Great Computing Share

How much do the technologies in our school contribute to climate change?

AGE RANGE: 7–11 years

OVERVIEW

This enquiry is in 2 parts. Firstly, pupils explore a range of technologies used regularly within school. They collect data on the number and frequency of use of different devices to determine which produces the most carbon dioxide. Secondary data supports them to draw conclusions. Secondly, pupils use computing to create an animation using 'Scratch' coding to share their investigation findings with new audiences.

Climate Action is addressed by encouraging pupils to develop awareness about how technology produces carbon dioxide. They review how the different types of technology in school have different carbon emission levels. They discuss how what they have found informs them about the impact of greenhouse gases on the environment.

LEARNING OBJECTIVES

WORKING SCIENTIFICALLY

- Gather, record and present data in a variety of ways to help answer questions
- Report and present findings, including conclusions, casual relationships and explanations
- Use results to draw simple conclusions

COMPUTING

- Develop an understanding of some Scratch command blocks through guided explanation
- Identify how programs with two sprites are sequenced
- Sequence a program with two sprites to communicate information

RESOURCES (groups of 2)

- A computer or laptop with access to www.scratch.mit.edu
- Access to Scratch programming environment
- School technology audit recording table
- Program code Support Sheet
- Investigating with Scratch sheet
- Animation storyboard planner
- Scratch files 'Predict and Run' and 'Modify'

TO SUPPORT TEACHING

- Scratch file 'Carbon calculator using lists'
- A range of data to show the number of times the school turns on dishwashers, washing machines and tumble dryers during one week
- Great Computing Share Teaching Slides
- Careers Chat Videos and Profile cards
- 7-11 Great Science Conclusion Creator

KEY WORDS

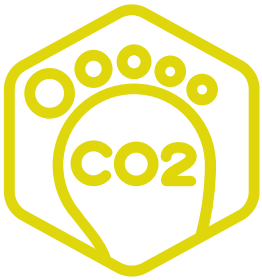
- climate change
- carbon dioxide
- greenhouse gases
- emissions
- secondary data
- compare
- command blocks
- sequence
- wait command block
- say command block
- sprite
- section

Video links

VIDEO 1 | VIDEO 2 | VIDEO 3 | VIDEO 4

Step-by-step guide

1. Engage pupils' understanding of the term '**climate change**' by initially asking them to share their thoughts with a partner. Use the '**True or False Quiz**' (see Great Computing Slide 2) to review as a class. Explain to pupils that while one school can only make a small difference, the cumulative effect of lots of small differences can lead to a much greater impact.



Climate change is when the Earth's climate starts to change over a long period of time. It happens because of certain things people do that affect the Earth's atmosphere. But when people do things such as burning fossil fuels (like coal, oil, and gas) and cutting down lots of trees, it can add extra gases to the atmosphere. These gases, which are called greenhouse gases, trap more heat.

2. Introduce the scientific question **'How much do technologies in our school contribute to climate change?'**. Elicit pupils views by asking them to create a continuum line. To create this - Pupils stand at one side of the room to indicate a response of 'Very much so' or the other side for 'Not at all'. Encourage them to explain their choices.

3. Use the **video** and **profile card** in the **Careers Chat** resources to explain the role of scientists in the fight against climate change. Watch the video and download the accompanying profile card.

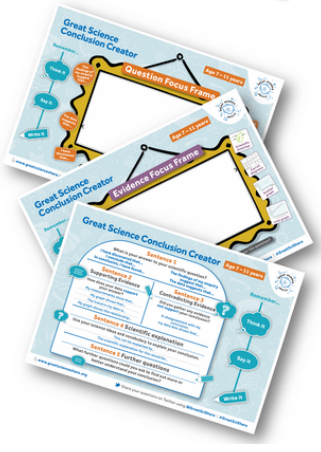
Explain that climate scientists gather evidence about carbon dioxide emissions, as this is a 'greenhouse gas' and thought to impact on the temperature of planet Earth. Invite pupils to make predictions about which items in their school produce the most carbon dioxide (and therefore can impact on climate change) Slide 6.

Review the data on slide 7 in relation to the technology used in the school. What do the pupils notice?

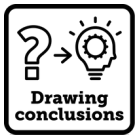
4. Gather ideas about what are the missing pieces of evidence that will enable them to work out how many technologies in their school contribute to climate change.
Brainstorm the data that needs to be collected:

- **what** technologies the school has
- **how many** of each technology there are
- **how often** they are used in a day or week etc.

For ease, try to stick to the list of technologies provided, as the data on slide 7 will support them to work out carbon dioxide emissions.
If helpful, use the sample Results table to record data.



