other insects in some soil for students to find. You could use plastic toys or even cooked spaghetti! If you use cooked spaghetti it will encourage students to be gentle, like they need to be with real worms, as the pasta will break if squeezed or pulled.

Puddle and Rain - Teacher Notes

Water is a precious resource, especially in Western Australia, and humans could not survive without it. It also happens to be lots of fun to play with!

A measurement activity to do with students is examining how puddles change when the sun is out. Firstly, pour some water on a level concrete area outside to make a puddle. It is best to choose an area that is low in traffic so your puddle won't be disturbed. Draw a chalk line around the puddle and come back and monitor it every so often, adding another chalk line when you check it to show how much the puddle shrinks.



This is a good opportunity to prevent students developing misconceptions about what happens to the water from the puddle. They may think it has disappeared but in reality it has soaked in to the small spaces in the concrete or it has evaporated. Evaporation is probably too difficult a concept for many kindergarten students to understand so you may like to just explain that liquid water can change into solids (ice) or gases and in this case it's changed into a gas. The water is still there but the particles are now so small that we can't see it.

There are plenty of traditional songs and nursery rhymes about puddles and rain with actions for the students to learn. You Tube also offers a range of short animations, songs and stories on the topic.

Protostorming Rainwear - Teacher Notes

A great STEM activity to get students really thinking is a protostorming session to design and make a raincoat (no pun intended!).

Protostorming is where you give students a wide range of materials and get them to design and make as many prototype models as they can in a short space of time. With older students you would not give them a specific item to make but Kindergarten students probably need more guidance. The idea is the students come up with lots of different designs and the time constraints tend to stop them from overthinking the design so some amazingly creative ideas come out. The emphasis is on the quantity of designs they come up with, not the quality of the models they make.

Leading on from the protostorming session, you could have a discussion with the students on the suitability of different materials, thinking about properties such as if they are waterproof,

flexible, durable, breathable and whether you could use recycled materials. You will be amazed at the fantastic creative ideas that the students come up with.

Drinking Plants - Teacher's Notes

How do plants transport water around so even the tips of the leaves get supplied?

Students will probably know that plants need water to survive but it's reasonable to assume that Kindergarten students won't understand that plants have cells and all of these need water, so it has to be moved around. Without going into too much detail, you can show students that plants have a transport system.

Place some celery stalks in a container of water with food colouring added. The celery should still have its leaves attached and after a few hours, you will be able to see the leaves starting to change the colour of the food colouring you have used.

This works best if you use very fresh celery and a strong solution of food colouring, red and blue give the best results.

After a day or so, if you slice through the celery stalk, you will see the 'veins' that the coloured water has travelled through. This experiment can also be done with white flowers, such as carnations, but this is not always as successful.

Do Plants like Salty Water? – Teacher's Notes

This activity ties in well with some of the soils activities mentioned earlier in this resource in that it asks students to consider what plants need to grow. You can firstly discuss with students the difference between seawater and the water that comes out of our tap. Why wouldn't we want to drink seawater? Because it's salty. Can plants grow if the water we give them is salty? Let's try an experiment!

There are a couple of ways to approach this experiment. You could use some established plants or seedlings in pots, watering one with tap water and the other with salty water. You may even like to extend the experiment using more plants and a range of concentrations of salty water. Ask students to observe the growth and general appearance or health of the plants over a week or so.

Another approach is to try growing alfalfa or other seeds on cotton wool. Soak a large piece of cotton wool in tap water, place it on a saucer or container lid then sprinkle seeds over the cotton wool. Put the saucer on a sunny windowsill and keep the cotton wool damp as the seeds sprout. Repeat the same set up, substituting salty water for the tap water and get students to observe how each lot of seeds grow.

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Who Needs Water? - Teacher Notes

All living things require water in some form to survive. When asked what things need water, students will probably answer straight away that people do. They could then be asked to draw pictures of other things that need water (e.g. animals, insects, trees) and perhaps even some that don't (e.g. rocks, clothes, tables).

This activity could be extended to include what we use water for, again asking students to draw a picture, this time of people using water. If your school happens to be a Waterwise school then this is a good opportunity to talk about responsible use of water (e.g. turning taps off properly, having shorter showers, using the half flush button on the toilet).

