



## Delve Into the Deep

### Slippy Sinkholes

The Marble Arch Caves are delighted offer some updated learning resources to help students get inspired about one of our favourite places, caves.

These resources are included in free teacher packs, available to download free of charge from our website at [www.marblearchcaves.co.uk](http://www.marblearchcaves.co.uk). In the packs, you will find practical experiment cards, lesson outcomes, instructions and methods, class questions, lesson outlines/plans and plenary activities to aid learning on the topics of caves and limestone landscapes.

To help teachers and students with their experiments the team at the Marble Arch Caves have also created a series of three online videos with practical demonstrations. In the videos, we discuss the materials and equipment you will need, and provide simple step-by-step guidance to undertaking your own experiments back at school. These can be accessed via Youtube at [\(Click Here\)](#)

### Experiment 2: Slippy Sinkholes – Beneath the Earth



*Newby Moss. Stephen Oldfield*

This activity is designed to help students gain a greater understanding of how local landscapes and topographical features observed above ground provide us clues about what is happening below the surface. If we delve underground, we find interesting soils and geology across Northern Ireland. The limestone (karst) landscape surrounding the Marble Arch Caves is the focus of our experiments.

The natural processes, which shape our world above ground, occur underground too. The local geology and hydrology, the rocks and water, have led to the formation of sinkholes, also known as dolines. These depressions in the ground are caused by the dissolution of the underlying limestone bedrock 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 that students can research before they begin their experiment. This should help them develop a basic understanding of the geology (the rocks and earth) and the hydrology (the water) of our local landscape.

### Materials - You will need

- A jar.
- Some dry soil
- A toilet paper tube
- Sugar or flour (any 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.                     | <input type="checkbox"/> |
| 2. Explain what is happening using appropriate keywords.               | <input type="checkbox"/> |
| 3. Record my results and observations of what is happening.            | <input type="checkbox"/> |
| 4. Suggest improvements to the experiment and other things we can try. | <input type="checkbox"/> |

Tick (☑)

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

1. Collect a jar which is taller than the height of your cardboard toilet paper tube.
2. Place a small amount of soil into the jar to act as a base that 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 without leaning against the edge of the jar.
4. Fill the jar, outside the tube, to  $\frac{2}{3}$  full with dry soil.
5. Pour the flour /sugar into the centre of the tube up until it reaches the top. This will represent our rock layer that is more easily dissolved.
6. Very carefully pull the tube upwards out of the jar, and try not to mix the soil and sugar together.
7. To- up the jar with some soil, make sure the sugar or flour is well covered but not compacted. This will represent the land at the surface.
8. Pour some water into the jar from above, and watch what happens. Slowly keep adding more and more water and record the movement and direction of the soil.

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

### Key Questions

- Do you think the sugar or flour works better?
- Can we find some real life examples of sinkholes?
- What impacts might a sinkhole have in real life e.g. on local residents or businesses?

## Lesson outline.

### Preparation

1. Decide on group sizes and composition based on individual needs of each pupil.
2. Source a jar, dry soil, toilet paper tube, sugar or flour, water for each group.

### Introduction

Key points:

1. Water can flow below ground in limestone environments, also known as karst landscapes.
2. Water chemically erodes rock and washes away soil.
3. A sinkhole forms when water washes away a pocket of rock beneath the surface and eventually the earth caves in or 'sinks' into the ground.

Useful videos

[https://www.youtube.com/watch?v=xlu6i6IT\\_vk](https://www.youtube.com/watch?v=xlu6i6IT_vk) sinkhole animation.

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

### Demonstration

Key points:

- We need to keep the soil separate from the flour/sugar to allow the sinkhole to form.
- Make sure to add only a **small amount** of water at intervals to the jar

### Experiment – Top Tips

- Putting 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 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. Some soil types stick together and resists collapsing e.g. clay.

### 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 a 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? Can 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?

I think that.....

Why do I think this might happen?

This will happen because.....

### After Carrying Out the Experiment

What happened?

I found that.....

Why do I think this happened?

This happened because.....