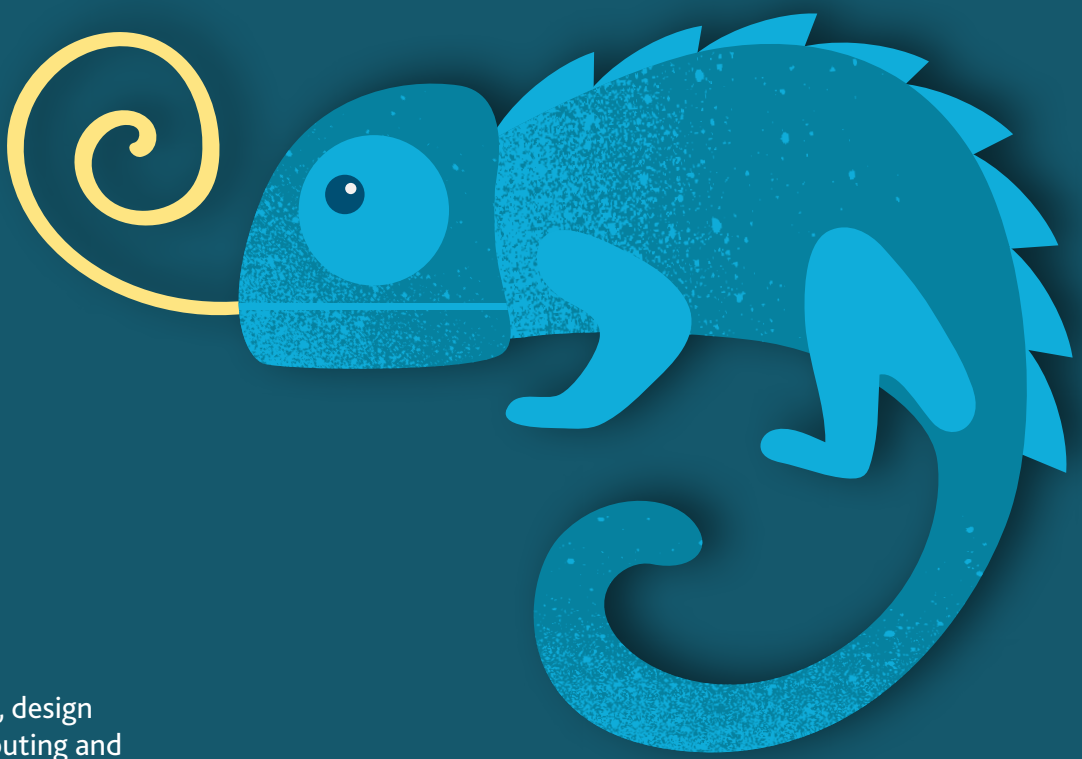
STEM CLUBS

NUMBER 1 FOR STEM

A STEM FUTURE: SUITABLE FOR STUDENTS AGED 7-9

Animal adaptations

STEM Learning activity resources



SUBJECT LINKS:

Science, mathematics, design and technology, computing and essential employability skills.

A STEM FUTURE: SUITABLE FOR AGE 7-9

Animal Adaptations

STEM Learning activity resources

Introduction

This programme has been created by STEM Learning, the largest provider of STEM education and careers support in the UK. It has been developed in partnership with STEM Club leaders and supports essential employability skills and the Gatsby Careers Benchmarks.

Animal Adaptations

In this programme, pupils look at how animals have adapted to cope with all sorts of conditions. They explore communication strategies, travel, camouflage and life in challenging settings, and look at the way humans can learn from animals.

Key information

AGE RANGE: 7–9

SUBJECT LINKS: Science, mathematics, design and technology, computing.

DURATION: Activities range from 20 to 90 minutes – at least 6 hours in total.

FLEXIBILITY: Complete the whole programme over a half term or choose individual activities to suit the needs of your Club.

RESOURCES: Each activity includes a list of the resources required and a comprehensive set of Club leader and pupil notes in the form of guides.

ESSENTIAL SKILLS: Each activity identifies essential employability skills as recognised by the Skills Builder Framework

IMPACT MEASUREMENT: Each set of resources is designed to help evaluate and assess the progress of Club-based learning on Club members. A useful set of assessment tools are available at www.stem.org.uk/enrichment/stem-clubs

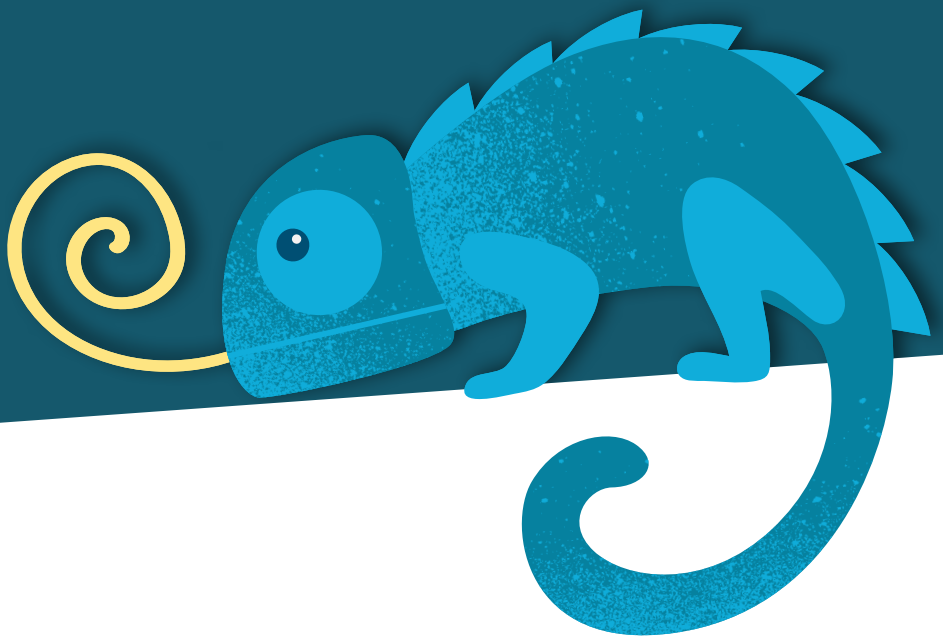
ACHIEVEMENT: Pupils that successfully complete an entire set of activities can be rewarded with the downloadable STEM Clubs certificate of achievement. Pupils may be able to use these resources to work towards a CREST Discovery Award.

APPROPRIATE VENUES: Club leaders can run most activities in general spaces e.g. classrooms, halls, and outdoor areas. If not, suggested locations are marked clearly in the Club leader guide and in the table below.

SAFETY: Each activity includes details about significant health and safety considerations, such as appropriate eye protection, gloves, etc. Club Leaders should ensure that all equipment is handled with care, particularly sharp instruments. Advice and guidelines are available from CLEAPSS and SSERC, or see the STEM Clubs handbook (page 20). We recommend that practical activities are risk assessed before commencing and Club Leaders must follow their employer or organisation's policies.

OTHER ACTIVITIES: Visit www.stem.org.uk/resources/stem-clubs/ for a wealth of ideas for STEM-related Clubs.

FURTHER SUPPORT: The STEM Clubs Best Practice Handbook can be found at www.stem.org.uk/stem-clubs/support A selection of careers information, resources, programmes and guidance can be found at www.stem.org.uk/stem-careers



Activities

CLUB LEADER GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

1 Living in the dark

Objective

In this activity, pupils explore how some animals have adapted to life without light and how they solve problems like finding food.

HEALTH AND SAFETY:

A suitable risk assessment must be carried out by the activity leader and any significant findings recorded: if carried out in schools, guidance from CLEAPSS or SSERC must be used where appropriate.

Check allergies before choosing materials to test.

TOPIC LINKS

- Science: methods of catching prey
- Design and technology: creating an effective 'trap' based on an animal adaptation

ESSENTIAL SKILLS SUPPORTED

Listening, problem solving, teamwork

TIME

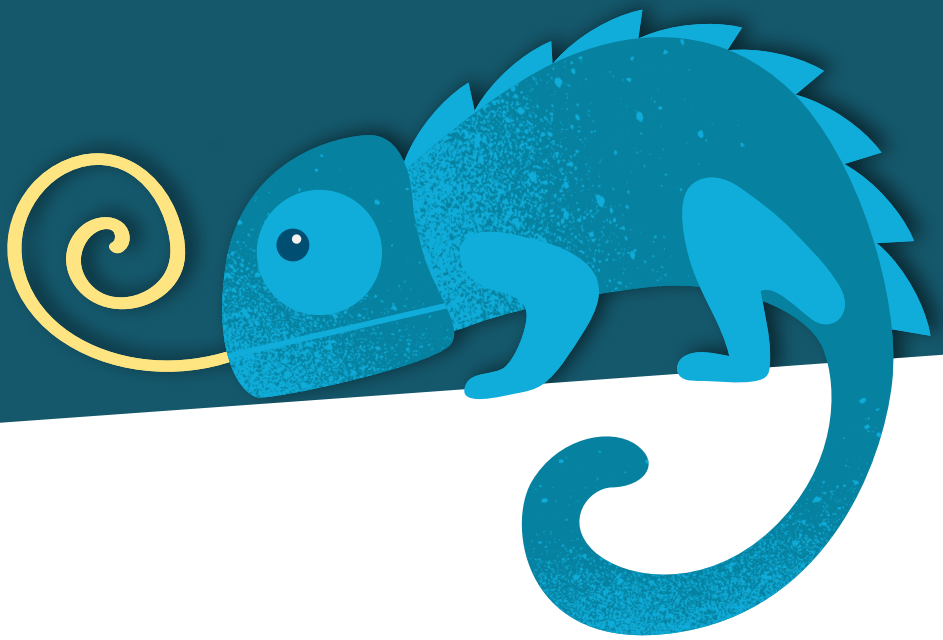
50 minutes

RESOURCES AND PREPARATION

- cotton or wool strings of varying length and thickness
- a cardboard box
- honey/similar sticky substance
- other liquids that are more or less sticky (e.g. water, juice, milk, etc.)
- tissue paper (for the 'bugs')
- elastic rubber pocket-money toys, such as Mr stretch (for extension)

DELIVERY

1. Ask pupils to think of animals that live in the dark. What might be more difficult for these animals? How might they get around these problems?
2. Introduce the glowing spider worm that lives in caves in New Zealand. (See Useful links for more information.) Explain that the spider worm larvae needs to be able to catch bugs to eat – how can they do this if they have no light to see when a bug flies by?
3. Give each group a cardboard box to represent the cave, some crumpled bits of tissue paper to act as 'bugs', an assortment of strings, and a range of sticky and less sticky liquids. Set pupils the challenge of using the materials they have to find a way to help a spider worm catch bugs. To give some direction, explain that the spider worm larvae is able to produce threads of silk and a sticky mucus substance. They will test if their solution is effective by throwing the bits of tissue paper in the cave, and seeing if they can get them to stick.
4. Pupils should first design their idea on paper, and then build their model cave.
5. Allow pupils time to experiment with their models. Is there anything they can change to make their bug trap more effective? They might consider: Does it help if the strings are thicker or finer? Longer or shorter? Which sticky substance is most effective in trapping their prey?
6. Once they have found their optimal design, they can share their models and test each other's ideas. Is there anything else they would want to change to improve their designs?
7. Ask pupils to think about whether humans might be able to learn something from the glowing spider worm. Could anything they've observed help people exploring dark places, or maybe for people with visual impairments?



WHAT'S GOING ON?

Many animals have evolved to cope with living in conditions without light, such as the glowing spider worm. It lives in caves in New Zealand, so it is effectively blind. Its solution to food-finding is to dangle sticky strings from the roof of the cave to catch flying insects. It deposits a droplet of mucus at regular intervals on the string to help trap prey.

TIPS

- Cover the table with newspaper or something protective to make cleaning up a bit easier!

EXTENSION IDEAS

1. Pupils could research how other animals see in the dark to catch prey or avoid being caught. For example, some nocturnal animals such as owls, possums and bush babies have very large eyes, to allow as much light to their retinas as possible.
2. Pupils could research other animals that use sticky substances to catch their prey, such as frogs. Simulate this by using stretchy rubber pocket money toys to pick up paper objects of different sizes and weights at a distance across the space.
3. Ask pupils to research carnivorous plants that trap insects, for example the Venus Fly trap.

DIFFERENTIATION IDEAS

Support: limit the range of materials you ask pupils to explore. Explain how the spider worm catches prey before they try to design their own traps.

Challenge: don't reveal the spider worm's solution until pupils have tried their own ideas. Provide more materials and variations for pupils to test.

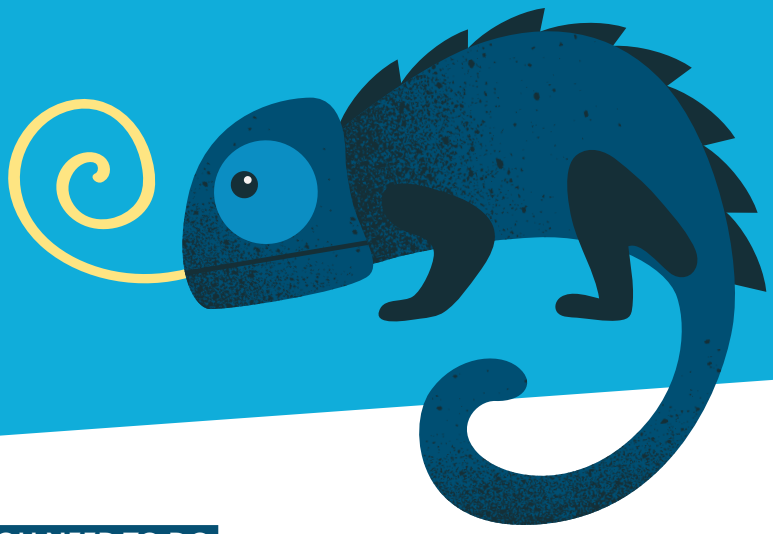
USEFUL LINKS

- More about the glowing spider worm
  www.sciencealert.com/watch-meet-the-carnivorous-worms-that-make-caves-look-like-the-night-sky
- More about animals that live in perpetual darkness
  https://news.nationalgeographic.com/2016/04/160415-life-in-the-dark-dumbo-octopus-glowing-squid-blind-salamander/
- More about frogs' sticky tongues
  https://blog.nationalgeographic.org/2014/06/12/how-frogs-sticky-tongues-lift-giant-prey/

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

1 Living in the dark



Briefing

Some animals live their whole lives in dark places, like the glowing spider worms that live in caves. But living without light can be really hard. How can they find food if they can't see? You are going to design a way to help one animal make a trap to catch its favourite food – bugs!