Day and Night - Teacher Notes

How do we know when it is day and when it is night?

There are some obvious answers to this question, such as looking at the time on a clock, but other differences are something that can be explored with young students. Some suggestions for discussion points include:

- The position of the Sun in the sky
- Different things we use during the day and at night e.g. Sun hats or sunglasses, car headlights
- Animals we can see at different times of day
- Activities we do e.g. going to the park, sleeping
- Size and position of shadows
- Day and night on different sides of the world

Shadow Play - Teacher Notes

Shadows can be lots of fun to observe and play with.

To tie in with the theme of day and night and to introduce the concept that the Earth rotates, you can track the size and position of student's shadows.

Use a clear area outside, such as a basketball court, or alternatively a large piece of paper. Get students to work in small groups to mark where their shadow is pointing and how tall it is at a few intervals during the day, making sure they always stand in the same spot to make the measurements.

You could use chalk if you're working on a hard surface or even take photographs with iPads and compare the pictures. Formal measurements could be made with pieces of string or measuring tapes.

Extension: A graph could be constructed of the height of the shadows of everyone in the class at a certain time of day, comparing this to their actual height.

Seasonal Changes - Teacher Notes

Whilst we do not tend to have extreme weather changes between our seasons in Australia, there are still observable changes that occur. Students can be asked what they see, smell, hear, feel and taste in the different seasons. This is another good way to practice observation skills using all senses. An example might be:

Spring

I know it is spring when I can **see** lots of baby animals.
I know it is spring when I can **smell** flowers.
I know it is spring when I can **hear** insects buzzing.
I know it is spring when I can **feel** the warm Sun.
I know it is spring when I can **taste** strawberries and blueberries.

Seasons are an excellent way to compare different cultures both around the world and in Australia. Firstly, you could introduce students to the Aboriginal seasons in your local area, pointing out how these seasons are based around what would be seen in the natural environment, which would guide the activities at that time.
The Bureau of Meteorology has the Indigenous Weather Knowledge resource covering the seasons recognised by some of the indigenous people in different areas of Australia.
http://www.bom.gov.au/iwk/index.shtml

Seasonal Changes - Teacher Notes

A Noongar calendarmarking the seasons outside Mirrabooka Library, Mirrabooka, Western Australia

By Orderinchaos [CC BY-SA 4.0 (https://creativecommons.org/licenses/by-sa/4.0)], from Wikimedia Commons

Your class may have a weather board to assist the students in learning to recognise when it is rainy, windy, sunny and so on. You could add another section for the students to recognise the season also. This section may include a symbol or some clothing that would be appropriate to wear during that season.

On Shaky Ground - Teacher Notes

The mechanisms that cause earthquakes are too complex to try and explain to Kindergarten age students but the effects of earthquakes can be explored in lots of fun ways. It is rare for us to experience strong earthquakes in Australia, due to our landmass not being located close to a tectonic plate boundary, however, some regions of Australia experience fairly regular earthquakes that can be felt.

A fun way to explore what happens in an earthquake is to look at how buildings and other structures behave. Students could build towers or bridges then they could be tested on a 'shake table'.
A shake table can be as simple as a large container of jelly – you may like to experiment with different ratios of jelly crystals to water to change the firmness of the set jelly. Other ideas for table design include using a large sheet of stiff cardboard positioned on top of some balloons anchored to a table or some firm springs sandwiched between wooden boards.
Buildings and bridges could be made from blocks, marshmallows and spaghetti, straws, biscuits or Lego. To test the structure design, place it on top of your shake table and give it a wobble! If the structure collapses, encourage students to think about how they might improve the design to make it stronger.

Lava-ly Activities - Teacher's Notes

Volcanoes are a fascinating topic. There is some good background information for teachers available through Geoscience Australia (http://www.ga.gov.au/education/classroom-resources) and whilst the activities are designed for older students, you may find one that could be adapted for Kindergarten classes. Aside from the classic building papier mâché volcanoes and reacting vinegar with bicarbonate soda activities, here are some other ways to engage your class.