5. Explain that pupils are going to use Scratch to process the data they have collected and to share their findings. Download the **Carbon Calculator** (**Video 1**). As a class, enter the data and the programme will calculate the total carbon emissions for each device.



6. Support pupils to use the data to generate a conclusion.
The **7-11 Great Science Conclusion Creator** can support them.
Ask pupils to decide if the school should reduce its carbon emissions, and if so, where they recommend this could be done and how.

Extension: Pupils could also research ways to reduce the amount of carbon dioxide they create from their technology at home, e.g. they could stream videos in SD rather than HD; disconnect devices from Wi-Fi when not in use; turn the charger off when the battery is fully charged.

Using Scratch to start developing the animation

In this section, pupils get to know how to use 'Scratch' (a free programming software for block coding). Watch Video 2 for an introduction to Scratch if needed.
You may skip this section if your pupils are confident in the use of Scratch.

Preparation by the teacher:

- Open Scratch (free software) in a web browser
- Download the 'Predict & Run' and 'Modify' files onto your own computer
- Upload the files into Scratch
- Enable the pupils to have access by saving the 'Predict & Run' and 'Modify' files to a shared space on the school network.

1. Provide pupils with the '**Program Code**' sheet (also given on slides 8-9 on the slide deck). Explaining that the code is from 'Scratch' and is used to control the two on-screen characters shown on slide 10.
The characters are known as '**Sprites**'.

Each part of the program controls a different sprite.

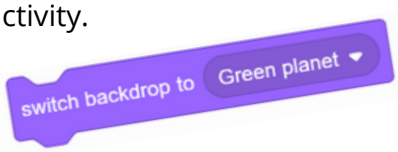
In pairs, ask pupils to look at the code and predict what each command block might do. Take feedback before running the program and identifying what the output is.

Sprites

Pupil 1 Pupil 2

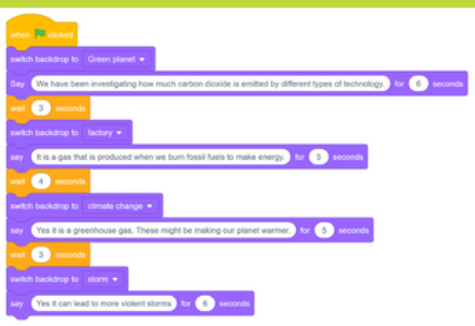
2. Explain to pupils that they are going to work in pairs to make some changes to the program to help them understand further how some of the command blocks work. Ask pupils to open the '**Predict & Run**' file in Scratch.

Provide the '**Investigating with Scratch**' sheet. Pupils follow the instructions to explore what happens when they make the suggested changes to the command blocks. They should run the program and record their observations. Invite pupils to feedback on their activity.

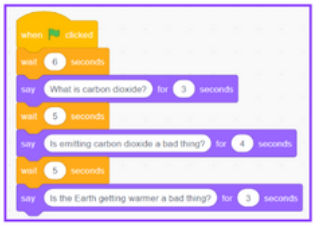


Help: Video 3 'Investigating a Program in Scratch' provides more detail.

Scratch program part 1 - Sprite Pupil 1



Scratch program part 2 - Sprite pupil 2



Using Scratch to start developing the animation continued

In this section, pupils use 'Scratch' to create an animation to share their findings creatively with others. Pupils who are confident with Scratch coding should start here.

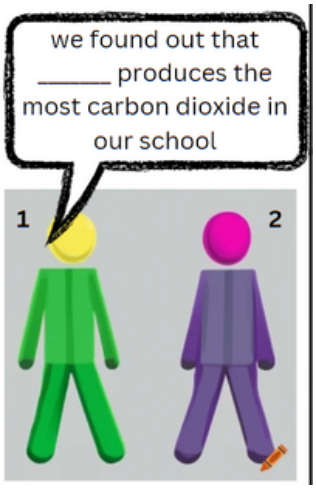
Preparation: Pupils upload the '**Modify**' files into Scratch.

1. Explain to the pupils that they are going to use the '**Modify**' file to create an animation to share their findings from the scientific enquiry. Show them that there are some command blocks in the 'script area', that are not attached to the main program. Explain that they can sequence these to create a animation.

2. Share slide 11 and provide a copy of the '**Storyboard**'. This shows the pupils the ongoing narrative between the two characters (sprites). Explain that the task is for the pupils to create additional coding blocks to tell the story as shown on the storyboard. Use each of the sections on the storyboard as their guide. Pupils should add their own text where required.