YOUR TASK **Design and make a bug-catching trap inside a cave so the spider worm larvae can catch a tasty meal.**

WHAT YOU NEED TO DO

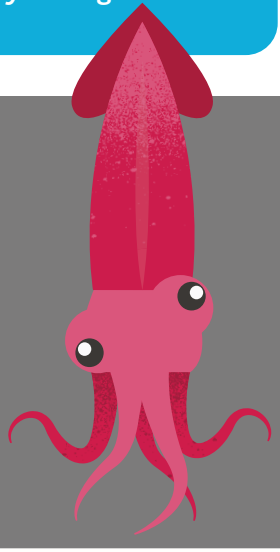
1. Look at the items you have been given to solve the challenge. With your team, talk about how you could use them to help the spider worm larvae to catch bugs.
2. Work together to draw a design for your cave and label it. Now build your model, remember to include a string coated in each liquid. Is there anything you would like to change to make it better?
3. Make tiny bugs out of small balls of crumpled tissue paper, about the size of a pea, you will need to make 30 bugs.
4. Test your model by gently throwing the bugs you have made at the sticky strings. Use a tally chart to show how many balls of tissue paper stick to each string.
5. Create a block diagram from your tally chart data to show how successful the strings are.
6. At the end of the activity, your team can show your cave to the other teams. Use the data you collected and your drawings to talk about the design, how many bugs were captured, what you learned and what changes you would make. Give helpful feedback to the other teams on their designs.

TIPS

- **Try different types of string, and different sticky liquids. Does it help if they're closer together or farther apart? What about if they're long or short?**

FUN FACTS

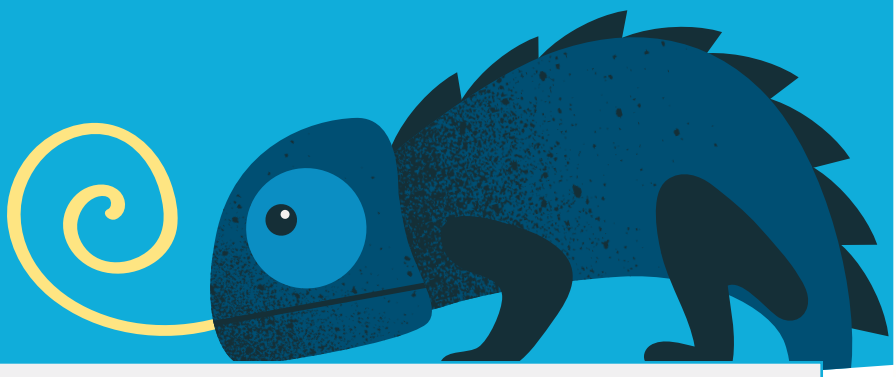
1. The cockeyed-squid has mismatching eyes to help it see in the dark. One looks upward to find shadows, and the other looks down to look for prey.
2. Frogs' tongues are extremely sticky and strong. A frog can lift 1.4 times their own body weight with its tongue!
3. Some animals that live in darkness can create their own light. This process is called bioluminescence and it happens when an enzyme in their bodies combines with oxygen.



STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

1 Living in the dark



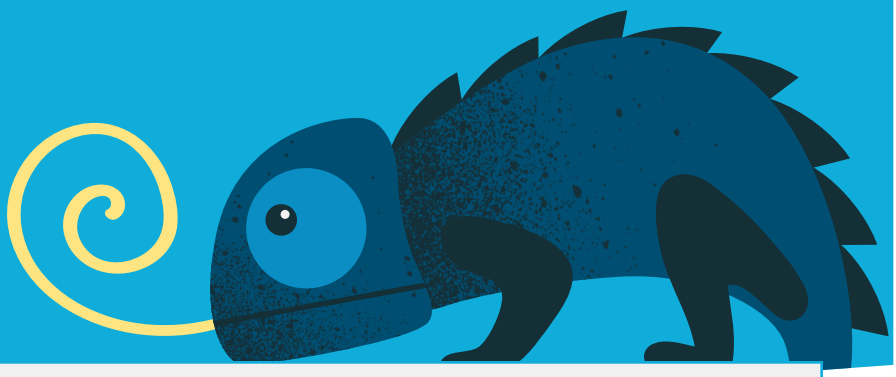
Name:

Design of my trap

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

1 Living in the dark



Name:

Tally table

Sticky Substance	Length of String	Number of Bugs

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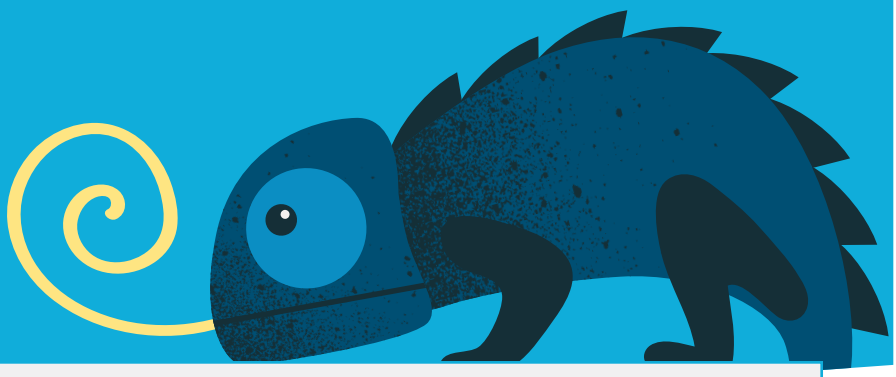
Animal Adaptations

1 Living in the dark



Name:

Block Diagram

CLUB LEADER GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

2 Living deep down

Objective

In this activity, pupils find out about a chemical reaction that some organisms can control to give out light: bioluminescence. They also discover how scientists are studying it to learn how to apply the process to the improvement of human life.

TOPIC LINKS

- Science: animal adaptations (bioluminescence)
- Design and technology: designing items to keep people safe in the dark

ESSENTIAL SKILLS SUPPORTED

Listening, creativity, staying positive

TIME

50 minutes

RESOURCES AND PREPARATION

- phosphorescent powder or glow-in-the-dark powder (available online or from art supply shops)
- black bin bags
- ready-mixed paint or clear acrylic gel
- a container
- paintbrushes

HEALTH AND SAFETY:

A suitable risk assessment must be carried out by the activity leader and any significant findings recorded: if carried out in schools, guidance from CLEAPSS or SSERC must be used where appropriate.

Ensure pupils take care when handling the powder, keeping it away from their faces.

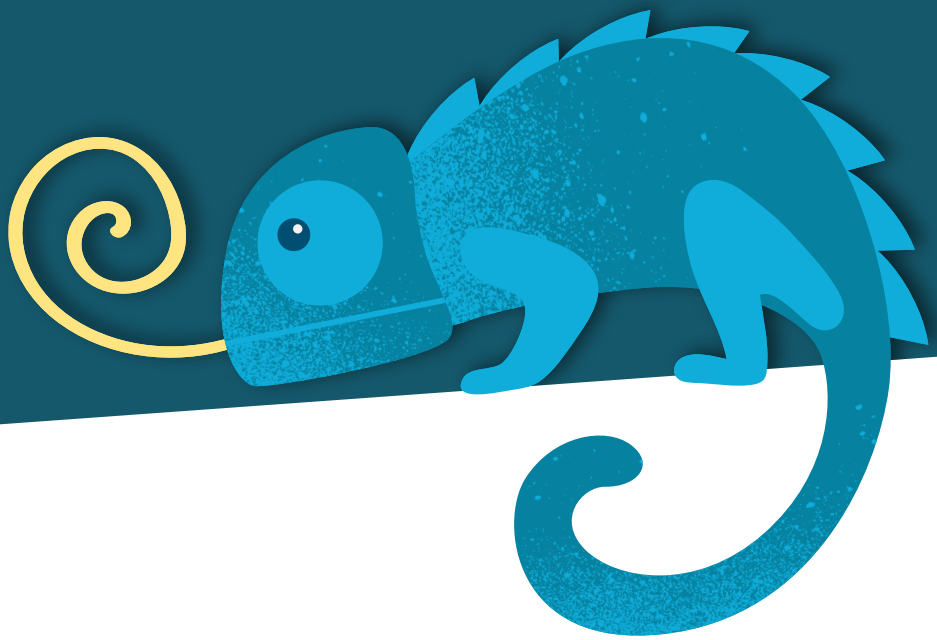
Pupils may want to wear gloves and aprons to keep paint off their clothes and skin.

Ensure holes are cut in bags to allow pupils' arms and heads to go through. Do not allow pupils to place bags over their heads unsupervised.

DELIVERY

1. Explain to pupils that bioluminescence is a natural phenomenon that is very difficult to observe first-hand, but some aquariums have bioluminescent creatures. Watch a video of bioluminescent fish/marine life www.youtube.com/watch?v=9HXXQBz6Vv0
2. Ask pupils to think about the purpose of the light. For example, could it be to warn predators that the creature is not good to eat, to lure prey, or to communicate?
3. Ask pupils to think about how bioluminescence could help humans (for example, glow-in-the-dark coats could keep children safe when walking outside in the dark).
4. Their task is to design and create their own glowing 'coat'. Ask them to create a design and decide which colours and symbols would be most useful. They should be able to talk about why they designed their coat the way they did.
5. Pupils can mix their own phosphorescent paint using one part phosphorescent powder to five parts of paint/clear acrylic gel. (Club leaders could also do this step if it is not appropriate for their pupils.) You can allow them to experiment to find the best combination of paint or gel with powder.

   Larger granules will glow more brightly, but the texture when dry will be grittier. Smaller-sized granules will give a smoother appearance but will not glow as brightly. If they would like their markings to be 'invisible' in the light, use a clear medium such as an acrylic gel or paint.
6. Cut head and arm holes in bin bags to use as the coat and give to pupils to use with the paint.
7. Allow the coats to dry, then turn off the lights and test them out. It may not be very visible if there is not complete darkness, but do any of the designs work? Can pupils take a photo of their coat in the dark that evening and share with the group in the next session?



TIPS

- Secure bin bags in place using tape on the corners
- The phosphorescent powder requires light to 'charge' the particles, so hold under a bright light for a few minutes

WHAT'S GOING ON?

In the deepest part of the oceans, sunlight cannot penetrate the water, but the creatures are able to create their own light with a phenomenon called bioluminescence. Chemical energy can be released as heat, but in bioluminescent organisms, that chemical energy can also be released in the form of light. They also have a unique compound called luciferin. When this is exposed to oxygen, a reaction takes place that emits light.

EXTENSION IDEAS

1. There are other applications for bioluminescence also being researched, including using trees as street lights, smart crops that glow when they are ready to be harvested, and even a test for toxins, where a strong glow is diminished in the presence of harmful chemicals. How would tree street lights be beneficial? Can pupils think of any other uses for bioluminescence for humans?
2. Try painting with light, using a camera that can be set for a long exposure and a glow stick. By allowing the camera shutter to be clicked open for longer, a glow stick can be moved around and all the movement captured on one photograph, appearing as a light painting. A free app for slow shutter and long exposure photographs is available called 'LongExpo'.

DIFFERENTIATION IDEAS

Support: suggest markings that can help people keep safe on the road to pupils. What will make other road users know that pupils are walking there?

Challenge: allow pupils to experiment with different quantities of phosphorescent powder and paint to find the best ratio.

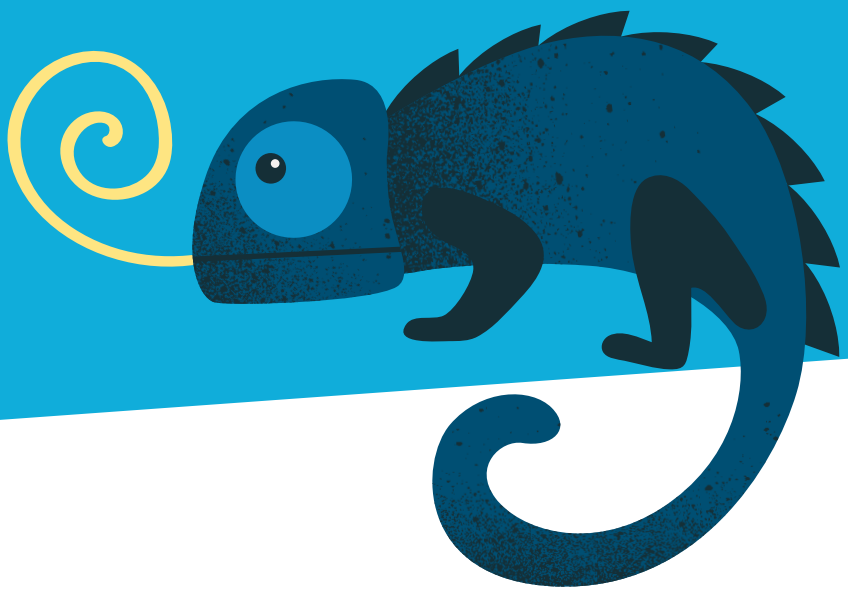
USEFUL LINKS

- How bioluminescence works
  https://animals.howstuffworks.com/animal-facts/bioluminescence1.htm
- Information on why some animals use bioluminescence
  http://biolum.eemb.ucsb.edu/functions.html
- Ideas for applications of bioluminescence (extension ideas)
  www.popularmechanics.com/science/green-tech/g706/6-bright-ideas-for-bioluminescence-tech/?slide=1

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

2 Living deep down



Briefing

Deep in the ocean, where it is very dark, some animals can create their own light using a process called 'bioluminescence'. Can you take inspiration from them?

YOUR TASK **Your challenge is to make a coat that would help you stay visible in the dark, using the equipment provided.**

WHAT YOU NEED TO DO

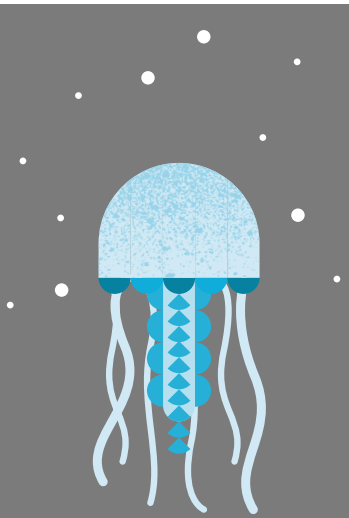
1. What colours and designs will be very easy to see in the dark? Draw your idea below. Why did you choose this design?
2. Mix your paints and create your coat. How will you make sure the paint is easy to see?
3. Test it out in the dark! Is there anything you could change to make it even better?