A good way to introduce students to volcanoes is to start talking about lava. To clarify; MAGMA is molten rock that is found under the Earth's surface and LAVA is molten rock that has made it's way to the surface.
You can use candle wax to help demonstrate that lava is a liquid that changes to solid rock when cooled. Melt some wax, keeping little fingers well away, and move the liquid wax around a container to show the students it flows like a liquid. Allow the wax to cool completely then pass a piece around to students so they can feel that it is now solid. If possible, have some examples of volcanic rocks to show students like basalt, pumice, scoria, rhyolite and andesite.

There is a cute You Tube clip https://youtu.be/pNnLCdsc11g from Dance and Beats Lab named 'Explode, Volcano' which has a song with simple actions you might like to teach your students.

A cartoon with a song that your students may already be familiar with is the short animation from Pixar studios named 'Lava'. It can be found on the special features of the DVD/BluRay of the movie 'Inside Out' and is the story of a volcano who thinks he is all alone. He sings of his hopes for some company, which is heard by a volcano forming under the ocean.

Lava-ly Activities - Teacher's Notes

It shows a little about how some volcanoes form under the ocean and also how volcanoes become dormant or extinct eventually but mostly it is a very sweet love story with some lovely singing.

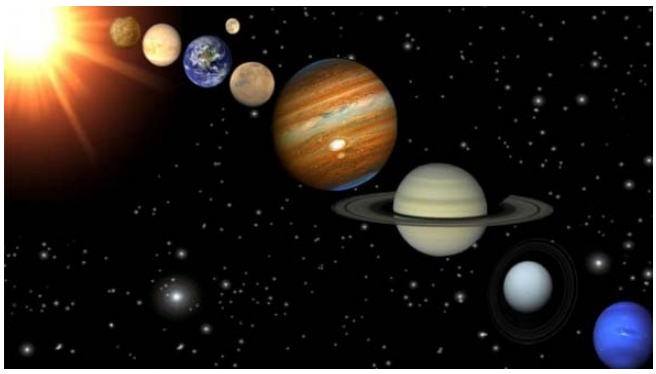
Students may like to work together to construct a volcano in the sand pit and you could use a hose to run water over the volcano to demonstrate how the shape may change when a volcano erupts. Some internet research will yield before and after eruption photos of volcanoes around the world, which you could show students.

The shape of Mount St Helens in the USA changed dramatically after it erupted in 1980

Another way to construct a volcano that students could use as a play space is to use red and yellow streamers anchored to one point in the ceiling. The streamers are then anchored to the ground in a circular pattern to form a cone shape.

Blast Off! - Teacher Notes

Space is an exciting topic for students of any age as there is so much that we do not know yet so their imaginations get a good workout. This topic can easily become a classroom theme with decorations, mathematics and literacy activities, even the behaviour management system tied in (a rocket that students move up or down in depending on behaviour).



Rockets are a good place to start as they are a mode of transport to get us into space. Students can be asked to consider what needs to be included in the design of a rocket. They may include things like:

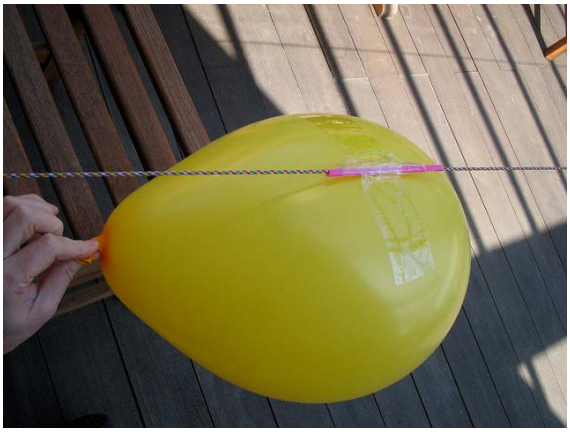
- powerful engines to help them blast off
- windows so we can look into space when we're up there
- a ladder so we can climb in and out when we land on other planets
- fins to help steer
- flashing lights to tell us if things go wrong
- seats for the astronauts

They could then draw a picture of their own design of both the

inside and outside of a rocket. Once they have their design, students could construct the rocket using recycled materials and other things, like aluminium foil and cellophane.

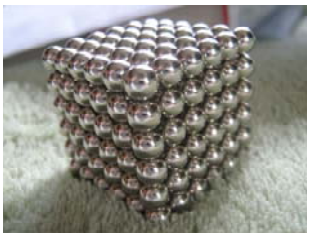
To extend this activity again, you could discuss with students what they will need to take with them when they go to space. What is essential to survive, what would be useful and what would be considered a luxury to have?

