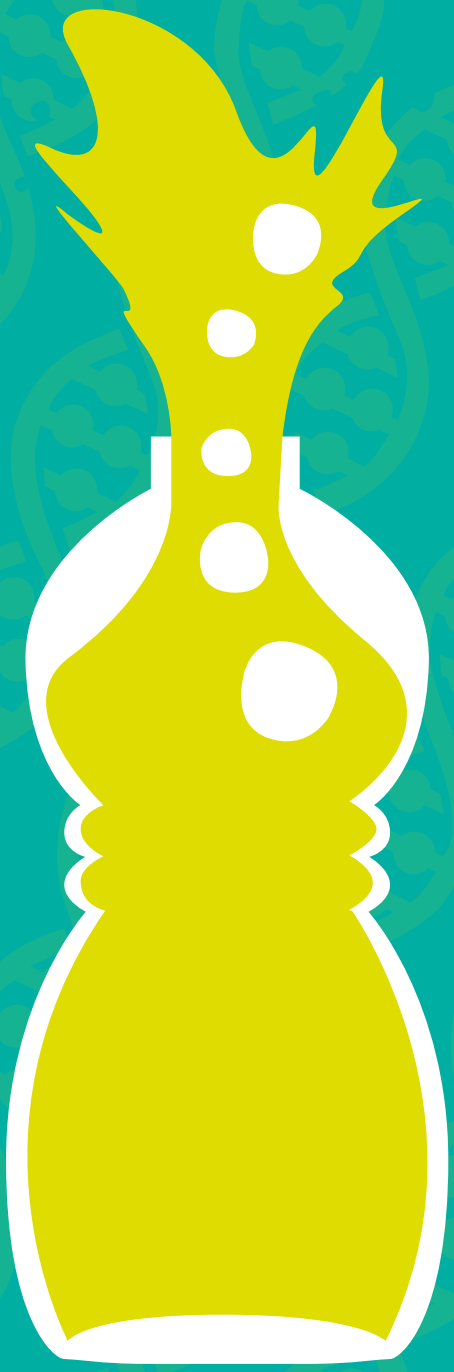
Messy Church®

does science

after-school club

Ten fun-filled sessions!



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Contents

Introduction

This pack is for churches who want a tried-and-tested way of contributing to the life of their local school, or for schools who would like to hold an after-school event with the values of Messy Church. The idea is simple: an after-school club for families to explore faith questions through science. To take place after school, ideally in the school itself; for team, carers/parents and children to have a snack together and hear the Bible story of the day; have fun doing two to three science activities related to that story; finishing with a gathered time to discuss and bring the session into a focus on the Christian faith and, if appropriate, join in a prayer together. The session can be facilitated by a team from the local church, older children, teaching staff or a mixture of any of these.

Each session will:

- Be approximately an hour long.
- Incorporate the Messy Church values: being Christ-centred, hospitality, creativity, celebration and being all-age.
- Work alongside the exploration of the sciences: several scientific disciplines including chemistry, biology, geology, physics, astronomy and zoology.
- Be related to the Messy Church model but adapted for an after-school club setting. We envisage this as:
    - A welcome with light snacks and refreshments as people arrive and sign in
    - 30–40 minutes of Bible-based science activities
    - A 20-minute celebration with the emphasis on using interesting and challenging questions to encourage families to share what they've learned.

The content of the sessions will mirror the topics/chapters found in *Messy Church Does Science* and are as follows:

1 **Water** – looking at sound waves and forces such as buoyancy, density and supercooling.

2 **Earth, stars and space** – exploring the universe and its laws.

3 **Air** – looking at air pressure and resistance, as well as things like convection current.

4 **Light and colour** – diffraction, chromatography, linear optics and the like.

5 **The human body** – exploring how different parts of the body work.

6 **Plants** – looking at tree rings, camouflage, seeds, osmosis, etc.

7 **Animals** – evolution, the classification of animals and the world of insects.

8 **Power and energy** – kinetic energy, batteries, insulation and similar topics.

9 **Transformations and reactions** – a chemistry-based chapter exploring chemicals/gases such as carbon dioxide and hydrogen peroxide.

10 **Time and measurement** –exploring the importance of accurate measurement in science: length, heat, weight and time.

The after-school club will give an opportunity for greater interaction between churches, schools and the local community, improve confidence and skills among the people involved in exploring scientific topics, help people better appreciate the interaction between science and faith and make space for families to ask questions about science and about faith.