REPORT

Look at the other coat designs in the group. Which are the most visible in the dark?

FUN FACTS

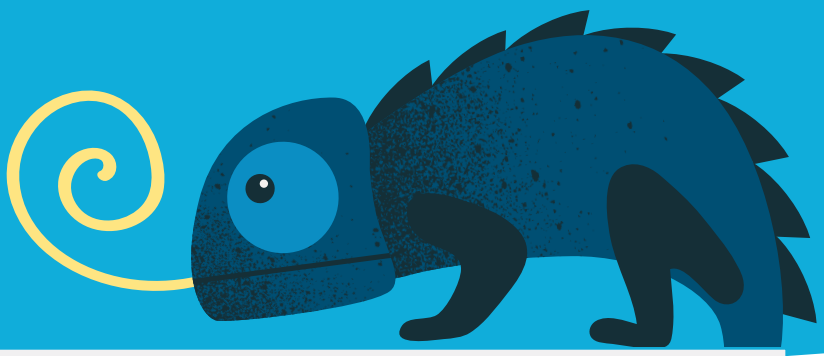
1. 90% of deep-sea ocean creatures can create their own light.
2. Animals can make different coloured lights. Most animals in the deep ocean make green-blue light because it's the easiest to see underwater.
3. Jellyfish can create the most amazing light shows. Some can release tiny glowing particles that look like plankton.



STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

2 Living deep down



Name:

Design

CLUB LEADER GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

3 Hedgehog Hibernation

Objective

In this activity, pupils explore hibernation. They will also find out about hedgehogs and create shelters to protect them during their winter hibernation.

TOPIC LINKS

- Science: dormancy in animals
- Design and technology: create a hedgehog nest
- Computing: use technology to detect and monitor hibernating animals

ESSENTIAL SKILLS SUPPORTED

Creativity, problem solving, teamwork

TIME

40 minutes

RESOURCES AND PREPARATION

- computers for research
- natural materials for creating a nest: dry leaves, straw, long grasses, slate, wooden logs, feathers, etc. collected as part of STEM Club time
- additional materials for nest: plastic guttering, roof tiles, clear acrylic sheets, etc
- optional: equipment to monitor the nest, e.g. Bluetooth camera

HEALTH AND SAFETY:

A suitable risk assessment must be carried out by the activity leader and any significant findings recorded: if carried out in schools, guidance from CLEAPSS or SSERC must be used where appropriate.

Appropriate eye protection should be worn when handling materials.

Ensure pupils are handling materials carefully. Tiles, acrylic sheets, etc. may have sharp edges.

DELIVERY

1. Ask pupils to find out something about hibernation. Possible questions are:

a. What's the difference between this and regular sleep? (Dormancy/hibernation is the state that animals enter when facing stress from the environment such as changing seasons.)

b. What are some animals that hibernate in the UK? (hedgehogs, bats, dormice)

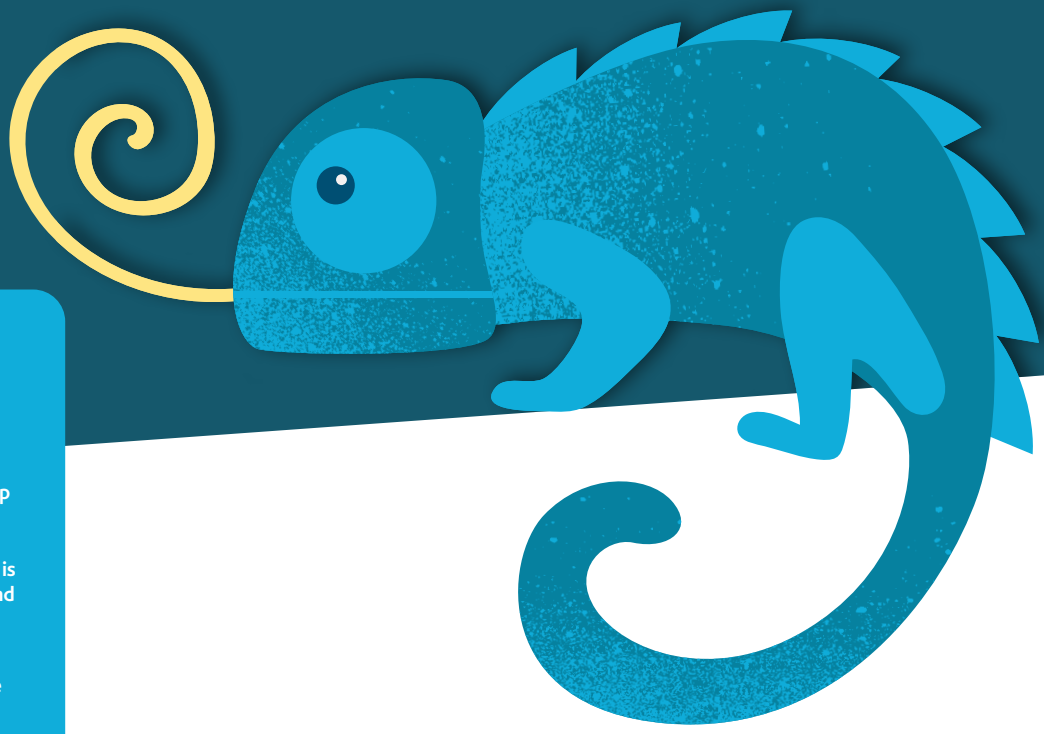
c. What happens to the animal's body during this time? (Their heart rate can reduce by up to 90%, which conserves energy so they don't need food.)

d. How long do animals hibernate? (It can be weeks or months, depending on the animal and environment.)

2. In the UK, hedgehog numbers are falling very quickly, with a third of hedgehogs lost since the year 2000. Pupils can find out more at www.wildlifetrusts.org/hedgehogs. Tell pupils they are going to help protect the hedgehog by building a safe place for them to spend the winter.

3. Instruct pupils to build a hedgehog shelter and create a hedgehog highway across part of the land. They should research good shelters and places that will be undisturbed. Pupils will need to be able to periodically check on the nest for signs of life in a non-invasive way.

4. Show pupils the materials that are available. They should design a shelter that uses mostly natural materials, but can have some plastic guttering, roof tiles or even clear acrylic sheets to provide some structure to the shelter and to make it as waterproof and windproof as possible.



TIPS

- where signs of life (even if in deep sleep) are discovered, make sure the area is well signed to avoid disturbance, particularly if there is public right of way across the land for dog walkers, for example
- if signs of life are discovered, you may wish to install a remote camera that can be activated by Bluetooth technology to check on the inhabitants of the nest without needing to disturb it again
- record dates that the nest was made, checked, inhabitants found or not, as useful feedback for the Hedgehog Street campaign

5. Pupils draw their ideas first then work in teams to compare ideas and decide which aspects of the ideas will be put together to make a final design.
6. Working in teams the pupils build their structure, taking it in turns to lead on different aspects to complement their skill sets. Encourage them to review their design as they build, and to adapt the structure to make the best use of building materials. Is there anything they need to change now that they're using real materials?
7. Once everyone is happy with their structures, set them up outside, if possible. Don't forget to check back on the shelter during the autumn and winter months to see if any hedgehogs have moved in!

EXTENSION IDEAS

1. Hibernation helps some animals to survive when food is scarce, such as during winter. Magicada don't hibernate, but they do spend up to 17 years underground, then all of them emerge at the same time. Ask the pupils to research Magicada and discover why this might be a survival technique.
2. Can pupils find out about aestivation (dormancy during the summer time)? What are some of the similarities and differences between hibernation and aestivation?

DIFFERENTIATION IDEAS

Support: support pupils through questioning to position the softest materials in the centre of the nest. Encourage pupils to add a waterproof roof to the nest – it will be more like a burrow than a birds' nest as the hedgehog will be in a deep sleep so needs to conserve heat.

Challenge: install a camera and start a blog to keep others informed of the nest. They may wish to check weekly until it is inhabited, then check and report more often.

USEFUL LINKS

- **Information about hibernation and aestivation**
  https://animalsake.com/difference-between-hibernation-and-other-types-of-dormancy
- **Hedgehog Street (a campaign to protect the hedgehog)**
  https://www.hedgehogstreet.org/about-our-hedgehog-street-campaign/
- **Information about magicicadas**
  www.cicadamania.com/cicadas/cicada-myths/

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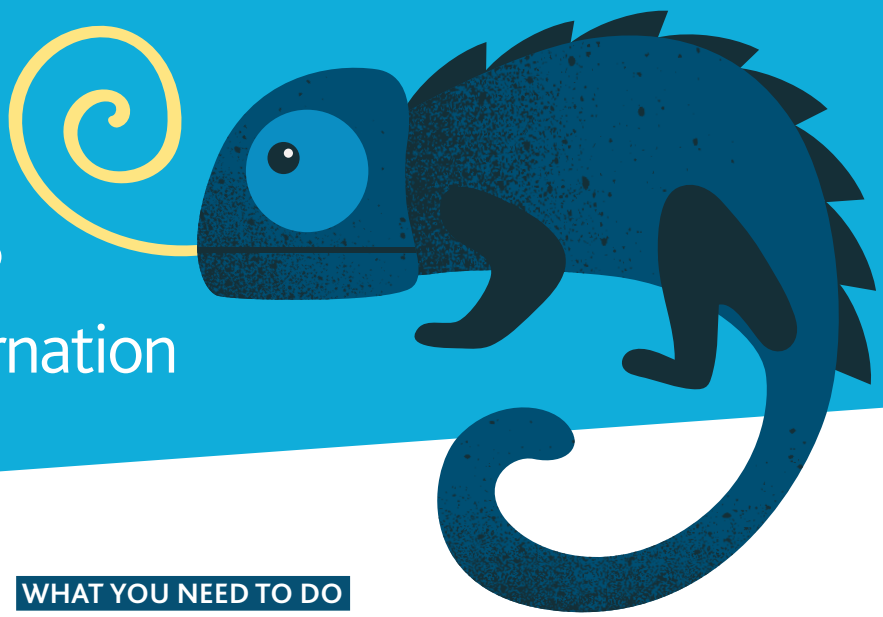
Animal Adaptations

3 Hedgehog Hibernation



Briefing

Many animals like the hedgehog hibernate during the winter. They need a safe place to stay. You are going to build a hedgehog shelter to help keep them safe!

YOUR TASK **Build a hedgehog shelter and highway for a hedgehog and design it so that it can be regularly checked for residents!**

WHAT YOU NEED TO DO

1. Look at the materials you have. How could you use them to make a safe winter shelter for a hedgehog?
2. Remember that you will need to check on the shelter later to see if a hedgehog has moved in. How can you design your shelter so you can check it without disturbing the hedgehog?
3. Draw your design in the space provided. With your team compare the designs, find a good idea in all of them and talk about which ideas could work well together. As a team draw the final design for your shelter.
4. Once you're happy with your design, start building! Work together to make the shelter, take it in turns to lead and be supportive of each other. Is there anything you need to change now that you're using real materials?
5. Set your shelter up outside.

THINGS TO THINK ABOUT

1. Where do hedgehogs normally hibernate? Can your shelter be similar to that type of space?
2. How big is a hedgehog? How big will your shelter be?
3. How will you know if a hedgehog has moved in?

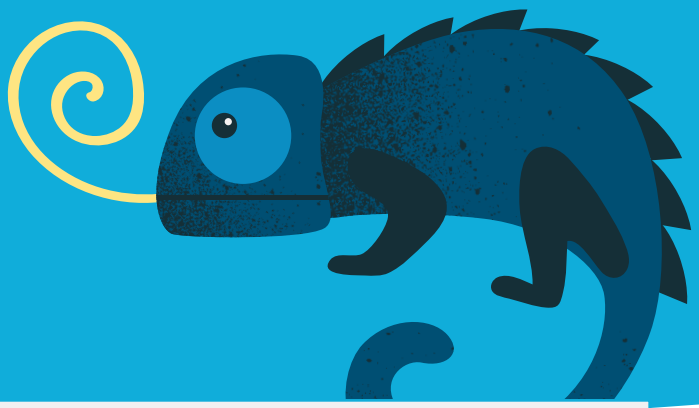
FUN FACTS

1. The black bear can gain 13.5kg a week during its pre-hibernation binge!
2. Some species of bat can lower their heart rate from 1000 beats per minute to less than 25 and they only take breaths every two hours!

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

3 Hedgehog Hibernation



Name:

Design of shelter

CLUB LEADER GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

4 Body language

Objective

In this activity, pupils learn how animals communicate non-verbally, including through chemicals and movement. Pupils use these ideas to develop their own signalling system.

TOPIC LINKS

- Science: animal communication
- Design and technology: design a code based on animal adaptations

ESSENTIAL SKILLS SUPPORTED

Problem solving, leadership, teamwork

TIME

45 minutes

RESOURCES AND PREPARATION

- honey or sweets
- 4–5 different essential oils or scents
- paper or card

HEALTH AND SAFETY:

A suitable risk assessment must be carried out by the activity leader and any significant findings recorded: if carried out in schools, guidance from CLEAPSS or SSERC must be used where appropriate.

Be sure to check for allergies before using essential oils or giving pupils sweets.

DELIVERY

1. The pupils will work in teams and will need to elect a leader. The team leader will need to make sure everyone works together and that they solve each aspect of the challenge on time.
2. Set timings for each aspect of the challenge for example:

   5 minutes to watch the video and discuss what they have seen

   10 minutes to work out their instructions and test them

   5 minutes for the 'bee' to find the nectar etc
3. Explain that you are going to investigate how animals communicate with each other when they can't speak. Tell pupils they are going to play some games today to find out about this and devise their own type of non-verbal communication.
4. Introduce the Bee waggle dance.

a. Watch the video (see Useful links), then give pairs or small groups of pupils some time to think of their own six movements that can communicate instructions. For example, a figure 8 movement means go in that direction. An up-and-down movement means higher or lower.

b. Select a pupil from each group to send out into the hallway while you hide some 'nectar' (sweets) around the room.