3. Role model the first section or two with the pupils demonstrating their suggestions.

4. Use the 'Share' button in Scratch which opens a 'Project Page'. From here the animation will run as a short video. Pupils can copy the URL for their animation and send/share with others. This will play the animation.



Help: For further information on how to complete the program use **Video 4 - 'Modifying a Scratch Program**.'

Extension: Pupils who need an additional challenge could be asked to take the animation further by adding more further command blocks to share more information from their scientific enquiry.

Paired Programming
Support can be provided by pairing pupils with more able pupils and using a shared programming approach. One pupil controls the computer, the other gives instructions to complete the task. The person on the computer carries out the other's instructions. These roles should be changed regularly.

Use the Talk Prompts in the fashion-linked **Great Question Ponder** as part of science and oracy development.

Does your carbon footprint really matter?

SCRATCH Education Collaborative

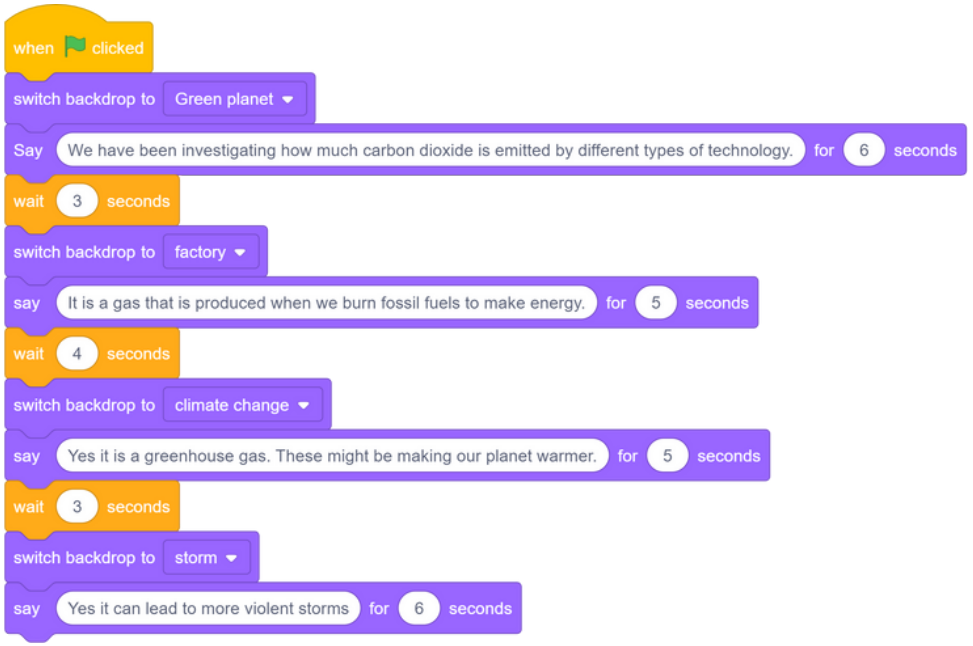
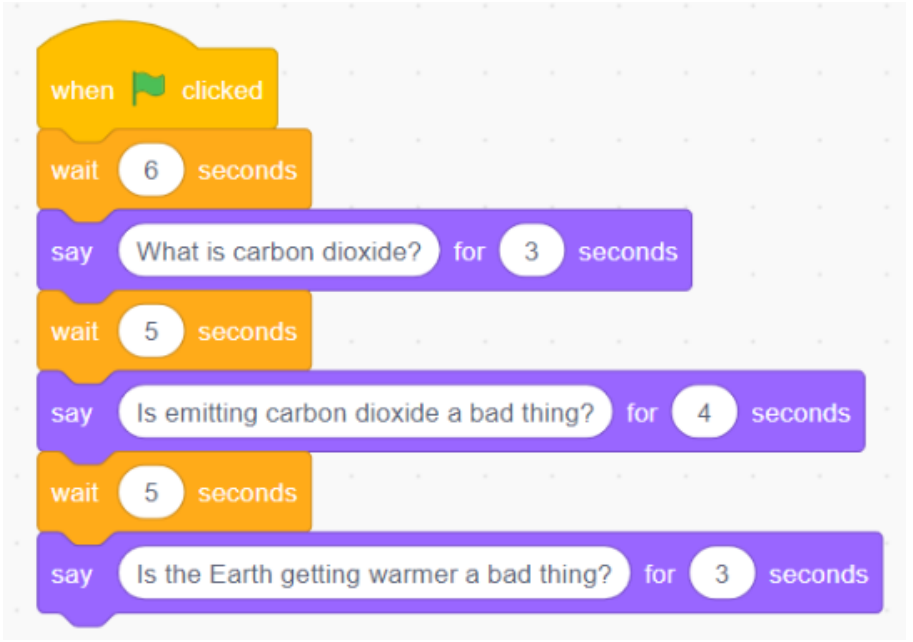
Barefoot Computing at School