While there are many differently governed schools in which this club would be effective, those who are connected to the Church of England will be aware of the bishops' vision paper of February 2019, *Growing Faith*, which encourages churches, schools and households to work together to resource and support households to grow in faith together. Among other things, it wants to see:

- Clergy and lay ministers who are confident in supporting households in sharing faith at home.
- Congregations which nurture and support the faith of children and young people.
- Churches which serve and are served by their local school communities, actively building strong relationships between church, schools and households.
- Children and young people who are confident to share their faith with their peers and families.

This club is one way to make these aspirations a reality.

Every church will have a different relationship to the school in its community, so it's impossible to give a universal list of what needs to be done to make it possible to run this club. However, here are some suggestions:

- Make an appointment to talk to the head teacher, and be clear about what you're proposing and open to their suggestions for contextualising your proposal.
- Follow all safeguarding guidelines assiduously.
- If possible, develop an all-age team of leaders and facilitators. Scientists will probably pop out of the woodwork, keen to join in.
- Brief the team fully with the bigger picture as well as specific instructions for the activity they're running. Help them to encourage questions and to talk about and around the activity using the notes provided.
- Hold a short reflection meeting at the end of each session to thank people, note what went well and what to develop or avoid next time.
- Keep the school fully informed of what happens each week.

Practical suggestions

- Name badges or sticky labels for team, children and adults are useful.
- Decide with the school what is the most appropriate way to sign people in and what procedures you need to follow to keep their data.
- The snack time not only helps energy levels but creates a hospitable space where people feel welcomed and safe to ask questions.
- Adults appreciate tea and coffee with their snack.
- If you can get permission, take photos and videos to share with the school and church.
- Ideally, have a leader at each activity to lead it, plus a helper or two to help after the explanation or demonstration.
- If time or inspiration runs out, a very simple all-purpose prayer is to go round at the end and share one thing each person is thankful for, amazed by or determined to find out more about, with everyone else saying 'Amen'.
- Give the families lots of encouragement to try out the experiments at home: send any excess materials home with them in bags if you can afford to.
- Print off the take-home ideas and hand out at the end.
- You could give every family a certificate for taking part.
- Make sure you have a good ratio of team to families, one that you feel safe and happy with.
- If the school is happy for you to do so, give out publicity for your Messy Church so they can carry on the friendships formed at the club.

Working scientifically objectives

Each activity contains relevant science subject knowledge links to the National Curriculm, provided by Tessa Senior. The following are the investigative skills that each year group should also be developing.

Years 1 and 2

During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking simple questions and recognising that they can be answered in different ways.
- observing closely, using simple equipment.
- performing simple tests.
- identifying and classifying.
- using their observations and ideas to suggest answers to questions.
- gathering and recording data to help in answering questions.

Years 3 and 4

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them.
- setting up simple practical enquiries, comparative and fair tests.
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables.
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.
- identifying differences, similarities or changes related to simple scientific ideas and processes.
- using straightforward scientific evidence to answer questions or to support their findings.

Years 5 and 6

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
- using test results to make predictions to set up further comparative and fair tests.
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.
- identifying scientific evidence that has been used to support or refute ideas or arguments.

1 Water: sink or swim?

> “We have had such an amazing experience… The families are already saying how much they are going to miss it from their week. As a team, although it has been a lot of extra work for us, it has also been well worthwhile. The contacts we have made and the conversations about science and faith we have shared, as well as seeing people engage with the materials, with lots of fun and laughter, have been priceless for all involved.”

Bible passage

Immediately Jesus made the disciples get into the boat and go on ahead of him to the other side, while he dismissed the crowd. After he had dismissed them, he went up on a mountainside by himself to pray. Later that night, he was there alone, and the boat was already a considerable distance from land, buffeted by the waves because the wind was against it.

Shortly before dawn Jesus went out to them, walking on the lake. When the disciples saw him walking on the lake, they were terrified. ‘It’s a ghost,’ they said, and cried out in fear.

But Jesus immediately said to them: ‘Take courage! It is I. Don’t be afraid.’

‘Lord, if it’s you,’ Peter replied, ‘tell me to come to you on the water.’

‘Come,’ he said.

Then Peter got down out of the boat, walked on the water and came towards Jesus. But when he saw the wind, he was afraid and, beginning to sink, cried out, ‘Lord, save me!’