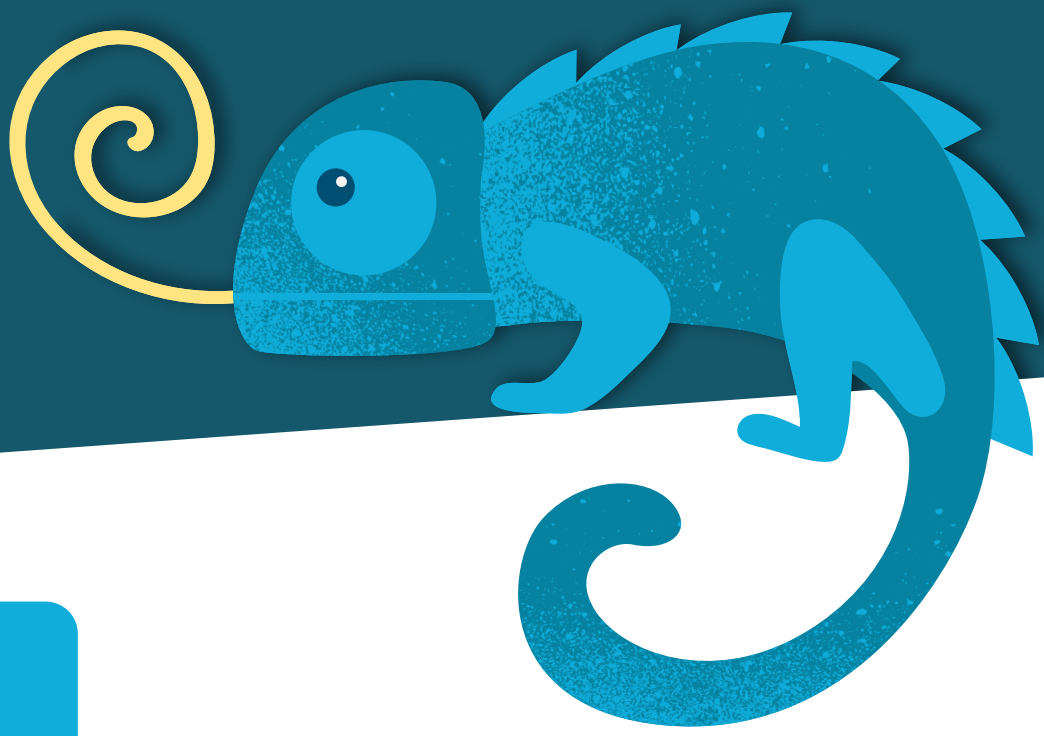
c. When they return, their group should use their 'dance' to help them find the nectar.

5. Introduce Ant communication.

a. Before the session, spray or drop different scents (essential oils) on identical pieces of paper or card. Make sure each scent is used on two cards. You could also put a secret marking system on them so you can identify correct pairs once the pupils have attempted the game.

b. To test out their own ability to recognise scents, mix up the scented cards. The pupils should now try to match the cards using their sense of smell.

6. Now pupils have played both games, ask them to use the ideas to develop their own secret code to signal where hidden sweets are to others. Give them time to



TIPS

- Don't prepare the essential oils too far in advance or the scents will mix and be impossible to match!

work out some codes or movements, then test it out. How easily could they get their message across? You may want to time them (or ask them to time themselves).

7. After one attempt, allow them to refine their communication system. Repeat the test. Did their modifications help? Can they finish the task more quickly the second time?

WHAT'S GOING ON?

Bees communicate the whereabouts of nectar-rich flowers through a waggle dance. This communicates flower type, distance, direction from the sun and angle from the hive so other bees can accurately find the nectar.

Ants can communicate through chemicals they produce called pheromones. These are produced by hormones in their body. Other ants smell them and understand the scent signature. Different pheromones are produced if the ant is in danger, compared to if they are finding food.

EXTENSION IDEAS

1. Some humans communicate non-verbally using sign language like British Sign Language or Makaton. Can pupils find out how to sign their names using fingerspelling? Can they find out the signs for the words for 'happy' 'danger' and 'food'?

2. Humans have also invented many codes so secret messages can be passed on, such as Morse code. Try this Morse code translator. Pupils need to complete the challenges in order to translate the code. www.101computing.net/morse-code-encoder/

DIFFERENTIATION IDEAS

Support: give pupils ideas of which signals they should give, e.g. turn right/left, go forward, look up/down, etc.

Challenge: allow pupils to come up with their own ideas as to which signals will be most helpful.

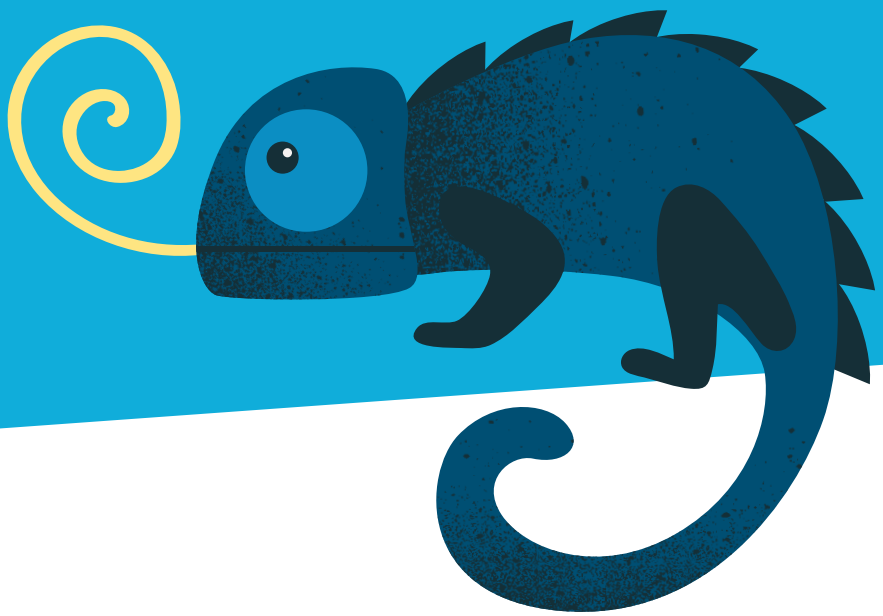
USEFUL LINKS

- **National geographic video of bee waggle dance**
  https://video.nationalgeographic.com/video/weirdest-bees-dance
- **DK Find out – information on ant communication**
  www.dkfindout.com/uk/animals-and-nature/insects/how-do-ants-communicate/
- **BSL fingerspelling alphabet**
  www.british-sign.co.uk/fingerspelling-alphabet-charts/

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

4 Body language



Briefing

Some animals do not communicate through sound but use other methods of communication such as their bodies and senses. You are going to learn to create your own method of secret communication!

YOUR TASK **Create your own code, based on how bees and ants communicate, to direct your group to a goal.**

WHAT YOU NEED TO DO

1. You are going to work in teams to solve this challenge. One of you will lead the team to make sure you complete the tasks on time. Your team leader needs to be good at telling the time and good at helping others. Ask your club leader to help you select your team leader.
2. What sort of code would be best? A visual code using body movements? A way to use scents to tell people where to go? Something else?
3. How many signals will you need?
4. Test out your code. Time yourself while you try to do a task. Can you communicate your message? Is there anything you can change to make it better?
4. Make changes and try again. Is it easier this time?

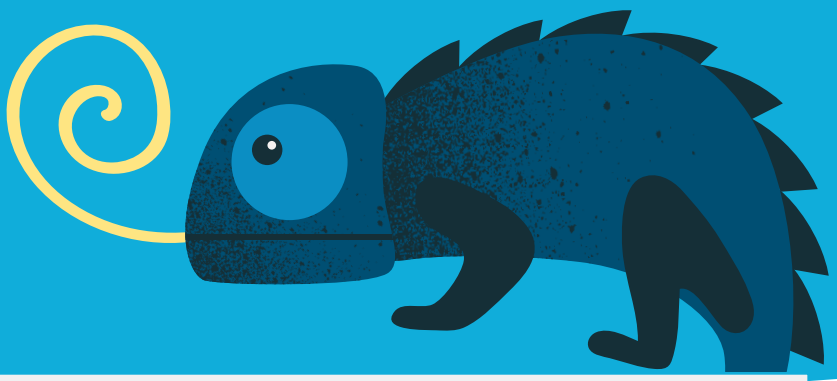
FUN FACTS

1. British Sign Language was first founded in 1760 by Thomas Braidwood. He ran the UK's first school for the deaf.
2. In 1973, a German professor was awarded the Nobel prize for his research about the waggle dance.

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

4 Body language



Name:

REPORT

Record your bee dance movements, notes on the scent activity and the secret code you have invented.

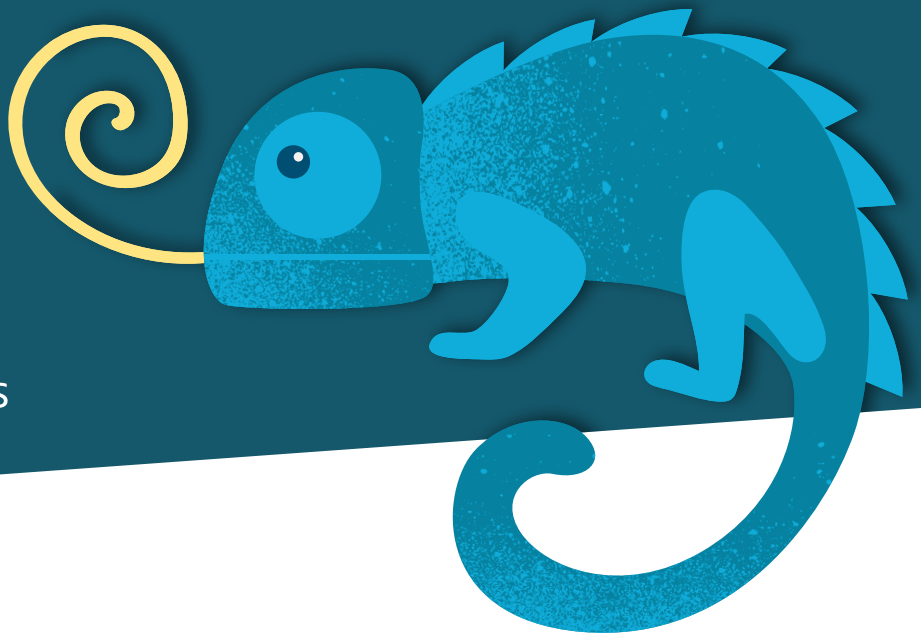
STEM CLUBS

NUMBER 1 FOR STEM

CLUB LEADER GUIDE:
SUITABLE FOR AGE 7-9

Animal Adaptations

5 Talking without words



Objective

In this activity, pupils learn how animals communicate non-verbally, including through chemicals, movement and light or chemical signals. Pupils use these ideas to develop their own signalling system that could be used as a simple code.

HEALTH AND SAFETY:
A suitable risk assessment must be carried out by the activity leader and any significant findings recorded: if carried out in schools, guidance from CLEAPSS or SSERC must be used where appropriate.

TOPIC LINKS
- Science: animal communication
- Computing: programme your own light signals

ESSENTIAL SKILLS SUPPORTED
Listening, problem solving, staying positive

TIME
50 minutes

RESOURCES AND PREPARATION
- computer program such as Scratch to code signals

DELIVERY

1. Show pupils the short video about squid communicating by skin colour changes (see useful links). Ask them what the different signals are and what they are for.
2. Ask pupils to create a program where a fish can change colour to show that there's danger.
3. Start with this Scratch program – https://scratch.mit.edu/projects/192183395/ – to give pupils an idea of what to create. Ask pupils to follow the instructions in the pupil guide to code their fish to change colour.

EXTENSION IDEAS

1. Pupils create their own code using light or sound and create a key. Ask them to program a secret message and see if they can communicate it to a friend!
   Top tip: Keep the message short!

DIFFERENTIATION IDEAS

Support: allow pupils to follow the step-by-step instructions in the pupil guide. Give them only one message to communicate through colour change.

Challenge: some pupils may want to experiment on their own before getting a full set of instructions.

You could also add challenge by asking pupils to create more than one signal. For example, a pink fish could be happy and a red fish could be danger. Pupils would select 'h' or 'd' as their button to press.

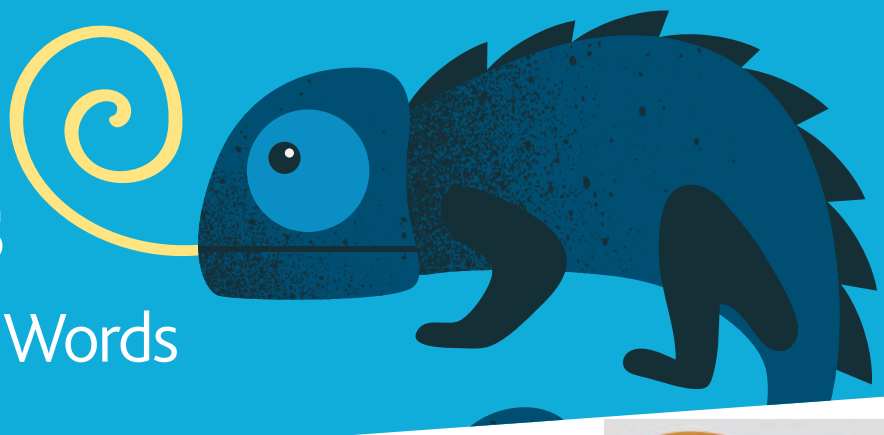
USEFUL LINKS

Wired article and video about squid chemical and colour communication
www.wired.com/2017/02/squid-communicate-secret-skin-powered-alphabet/

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

5 Talking Without Words



Briefing

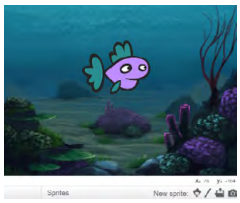
Squid can communicate really well, even though they don't have voices to speak! Today, you are going to use a computer program to create your own visual signals.

YOUR TASK

Code your fish so it changes colour when it sees danger.

WHAT YOU NEED TO DO

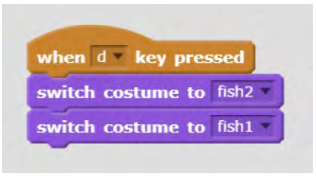
1. Click Create on the Scratch homepage. Select 'new sprite' and choose the fish. Delete the cat sprite.



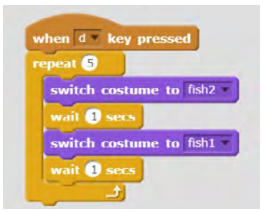
2. Select the costumes tab and right click the fish in the new costume menu, select duplicate. You now have two fish in the costume menu. Select 'fish2' and use the tools on the right to change the colour of the fish or to add a pattern.
3. Select 'fish1' in the new 'costume' menu and get ready to add some code.
4. Click on the 'scripts' tab and go to the 'events' menu.
5. Add 'when space key is pressed.' Change this to 'd' for 'danger'.

