



Free activities from Messy Church Does Science

Chapter 1: Water

Making music

Ratings

MESS  DANGER  DIFFICULTY 

Theme

Offering our song of praise to God

Equipment needed

Jars (at least three or four of the same or a similar size); water; spoons; food colouring in a few different colours

Before you begin

Make sure your jars are the same or very similar in size and line them up ready to make your musical instrument.

Experimental method

Fill each jar with a different amount of cold water and make each a different colour with the food colouring. Gently tap each jar with a metal or wooden spoon and listen to the different sounds.

To make this a bit harder, you could talk about which jars make the lowest and highest sounds. Why is this? Do you think the food colouring might have made a difference to the note? Test this.

Big thinking

Why do the different jars make different sounds? The sounds you hear are caused by sound waves, which are themselves caused by the glass vibrating as you hit it. The frequency of sound depends on how fast the glass is vibrating. When a glass contains more water, the vibration is slower and the pitch is lower. Conversely, when the glass contains less water, the vibration is faster and the pitch is higher. If you're feeling particularly musical, try to work out how to fill the jars to create a musical scale or even a tune. The more jars you use, the more possibilities there are!

You could do this experiment a slightly different way with some plastic water bottles with different amounts of water in. Rather than hitting the bottles, blow over the top of them. Now what do you hear? Which has the highest and lowest pitch? It should be the opposite of what you found when you hit the jars. This is because in this case, it is the vibration of the air in the bottle and not the actual bottle that causes the sound you hear. In the bottle with only a little water in, there is a longer air column and the sound waves in the air vibrate slower so that the pitch of the note is slower. With a lot of water and little air, the sound waves in the air vibrate faster and the pitch is higher.

Big questions

The person who wrote one of the Psalms said, 'Let everything that has breath praise the Lord!' (Psalm 150:6). Sometimes we can praise God through words, but what do you think it means to praise God without words? Do non-humans praise God, do you think? Do trees and rivers? Do animals? How would you praise God silently? Is it possible?

Chapter 2: Earth, stars and space

Dinosaur hunt

Ratings

MESS  DANGER  DIFFICULTY 

Theme

God is; the other comes and goes

Equipment needed

Set of model dinosaurs; hoops; string

Before you begin

The dinosaur hunt in a room/hall need not be included if the group mainly consists of older or less able people. It is fun though! It is best to make some dinosaurs easy to find and some difficult to find and put them at different levels.

Experimental method

Start by hiding the model dinosaurs in your church, hall or garden. When each member of the group has found one, share information about what we know already.

Use a Venn diagram to categorise dinosaurs according to different criteria e.g. carnivores, herbivores and omnivores (see photo online). Think about which features would have enabled dinosaurs to survive in their environments better.

Construct a timeline with string. Get familiar with it by putting a cross on it and some familiar biblical/historical markers. Where would we place dinosaurs? Theistic evolution would subscribe to an old universe (13.5 billion years since the beginning) so their timeline would start then. Young Earthers would put it at 10,000 years and equate dinosaurs with monsters mentioned in the Old Testament such as dragons and behemoths mentioned in Job, one of the oldest books in the Bible.

Big thinking

Dinosaurs have been controversial amongst Christians for decades, since they relate to the theory of evolution. Christian scientists vary as to which approach they subscribe to and how they interpret Genesis. However, dinosaurs are not incompatible with trust in the biblical account, and there is lots of scientific evidence for dinosaurs.

Big questions

God designed the whole world, including dinosaurs, even though he knew they wouldn't still be alive today. What can we learn from this about how creative God is?

Chapter 3: Air

Invisible air pressure

Ratings

MESS  DANGER  DIFFICULTY 

Theme

Christians believe that God is invisible – but that doesn't mean he isn't there

Equipment needed

Paddling pool or large tray; plastic jug; water; fairly rigid plastic cups; waterproof card; lots of spare towels

Before you begin

If you can't find any waterproof card, you can make your own by covering ordinary card in sticky tape. It's best to do this activity while standing in a paddling pool, but if you have older children, a large tray works just as well.