Immediately Jesus reached out his hand and caught him. ‘You of little faith,’ he said, ‘why did you doubt?’

And when they climbed into the boat, the wind died down. Then those who were in the boat worshipped him, saying, ‘Truly you are the Son of God.’

MATTHEW 14:22–33

Reflection

Belief and doubt: scientists and people of faith need belief. We need the belief that there is something bigger out there, something to step out of the boat for, something to aspire to and something to walk towards. We need to keep our eyes fixed on our goal. And when we start to doubt, we need to know that we won’t go under, but that someone is there to reach out and catch us; we need to be confident that it’s worth taking risks and getting things wrong, because ultimately someone bigger than us is looking after us, looking after the bigger picture.

#discipleship: team

How does this session help people grow in Christ?

This session helps us understand that doubt and questioning can be important parts of our journey with Jesus.

#discipleship: families

Take-home idea

When you get home and have a bath, see if you can re-enact this story with your bath toys.

Question to start and end the session

So… what happens when we feel as if we’re sinking under our questions and doubts?

Activities

1 Wave machine

YOU WILL NEED:
water; plastic bottles; blue food colouring; vegetable oil

Before you begin

Remember that oil can be messy, so it may be a good idea to have some kitchen paper close by in case of spillages.

Experimental method

Pour a cup of water into the bottle, add a few drops of blue food colouring and then a cup of vegetable oil, and put the lid on the bottle. Place the bottle on its side and the liquids will separate, with the oil on top. Tip the bottle gently backwards and forwards to create waves.

Big thinking

Why do the liquids separate? They separate because of their different densities; oil is less dense than water and so the oil will sit on top of the water. Have you ever noticed that when you've got oily hands it can be very difficult to wash off the oil? It is the different densities of the liquids which makes this happen. Similarly, it can be tricky to wash up an oily pan with water.

The waves occur when the bottle is moved from side to side because the rocking action means that energy moves through the liquid in the bottle, creating waves.

In the real ocean, waves occur in a similar way when the wind causes energy to move through the water. Lots of interesting wave and ocean facts can be found at this website: oceanservice.noaa.gov/facts/wavesinocean.html

Big questions

Can we expect our lives to be calm and 'wave-free'? What 'rocks your boat' at the moment? Where do you see Jesus in that? A long way off, like when the disciples first saw him, or as close as Peter was when Jesus caught his hand?

National Curriculum links

Year 2 – Uses of Everyday Materials

- find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Year 6 – Properties and Changes of Materials

- compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.
- know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.

2 Water rockets

YOU WILL NEED:

a two-litre plastic bottle half filled with water; a cork wide enough to plug the bottle; duct tape; a pump with a needle long enough to go right through the cork (such as a football pump); a launcher made out of strong card or wood; a sheet of card

Before you begin

Find a safe, clear outdoor space to launch your rockets and make sure any younger children are supervised at a safe distance from the launch pad. When making the launcher, the material used must be very strong, strong enough to support the weight of a bottle half filled with water.

You should of course also retrieve your bottles after they have been launched.

Experimental method

Plug the bottle securely with the cork and wrap a piece of duct tape around the cork to make it easier to pop off. Turn the bottle upside down and place it carefully into the launcher stand. Use the sheet of card to make a cone shape to stick to the bottle to give it a rocket shape. Insert the needle of the pump through the cork into the water in the bottle (you may find that it is easier to make a small hole in the cork first to stop the needle getting blocked with broken cork). Begin pumping and the rocket will fly into the air!

Big thinking

Why does the rocket fly? As air is pumped into the bottle, air pressure inside the bottle will increase. This pushes on the water in the bottle. Water is an incompressible fluid – if you squeeze it, its volume does not change. So the increase in air pressure is transmitted through the water to the cork. After a while, when the pressure pushing down becomes too great, the cork will pop out of the bottle. The water is pushed out of the bottle, which causes the rocket to react in the opposite direction and fly into the air – and you will probably get wet! This is an example of Isaac Newton's Third Law of Motion, which says that for every force there is an equal and opposite reaction. You can find a video demonstration at science-sparks.com/2012/03/12/making-a-bottle-rocket

Big questions

When have you felt your faith in God was 'flying' and going somewhere exciting and direct, like this rocket? Can life be like that all the time, do you think? Why (not)?

National Curriculum links

Year 4 – States of Matter

- compare and group materials together, according to whether they are solids, liquids or gases.