To build a simple rocket that will delight students, take a balloon, a straw, some tape and a length of string that will reach across your classroom. Thread the straw onto the string then attach either end of the string to the sides of the classroom, ensuring the string is taut and is high enough to provide a clear path for the rocket. Inflate the balloon, without tying it off, and attach it to the straw with a couple of pieces of tape. After asking the students to stand clear of the string, release the balloon and it will very quickly fly across the classroom. You can experiment with different shapes of balloons and also the size that the balloon is inflated to and perhaps even by adding cardboard fins to stabilise.



Outta This World - Teacher Notes

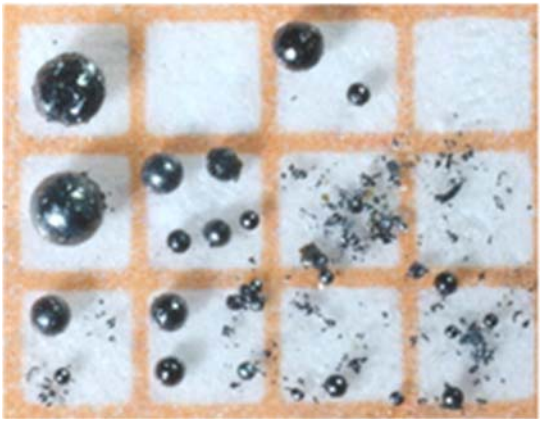
Many people are not aware that there are small pieces of rock and dust constantly entering our atmosphere from space and burning up. These are what are commonly known as shooting stars. Sometimes, a tiny fragment of a rock that enters our atmosphere may survive the fiery journey and land on Earth. These rock fragments are quite tiny (like dust) and are called micrometeorites. Micrometeorites are quite dense and metallic so can be collected using a strong magnet, such as a neodymium magnet. *These magnets are extremely strong and care should be taken when using them as they can pinch little fingers and skin when attracted to other objects.*



To search for micrometeorites, it is best to wait until your local area has dried out, after a heavy shower of rain. The rain will help to wash the micrometeorites into cracks and gaps in the pavement. Put your strong magnet into a press seal bag, as it will be very difficult to remove the micrometeorites from the surface of the magnets.

Students should move the magnet slowly along the ground, concentrating on areas like gaps in paving or cracks in concrete. Once fragments have been collected they can be put them into a container by simply removing the bag from the magnet whilst holding it over a piece of paper or wide container. To examine the micrometeorites, you have to use a microscope or strong magnifying lens, as they are extremely small. A USB camera such as a Dino-Lite or one that can be attached to a tablet or smart phone is ideal. A standard microscope, if you have one available, could also be used. The micrometeorites will be quite spherical and metallic in appearance.

Some are shown in the photographs below.



I'm Standing on Mars! - Teacher Notes

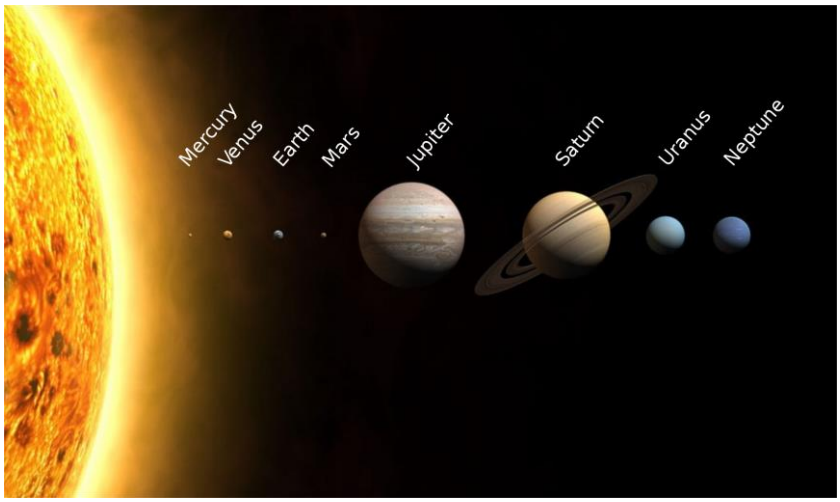
Students may not understand that the planets are all quite different sizes to each other so making some scale models may help.