6. Click on the looks menu and choose 'switch costume' to 'fish2'.

7. You need the fish to switch back to its normal colour once the danger has passed. Add the same 'switch costume' coding block, but select 'fish 1' to choose the original colour.



8. Test the program by clicking the green flag. Did it work? The fish changes colour, but is too quick for you to see, think about how you could fix this. Could you add another block of code from the 'control' menu? Which code should you choose?
9. Choose 'wait 1 secs' and place it between the two switch costume blocks. Think about how many seconds the fish should show the 'danger' colour? Change the number in the 'wait' block.
10. If you want to make the fish appear to flash, add a 'repeat' block from the 'control' menu. Remember to include another 'wait' code block below 'switch costume to fish1'.



11. Now select a background, click 'new backdrop' and choose an image. Remember to delete the old background. Press the green flag to check the code works. If it doesn't, you may need to debug. Can you think of adding extra code to make the fish do something extra?

FUN FACTS

1. We often think of fish as silent, but some actually make sounds like clicks or croaks.
2. Some species of fish can flare out their gill plates the same way a cat would raise the hair on its back.

THINGS TO THINK ABOUT

1. What sorts of things might fish have to react to?
2. Can you think of any other ways fish could send a signal to another fish?

STEM CLUBS

CLUB LEADER GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

6 Moving together

Objective

In this activity, pupils learn how large numbers of animals move together without bumping into each other, and consider how we could apply the simple rules learned to human technology.

TOPIC LINKS

- Science: working scientifically, using observations and ideas to suggest answers to questions

ESSENTIAL SKILLS SUPPORTED

Presenting, aiming high, teamwork

TIME

50 minutes

RESOURCES AND PREPARATION

- enough space for pupils to move around in
- (optional) remote controlled device – could be a car or spider

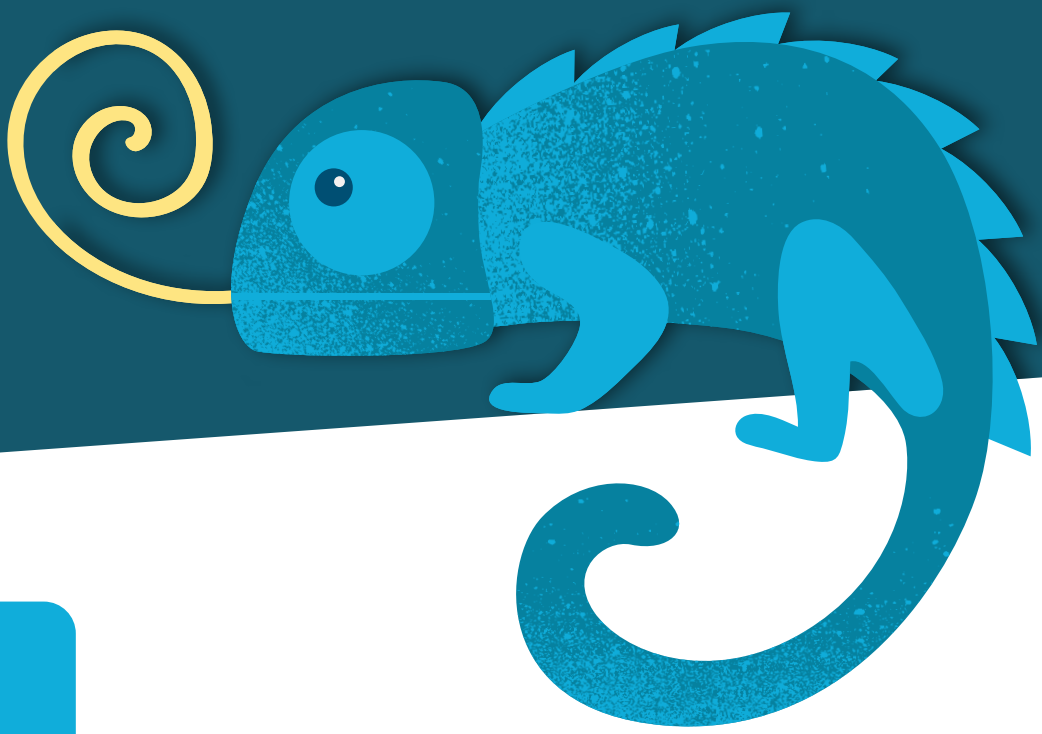
HEALTH AND SAFETY:

A suitable risk assessment must be carried out by the activity leader and any significant findings recorded: if carried out in schools, guidance from CLEAPSS or SSERC must be used where appropriate.

Ensure you have plenty of space to carry out this activity. Instruct pupils to walk, not run, so as to minimise the risk of collisions.

DELIVERY

1. Show a short video of a huge flock of starlings (see Useful links).
2. Ask pupils to think about how so many of them travel closely together, but never have a crash—even when they change direction.
3. Put pupils in small groups, and designate a space for each group. Tell them that they are going to move around their space, constantly changing direction. But they must not collide with or touch the other group members. Give them a few seconds to try it out, then ask how easy or difficult it was.
4. Now ask them to create one or more 'rules' that could help them do this more easily. For example, can they always move in a certain direction when they find they're too close to someone?
5. Pupils should now test out their system – is it easier to move around the space using their rules? What might they need to adjust about their rules? (e.g. wait until you are a certain distance from a possible collision before turning, reduce your speed if you're on a collision course, etc.). Give them one more chance to test it out.
6. Now ask groups to share their solutions with the other groups. Are there any similarities? Which one has been particularly effective? Do they work better if there are more or fewer rules? Choose (or allow them to choose) one of the more effective set of rules. Now the wider group will all try together to see if it still works with more people.
7. Give them a chance to refine their system once more once they've tested it out.
8. After completing the exercise, ask pupils how this could help humans. For example, is there anything we could learn from this that we can apply to things like programming drones or driverless cars?



TIPS

- Designating a space for each group will help avoid chaos and collisions, especially in small spaces.

WHAT'S GOING ON?

Scientists have discovered that birds tend to always veer to the right (and sometimes move up or down) when they find themselves on a collision course – this simple rule helps them consistently avoid collisions.

In addition, it's proposed that birds in a flock can anticipate a move or change in direction ahead of time. Birds' field of view is quite large, so they focus on the bird several feet away, as opposed to the one next to them. By the time they need to change direction, they can do it in time. It is a bit like a Mexican wave – it builds in momentum so that you can see it coming, and by the time it gets to you, you are able to jump up in time. You could demonstrate a Mexican wave to the pupils to help them understand.

EXTENSION IDEAS

1. Add a 'predator' in the form of a remote-control vehicle. The aim is to separate the flock, and will test if their rules still work even if there's a shock to the system.
2. Similar ideas are being applied to driverless car technology. This very simple simulation https://madewithmonsterlove.itch.io/error-prone shows how cars that are programmed to keep a set distance from each other are very reliable – but if a person tries to take control it gets harder!

DIFFERENTIATION IDEAS

Support: keep the groups smaller. Remind pupils of the solution the birds have come up with to guide them in making up their own rules.

Challenge: give pupils less guidance as they come up with their rules.

Don't have the class agree on a single set of rules before combining small groups after their initial tests. They can see if their original systems still work, or refine it together as a larger group.

USEFUL LINKS

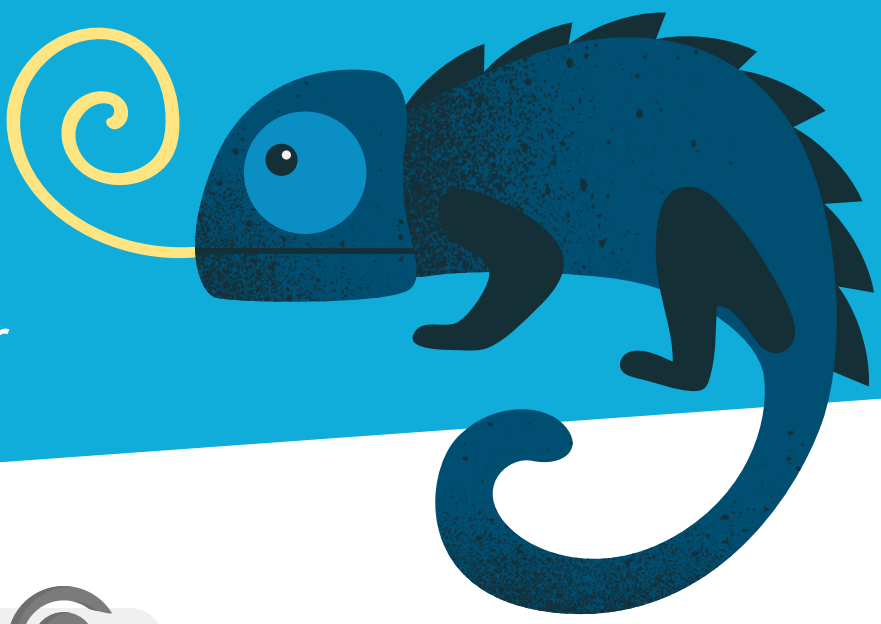
Starlings swarm over Rome
https://www.youtube.com/watch?v=3w90X92pDSs

Article on how birds avoid collisions
http://www.independent.co.uk/news/science/how-do-birds-fly-not-crash-mid-air-budgies-study-a7338916.html

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

6 Moving together



Briefing

Have you ever noticed that animals don't have crashes? Flocks of birds, shoals of fish and swarms of insects travel without ever bumping into each other, even when there are thousands of animals involved! How do they do it?

YOUR TASK **Come up with a system or some rules that help you avoid collisions in your group. For example, 'If someone is coming towards me, I will always**

_____.'

THINGS TO THINK ABOUT

1. Are there any rules that will always (or almost always) work?
2. Is it easier if you have lots or rules, or only one or two?

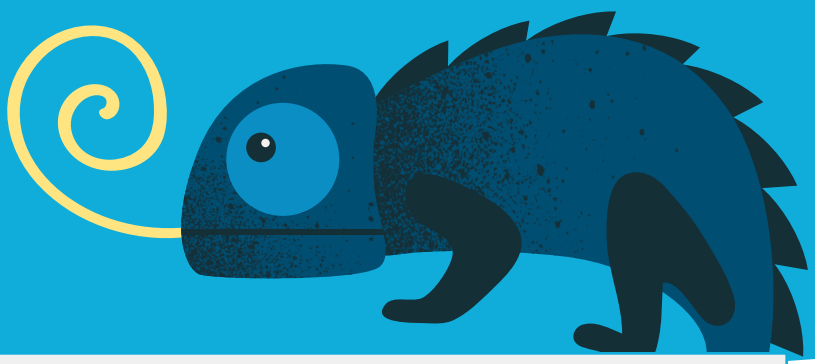
FUN FACTS

1. A swarm of honeybees can reach 30,000 individuals, but there is still only one queen.
2. You are more likely to see large flocks of birds in the evening as they make their way to roost for the night. A bright moon can trick birds into staying out!
3. When a school of fish want to defend themselves from predators, they pack tightly together to form a 'bait ball'. Only a few fish are exposed, so most of them stay safely in the middle.

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

6 Moving together



Name:

NOTES

Test 1 – Write down your rules, then test them out.

Test 2 – What can make them better? Write your new rules.

Test 3 – What can make them even better? Write your new rules.

STEM CLUBS

CLUB LEADER GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

7 Long-distance journeys

Objective

In this activity, pupils learn about birds that migrate enormous distances to reach breeding or feeding grounds. They will compare their size and body mass to the distance they travel and be astounded! Pupils will then make a glider and test how wingspan can affect its flight. They will use what they learn to help design an aircraft.

TOPIC LINKS

- Science: migration of birds
- Design and technology: create a glider
- Mathematics: calculating the mean

ESSENTIAL SKILLS SUPPORTED

Problem solving, creativity, teamwork

TIME

50 minutes

RESOURCES AND PREPARATION

- cardboard
- scissors or craft knives
- rubber bands
- glider template
- optional: different types of card or paper to test

HEALTH AND SAFETY:

A suitable risk assessment must be carried out by the activity leader and any significant findings recorded: if carried out in schools, guidance from CLEAPSS or SSERC must be used where appropriate.

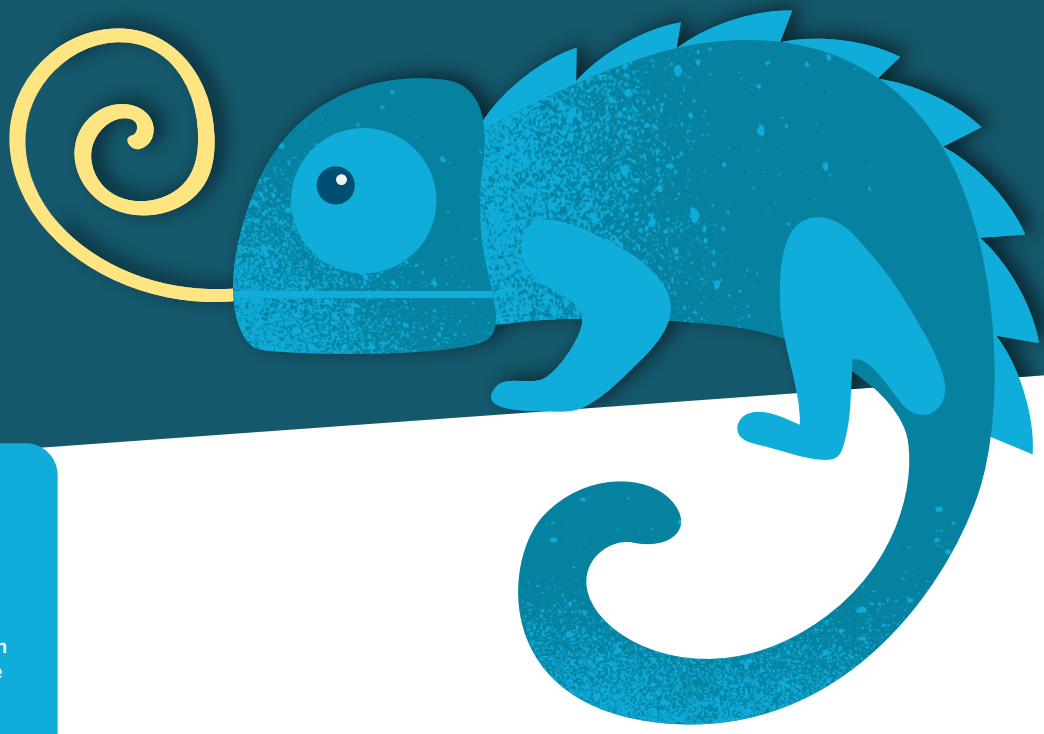
Instruct pupils to take care when using scissors or craft knives to cut the cardboard.

