

Activity Guidance

How can Stemville improve its biodiversity?

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 budgeting challenge for pupils to devise a plan to improve the biodiversity of the fictitious town of Stemville.

The aim of the activity is to highlight the various ways biodiversity can be improved and the role of the Environment Agency.

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.

> Pupils' prior knowledge

Pupils should have an understanding of:

- food chains, food webs and interdependence
- the factors that affect a living organism in a habitat
- human activities that impact the climate



Topic | Biodiversity



User Environment Agency STEM Ambassadors



Age group Ages 14 - 16



Length of activity 2 to 2.5 hours



Subjects Biology, Geography

Includes Numeracy skills

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

- ✓ Explain the meaning of biodiversity
- ✓ Explain why biodiversity is important
- ✓ Describe the role of the Environment agency in improving biodiversity
- ✓ Evaluate different methods to improve biodiversity
- ✓ Devise a plan to increase the biodiversity of a fictional town within a given budget
- ✓ Explain why certain actions can increase or decrease biodiversity (extension)



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

There are 2 versions of this activity. Both versions asks pupils to evaluate 12 methods to improve biodiversity, but the standard version gives a biodiversity improvement score out of 10 for each method to help pupils with their evaluation. In the extended version pupils are expected to identify for themselves from the information provided which methods will improve biodiversity the best and discuss why certain actions increase or decrease biodiversity. Discuss with the teacher in advance the age, ability and the time available for your session to decide which version to deliver. Some of the methods mentioned are controversial and are included to challenge pupils' thinking and stimulate debate. In advance of the session talk with the teacher about how to introduce these methods in a sensitive way.

Also discuss 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 teams as they come up with their plan to improve the biodiversity in Stemville and/or help to judge the presentations. 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 3 parts:

Part 1

 **Approx 20 mins**

The pupils will be learning about biodiversity, what it is and why it is important.

Slide 3 asks the question 'Which type of grass is better?' and asks the pupils to vote for one of the 3 options presented and justify their choice. This is a very open question so it gives you an opportunity to understand pupils' views on grass. It will be interesting to see how many pupils think of grass as a habitat. Keep a note of how many voted for each option.

Slide 4 asks pupils 'What is biodiversity?' and slide 6 asks 'Why is biodiversity important?' which again elicits how much prior knowledge the pupils have. The answers are provided on slides 5 and 7 respectively if needed.

Slide 8 is the opportunity for the Environment Agency STEM Ambassador to briefly explain the role of the Environment Agency in improving biodiversity.



Part 2

 **Approx 50 mins**

Split the class into suitable groups of 3 to 5 pupils.

This part of the activity challenges the pupils to improve the biodiversity for the fictional town of Stemville. Pupils are given the background of the town. They are provided with a list of methods to improve biodiversity on information cards and need to work as a team of specialists to evaluate the methods and come up with a plan. Please make it clear that the Environment Agency do not support all these methods because some are controversial but they are included to challenge pupils' thinking and stimulate debate.

There are 2 versions of the information cards. The standard version includes a biodiversity improvement score to aid pupils with deciding how well a method improves biodiversity. (Slide 12 explains how the scoring system works.) The extension version does not include this score as pupils are expected to identify for themselves from the information provided which methods will improve biodiversity the best.

There is a student 'biodiversity improvement method evaluation sheet' for each version of the activity which helps pupils collate the information from the biodiversity improvement methods and evaluate them. In addition there is a budgeting sheet where they can summarise their choices of biodiversity improvement methods and the costs. Pupils must be encouraged to understand that they are creating a 5 year plan and some of the measures need to be paid for each year to be effective, a one off will not be enough.

Pupils must ensure that they do not spend over the budget and then prepare a short 3 minute pitch explaining which methods they have chosen and why.

As pupils work on their plans you can circulate amongst the teams and answer any questions they may have. However do not tell the pupils which biodiversity improvement methods to choose, it is up to them to evaluate them and decide which they think is best. There is no right or wrong answer, the emphasis is on pupils discussing the methods, making suitable choices within budget and being able to justify them.

