

Protecting animals on land

**Activities:** 2

**Programming languages:** MakeCode

**Target age:** 7-11 yrs

**Subjects & topics:**

* Computational thinking: Algorithms
* Programming: Variables, Selection
* Networks: Communication
* Global Goals: 15 Life on land
* Design & technology: Product design

# Design challenge summary

In the **Spot the species** project, students explore the wildlife in their local habitat and create a species counter using the BBC micro:bit.

In the second activity, students learn about the illegal wildlife trade and create an **anti-poaching collar** using the radio function on the micro:bit.

## Overall key learning

* to learn more about wildlife in your local environment and elsewhere
* to consider the importance of biodiversity
* to consider how technology can help protect animals
* to build working micro:bit prototypes to record and protect species
* to analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
* to be responsible, competent, confident and creative users of information and communication technology.

## Additional skills

Researching, presenting, creative thinking

## Activity 1: Spot the species

Consider the wildlife you see in your local habitat and consider how important it is, then create a micro:bit counter to record different species.

**Key learning:**

* to learn more about wildlife in your local environment
* to consider the importance of biodiversity
* to create a simple algorithm for a working micro:bit species counter

## Activity 2: Anti-poaching collar

Learn about the illegal wildlife trade, with a focus on poaching, then use the micro:bit’s radio function to create an anti-poaching collar.

**Key learning:**

* to learn about how poaching endangers species
* to consider how technology can help prevent poaching
* to build a working prototype wireless anti-poaching alarm to be worn by animals

# Curriculum links

## England National Curriculum

#### KS2 computing curriculum

Curriculum aims:

* can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
* are responsible, competent, confident and creative users of information and communication technology

Students should be taught to:

* design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
* use sequence, selection, and repetition in programs; work with variables and various forms of input and output
* use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs

[Read the full KS2 computing curriculum](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239033/PRIMARY_national_curriculum_-_Computing.pdf)

#### KS3 computing curriculum

* design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
* understand several key algorithms that reflect computational thinking (for example, ones for sorting and searching); use logical reasoning to compare the utility of alternative algorithms for the same problem
* understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems

[Read the full KS3 computing curriculum](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239067/SECONDARY_national_curriculum_-_Computing.pdf)

#### KS2 science curriculum

Pupils should be taught to:

* recognise that environments can change and that this can sometimes pose dangers to living things

[Read the full KS2 science curriculum](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/425618/PRIMARY_national_curriculum_-_Science.pdf)

#### KS2 DT curriculum

* evaluate their ideas and products against their own design criteria and consider the views of others to improve their work
* apply their understanding of computing to program, monitor and control their products

[Read the full KS2 DT curriculum](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239041/PRIMARY_national_curriculum_-_Design_and_technology.pdf)

## Scotland Curriculum for Excellence

#### Technologies

* I can explore and experiment with digital technologies and can use what I learn to support and enhance my learning in different contexts (TCH 1-01a)
* I can explore and comment on processes in the world around me making use of core computational thinking concepts and can organise information in a logical way (TCH 1-13a)
* I understand the instructions of a visual programming language and can predict the outcome of a program written using the language (TCH 1-14a)
* I can demonstrate a range of basic problem solving skills by building simple programs to carry out a given task, using an appropriate language (TCH 1-15a)
* I can extend and enhance my knowledge of digital technologies to collect, analyse ideas, relevant information and organise these in an appropriate way (TCH 2-01a)
* I understand the operation of a process and its outcome (TCH 2-13a)
* I can explain core programming language concepts in appropriate technical language (TCH 2-14a)
* I can create, develop and evaluate computing solutions in response to a design challenge (TCH 2-15a)

[Read the full Curriculum for Excellence: technologies](https://education.gov.scot/Documents/Technologies-es-os.pdf)

#### Sciences

* I can distinguish between living and non living things. I can sort living things into groups and explain my decisions (SCN 1-01a)
* I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioural characteristics to their survival or extinction (SCN 2-01a)

[Read the full Curriculum for Excellence: sciences](https://www.education.gov.scot/Documents/sciences-eo.pdf)

## Northern Ireland Curriculum - Primary

#### Using ICT across the curriculum

* explore - investigate, make predictions and solve problems through interaction with digital tools
* evaluate - talk about, review and make improvements to work, reflecting on the process and outcome

#### KS1 - suggested curriculum ideas for the world around us

* design and make simple models
* the variety of living things in the world and how we can take care of them
* how people’s actions can affect plants and animals

#### KS2 - suggested curriculum ideas for the world around us

* design and make models
* the consequences of change through investigating global issues, for example, rainforest destruction or light pollution

[Read the full Northern Ireland Curriculum - Primary](https://ccea.org.uk/downloads/docs/ccea-asset/Curriculum/The%20Northern%20Ireland%20Curriculum%20-%20Primary.pdf)

#### KS1 & 2 - requirements for using ICT

* explore - investigate, make predictions and solve problems through interaction with digital tools
* evaluate - talk about, review and make improvements to work, reflecting on the process and outcome and consider the sources and resources used, including safety, reliability and acceptability

[Read the full KS1 & 2 requirements for using ICT](https://ccea.org.uk/downloads/docs/ccea-asset/Curriculum/Curriculum%20Requirements%20for%20Using%20ICT.pdf)

#### KS2 - the world around us

* interdependence - how living things rely on each other within the natural world

[Read the full KS2 requirements for the world around us](https://ccea.org.uk/downloads/docs/ccea-asset/Curriculum/Key%20Stage%202%20Statutory%20Requirements%20for%20The%20World%20Around.pdf)

#### Primary using ICT - desirable features - computational thinking and coding

**Level 4**

Pupils should:

* create a more sophisticated coding project using a broad range of commands; and/or
* solve a given problem using commands in a programming environment.

