

Activity Guidance

There will be rain

Introduction

This activity enables Environment Agency STEM Ambassadors to introduce their work to pupils and link it to elements of the National Curriculum. The main part of the activity is a design challenge for the pupils highlighting how the Environment Agency solve flooding problems.

It is designed to be delivered either by a teacher alone or an Environment Agency STEM ambassador (if one is available) together with a teacher.



Topic | Flood management



User Environment Agency STEM Ambassador



Age group Ages 11 - 16



Length of activity 50 - 60 mins



Subjects Biology, Chemistry, Geography

At the end of this activity pupils should be able to do the following:

- Describe flooding
- Explain causes of flooding
- Explain the link between climate change and flooding
- Describe the role of the Environment Agency
- Evaluate the design of a model to see if it can be improved
- Build a model of Natural Flood Management

> What is the activity about and how to organise it?

This is meant as a guide to running the activity, but please feel free to adapt it to suit your particular requirements.

The powerpoint presentation shows the full structure of the activity and there are guidance notes for some slides.

Before attending the school discuss with the teacher how much you would like to be involved in the delivery of this activity. It may be that you would prefer the teacher to deliver the session and you support the groups as they build their models and /or help to judge the final testing of the models. Or, you may feel more confident and want to deliver some or all of the session with the teacher's help.

In either case remember to introduce yourself to the pupils by inserting a slide with your name and job role on. If you can, add a picture of yourself at work which would help pupils understand what you do (a template - slide 2 is provided in the pack).

This activity is separated into 2 parts:

Part 1

 **Approx 15 mins**

The pupils will be learning about floods, what causes them and how they link to climate change.

Initially find out how much pupils know about floods, why they happen and why they are a problem. Slides 1 to 6 give prompts to activities to do this.

Slides 7 covers the following content:

- What is the link between climate change and flooding?
- How can the Environment Agency reduce the effects of flooding?

This information is part of a recorded video which is inserted into the activity slides and is vital for the pupils to understand the role that the Environment Agency plays in mitigating against the effects of flooding.

Part 2

 **Approx 35-40 mins**

The second part of the activity, starting at slide 8, challenges the pupils to develop a model of Natural Flood Management. Organise the class into groups of up to 4 pupils per group. Each group will be given a wooden ramp to represent a hillside and 12 marbles or other spherical objects such as molymods to represent rainwater. The challenge is for pupils to add structures to this ramp to retain half of the marbles on the ramp but allow half of the marbles to run down the ramp in the slowest possible time. The winning group gets half the marbles to the bottom in the slowest time. The other half of the marbles must stay on the ramp to win.



An example of materials used on a ramp to trap some marbles, but not others.

As the STEM Ambassador you should introduce the challenge on slide 9. If necessary, clarify that all groups know what they are aiming to achieve and remind pupils that the ramp represents a hillside, and the marbles represent water.

As the pupils build their models avoid telling them what to use and how to do it. This is a challenge so the pupils need to think and problem solve for themselves.

(Remember all the hillsides (ramps) must be set at the same angle and be the same length and each group is given the same amount of each of the building materials that are being provided).

Finally, after a specified amount of time (30 mins, depending on session length), it is testing time.

More able pupils could calculate the speed of the marbles as they reach the bottom of the ramp using the formula:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Once the students have completed the activity get them to reflect upon their designs and explain how they could be improved.

Finally explain to the students that the materials that they add to the ramp represent Natural Flood Management (slide 11). Natural Flood Management includes: trees planted on hillsides, protecting riverbanks with fences, adding inland storage pools and adding woody debris to streams that feed into rivers.

Extension

If there is time, there is an extra video embedded in slide 11 showing in more detail how Natural Flood Management works using a model.

> Literacy Guidance for STEM Ambassadors

In order for pupils to comprehend a text, or the words said to them, they must understand 95% of the vocabulary used. Teachers use a concept called 'Tiers of Vocabulary' to help them to identify words that pupils will struggle with.