Depending upon the length of school lessons the teacher may break this activity into 2 lessons and invite you to the second session to help pupils finish their evaluations and pitches and then judge them. Alternatively the whole activity could be completed as part of an off timetable science/climate challenge activity day.

An alternative for a shorter activity is to choose one of the biodiversity improvement methods and use it as the basis for a class debate.



Part 3

 **Approx 40 mins**

Pupils pitch their biodiversity improvement plan to a representative(s) from the local council. (The teacher and/or yourself.) Pupils could also judge the pitches to encourage their full engagement with the process. The winning team will be the group who comes up with the best plan which is within budget and has been calculated correctly.

Plenary

 **Approx 10 mins**

Revisit slide 3 and ask the pupils to vote again on which type of grass is better in a garden. Compare the numbers that vote for each option with the numbers from the start of the lesson. If they are different find out which pupils changed their minds and why.

Extension

 **Approx 20 mins**

Depending on the time available more able pupils could be asked to look at the cards and gather information on what factors change levels of biodiversity (slide 16 contains more detail).



> Literacy Guidance for Environment Agency 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

- Do not assume pupils know the meaning of key words related to this topic. Avoid using the following words, especially without explanation. The pupils may not have studied these yet and therefore will not understand unless the context is explained in very simple terms.
Ecological restoration, ecology, alien species, mitigation, conservation
- Avoid telling the pupils which methods they should pick and how many of them. For instance, paying for a worker to remove invasive plant species for only one year is not sensible, please don't tell them that this won't work directly, but question them about it as you move around the room.

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

Biodiversity - The variety and numbers of different species of organisms on Earth or within an ecosystem.

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

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.

Deforestation - The destruction of forests by the excessive removal of trees.

Ecosystem - The interaction of a community of living organisms with their physical environment.

Environment - Where an organism lives and its surrounding conditions.

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

Habitat - A place where organisms live.

Interdependence - When one organism is dependent on another.

Invasive species - A plant or animal, introduced by humans, which overpopulates and harms an ecosystem.

Native species - A plant or animal that has become part of an ecosystem, in a particular area, through natural processes over a long period of time.

Pollinate - To transfer pollen from the anther (male part) of one flower to the stigma (female part) of another flower. This enables fertilisation to take place and for a plant to produce seeds.

Pollutant - Any substance released into the environment by humans that has a harmful effect on living organisms.

Sustainable - The use of resources without harming the environment and ensuring resources are not depleted.



> Where does this fit into the National Curriculum?

Science - Key Stage 3: Biology

- the importance of maintaining biodiversity
- the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops
- the importance of plant reproduction through insect pollination in human food security
- how organisms affect, and are affected by, their environment, including the accumulation of toxic materials

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
- organisms are interdependent and are adapted to their environment
- the importance of biodiversity



> Equipment needed for session



The activity slides provided for the session



Computer, projector and speakers to display the presentation and play videos. (Most schools will have this equipment, but liaise with them in advance on how digital resources can be used.)



Pitch grading sheet for the teacher/STEM Ambassador and pupils if they are judging as well



Participant, winner and/or class certificates. Remember to add in the name of the teacher and/or the Environment Agency STEM Ambassador who ran the session

Each group will need

- Biodiversity improvement method cards of the version to be delivered (standard/extension) either available digitally or printed off and cut up
- Biodiversity improvement plan budgeting sheet
- Biodiversity improvement plan evaluation sheet (standard/extension version as appropriate)
- Access to a calculator - one per group
- Extension task (if required) 'What factors and actions affect biodiversity?'



> Resources for future use

The Environment Agency

<https://www.gov.uk/government/organisations/environment-agency>

DEFRA - Biodiversity Indicators

<https://www.gov.uk/government/statistics/biodiversity-indicators-for-the-uk>

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