Experimental method

Explain that you are going to demonstrate a strange effect. Take a plastic cup half-full of water, then hold a watertight piece of card to cover the top. Turn it over, still holding the card on the cup... and then take your hand away. The card should remain there, holding in the water. Discuss what might be happening here.

Set people the challenge of trying this out for themselves with different types of card and cup – are some better than others, and why? Toddlers and infants will be especially fascinated by this phenomenon – and, by the end, probably extremely wet.

Big thinking

Explain that air pressure is an invisible force pushing into all of us, and that it is pushing up into the card with greater force than the mass of the water being pulled down by gravity. (Without the air pressure, our bodies would explode – which is why space explorers wear pressurised suits.) The card provides the air with something rigid to push against. Without it, the water drops.

Big questions

How can we know if something is there, when we can't see it?

Air pressure is invisible until we see it in action. Similarly, God is invisible, but he still changes people's lives every day. Jesus came to show us what God was like, as a human being. God is much more than a 'force' – he cares deeply about us.

Bible links include: Paul's speech in Athens (Acts 17:23), John 1:18, John 5:37, Colossians 1:15.

Chapter 4: Light and colour

Chromatography: colour splitting

Ratings

MESS  DANGER  DIFFICULTY 

Theme

Parts making up the whole

Equipment needed

Coffee filter paper, preferably white; glasses of water; either a collection of coloured felt-tip pens or brightly coloured sweets, e.g. Skittles or Smarties

Before you begin

This is an experiment that can take a long time to work so is a good candidate for starting at the beginning of your Messy Church session and returning to later.

The colours we see are often very carefully created. Pick up some paint charts from the local DIY store, and see that a paint cannot just be blue, but must be 'moonlit lagoon'. You could ask people whether they have a favourite colour. But more interesting would be if they are fussy: do they like all reds or just that particular shade between burgundy and claret?

This experiment has been run as part of a forensic analysis activity, in which a message is written, and people are challenged to work out with which pen it was written.

Experimental method

If using sweets: Cut a disc of filter paper, which sits on top of the glass with a tab that drops down into the water (see photos online). Place the sweet at the top of the tab and wait for the water to soak up the paper.

If using pens: Cut long thin strips of filter paper. Using felt-tip pens, colour a line about a quarter of the way up the strip and suspend it with the bottom of the paper (but not the pen mark) in the water (see photos online). Wait for the water to soak up the paper.

This will take around 5–10 minutes. Be careful not to leave it for too long or the colours cannot be separately identified. In both cases, the colour will be dissolved into the water, but the different colourings within the dyes will separate out and be transported different distances. Note how many different colours make up the original colour.

Big thinking

Science has developed many different techniques to determine what a substance is made from. It is particularly important in police forensics to know that paint is made up from different individual dyes. A paint sample left at the scene of a crime can tell them the exact make and model of car used for the getaway. Every paint mix has its own unique chemical 'fingerprint'.

This experiment works because the different molecules of the different dyes mixed to make the original colour are different sizes. The difference in size means that they are carried different distances by the water.

Big questions

Who makes up the unique mix that is your Messy Church? Can you identify each person's contribution – big or small? The Bible has a lot to say about being the people of God but perhaps think about what Paul says in his letter to the Corinthians about the church being the body of Christ (1 Corinthians 12:12–31).

Chapter 5: Human body

Get in touch

Ratings

MESS  DANGER  DIFFICULTY 

Theme

The power of touch

Equipment needed

For two-point discrimination: business cards; glue or tape; toothpicks

For the feel bag: a variety of small objects such as (easy) cup, spoon, ball, block, sponge, fruit, sponge, rock, cotton ball, leaf, pine cone, feather, or (difficult) wood letters, wood numbers, foil, peanuts, bar of soap

For sandpaper rankings: as many different grades of sandpaper as you can find

Before you begin

The two-point discrimination test has been used by real-life neurologists, and is the most scientific and measurable. Other modalities such as pressure, temperature and vibration are also medically useful. Feel bags and sandpaper are other fun ways to explore touch.