DELIVERY

1. Explain to pupils that some animals, especially birds, travel long distances every year. This is called migration.
2. You could give pupils the information in the table about different migrating birds. It should be a surprise that some of the smaller birds make longer flights!

1. Bird Species	2. Wingspan (cm)	3. Body mass (g)	4. Distance migrated (miles)
Bar tailed Godwit	80	630	7,145
Arctic Tern	85	127	44,000
Northern Wheatear	32	25	18,000
Sooty Shearwater	100	790	40,000
Albatross	330	850	13,670

3. Tell pupils they are going to work in groups to design an aircraft that will fly as far as possible. A longer flight time should mean fewer fuel stops and therefore a more energy-efficient flight. They should use a glider to help them experiment with wing sizes.
4. Give pupils the template in the pupil guide, and ask them to trace and cut out each piece, and assemble as indicated. This is the control group. Ask pupils to throw their glider several times, record the flight distances, and find the average.
5. Now ask pupils to make a change to the design to see if they can make it fly further. Can they increase the size of the wings or body? What if they change the shape of the wings?
6. Ask them to re-test their new design and record their results as before. What difference has it made? What else can they try? Repeat the process a few times.
7. Ask pupils to compare their results. Which group's design flew the farthest?



TIPS

- to ensure a fair test, try to launch the gliders in a large room where wind will not be a factor
- ask the same person to throw each glider

WHAT'S GOING ON?

Birds migrate to and from places to avoid consuming all the available food in a place if they stayed there permanently. Their winter/summer cycle means food stocks have time to replenish. Densely populated colonies of birds are also susceptible to disease. If disease spreads in a permanent colony, it would be more difficult to survive.

Birds make use of air currents – rising warm air that helps to keep the birds gliding with minimum effort. Albatrosses in particular take advantage of these air currents.

Research has found that longer wingspan does not directly link to the length of migration. Instead, some scientists believe that larger wings for larger birds mean the bird is less able to prepare (fatten up) for it migration, as it will have to carry much more weight than a smaller bird with smaller wingspan. This is why the smaller birds migrate huge distances compared with larger birds. Other scientists believe wingspan is related to the food available in the habitat they will be arriving in. If food in feeding grounds is in short supply, the birds have shorter wingspans, so they are masters of both long and short distance flight.

EXTENSION IDEAS

1. How could this knowledge affect passenger plane design? Time how long it takes to get each wingspan size a certain distance and see if pupils can conclude which will be the fastest design.
2. Are there any animals they think would make inspirational design for an aircraft? Could they design a helicopter based on a dragonfly?

DIFFERENTIATION IDEAS

Support: ask pupils to only focus on how the size of the wings affects the glider. You may want to scale the template up and down and provide them with the standard wing shape in three sizes to test.

Challenge: provide the basic template to pupils, but ask all of them to explore their own ideas for modifying the initial design.

USEFUL LINKS

Amazing migrators! Bird species
www.treehugger.com/slideshows/natural-sciences/nature-blows-my-mind-6-longest-bird-migrations/page/2/#slide-top

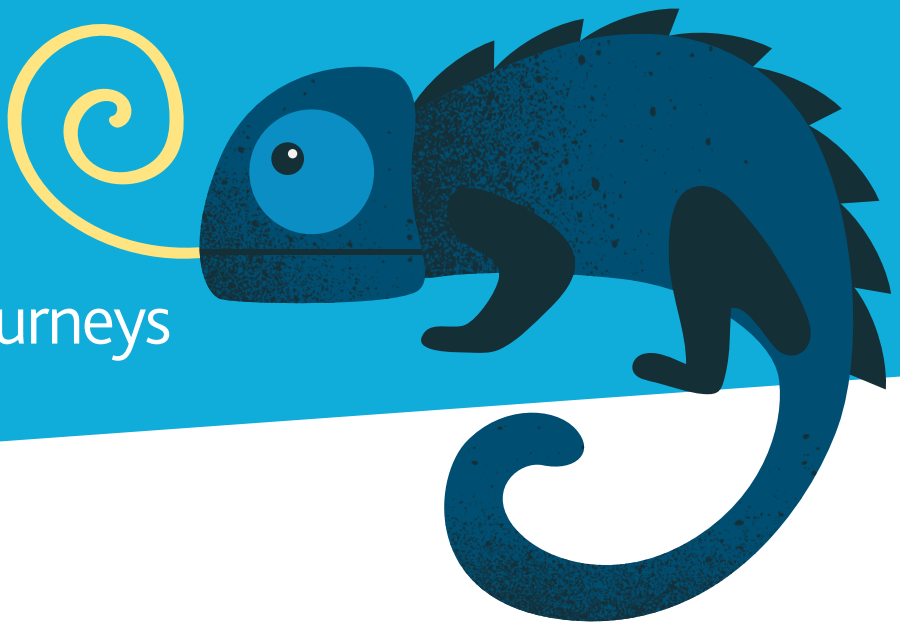
Animals that inspire aircraft design
https://blog.privatefly.com/how-animals-inspire-aircraft-design

Instructions to make a glider including template
https://www.instructables.com/id/DIY-Glider/

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

7 Long-distance journeys



Briefing

You're in charge of designing an aeroplane that can travel further using less energy. You know that some birds can travel very far, so you want to see how the size and shape of their wings could help you choose the best wings for your own aeroplane.

YOUR TASK **Design and build a glider that will fly the furthest.**

THINGS TO THINK ABOUT

1. Cut out all the pieces of the glider and follow the instructions to put it together.
2. Test how far it can go. Write your results in the table.
3. Make a change to your glider. For example:
   - make the wings bigger or smaller
   - change the shape of the wings
4. Test again and record your results. Did it fly further?
5. Make another change and test again. Which design makes your glider go the furthest?

RESULTS

Look at the designs from other groups. Whose can go the furthest? What is different about their design that makes it so effective?

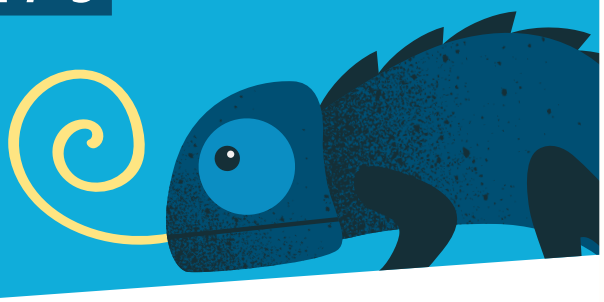
FUN FACTS

1. Bar headed geese are the highest flying migratory birds, flying at 5.5 miles above sea level!
2. The Arctic Tern flies an enormous 44,000 miles a year! Over its lifespan of 30 years, that is roughly the same as three trips to the moon, and back.
3. The Great Snipe flies for 4,200 miles at around 60 miles per hour, seemingly without using the wind to assist it.

STUDENT GUIDE: SUITABLE FOR AGE 7-9

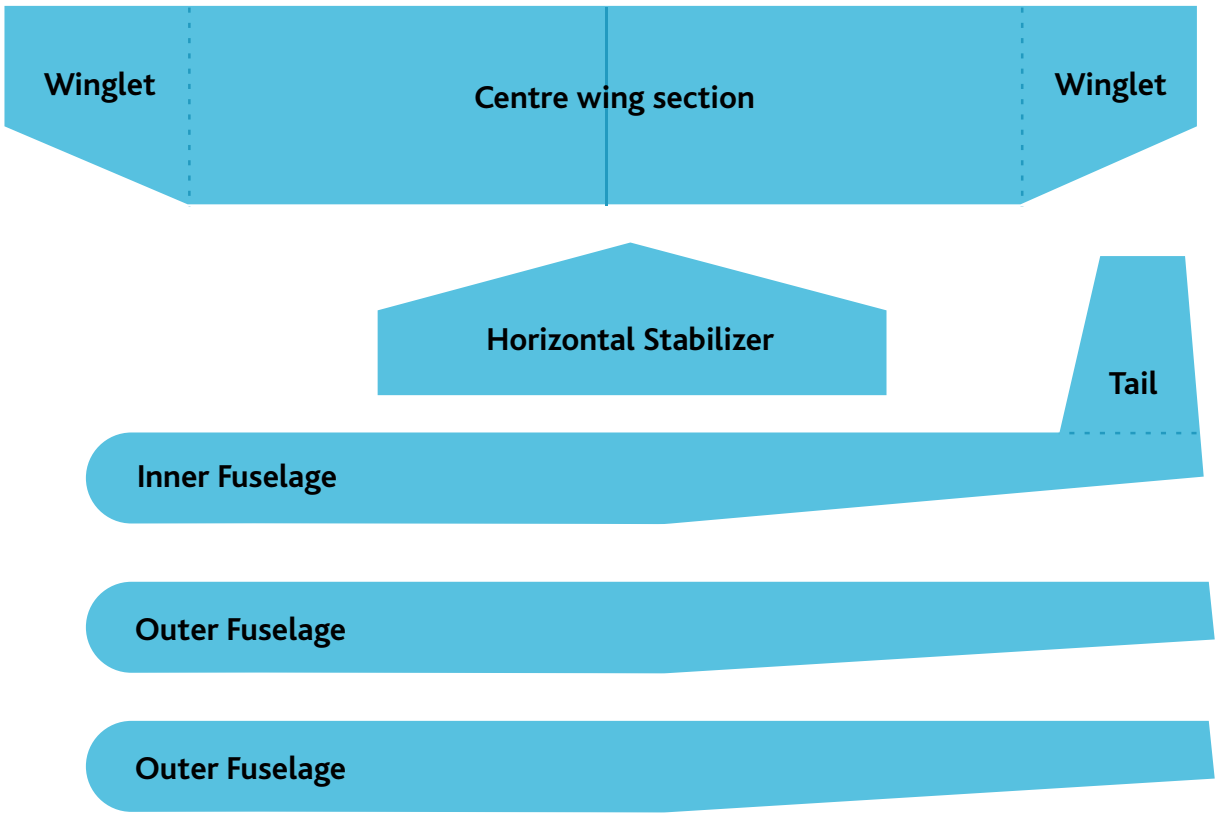
Animal Adaptations

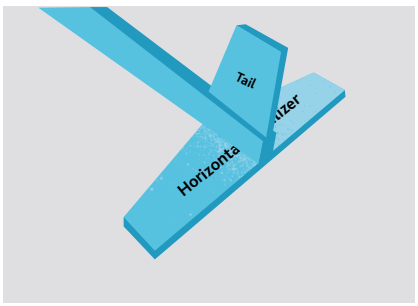
7 Long-distance journeys

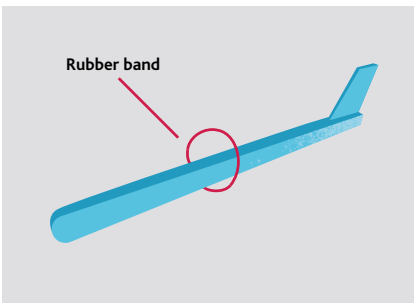


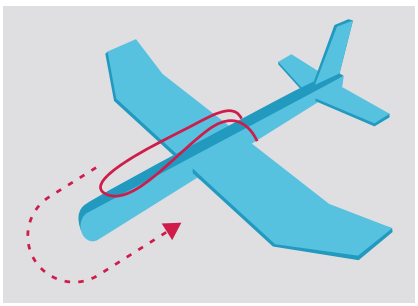
Instructions

1. Cut out each shape.







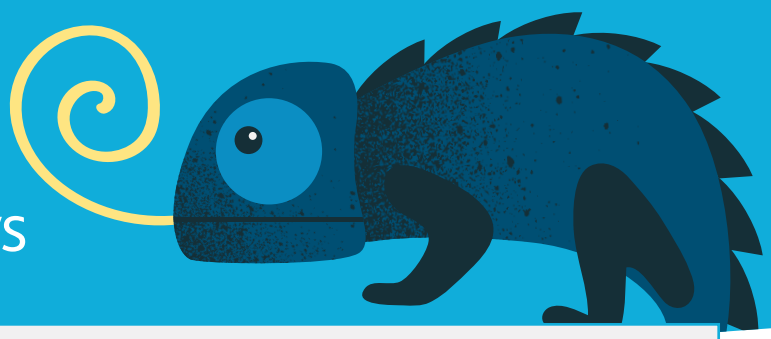


2. Tape or glue the outer body on both sides of the inner body.
3. With the tail pointing up, line up the flat end of the stabiliser with the end of the body, and glue or tape it below.
4. Now attach your wings. Place a rubber band underneath the body of the plane.
5. Put the wings on top, a little in front of the rubber band. Pull the rubber band up over the back of the wings, up over the top of them, and loop it around the nose of the plane.
6. Make sure the wings are tight, but not tight enough to crush your wings. Now take it for a test flight!

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

7 Long-distance journeys



Name:

		Changes Describe what you changed	Distance for each test	Average distance
Design 1 (control)	**Test 1**	n/a	1.	
	Test 2		2.	
	Test 3		3.	
Design 2	**Test 1**		1.	
	Test 2		2.	
	Test 3		3.	
Design 3	**Test 1**		1.	
	Test 2		2.	
	Test 3		3.	

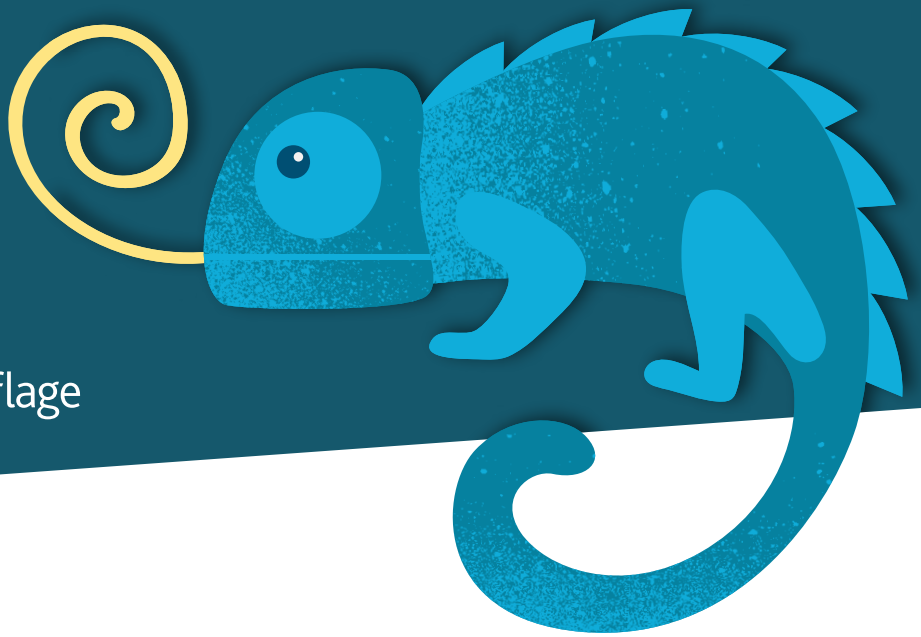
STEM CLUBS

NUMBER 1 FOR STEM

CLUB LEADER GUIDE:
SUITABLE FOR AGE 7-9

Animal Adaptations

8 Disguises and camouflage



Objective

In this activity, pupils learn about animals that can adapt to their surroundings by changing the way they look. Pupils then find out how humans have tried to copy animals to create colour-changing materials and use nature for inspiration to create other inventions that we now simply couldn't live without.

