



Delve Into the Deep

Slippy Sinkholes

The Marble Arch Caves are delighted to be part of the Northern Ireland Science Festive 2021. This year we are happy to showcase three practical science experiments and demonstrations to help both teachers and students to get hands-on experience with engaging activities based around the themes of caves.

These activities form part of our teacher resource packs, available to download from our website at <https://marblearchcaves.co.uk/2021/02/08/delve-into-the-deep/>. Within these packs you'll find our practical experiment cards, lesson outcomes, instructions and methods, class questions, our lesson outline/plan and our plenary ideas.

To help teachers and students with their experiments the Marble Arch Caves team have also created a series of three videos, to demonstrate the activities and to aid student learning with some background information and ideas for extension activities. The three experiments are Fantastic Formations, Slippy Sinkholes and Raging Rivers. These can be accessed via Youtube at;

<https://www.youtube.com/channel/UCRUTEghQo6RYoFCfNNneuiA>.

Experiment 2: Slippy Sinkholes – Beneath the Earth



Newby Moss. Stephen Oldfield

This activity is designed to help students gain a greater understanding of local landscapes and the features which tell us more about what's happening beneath the surface. Underneath the ground different layers of rock and soils exist across Northern Ireland. Laid down over time in different ways, the layers of earth and rock may look still and quiet but lots of interesting things are happening.

The processes which shape our world above ground occur underground too. The local geology and hydrology, the rocks and water, can lead to impressive features forming underneath the surface which can lead to dramatic things happening above ground as a result. In Ireland we find sinkholes, also known as dolines, depressions formed when underlying limestone bedrock is dissolved by groundwater.



Equipment & Materials

Here you find a list of items and materials students will need in order to begin making their very own sinkhole. We have also provided a list of key words which students can research before they begin their experiment. This may help them develop a basic understanding of the geology (the rocks and landscape) and the hydrology (the water) of our local landscape. These are also covered in our Youtube tutorial - <https://youtu.be/7HKYCAI3yeo>

You will need

- A jar.
- Some dry soil.
- A toilet paper tube.
- Sugar, or flour (a material that dissolves in water)
- A jug
- Water

Key words

- Erosion
- Dissolve
- Solution
- Subside
- Cave
- Soluble
- Insoluble

Student Learning outcomes.

I can:

1. Read and carefully follow written instructions.
2. Explain what is happening using appropriate keywords.
3. Record my results and observations of what is happening.
4. Suggest improvements to the experiment and other things we can try.

Tick (☑)

Method - this can be used in conjunction with our online tutorial

1. Collect a jar which is taller than the height of a cardboard toilet paper tube.
2. Place a small amount of soil into the jar to act as a base which will support the tube.
3. Place the tube upright in the centre of the jar and push down gently so that the tube supports itself upright.
4. Fill the jar, outside of the cardboard tube, to $\frac{2}{3}$ full with dry soil.
5. Pour the flour/sugar into the centre of the tube up until it reaching the top of tube. This will represent our rock layer which is more easily dissolved.
6. Very carefully pull the tube from the jar, being very careful not to mix the soil and sugar together too much.
7. Top up the jar with some soil, make sure the sugar or flour is well covered. This will represent the land at the surface.
8. Pour some water into the jar, and watch what happens. Slowly keep adding more and more water and record the movement and direction of the soil. Note, adding too much water too quickly can flood the jar.

In this experiment, the flour or sugar represent limestone rock beneath the surface of the land, and the soil represents the rock that is not dissolved.

Lesson outline.

Preparation

1. Decide on group sizes and composition based on individual needs of pupils.
2. Source a jar, dry soil, toilet paper tube, sugar or flour, water for each group plus one set for the demonstration. A funnel is also useful for adding the sugar, but not essential.

Introduction

Key points:

1. Water can flow below the ground in limestone environments, also known as karst landscapes.
2. Water erodes rock and washes away soil. Limestone is soluble, it dissolves.
3. A sinkhole forms when water washes away a pocket of soil and eventually the ceiling caves in.

Useful videos

https://www.youtube.com/watch?v=xlu6i6IT_vk sinkhole animation (first 2mins).

<https://youtu.be/e-DVIQPqS8E?t=238> Engineering sinkholes interesting experiment from 3:58

Demonstration

Key points:

- We need to keep the soil separate from the sugar to allow the sinkhole to form.
- Make sure to cover the first layer of soil and sugar with a good layer of soil.
- Make sure to add only a **small amount** of water at a time to the jar

Experiment – Top Tips

- Put the tube into the jar is much easier if you have some soil in the bottom already.
- Fill the jar with soil slowly, ensuring no soil gets into the tube. It may be worth covering of the top of the tube until this is completed.
- Flour takes longer to dissolve so may not show a dramatic collapse or inward movement of the soil. We found sugar works best as it dissolves more easily.
- Top up the jar with soil, make sure the sugar or flour is covered with loose dry soil. Moist soil sticks together and resists collapsing.

Plenary & Extension Activities

Key points:

What do you think is happening?

Is there anything else that we could try? Would a larger jar or tube work?

Consider: Can we find some real life examples of sinkholes in Northern Ireland or across the world?

What impacts might a sinkhole have in real life? Would you like to live in limestone/karst landscape where sinkholes are known to form?

Our sinkholes form when water dissolves underlying rock, but are there any other ways that sinkholes may form? Does human activity increase the likelihood of sinkholes forming?

<https://www.youtube.com/watch?v=KTViaGA1cqA> Real life sinkholes.

Student Experiment Worksheet - Notes

Name: _____

This is an area where you can make notes or observations on what is happening throughout your experiment 

Before Carrying Out the Experiment

What do I think will happen when the water is added?

I think that.....

Why do I think this might happen?

This will happen because.....

After Carrying Out the Experiment

What happened once the water was added?

I found that.....

Why do I think this happened?

This happened because.....