While doing the two-point discrimination experiment, be aware that toothpicks can be quite sharp. Tell your group not to put them anywhere near eyes or ears, or to run/be silly with them.

Ask your participants what kind of information skin can carry.

Experimental method

Two-point discrimination

Stick pairs of toothpicks on to the sides of two business cards with gaps of 60, 30, 15, 7.5 and 3.75 mm. Stick a final toothpick on to the remaining side by itself. Ask the participants whether they can discriminate (without looking) between the single toothpick and the paired toothpicks on various parts of the body, such as back, arms, hands, legs, and feet, or even tongue. For each part, write down the smallest two-point gap they could differentiate as different to the single point.

Feel bag

The aim is to identify a variety of objects by 'seeing their shape with fingers'. You can do this in several different ways, such as placing single items in a sock each, several into a pillowcase, or a fancier box with tunnels attached made from old socks to put hands through. To make it more challenging, race against the clock, show the item outside the box that needs retrieving by touch alone, or wear gloves of increasing thickness.

Sandpaper ranking

Cut small squares of different grades of sandpaper (which should have a measure of roughness somewhere on the back), and write a letter on the back of each corresponding to its rank. Jumble up the letters so you don't give the game away (i.e. don't write 1=A, 2=B, 3=C). You could stick the paper to wooden blocks. Then ask the members to rank the squares in order of roughness.

You can also test pressure with filaments of fishing line of different thickness, vibration with a tuning fork, and temperature with a hot water bottle.