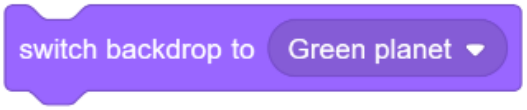
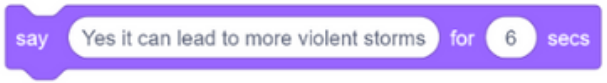
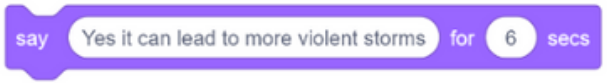
www.greatscienceshare.org

Type of Technology	Number of items/ times used each week	CO2 emissions (g)	Total CO2 emissions in a school day
Desktop computer		492 g per school day	
Laptop		42 g per school day	
Tablet		78 g per school day	
Interactive screen		78 g per school day	
Tumble dryer		1400 g per use	
Washing machine		700 g per use	
Dishwasher		800 g per use	

Look at the command blocks that have been used to create both parts of the program below.

Predict what will happen when the code is run.

Part 1	Part 2
	

Command block	Change to make	Describe how the output of the program changed
	In Pupil 1's part of the program, click the white arrow and choose another item from the list.Run the program. What has changed?	
	In Pupil 1's part of the program, change the words inside the first bubble. Run the program. What has changed?	
	In Pupil 1's part of the program, Change the value in the second bubble from 6 to 1.Run the program. What has changed?	
	In Pupil 2's part of the program, change the value in the seconds bubble from 6 to 2.Run the program. What has changed?	