HEALTH AND SAFETY:

A suitable risk assessment must be carried out by the activity leader and any significant findings recorded: if carried out in schools, guidance from CLEAPSS or SSERC must be used where appropriate.

If you feel it is inappropriate for your group to use images of themselves, you could use pictures of animals or other scenes.

TOPIC LINKS

- Science: materials that change colour to mimic the environment
- Design and technology: design a disguise

ESSENTIAL SKILLS SUPPORTED

Listening, problem solving, creativity

TIME

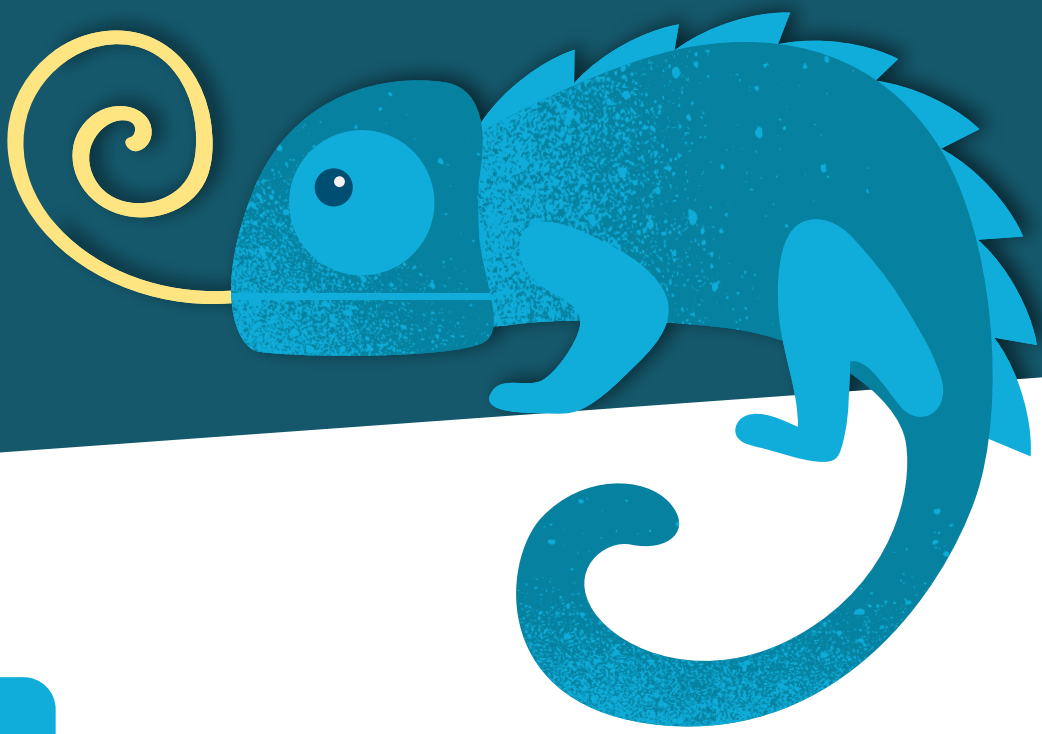
30 minutes

RESOURCES AND PREPARATION

- computer
- thermochromic paint (available online)
- portraits of each pupil
- hairdryer

DELIVERY

1. Ask if pupils know of any animals that use camouflage to escape predators. Some animals, such as stick insects, are well disguised because they look like their environment.
2. Some animals change to adapt to their environments. This type of disguise is called adaptive camouflage. The arctic hare changes the colour of its coat from white in winter to brown in summer. Some animals react even more quickly, including the chameleon and many species of octopus.
3. Explain that humans may not be able to change their own appearance, but they've been able to create disguises and camouflage, including special paints that respond to the environment.
4. Show pupils an image that you've painted over with thermochromic paint. Ask them to explore how they can reveal the image beneath. They might try holding it up to the light, looking from different angles, etc. Guide them if needed; use the hairdryer to warm the thermochromic paint, and demonstrate that heat can make the paint become transparent.
5. Pupils will now use thermochromic paint to disguise their own image.
6. Using printed portraits of each pupil, get them to add disguises (e.g. sunglasses, hats or moustaches) to the pictures. Once their designs are complete, mix them up and show them to the class. Can they identify the person in the photo? Use the hairdryer to reveal their true identity. Whose disguise was most effective?



TIPS

- Allow time to mix the thermochromic paint.
- Something to be aware of when researching 'adaptive camouflage': there are many search engine results with links to military research into this technology.

WHAT'S GOING ON?

Thermochromic paints contain leucodyes which change structure when they are heated. The leuco and non-leuco forms absorb and reflect light at different wavelengths appearing to change colour.

EXTENSION IDEAS

1. Apply some of the thermochromic paint to mugs. The message will disappear when filled with hot liquid.
2. Sit outside and ask pupils to observe nature. What do they find amazing or fascinating? Why is this? They will need to be guided to appreciate small-scale things. For example, is it the way water runs down the centre of a leaf? Is it the way animals dig burrows or tunnels without them collapsing? Is it the way trees are able to pump water high into the air, so the tree tops are able to get water? How can humans learn from this?

DIFFERENTIATION IDEAS

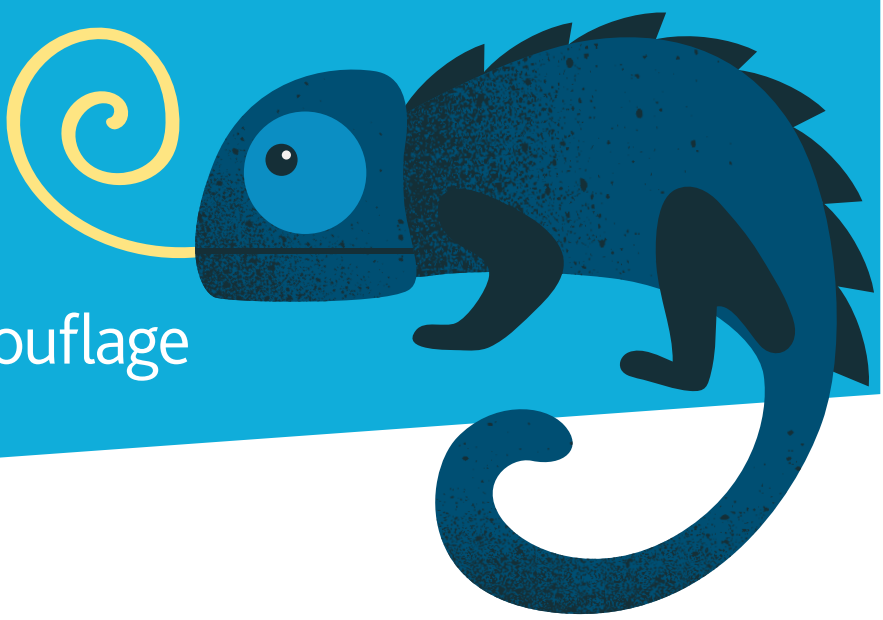
Support: allow pupils to disguise their image however they like.

Challenge: give pupils more constraints to increase the challenge. For example, can they still make an effective disguise if they can't cover the eyes?

STUDENT GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

8 Disguises and camouflage



Briefing

Many animals can adapt to their surroundings by changing the way they look. Some animals can even change the colour of their skin to blend in. You are going to look at how humans have tried to copy animals in this way.

YOUR TASK **Design a disguise so no one can recognise a picture of you.**

WHAT YOU NEED TO DO

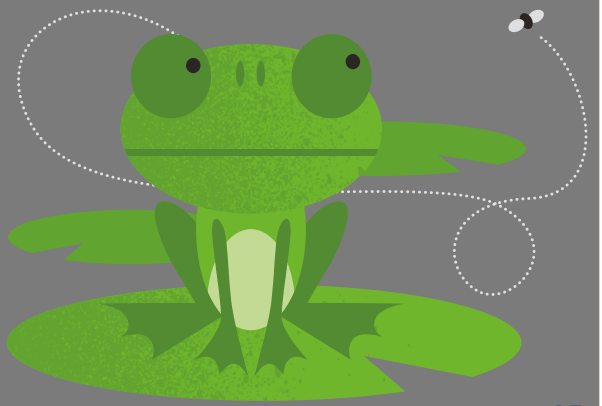
1. Your STEM Club leader will show you a picture with a hidden image. Can you work out how to reveal the image?
2. Once you know how it's done, it's time to make your own disguise! Use the paint to create a disguise for the image.
3. Show the rest of the group your design. Can anyone guess what's hidden?

THINGS TO THINK ABOUT

1. Which animals use camouflage? How does it help them?
2. Do humans ever use camouflage? Where and when? How does it help them?

FUN FACTS

1. An octopus can change the colour and texture of its skin to blend into its environment in less than a second.
2. Chameleons change their colour to reflect or absorb light so they can regulate their body temperature, not for camouflage.
3. Many amphibians such as frogs and toads have very similar colours and skin patterns to their surrounding environment.



CLUB LEADER GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

9 Broken food chain

Objective

In this activity, pupils learn that a food chain is a delicate ecosystem that is linked. Pupils will use computer modelling to see what happens when a food chain is broken.

TOPIC LINKS

- Science: food chains
- Computing: model the effects of a broken food chain
- Mathematics: angles and movement within Scratch program, if used

ESSENTIAL SKILLS SUPPORTED

Listening, presenting, problem solving

TIME

30 minutes

RESOURCES AND PREPARATION

- drawing pins
- wool
- scissors
- card for labels
- computers with Scratch

HEALTH AND SAFETY:

A suitable risk assessment must be carried out by the activity leader and any significant findings recorded: if carried out in schools, guidance from CLEAPSS or SSERC must be used where appropriate.

DELIVERY

1. Ask pupils what they know about food chains. Provide the example in Guam with coconut trees - insects - lizards and the brown tree snake. (See Useful links.)
2. Stick labelled pins into a pin board to represent each link in the food chain. Join these together by looping a piece of wool around them. Tie it off after the tertiary consumer. Ask a pupil to select another food chain from the food web. Place pins in the board and join with wool as before. Where there is already a labelled pin, use the existing one. (An alternative way of doing this by having the children represent each of the items on the food web. They hold string instead of the pins and drop out as they are eaten. This is a more interactive way of completing the activity.)
3. Repeat twice more.
4. Explain that in Guam, the brown tree snake is a non-native species. It was introduced by accident and has had huge effects on the ecosystem. It has eaten most of the native birds and their eggs on Guam. Cut the wool next to the pin marked 'birds', and watch the wool unravel. Explain that the food web is severely affected. Without the birds to spread their seeds, many of the plants on Guam are dying out.
5. Explain that you are now going to simulate what Guam will be like if nothing is done to stop the spread of the brown tree snake, using the computer to help you imagine.
6. Use this Scratch project as a starting point:

https://scratch.mit.edu/projects/209744964/#player

The completed program can be found here for reference: https://scratch.mit.edu/projects/209693919/#player

7. With this starting point, pupils will see a balanced 'ecosystem'—the birds eat the spiders when clicked, but the spiders reproduce quickly and maintain an equilibrium.

TIPS

- Explain that this is a simplistic model of what could happen, but there are many more factors involved.

8. Explain that pupils will now create the script for the brown tree snake, to show that when a non-native species arrives, it will throw off the balance. Pupils should follow the instructions in the pupil guide to set up their program. **Note:** the guide contains instructions for all three sprites, but if using the link above without changing, pupils will only need to look at the instructions for the snake.

DIFFERENTIATION IDEAS

Support: give pupils the link above and ask them to look only at the snake instructions in the pupil guide.

Challenge: clear out all the scripts (but don't delete the sprites!) and have pupils create the blocks for all three of the sprites.

EXTENSION IDEAS

1. Select a different food chain to model using the computer.

USEFUL LINKS

- Guam food web
  https://prezi.com/odiu5ru-rge-/guam-rainforest-food-web/
- Advantages and disadvantages of biological control
  https://owlcation.com/stem/Advantages-Disadvantages-of-Biological-Control
- Hedgehogs introduced in Orkney
  http://www.scotsman.com/lifestyle/spiky-issues-1-692845
- Rabbits introduced in Australia
  http://all-that-is-interesting.com/bunny-rabbits-australia

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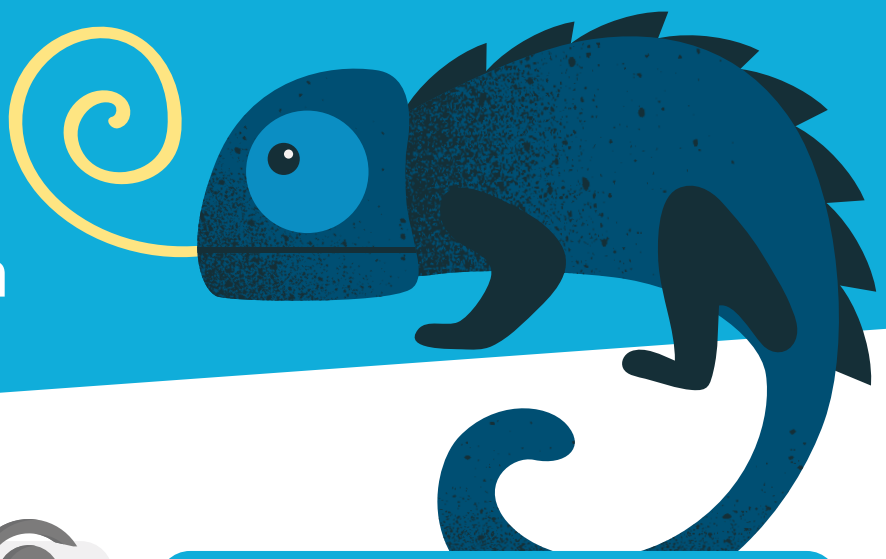
Animal Adaptations

9 Broken food chain



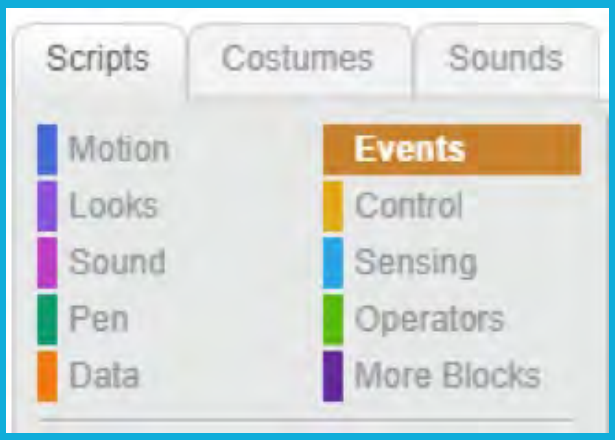
Briefing

Food webs are systems where every animal or plant affects every other animal or plant. Sometimes, when an 'alien' species enters the ecosystem, huge problems start. But getting rid of them isn't easy either. You are going to see what happens when a new species arrives.