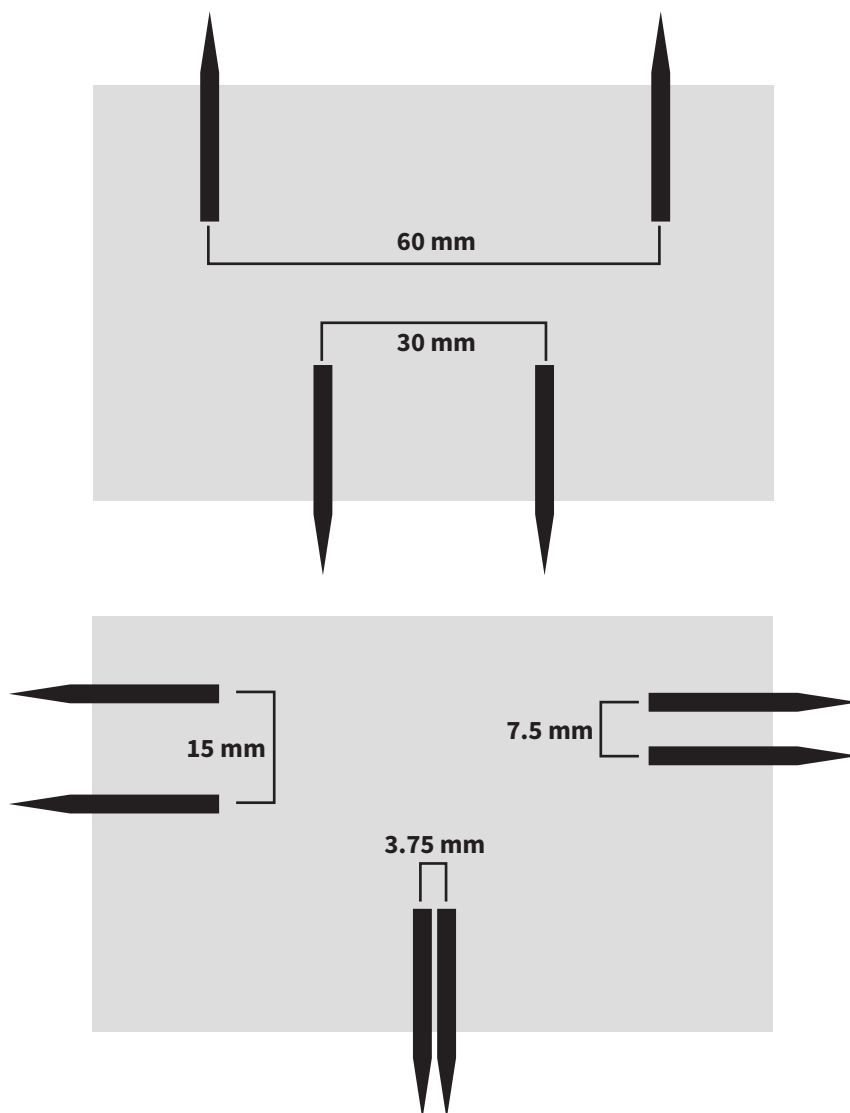
Big thinking

Skin is the largest sense organ, which can surprise us with its sensitivity and power to connect us with each other. Did your skin surprise you? What kinds of information can skin convey? The answer is not simple, but includes pain, temperature, vibration, position, pressure, shape and a lot more in non-verbal communication.

Big questions

Read Luke 5:13. How does touch change the way we feel? Can you think of examples when you needed a touch from someone? Why did Jesus often touch people who others would not?

Read 1 John 1:1. What difference does it make that God decided to become man? Why do you think God wanted to be touchable?



Chapter 6: Plants

Burning food

Ratings

MESS  DANGER **DEMO ONLY** DIFFICULTY 

Theme

Perseverance; energy changes; releasing potential

Equipment needed

Basin of water; basin of sand; stone floors (do not do this near carpet, lino or wooden floors); safety matches; long lighting tapers; tongs; dry biscuits like plain Ryvita, Ritz crackers, Jacobs crackers; copies of the packaging of the biscuits; timer

Before you begin

Different biscuits burn differently according to their ingredients. The sand is there in case the biscuit falls off the tongs, so you can relight the biscuit. The water is there to drop spent biscuits and ensure that any smoulderings do not reignite. Remember that church leaders take a dim view if your grade-1 listed building is consumed by a cracker-induced conflagration.

Experimental method

Get your participants to read the ingredients on the packages. Predict which biscuit will burn the best. There needs to be a reason!

Break the biscuits into bits: Ryvitas can be broken into four, Ritz crackers into two. Hold the biscuit part in the tongs. Light a match and use this to light the taper. Holding the biscuit over the sand tray, use the taper to light the biscuit (see photos online). Once the biscuit has finished burning, drop it into the water basin. Repeat with the remaining biscuits, timing which is the quickest and slowest to burn.

Big thinking

It might take perseverance to set the biscuit on fire, but once it gets burning it can stay alight. Ask people if they were surprised that the biscuits caught fire. What keeps it alight? This is because they contain fat that comes from oil made from plants such as sunflower seeds, olives, soya beans, nuts and other vegetables. It is spread through the biscuit and cannot be seen, which is why it might be surprising it caught fire! Fat is one way our body gets energy and helps us to live. You can see how much energy is in the biscuit by looking at the side of the packet—it is measured in Joules. But more often we talk about calories, which is an older way of measuring energy. Biscuits are nice to eat and, while the fat they contain helps us to have energy, too much of it is not a good thing as we can put on weight. In our bodies, the energy is released not by burning but by chemicals reacting with the fat to release the energy.

Vegetable oil isn't just used in cooking and making food. You can also make fuel to drive cars, lorries and tractors – even aeroplanes! In fact, in some parts of the world, the diesel that we put in our cars contains some fuel made from vegetable oil. The car engine burns the vegetable oil to release the energy in the fat just like the burning biscuit!

Big questions

Talk about how God has given each one of us something to help share his life – 2 Timothy 1:6: 'For this reason I remind you to fan into flame the gift of God.' How do you think you can keep the flame burning? Prayer? Using your gifts to serve God and others? The encouragement of other people? What might put the flame out? Perhaps when we don't use it for God, but just for ourselves? Or we do not trust God and so lack confidence to use it?