The first table below shows some scaled measurements of the diameter of the planets in our solar system, at a scale of 1:100,000,000. These measurements could be used to make cut-outs of the planets of a size suitable to have students stand on. You may only want to make a wedge of the Sun or demonstrate it's size in another way, such as with a length of string.
Note: Pluto has also been included but it was re-classified as a dwarf planet in 2006.
A fun Maths activity could be to count how many students can stand on the model of each planet. This could also involve students dressing up according to the conditions on each planet e.g. hot or cold, oxygenated atmosphere or not.

Diameter of objects in our solar system – Scale 1:100,000,000

Object	Actual diameter (km)	Scaled diameter (cm)
Sun	1,392,000	1,392
Mercury	4,879	4.9
Venus	12,100	12.1
Earth	12,740	12.7
Earth's Moon	3,474	3.5
Mars	6,779	6.8
Jupiter	139,800	139.8
Saturn	116,500	116.5
Uranus	50,720	50.7
Neptune	49,250	49.3
Pluto	2,372	2.4

I'm Standing on Mars! - Teacher Notes



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(Distances between planets in this image are not to scale)

The second table below shows scaled measurements for a much smaller set of cut-outs, that could be put up on a classroom wall. This scale is 1:300,000,000. Again, a model of the Sun will be massive so perhaps a sliver might be more manageable.

See over

I'm Standing on Mars! - Teacher Notes

Diameter of objects in our solar system – Scale 1:300,000,000

Object	Actual diameter (km)	Scaled diameter (cm)
Sun	1,392,000	464
Mercury	4,879	1.6
Venus	12,100	4.0
Earth	12,740	4.2
Earth's Moon	3,474	1.2
Mars	6,779	2.3
Jupiter	139,800	46.6
Saturn	116,500	38.8
Uranus	50,720	16.9
Neptune	49,250	16.4
Pluto	2,372	0.8

The Astronaut's New Clothes - Teacher Notes

A fun way to make a decoration for the classroom, whilst learning about clothing for astronauts, would be to make an astronaut poster. Start by placing a long piece of paper or card on the ground and asking one student to lie on their back on it, spreading out their arms and legs slightly. You then trace around the student with a pencil. To make the astronauts suit, use materials such as paper plates, aluminium foil, white plastic bags, plastic tubing and latex gloves.

Astronauts must train hard to be able to do tasks whilst wearing their thick gloves. Students could mimic this by trying to pick up and move objects whilst wearing adult sized washing up gloves or thick leather welding gloves. Perhaps they could try doing a puzzle or building a tower from blocks.

You may even like to set up a glove box with holes in that you attach gloves to for students to manipulate objects contained in the box. This could be a plastic crate or a cardboard box. For added effect (and difficultly!) students may like to wear goggles, a visor or a face shield to mimic the limited field of vision inside an astronaut's helmet.

As well as being fun, this is a good way to practice fine motor skills.

Reading List – Teacher Notes

Listed here are some of the many books available on the topics of space, rockets, the planets and the like. This list is by no means complete but just a taste of what is available.

- *Zoom, Rocket, Zoom!* by Margaret Mayo
- *Amazing Machines: Roaring Rockets* by Tony Mitton
- *Rocket Town* by Bob Logan
- *On the Launch Pad: A Counting Book About Rockets* by Michael Dahl
- *If You Decide To Go To The Moon* by Faith McNulty
- *What the Moon is Like (Let's-Read-and-Find-Out Science)* by Dr Franklyn M. Branley
- *I Want to Be an Astronaut* by Byron Barton
- *Me and My Place in Space* by Joan Sweeney
- *There's No Place Like Space: All About Our Solar System* by Tish Rabe
- *National Geographic Little Kids First Big Book of Space* by Catherine D. Hughes
- *Smart Kids: Space: For Kids Who Really Love Space!* By Roger Priddy
- *The Darkest Dark* by Chris Hadfield (a Canadian astronaut who spent some time on the International Space Station!)
- *Margaret and the Moon: How Margaret Hamilton Saved the First Lunar Landing* by Dean Robbins

PALMS

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