YOUR TASK **Use the computer, with some help from your STEM Club leader, to find out what happens when the brown tree snake is left alone in Guam.**

TIPS

- **Make sure to look at the colours of the coding blocks.**



FUN FACTS

1. Organisms that can make their own food are called producers. Producers are usually plants.
2. There are four types of consumer in a food chain: carnivores, herbivores, omnivores and scavengers.
3. It's common for birds to eat fish, but the giant trevally fish can flip the food chain – they've been known to eat birds!

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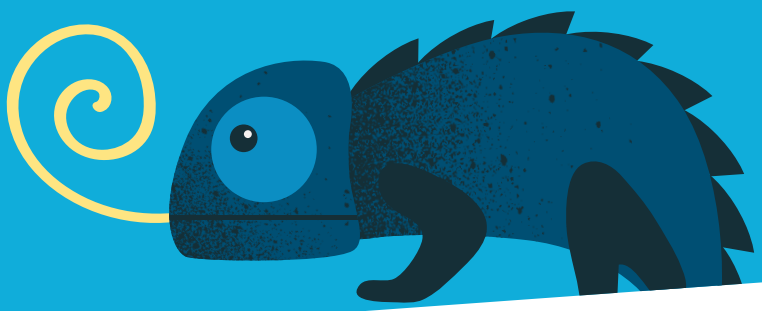
Animal Adaptations

9 Broken food chain



PARROT

1 Click on the parrot sprite to open the script area.

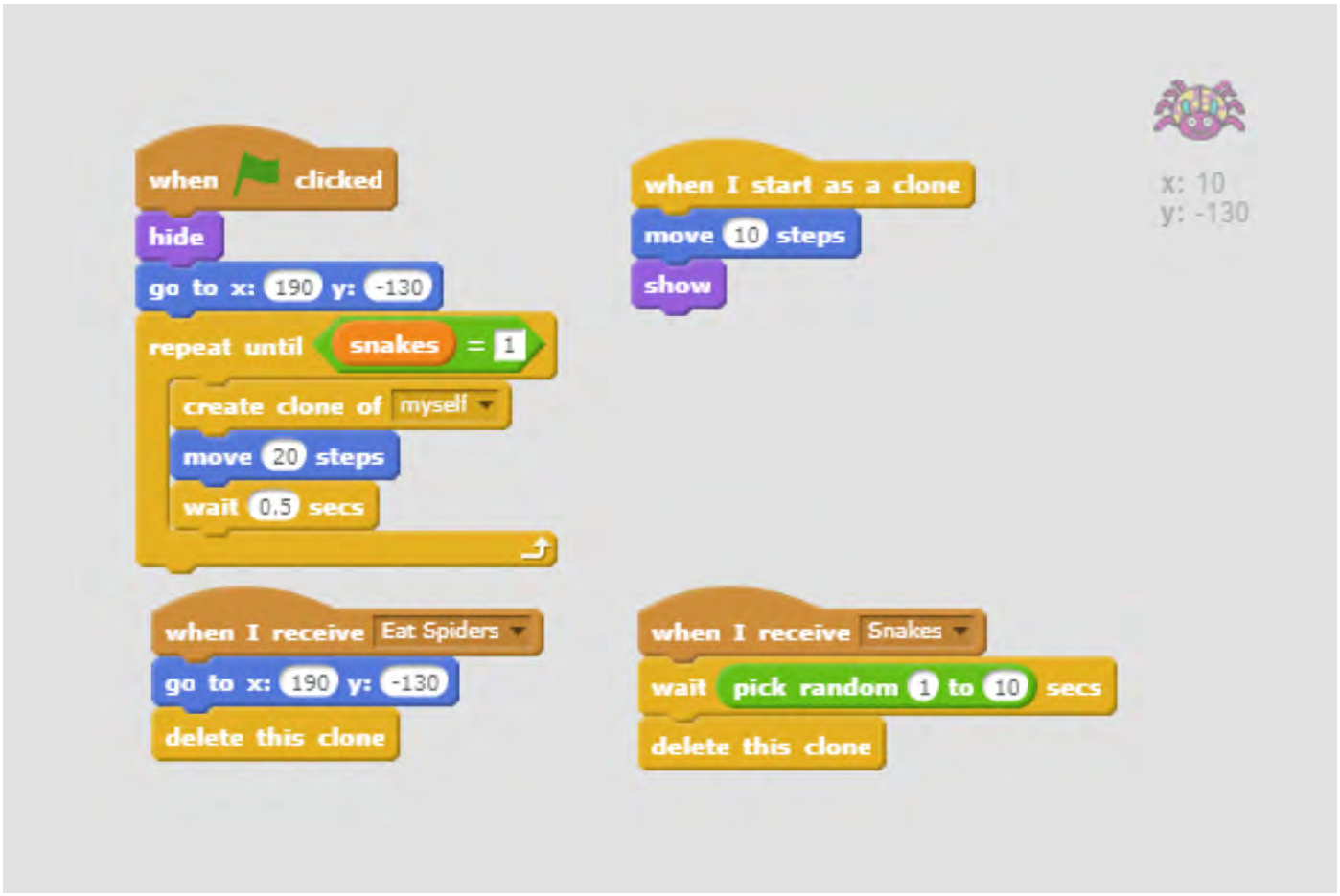
2 Can you explain what the different blocks do?

Animal Adaptations

9 Broken food chain

SPIDER

1 Click on the spider sprite to open the script area.



2 Can you explain what the different blocks do?

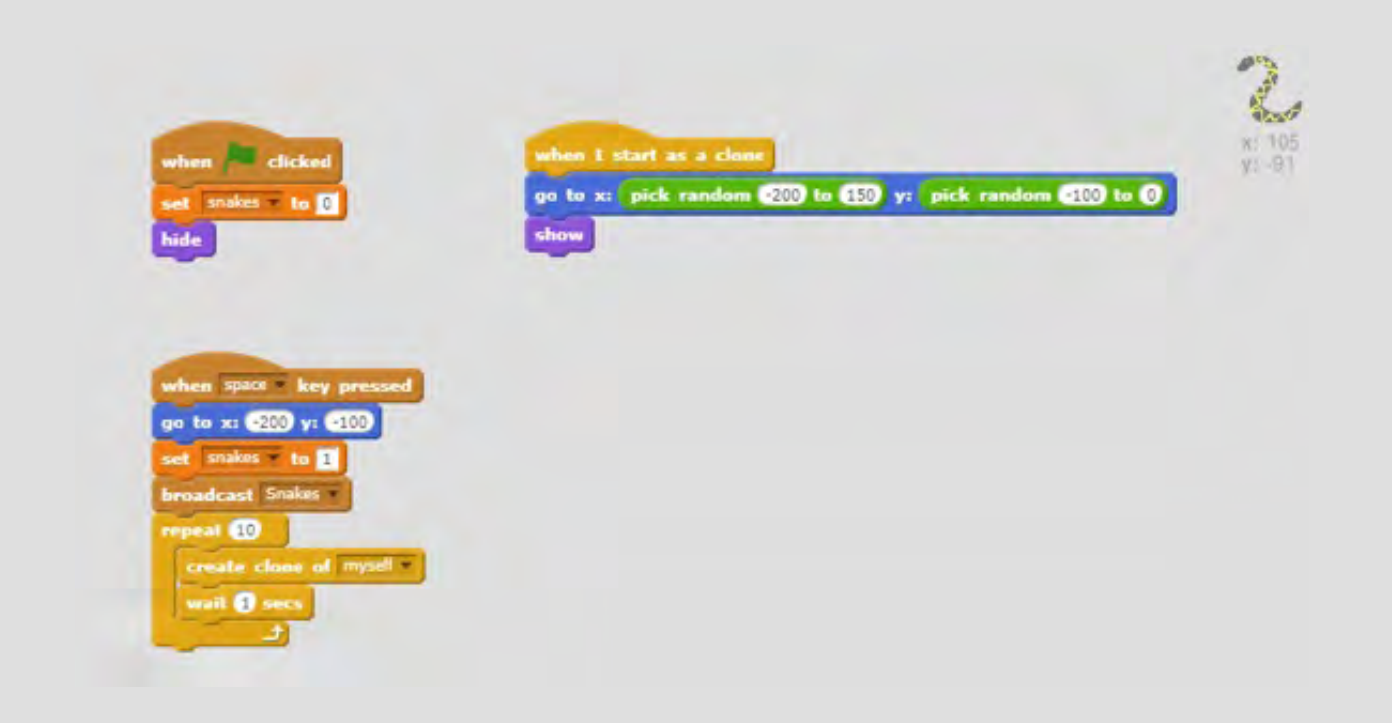
3 Test out your program. You should see that when you click the parrots, they 'eat' some spiders, but the spiders grow quickly. This keeps a nice balance in the environment.

Animal Adaptations

9 Broken food chain

SNAKE

1 Now find out what happens when a new species arrives! Click on the snake sprite to open the script area. Add these coding blocks so that when you hit the space bar, the snake is introduced.



2 Can you explain what the different blocks do?

3 Test out the program. You'll know it works correctly if you have a screen full of snakes after a short time!

4 If it doesn't work, look back at the coding blocks. Is there anything you need to change?

5 Can you remix the project? Maybe you could make more parrots disappear, make the spiders move around, or even add another animal to the mix!

CLUB LEADER GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

10 The Skills Builder Framework

Skills Builder FRAMEWORK

The Activities and Employability Skills

Each activity within this resource pack has identified the essential employability skills it supports and develops in students. These skills have been mapped to the essential skills identified by the Skills Builder Framework, which breaks down eight essential skills into 16 teachable and measurable steps. Club leaders and teachers can use the activities to promote good practice and enhance each student's individual learning curve. Helping to promote transferable skills key to their education and future employment.

ABOUT THE SKILLS BUILDER PARTNERSHIP

The Skills Builder Partnership brings together educators, employers and skills-building organisations around a common approach to building eight essential skills. Their programmes include training and resources, supporting schools and colleges to embed a rigorous approach to building skills and achieve the Gatsby Benchmarks. As an individual teacher or Club leader, you can freely access a suite of online teaching tools and resources, designed by their team of teachers to build essential skills. The suite includes learning activities, supporting videos, classroom resources, assessment tools and the Skills Builder Framework, which you can use in STEM clubs and classroom teaching.

THE SKILLS BUILDER FRAMEWORK

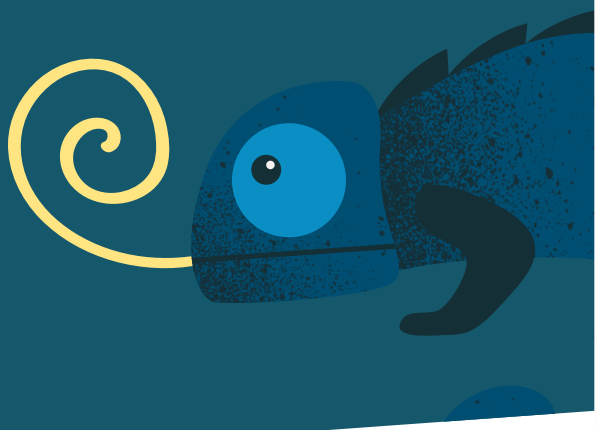
The Skills Builder Framework breaks down eight essential skills into 16 teachable and measurable steps, providing a common set of expectations and a roadmap for progression. Step 0 is for the least experienced learners and Step 15 represents a highly skilled adult. The Framework can be used by teachers and Club leaders to talk to students about their skill strengths and areas for development and is a useful tool for framing conversations about careers and employability. Focusing student learning through the Framework, enables students to recognise their own essential skill levels and work to master them over time. The Framework can provide a language for students to articulate this progress to helping to develop employability skills and prepare students for future careers.

Skills Builder also provide multiple online assessment tools, including a student self-assessment, student-by-student teacher assessment and class-level formative assessment through the Skills Builder Hub. This means that programmes can be differentiated and focused to meet individual needs.

CLUB LEADER GUIDE: SUITABLE FOR AGE 7-9

Animal Adaptations

10 The Skills Builder Framework



EIGHT ESSENTIAL SKILLS

The eight essential skills broadly break down into four domains we know both teachers and employers value.

Communication

1. Listening – ability to listen and understand information
2. Presenting – vocal communication of information or ideas

Creative Problem solving

3. Problem Solving – ability to find a solution to a complex situation or challenge
4. Creativity – use of imagination and the generation of new ideas

Self-Management

5. Staying Positive – ability to use tactics to overcome setbacks and achieve goals
6. Aiming High – ability to set clear, tangible goals and devise a robust route to achieving them

Inter-personal

7. Leadership – supporting, encouraging and motivating others to achieve a shared goal
8. Teamwork – working cooperatively with others towards achieving a shared goal

You can find out more about essential skills and the Framework on the Skills Builder website, https://www.skillsbuilder.org/framework and you can access resources on the Skills Builder Hub https://www.skillsbuilder.org/hub

You can find additional support and information on careers and employability skills on the STEM Learning Careers pages, https://www.stem.org.uk/stem-careers. You can also download the free Skills Builder toolkit from the STEM Learning website https://www.stem.org.uk/rxfum6

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STEM Clubs Programme, led by STEM Learning

Achieving world-leading STEM education
for all young people across the UK.

For more information on the programmes and publications available from STEM Learning, visit our website www.stem.org.uk