Storyboard

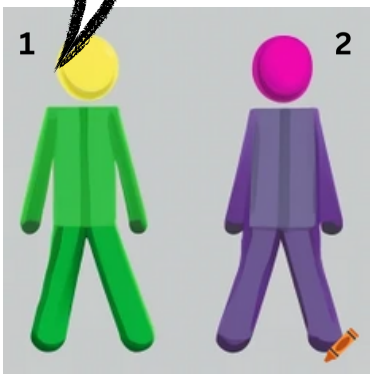
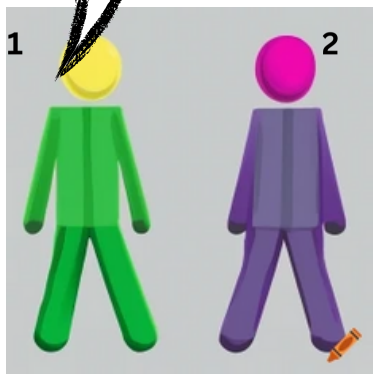
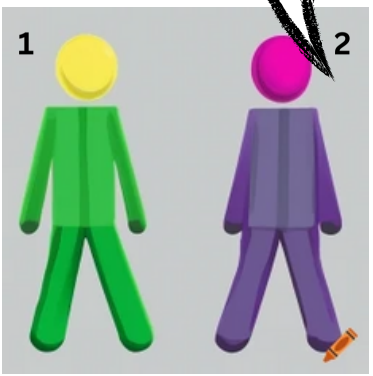
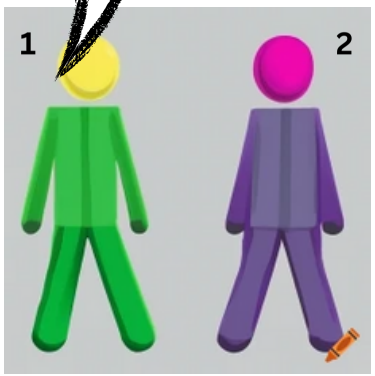
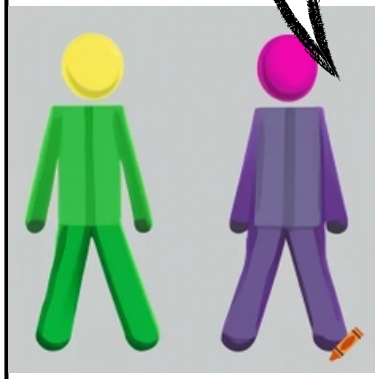
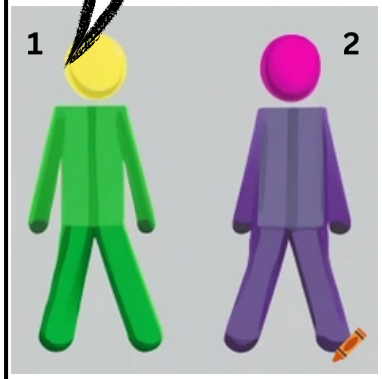
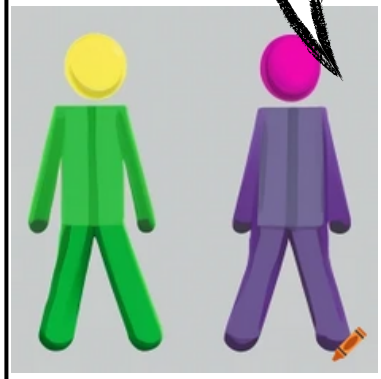
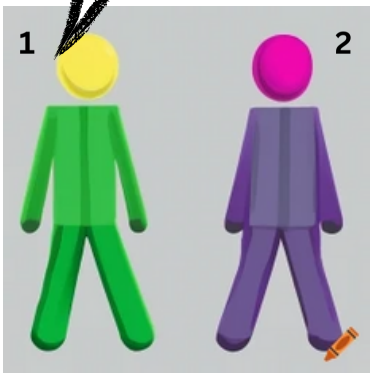
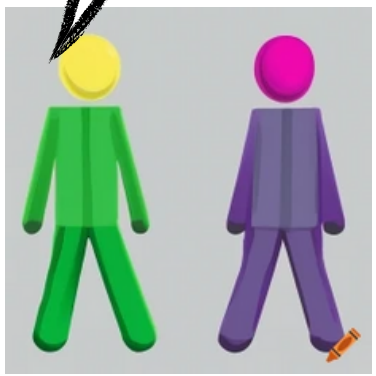
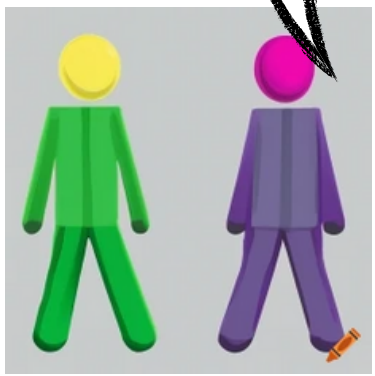
severe drought  change background to drought	and the loss of habitat for some animal species.  change background to polar bear	That is terrible! What can we do about it?  	we found out that _____ produces the most carbon dioxide in our school  change background to carbon dioxide	How much carbon dioxide do they produce? 
they produce _____g of carbon dioxide every day.  	What are you going to do about this? 	As a class, we decided what actions we could do to help.  change background to pledge	To help protect our planet, we pledge to _____. 	That is a great idea. I am going to share this information with my class. 

image generated using https://www.craiyon.com/

Great Science Share for SCHOOLS

Great Computing Share

7-11 years

Teaching Slides

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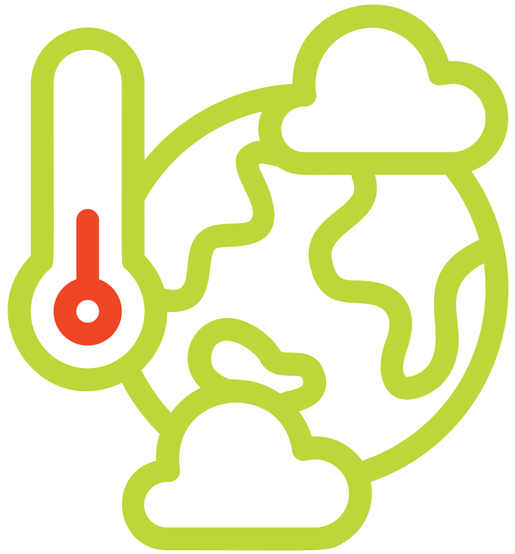
True or false?

The Earth's average temperature has increased by 1 degree Celcius in the last 100 years.

The warming of the planet is harming plants and animals.

When we use energy, carbon dioxide is emitted into the Earth's atmosphere.

Carbon dioxide is a greenhouse gas which contributes to the warming of the Earth.



One school cannot do anything to combat climate change.