Chapter 6: Plants

Smells

Ratings

MESS  DANGER  DIFFICULTY 

Theme

Ephesians 5:2: Christ a fragrant offering; detecting using experience

Equipment needed

Smelly things such as: crushed garlic, cardamom pods, freesia flowers (but be warned that 4–10% of people cannot smell these), pine needles, an old sock, grated chocolate, tea, ground coffee, squashed lemon, sliced cheese, onion, etc.; opaque jars (old jamjars covered in paper); lids for the jars so that the room is not filled with EVERY smell; cheesecloth or similar netting material to cover the openings to stop people looking in once the lid is removed

Before you begin

Ideally you want around six to eight jars with different smells. Feel free to get creative!

How do we detect what's in the jars? How easy is it? Our nose can detect many smells but can get confused very easily, especially if the smells are similar. Trained noses like those of perfumiers or deodorant testers (yes, really...) can detect with some accuracy the scents of hundreds of substances. So can people identify the substance(s) inside the jar without looking?

Experimental method

Make up jars of single substances. You could also make up some 'expert' jars in which you put two or three things: coffee, chocolate and garlic; or tea, mint and cardamom (see photos online). Be creative and have fun! You could create an answer sheet for people to write on if this is easier, or just have them guess out loud.

Keep secret what's in the jars, although you might like to label them A, B, C, etc. and have a 'cheat sheet' for yourself to confirm the people's answers.

Big thinking

We can only identify what's in the jars if we have already had some regular experience of the thing. Different receptor cells in the nose are triggered by differently shaped molecules, sending electrical signals to the brain. This then cleverly takes the signals pattern and sees if it matches known patterns in your memory. We are indeed 'fearfully and wonderfully made'...

Big questions

People may have had to guess the smells, especially in the expert jars. Sometimes in life, we have to make decisions based on experience, and sometimes we have to have a guess. When we make decisions, how can we make good decisions, ones that are fragrant to others, rather than bad ones which would be a stench?

Chapter 6: Plants

Seaweeds

Ratings

MESS  DANGER  DIFFICULTY 

Theme

Identification; discernment

Equipment needed

Seaweed identification guide (easy to source online); seaweeds (make sure you know what they are); buckets of sea water to keep the seaweeds fresh between collection and your session; newspapers; plastic sheets; hand gel; labels; pens; pins; small prizes (optional); edible seaweed (optional)

Before you begin

You will need to be able to identify seaweeds, even if it's just the brown bladderwracks or spiral wracks. You may want to get some green ones if you are feeling adventurous. Reds are annoying and bleach to look green or brown, so be careful. There may also be local rules about how much seaweed you can collect; some countries require a licence to do so. Work hard to remove any little creatures who inhabit the seaweeds: serrated wrack is loved by tiny flat periwinkles (who come in different colours) and little crabs too. So be gentle.

Experimental method

Pre-sort the seaweeds into each bucket so that they are easy to pull out for each session. Lay out plastic sheets and place newspaper on top (to soak up water and reduce mess when tidying away). Lay out a few strands of each type on to the newspaper (see photos online).

Challenge people to guess the names of the seaweeds. Get the people to place the name labels on the seaweeds. Extra challenge: can you name where on the shore they come from? If you would like, give out small prizes for those who guess correctly!

You could also bring in some edible seaweed for the adventurous ones in your group.

Big thinking

Each seaweed has a range of adaptations which allow it to exist at particular places on the shore, like slime, curling or bladders. Identifying them requires a degree of judgement or discernment, and relies on matching general features with more particular ones.

Big questions

You could think about discernment (see Matthew 16:1–3, Luke 12:54–56). How do we judge whether someone is a good person to be friends with or not? How do we know we are right? What happens if we are wrong? What about larger situations? How do we know if the decisions we have made are right or not? We find some things easy to identify, so why is it so hard to get it right with people or situations? Can seaweeds change their abilities to live where they are? What would you change about yourself? Why does the Bible talk about being a Christian as a new creation?