Year 6 – Forces

- explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- identify the effects of air resistance, water resistance and friction, that act between moving surfaces.
- recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

3 Moulded plasticine

YOU WILL NEED:
a large bowl of water; plasticine (have plenty as it doesn't work so well once it's wet)

Before you begin

For most effective results, make sure your two starting pieces of plasticine are very similar in size.

Experimental method

Take a small piece of plasticine and mould it into a shallow bowl. Place it into the bowl of water and watch it float. Now, take the plasticine and mould it into a ball shape. Ask people what will happen when they place it back in the bowl of water. Place it back in the water – does it behave as they thought it would? (It should sink this time.) Ask people if they can explain why the same weight of plasticine would both float and sink.

Big thinking

An object placed in a liquid has two forces acting on it: the force of gravity, pulling it downward trying to make it sink, and an upward buoyancy force in the liquid trying to keep it afloat.

Over 2,000 years ago, while having a bath, the Greek mathematician and inventor Archimedes realised that the buoyancy force was equal to the weight of water pushed aside by the object.

Plasticine has a density which is greater than water. So, when you roll it up into a ball, the weight of the ball is greater than the weight of water it pushes aside. The buoyancy force is less than the force of gravity pulling the ball down, so it sinks.

When you make the plasticine into a shallow bowl, the object now includes a lot of air, which is less dense than water. The weight of the object is lighter than the weight of the water it pushes aside when it is placed in the water, and the upward buoyancy force is larger than the pull of gravity, and so the plasticine floats.

This is how huge ships made of very dense iron float when, if they were crushed down into a block of iron, they would sink. Boats sink when they get a hole in them because water replaces the air and so the weight of water pushed aside is less than the whole weight of the boat and water that fills it.

Big questions

What sort of forces mould the shape of you? What was the biggest force shaping Peter's life, would you say?

National Curriculum links

Year 1 – Everyday Materials

- identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock
- describe the simple physical properties of a variety of everyday materials
- compare and group together a variety of everyday materials on the basis of their simple physical properties.

Year 2 – Uses of Everyday Materials

- find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Year 4 – States of matter

- compare and group materials together, according to whether they are solids, liquids or gases.

Year 5 – Forces

- identify the effects of air resistance, water resistance and friction, that act between moving surfaces.

Celebration

Gather together and talk about what you enjoyed today and what you learned that you didn't know before.

Invite everyone to imagine it's been a long day and they've been outside listening to Jesus' stories, then taking bread and fish around to crowds of people, then picking up all the leftovers. Now they're out on a lake in a small boat and it's getting windier and windier.

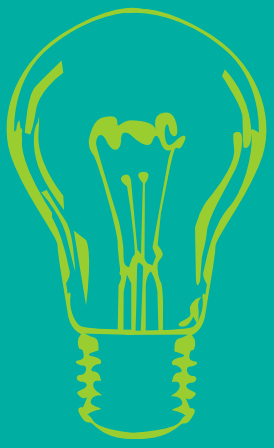
Read the story for today.

Pass round a bowl of water. As each person takes the bowl, invite them to ask one brilliant question about today's story. There's no need to answer them, but if there are some really good ones, you might invite everyone to see if they can find out the answer over the coming week.

One thing that is true of both science and of faith is that not being happy to 'stay in the boat' is really important. Peter might have nearly sunk, but he also got the amazing excitement of being able to walk on the water. Jesus didn't let him go under, even when his faith disappeared, but reached out and caught him. Do we trust Jesus will catch us, even when – or perhaps especially when – we have lots of questions?

Prayer

Give everyone a paper square and a pen. Write your prayer on your square, then fold the corners into the centre of the square. Place your folded square in a large bowl of water and watch it open out.



This pack is for churches who want a tried-and-tested way of contributing to the life of their local school, or for schools who would like to hold an after-school event with the values of Messy Church. Based on **Messy Church Does Science** (BRF, 2017), these ten sessions will help you run an after-school club for families to explore faith questions through science. Each session focuses on two or three science activities, with further ideas for a Bible-based celebration and, if appropriate, a prayer.

The sessions cover the following themes:

- Water
- Earth, stars and space
- Air
- Light and colour
- The human body
- Plants
- Animals
- Power and energy
- Transformations and reactions
- Time and measurement

Lucy Moore is the founder of Messy Church. She promotes Messy Church nationally and internationally through training and speaking events, and is the author of a number of books for BRF.

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