**Programmable devices (such as Parrot Drone, micro:bit or Sphere)**

* look at and talk about examples of coding projects, including the use of motion, looks, lights or sounds, sensors, control and events such as ‘if...then’ and ‘loop until’ (or equivalent) that make the code more efficient;
* recognise that these projects are composed of different components and break the task into smaller manageable tasks (decomposition);
* in small groups, plan and storyboard their own coding project, working out what different parts of the program must do, using logical reasoning to discuss and compare the commands that are required for their algorithm;
* use a range of commands to create a project including triggering commands such as ‘if...then’ and ‘loop until’ to facilitate a more efficient method of interaction;
* test and debug at regular intervals and collaborate with others to solve problems as they arise;

**Finally**

* share their work (possibly using digital tools), respond to feedback and comment on others’ work; and
* organise files and export work in an appropriate format so that others may view it.

[Read all Primary using ICT desirable features](https://ccea.org.uk/downloads/docs/ccea-asset/Curriculum/Primary%20Using%20ICT%20Desirable%20Features%20Update%202019.pdf)

## Curriculum for Wales

#### Science and technology

Progression step 2 - design thinking and engineering offer technical and creative ways to meet society's needs and wants:

* I have experienced using basic prototyping techniques to improve outcomes
* I can identify things in the environment which may be harmful and can act to reduce the risks to myself and others

Progression step 3 - design thinking and engineering offer technical and creative ways to meet society's needs and wants:

* I can consider how my design proposals will solve problems and how this may affect the environment

Progression step 2 - the world around us is full of living things which depend on each other for survival:

* I can recognise that what I do, and the things I use, can have an impact on my environment and on living things
* I can explore relationships between living things, their habitats and their life cycles

Progression step 2 - computation is the foundation for our digital world:

* I can safely use a range of tools, materials and equipment to construct for a variety of reasons
* I can follow instructions to build and control a physical device

Progression step 3 - computation is the foundation for our digital world:

* I can use sensors and actuators in systems that gather and process data about the systems’ environment

[Read the full science and technology curriculum](https://hwb.gov.wales/curriculum-for-wales/science-and-technology/descriptions-of-learning/)

#### Humanities

Progression step 2 - our natural world is diverse and dynamic, influenced by processes and human actions:

* I can describe how people and the natural world may impact on each other

Progression step 3 - - our natural world is diverse and dynamic, influenced by processes and human actions:

* I can describe and give simple explanations about the impact of human actions on the natural world in the past and present

Progression step 2 - Informed, self-aware citizens engage with the challenges and opportunities that face humanity, and are able to take considered and ethical action:

* I am beginning to appreciate and care for living things and my own environment

[Read the full humanities curriculum](https://hwb.gov.wales/curriculum-for-wales/humanities/)

#### Digital competence framework

Progression step 1 - data and computational thinking - problem-solving and modelling:

* I can recognise and follow instructions in the appropriate order to perform a task.
* I can organise, select and use simple language to give instructions to others.
* I can control devices giving instructions.
* I can identify errors in simple sets of instructions (algorithm).

Progression step 2 - data and computational thinking - problem-solving and modelling:

* I can detect and correct mistakes which cause instructions (a solution) to fail (debug).
* I can create and record verbal, written and symbolic instructions to test ideas, e.g. the order of waking up through a diagram or flowchart.

Progression step 1 - producing - evaluating and improving digital content:

* I can comment on work in relation to a single success criterion.

Progression step 2 - producing - evaluating and improving digital content:

* I can give an opinion about my own work and suggest improvements based on the success criteria.

[Read the digital competence framework](https://hwb.gov.wales/curriculum-for-wales/cross-curricular-skills-frameworks/digital-competence-framework)

## USA Code.org

Course D, E and F

Concepts included:

* events
* loops
* conditionals
* sequencing
* variables

[Read the full CS Fundamentals curriculum](https://code.org/educate/curriculum/csf)

## USA CSTA Standards

#### Grades 3-5

* 1B-CS-01 - Describe how internal and external parts of computing devices function to form a system.
* 1B-CS-02 - Model how computer hardware and software work together as a system to accomplish tasks
* 1B-CS-03 - Determine potential solutions to solve simple hardware and software problems using common troubleshooting strategies.
* 1B-DA-06 - Organize and present collected data visually to highlight relationships and support a claim.
* 1B-AP-08 - Compare and refine multiple algorithms for the same task and determine which is the most appropriate
* 1B-AP-09 - Create programs that use variables to store and modify data.
* 1B-AP-10 - Create programs that include sequences, events, loops, and conditionals.
* 1B-AP-11 - Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.
* 1B-AP-12 - Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features.
* 1B-AP-17 - Describe choices made during program development using code comments, presentations, and demonstrations.

[Read the CSTA Standards in full.](https://csteachers.org/k12standards/ )

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