Chapter 7: Animals

Evolution: the grand adventure of life

Ratings

MESS  DANGER  DIFFICULTY 

Theme

God creates creation to create itself

Equipment needed

Animal templates printed off (download them online); set of dice or dice templates printed off (download them online); scissors; sticky tape

Experimental method

The object of the game is to construct a new animal using the parts (body, head, tail, front and rear limbs) of the animals depicted in the figures. You need three dice, or you can make them using the templates provided. Photocopy the animals, or draw your own, and cut them out. Also cut along the dotted lines to use the parts of each animal, and cut out the bird's wing.

Designate the yellow die to tell you what kind of animal to include in your evolving creature: 1 – snake, 2 – fish, 3 – frog, 4 – bird, 5 – mouse, 6 – your choice. The other two dice will tell you which parts to use, but you need both numbers the same to be able to include the parts in your animal as follows: double 1 – body; double 2 – head; double 3 – tail; double 4 – forelimbs; double 5 – hind limbs; 6 – free choice. You can use parts in any order but you must start with a body (1 or 6 on the yellow). And, yes, you can put wings on your snake's body, but the snake only contributes head, body and tail.

Big thinking

One thing that is special about humans is our big brains. God has given us the means to look around us and weigh the evidence of our own existence as a created thing – and God is who we have been able to discern as our creator. The biblical book of Genesis speaks of our origins. It tells us in the most wonderful and beautifully poetical form that God created us, out of the earth, but it doesn't tell us in detail how. Now, God has given us science to try to understand a bit more about how he did this, and it is clear that it was through the process of evolution. But we are still trying to understand how that works. Through the science of genetics, it is becoming clear that elements we thought rather random are actually less random than we thought, and that there are goals for evolution determined by what works and what doesn't in a process that Charles Darwin first recognised and called natural selection. So the evolution game has a rather random element – dice – shuffling genes, and a goal (a telos): you need to get the right numbers to win.

Big questions

Christians read the book of Genesis in different ways. Some say Genesis is a very special kind of poetry called allegory, which tells us some deep truths about our relationships with God and the rest of creation, but not in detail how he did it. So Genesis 2:19 says: 'Now the Lord God had formed out of the ground all the wild animals and all the birds in the sky,' and that he created us humans out of the earth – that is even what the name Adam means; we are of the earth. But creation is ongoing: as the Christian theologian Thomas Aquinas (1225–74) called it, Continuous Creation. So talk about how the book of Genesis captures in its first three chapters what you know about human origins from science, and how they are telling the same story in different ways and how, in an amazing way, charged with wisdom, and with our active participation, God has been 'playing the evolution game'.

Chapter 8: Power and energy

Speedboat matchsticks

Ratings

MESS  DANGER  DIFFICULTY 

Theme

The energy of water; floating on water

Equipment needed

Water; bowl or shallow plate; washing-up liquid; cotton bud; spent matchsticks; ground black pepper (optional)

Experimental method

Fill a bowl with water and float a matchstick on the water in the centre of the bowl. Place a small amount of washing-up liquid on one end of the cotton bud, leaving the other end dry.

With the dry end of the stick, touch the water just behind the match. Watch what happens. Now, use the end with washing-up liquid on to touch the water just behind the match. Watch what happens. The match should shoot across the water like a power point. How many times can you make it do this?

You could do this experiment in a large tray of water, dropping in lots of matchsticks, and get each participant to experiment with moving the matchsticks themselves.

Optional: Dispose of the water, and wash the bowl to ensure no washing-up liquid remains. Then refill with water and sprinkle ground black pepper on so the surface is covered. Now touch the centre of the water with the cotton bud with washing-up liquid on. What happens? (The black pepper should shoot away to the edge of the bowl.)

Big thinking

Water molecules are like a battery – they have a positively and a negatively charged end. The electric charges attract one another and make the water stick together. But at the surface, the water does not stick to the air above, so they pull towards one another more. This is called surface tension and it means that small, light objects can float on water.