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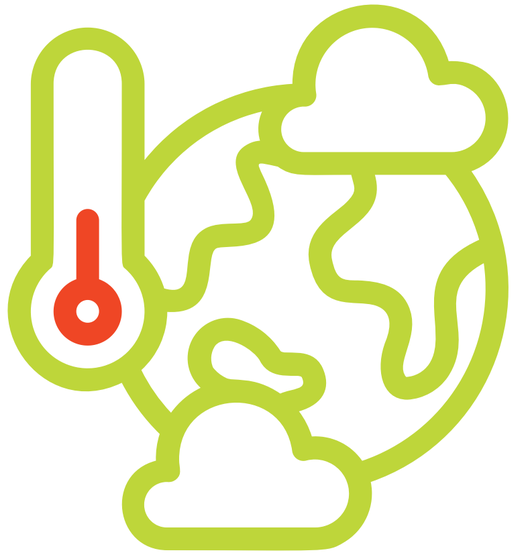
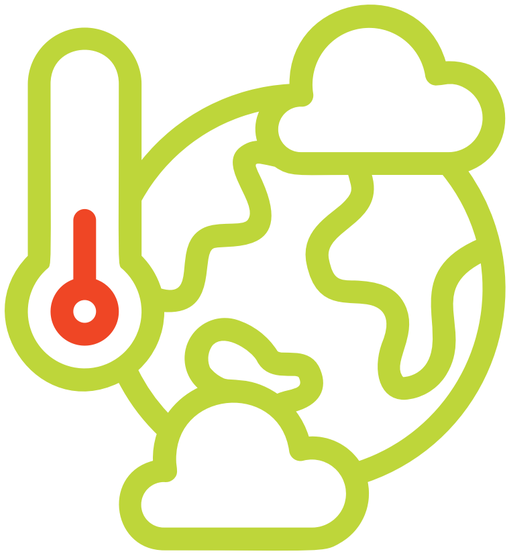


One school cannot do anything to combat climate change.

Which types of machines and technologies in our school contribute to climate change?



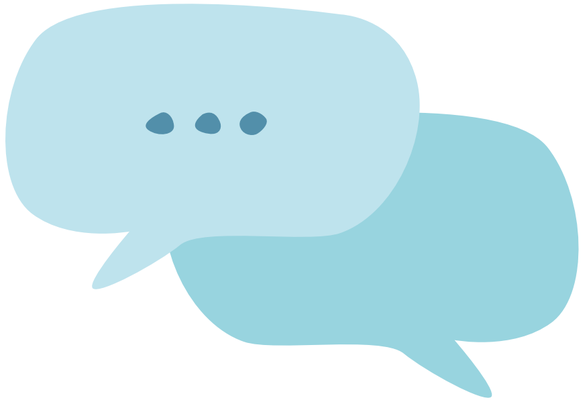
What is the role of scientists in climate change?

Which types of machines and technologies in our school contributes to climate change?

Type of technology
Desktop computer
Laptop
Tablet device
Interactive screen
Tumble dryer
Washing machine
Dishwasher

Do they produce carbon dioxide a little or a lot?

We think...



because...