In summary, vocabulary can be divided into 3 tiers:

- Tier 1 - high frequency words spoken commonly (eg. table, slowly, write, horrible)
- Tier 2 - high frequency words used across different subjects, but they are not spoken as frequently so can cause significant problems for pupils when used in conversation. (e.g. formulate, evaluate, maintain, required, economic, issues, sustainable, objective)
- Tier 3 - words that are not used frequently and are subject specific (eg. osmosis, respiration, diffusion)

In education teachers take time to explain the tier 3 words. However, the tier 2 words are often neglected so these tend to be the words that pupils will struggle the most with. As a rule of thumb pupils are unlikely to understand words that are not used in everyday language.

What to avoid

- Avoid using the following words, especially without explanation. These will not be words that the pupils have studied yet and therefore will not understand unless the context is explained in very simple terms.

Mitigation, surge, deluge, effluent, measures (in the context of flooding), risk management, sustainability

There is a full list of Tier 2 words on this website if you would like more information (<https://learningspy.co.uk/literacy/closing-language-gap-building-vocabulary/>)

> Key words

Pupils' speak definitions for subject specific terminology you may use in this session:

Science

Biodegradable - A material that can be broken down by microorganisms

Carbon dioxide - A gas present in the atmosphere at a low percentage and is a greenhouse gas

Carbon footprint - The total amount of carbon dioxide and other greenhouse gases emitted by a person or over the full life cycle of a product, service, service or event.

Global warming - the increase in the Earth's temperature due to increases in carbon dioxide and other greenhouse gas levels

Climate emergency - A scenario in which people, wildlife and the environment cannot adapt as fast as the climate is changing.

Embankments - A raised structure, usually made of earth, near a river or seafront to reduce the flood risk.

Erosion - Wearing away and removal of material by a moving force such as a breaking wave.

Flood – an overflow of water from rivers, the sea or heavy rainfall.

Floodplain - Relatively flat area forming the valley floor either side of a river channel that is sometimes flooded.

Meander - A wide bend in a river.

Greenhouse gas – gases which trap heat in the Earth’s atmosphere such as carbon dioxide and methane.

Sustainable resource - A resource that will not run out because it is being managed responsibly to meet the needs of both present and future generations.




Geography

Biodiversity - Short for biological diversity, the variety of habitats and species on Earth or in a particular ecosystem.

Climate Change - The long-term change in weather patterns which leads to more extreme weather, rising sea levels and continued increases in temperature that affect people, wildlife and the environment.



> Equipment needed for session

-  The activity slides provided for the session
-  Speaker equipment and projector to play the video clips
-  Participant, winner and/or class certificates as required (remember to add in the name of the teacher and/or STEM Ambassador who ran the session)

Each group will need

- Wooden ramp (all the same length)*
- Stand for one end of the ramp to create an incline (all the same height)
- Scissors
- 12 marbles or other spherical objects such as molymods
- Stop clock
- Calculator if you have an able group and are asking them to calculate speed
- No more than 30cm of Sellotape per group
- Building materials from*:
 - Cardboard
 - Paper / Newspaper / Kitchen towel
 - Art Straws
 - Modelling clay / Plasticine / Blutak
 - Aluminium Foil
 - Old carpet
 - Cocktail sticks/bamboo toothpicks

**If you do not have access to ramps (usually held in science departments for physics investigations) you can use stiff cardboard*

**If you do not have access to all the building materials you can substitute them for something you might have*

> Where does this fit into the National Curriculum?

Science Key Stage 3: Chemistry

- the production of carbon dioxide by human activity and the impact on climate.

Geography Key Stage 3

- understand how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems

Science Key Stage 4: Biology

- positive and negative human interactions with ecosystems.

Science Key Stage 4: Chemistry

- evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change
- potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's climate

Geography Key Stage 4

- Changing weather and climate – The causes, consequences of and responses to extreme weather conditions and natural weather hazards, recognising their changing distribution in time and space and drawing on an understanding of the global circulation of the atmosphere. The spatial and temporal characteristics, of climatic change and evidence for different causes, including human activity, from the beginning of the Quaternary period (2.6 million years ago) to the present day.

> Further resources

The Environment Agency - Living better with a changing climate

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1025955/environment-agency-climate-change-adaptation-report.pdf

The Environment Agency - Personal flood plan

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/444659/LIT_4112.pdf

The Environment Agency - Flood Warnings Information Service

<https://flood-warning-information.service.gov.uk/warnings>

The Environment Agency - Long Term Flood Risk Service

<https://flood-warning-information.service.gov.uk/long-term-flood-risk/postcode>

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