Adding washing-up liquid pushed the water molecules at the surface apart, which pushes the boat along. The same thing happens with the ground pepper – it gets pushed to the edge of the bowl. Why does the pepper move farther and faster than the matchstick when you touch the water with the cotton bud? Perhaps because the individual particles are lighter?

You can see water tension in a glass – just look at where the water touches the edge: it is slightly higher than the level of water in the glass. Or pour water on to a water-resistant surface. The water clumps together in drops because of the energy of surface tension. And on a pond, some insects like ‘water boatmen’ can walk on water because surface tension holds them up.

Big questions

Look at the story of Jesus and the children in Matthew 19:13–14. The disciples tried to push the children away, but Jesus kept on drawing them back. Have you ever known a time when you felt pushed away from Jesus? Or from someone else? How might you be more like the surface tension of the water and bring people together? Jesus calls this being a ‘peacemaker’ – it’s a very valuable part to play at home, at school, at work, in politics...

Chapter 9: Transformations and reactions

Meringues

Ratings

MESS  DANGER  DIFFICULTY 

Theme

Psalm 34:8 ('Taste and see that the Lord is good'); Exodus 13:21 and 19:9 (God in the cloud); Psalm 119:103 ('Your teachings are sweeter than honey')

Equipment needed

Mixing bowls; hand or electric whisks; baking sheets (if baking at Messy Church) or paper plates (if taking home to bake); baking paper; eggs; caster sugar (one medium egg white per 55 g caster sugar)

Before you begin

Our experiment sees what happens as egg white is transformed as it is whisked. Egg white is made of protein and water. We will use the whisked egg to make delicious meringue. It is important to supervise to keep little fingers out from the inside of whisks. People will want to taste the mixture but remember it is made of raw egg which can contain salmonella bacteria (you could use powdered egg whites instead).

Experimental method

First separate the eggs – no egg yolk must go in your bowl at all. Use a separate bowl to do this and then pour in to prevent messing up a whole batch of eggs. Whisk the egg whites slowly at first, then faster. This will take a long time if you are using a hand-turned mixer but is great fun and leads to turn-taking! With an electric whisk, watch fingers and again take turns and get people to watch closely. Once you have white, stiff peaks the egg whites are ready.

Add the sugar slowly, a few tablespoons at a time, and whisk after each sugar addition. Be careful not to overbeat. Place two spoonfuls of mixture on to the baking paper and repeat as many times as necessary.

If your participants don't want to make the mixture, you could instead give each person a piece of baking paper with a mould/outline (cookie cutters, or make your own out of cardboard). They can spoon the mixture into their mould ready to be cooked.

Cook at home or in Messy Church depending on your oven space and time. Cook in the oven on a low heat for about 45 minutes, then turn the oven off, leaving the meringues inside for 15 minutes more.

Big thinking

When we whisk the egg white, two things happen: firstly, the whisk pushes through and unfolds the protein molecules in egg white; secondly, it traps air bubbles in the protein to make a foam. The oven dries out the foam to make meringue.

Big questions

Making meringue transforms the unattractive egg white to yummy meringue. How has Jesus transformed you?

'The people remained at a distance, while Moses approached the thick darkness where God was' (Exodus 20:21). Why do you think God appeared in a cloud rather than face to face? Do you sometimes feel your faith is foggy?

The Bible talks about tasting God and God's teachings being sweet. How have you found God to be 'sweet'?

Chapter 9: Transformations and reactions

Thaumatrope or spinner

Ratings

MESS  DANGER  DIFFICULTY 

Theme

Holy Spirit; sin; forgiveness

Equipment needed

White card; felt-tip pens or coloured pencils; small circular lid or mug to trace; scissors; string; small hole punch

Before you begin

All ages will have fun making this spinning toy known as a thaumatrope (or mini-movie). It appears magically to create one picture from two and demonstrates one of the visual concepts behind movies.