Carbon dioxide emissions from different types of machines and technologies

Type of technology	Carbon dioxide emissions (g)
Desktop computer	492 g per school day
Laptop	42 g per school day
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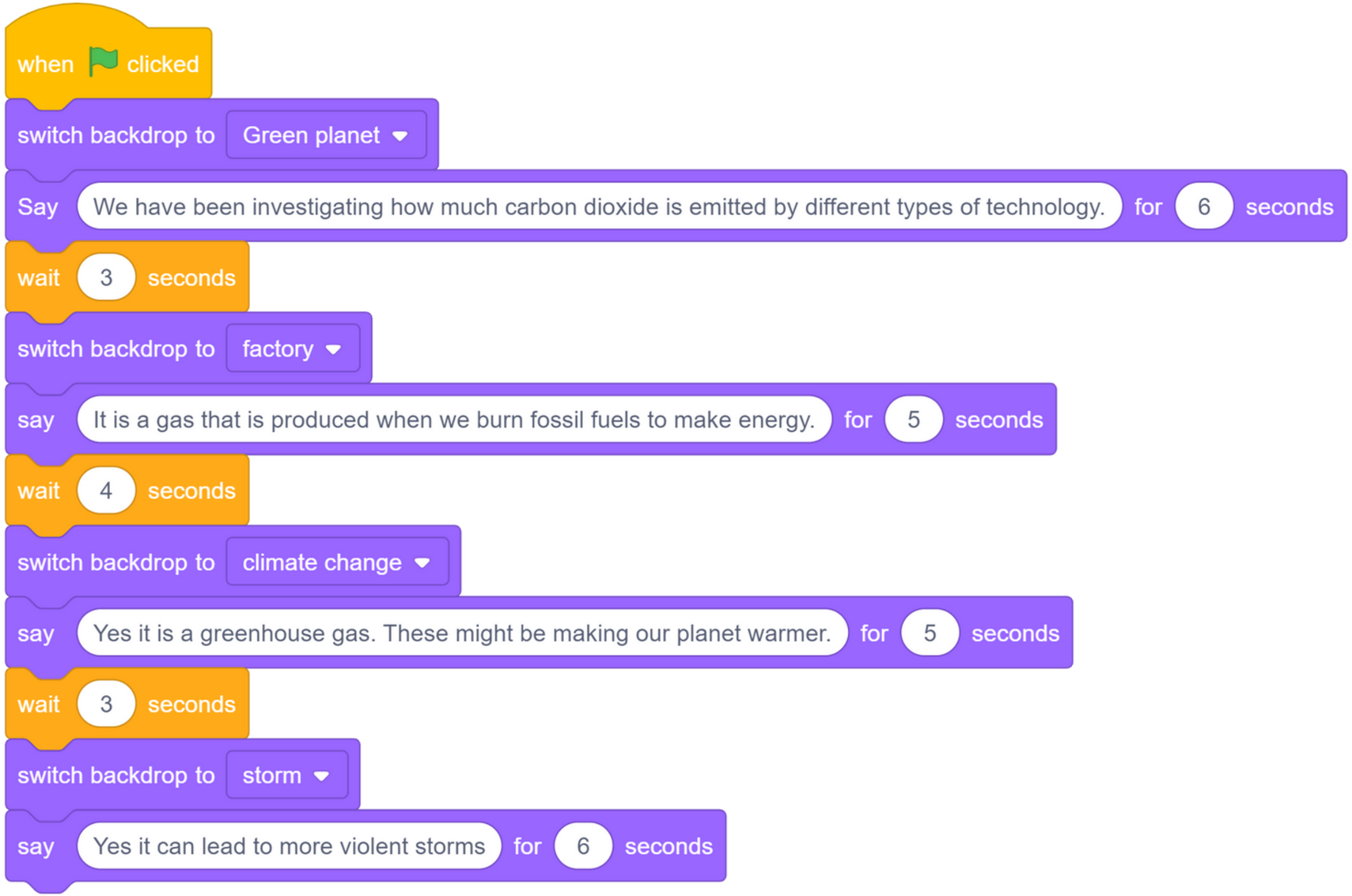
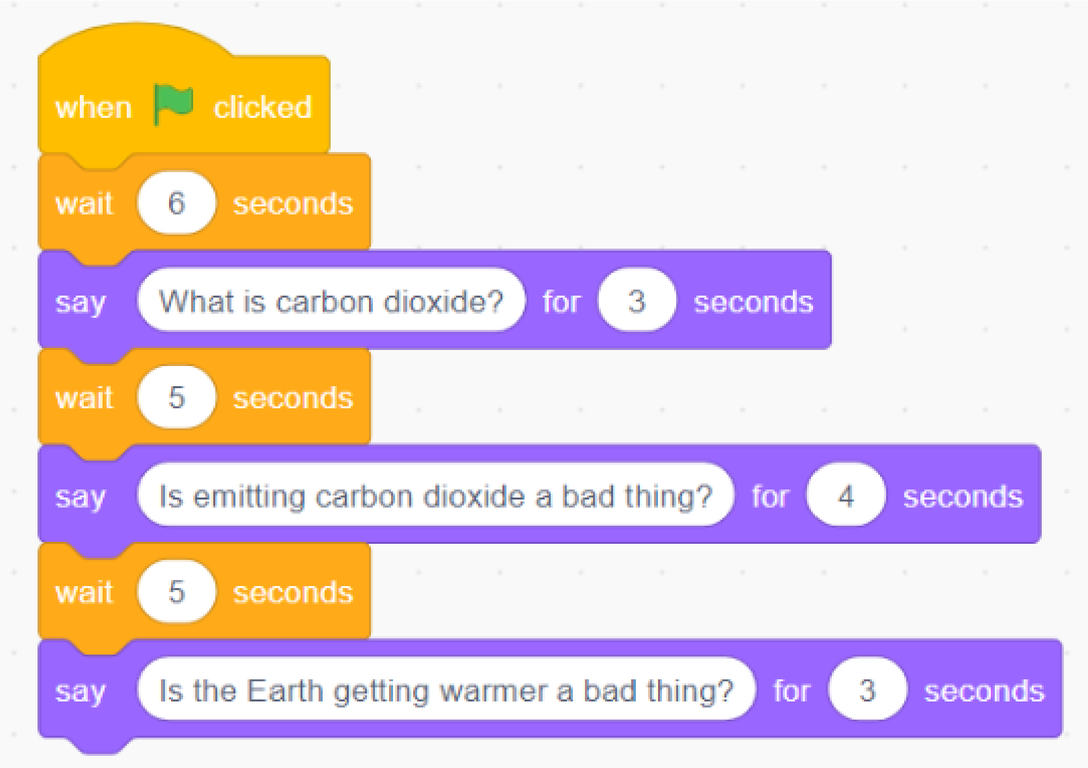
Scratch program part 1 - Sprite Pupil 1



