Starter Activity: Biology through the window: the environment and us in it

Introduction: This is a starter activity where you will look through the window and discuss what you see.

Key Stage: Biology KS4

National Curriculum Ref: Sc2 1b; 2f, g, i-l, o-q; 3b, f, h; 4a; 5a, b.

Time: 15 minutes

Pupil learning outcomes: Humans have impacted the environment in which we live enormously in a variety of ways. In turn, we respond to environmental changes through our own body mechanisms.

Context: Humans impact the environment, but the environment also impacts on humans.

Common misconceptions: It is often not appreciated that the whole environment in which we live has been massively impacted by human activity over thousands of years.

The view from the window *(Starter Activity)*

All photographs can be found in colour on the Earth Science Education Unit website.

Activity: Participants look through a nearby window and attempt to answer the questions on the participant card. This is best done in pairs or groups to encourage discussion.

Resource list: Participant card per group

Follow-up: Pupils can continue to look for more 'through the window' type examples on their way home from school. They could be asked to discuss the results with their parents and attempt to add things to the tables.

Some questions and answers:

1. The environment through the window.

   This is intended to show the impact of human influence on all the environments humans commonly inhabit – and the importance of variation (environmental and genetic) in our environments.

2. Us in the environment – how our bodies respond to environmental changes. If you were outside in the environment through the window at break or lunchtime, what examples might you expect to see of human bodies naturally responding to environmental changes?

   This question is intended to highlight our natural responses to changes in environmental conditions and to focus on key parts of the KS4 Programme of Study

1. The environment through the window	
What parts of the environment through the window have been most affected by humans?	Human influence can be seen in: • Buildings, paths, roads etc • Fields, hedges, lawns • The plants themselves – all the cultivated plants have been modified by artificial selection • All the weeds are probably only there because humans cleared or otherwise modified the environment • Any domestic or farm animals seen have undergone selective breeding • Wild animals and birds are occupying niches produced by human activity Participants may choose to discuss any of these or a combination of them.
What parts of the environment through the window have not been affected by humans?	• None – humans have probably influenced all parts of the environment outside, since if they hadn't the view would be dominated by dense forest or swamp.

If the environment through the window were no longer to be managed by humans, how might it change?	• Buildings, paths and roads would crumble due to physical, chemical and biological weathering followed by erosion • Plants would colonise open surfaces, with a succession of colonisers such as lichen, then moss, then rooted plants • Any existing vegetation would grow and reproduce unchecked • A wider variety of ecological niches would develop, which would be populated by a wide variety of plant and animal species • Over thousands of years the environment might return to its original forest or swamp ecosystem
If an organism is not adapted to its environment, it will not survive. How has one of the plants through the window become adapted to its environment? Include either genetic variation (inherited) or environmental variation (changes during life) or both	Examples chosen may include: • Grass – fast-growing; grows from base not tip (so continues to grow if the blade is eaten or cut); soil-binding roots; reproduces both sexually (with seeds) and asexually (with rhizomes) • Trees – deep roots stabilise the tree and absorb water and nutrients; tall trunk holds leaves above other plants to exploit maximum sunlight; seeds will fall from tree or be dispersed by wind over wide area • Flowers – have evolved a range of strategies for pollination (often by insects) and seed dispersal (fruits attractive food for animals) Leaves of all of these plants have stomata which regulate flow of gases and water vapour, a waxy outer layer to reduce water loss, and contain chlorophyll for photosynthesis
How has one of the animals through the window become adapted to its environment? (genetic or environmental variation)	Examples chosen may include: • Dogs – legs for speed whilst foraging/hunting; teeth and claws for attack/defence; temperature regulation methods (panting, fur); good eyes, ears and nose to sense environment • Birds – wings for flight; claws for perching; beak adapted to particular food type; coloration/song for signalling to other members of species • Insects – feeding adaptations (e.g. bees lap up nectar with tongue-like structure; gnats and mosquitoes have 'drinking straw'-like mouthparts for sucking blood;); predatory/defence adaptations (e.g. wasp stings; warning coloration of bees and wasps); division of labour in colonies (bees, ants, wasps) • Humans – legs adapted for standing, walking and running, leaving hands free for holding and manipulating objects; eyes and ears for three dimensional vision and hearing; large brain relative to body size; various temperature regulation mechanisms; reflex reactions *Note: animals, particularly humans, have the capacity to change the environment rather than simply adapting to it*
How has one of the organisms you can see been selectively bred by humans (i.e. genetic modification by selective breeding)	Examples chosen may include: • Grass – fast, dense growth; good root mat; resistance to unfavourable conditions • Flower – size; colour; resistance to unfavourable conditions • Dogs – size, shape, colour, temperament

2. Us in the environment	
Examples outside I might expect to see of:	**Example**
a reflex reaction	• Blinking eyes • Iris response to light changes • Response to pain
mechanisms supporting homeostasis (control mechanisms to keep a balance of conditions/chemicals in the cell/body)	• sweating or shivering to maintain temperature • breathing hard after activity to maintain oxygen levels
natural body defence mechanisms	• reflex response to pain • blood clotting forms scab • mucus (mouth, nose, eyes)
an 'oxygen debt' building up	• Someone engaged in vigorous activity (e.g. running, fighting)
the effects of drugs	• Examples chosen may include: • Smoking – evidence includes loss of stamina, increased coughing, stained fingers and lingering smell • Use of painkillers – pain decreases • Use of insulin to control blood sugar levels by diabetics • Use of contraceptive pill to affect fertility

Starter Activity
Biology through the window: the environment and us in it

Introduction:
Look through the window and discuss what you see.

1. The environment through the window

What parts of the environment through the window have been most affected by humans?	
What parts of the environment through the window have not been affected by humans?	
If the environment through the window were no longer to be managed by humans, how might it change?	
If an organism is not adapted to its environment, it will not survive. How has one of the plants through the window become adapted to its environment? Include either genetic variation (inherited) or environmental variation (changes during life) or both	
How has one of the animals through the window become adapted to its environment? (genetic or environmental variation)	
How has one of the organisms you can see been selectively bred by humans (i.e. genetic modification by selective breeding)	

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2. Us in the environment. If you were outside in the environment through the window at break or lunchtime, what examples might you expect to see of human bodies responding naturally to environmental conditions?

Examples outside I might expect to see of:	**Example**
a reflex reaction	
mechanisms supporting homeostasis (control mechanisms to keep a balance of conditions/chemicals in the cell/body)	
natural body defence mechanisms	
an 'oxygen debt' building up	
the effects of drugs	