There are two science concepts to bring out here. The first is about the transformation of your energy to make the card spin and the second is how the brain works to make the images appear to be one.

Experimental method

Either pre-cut 5 cm circles of card or make that part of the activity depending on the ages and time available.

For each spinner, cut two lengths of string about 30 cm long. Make two small holes through your card with a small hole punch or the end of pointed scissors. Tie one piece of string to each side. Draw a design on one side and then upside down on the other.

Hold each end of the string and move your hands in circular motions about 10 to 15 times to wind up the string. Pull tightly on the end of the string and watch what happens to the card.

Big thinking

What happens to the card? It should spin quickly as the string unravels. This shows how energy is transformed into different forms. When you moved your arms to twist the string you used your energy and this transferred to the string as potential energy, or energy which hasn't been used yet. When you pull the string taut, the potential energy transforms into kinetic or moving energy and spins until all the energy is used.

As a bonus science fact, you also will have noticed that the images on your circle spun around and looked like one picture. This is because your brain holds the image for a moment after it goes, so that your brain sees both images together.

Big questions

We are filled with 'potential' energy through the Holy Spirit. But we need to 'release' that energy and allow it to work. How can you use that energy to transform our world?

Proverbs 3:6 (NRSV): 'In all your ways acknowledge him, and he will make straight your paths.'

God is always with us, but when he's moving in our lives—that's when we live life to the full. Sometimes we feel we have run out of energy and action; the things we do drag us down; and we feel lifeless like the string. We need to 'straighten out' and put God in charge before we can use God's good energy. What happens when we do that?

Chapter 10: Time and measurement

Hard-boiled egg?

Ratings

MESS  DANGER  DIFFICULTY 

Theme

Seeking truth

Equipment needed

Two eggs (one raw, one hard-boiled) of similar size and weight; permanent marker pens; flat-bottomed bowl; kitchen scales

Before you begin

Explain that in doing scientific experiments, making accurate observations is important to finding out the answer to questions we ask about what things are like or how something works. You are going to use different methods – without cracking the shells – to try and determine which of two eggs is raw, and which is hard-boiled. We are looking for any differences between the eggs that we can find.

Experimental method

Begin by marking the eggs 1 and 2 with the marker pen.

- 1 Weigh the eggs. Is one heavier than the other?
- 2 Put both eggs in water. Do they float or sink? Do you notice any difference in how they sit in the water?
- 3 While they are in the water, try and spin them. Do they behave differently?
- 4 Take them out of the water and place them on a smooth surface. Spin each of them and then stop them with your finger. How do they behave?

Based upon your observations, which egg is the hard-boiled one? Once you have made your choice, crack one on your head. You might want to have kitchen towel available just in case you make the wrong choice!

Big thinking

Whether hard-boiled or raw, the eggs should weigh about the same. They both should also sink in water, but while the hard-boiled egg lies on its side, the raw egg will lie more vertically. This is because the small amount of air inside the egg is free to move around and so goes to the top. Also, the hard-boiled egg will spin easily underwater, while the raw egg does not spin as well. On a smooth surface, both eggs will spin easily, but while the hard-boiled egg will stop when it is touched, the raw egg will continue to spin.

The difference in the behaviour of the eggs when they spin is that one is a solid, while the other is filled with a fluid. The hard-boiled egg spins at the same speed all the way through. When it is stopped, all parts of it stop at the same time. When the raw egg is stopped, only the shell is stopped – the inside fluid still spins, and this makes the shell start to spin again. This behaviour is the main way to determine if the egg is raw or hard-boiled.

Big questions

Read Luke 6:43–45: 'No good tree bears bad fruit, nor does a bad tree bear good fruit. Each tree is recognised by its own fruit. People do not pick figs from thorn-bushes, or grapes from briars. A good man brings good things out of the good stored up in his heart, and an evil man brings evil things out of the evil stored up in his heart. For the mouth speaks what the heart is full of.'

Talk about how we might know if people are trustworthy. We cannot look inside them, but we can look at how they behave and act towards others.