Scratch program part 2 - Sprite pupil 2



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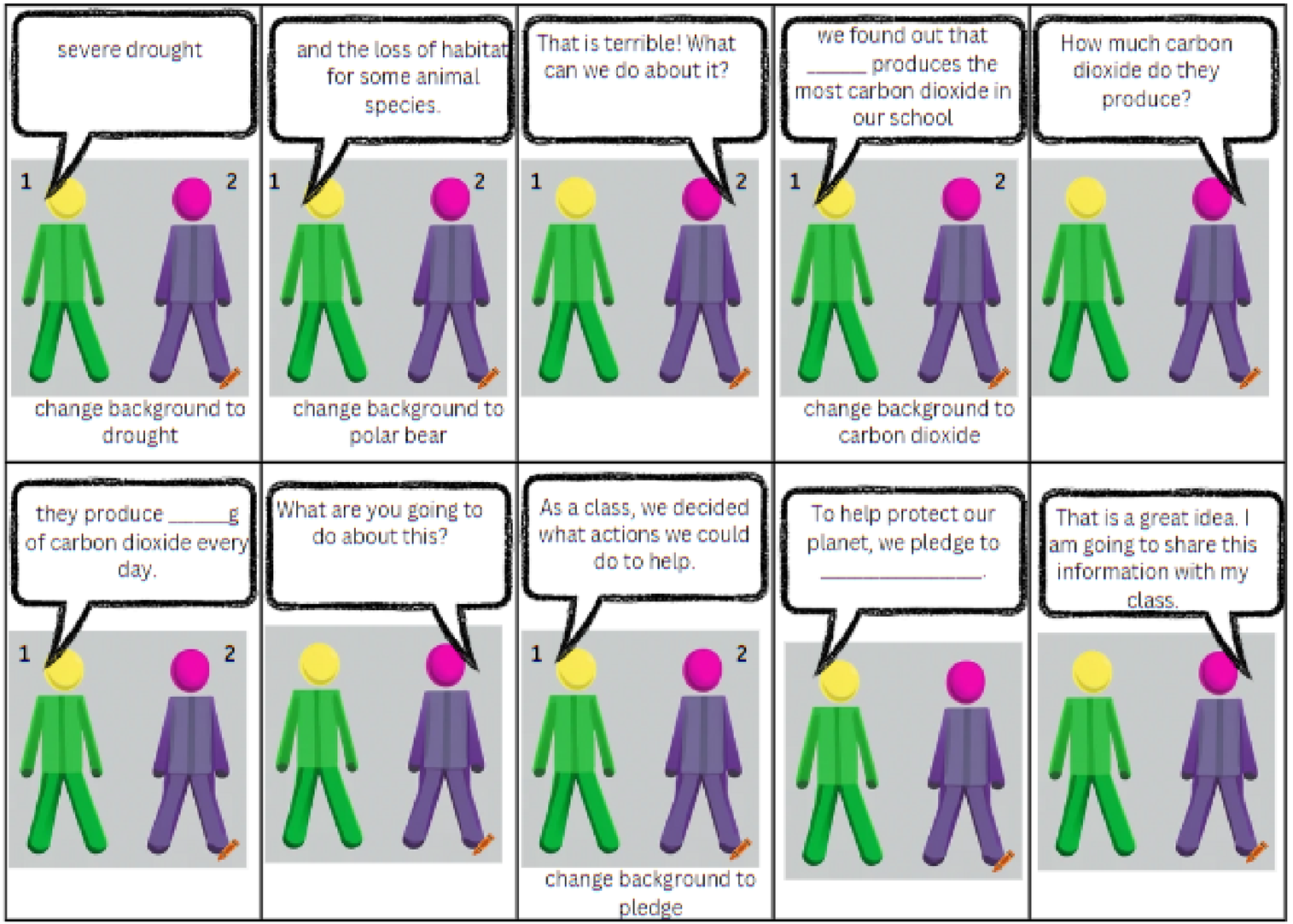
Storyboard to continue the animation



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