



Improving our Classroom Environment

Activity 1

The class that
kept falling asleep





Abbie tried hard to concentrate. Her teacher Mr Prentice was showing the class how to do a complicated maths calculation. She tried to focus but her eyelids felt heavy and the numbers on the whiteboard seemed to be jumbled.



Abbie yawned and looked at the clock on the classroom wall. There was still 8 minutes to go until lunch. She rubbed her eyes and sat up in her chair to try to stop herself from falling asleep.



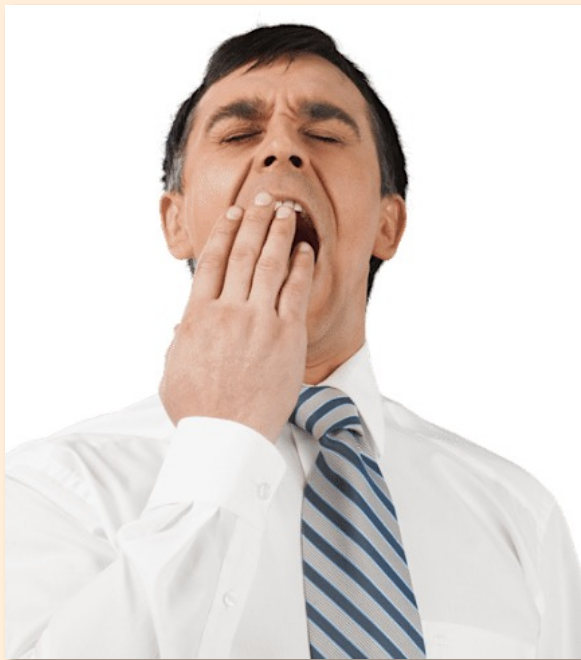
Mr Prentice suddenly stopped writing. “Ryan,” he said in a loud voice. All the pupils looked over to where Ryan was sitting, next to the classroom window. Ryan had his head on his hands and he was fast asleep. Mr Prentice shouted “Ryan . . . wake up!” but it was no use, Ryan kept on sleeping.



“It’s not just Ryan,” said Kimberly.

“Look at Jasmine . . . she’s asleep too.”

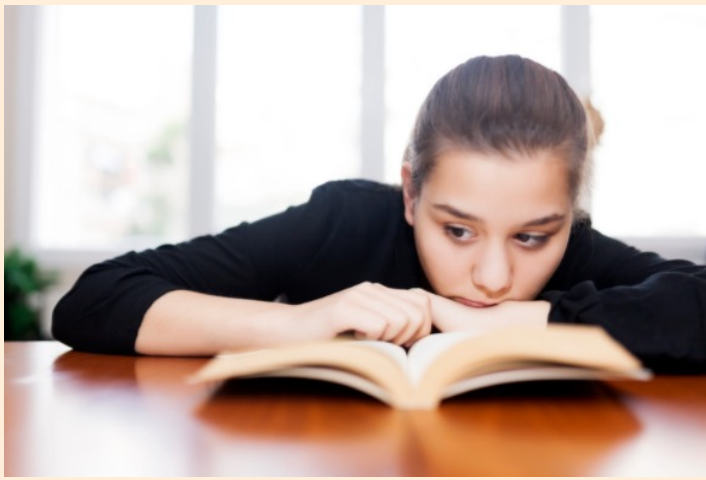
“I don’t know what’s happening with this class,” Mr Prentice said, shaking his head. “What on earth’s the matter with you?”



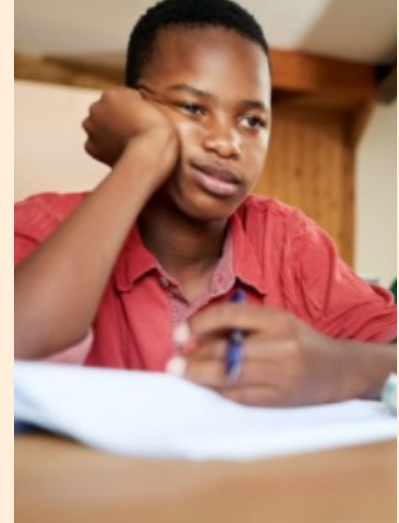
Then the teacher yawned and rubbed his eyes.



There's something strange happening, Abbie thought. Every day she came to school feeling bright and energetic. But as the morning wore on, she became more and more tired and the last half hour before lunch always seemed to be a struggle. It was the same towards the end of the school day. By 3 o'clock she was always drowsy and heavy-eyed.



It wasn't just Abbie. Everyone seemed to be tired in Mr Prentice's class. Yesterday, Zac had fallen asleep in the middle of a spelling test and Abbie's friend Poppy had nodded off three times.





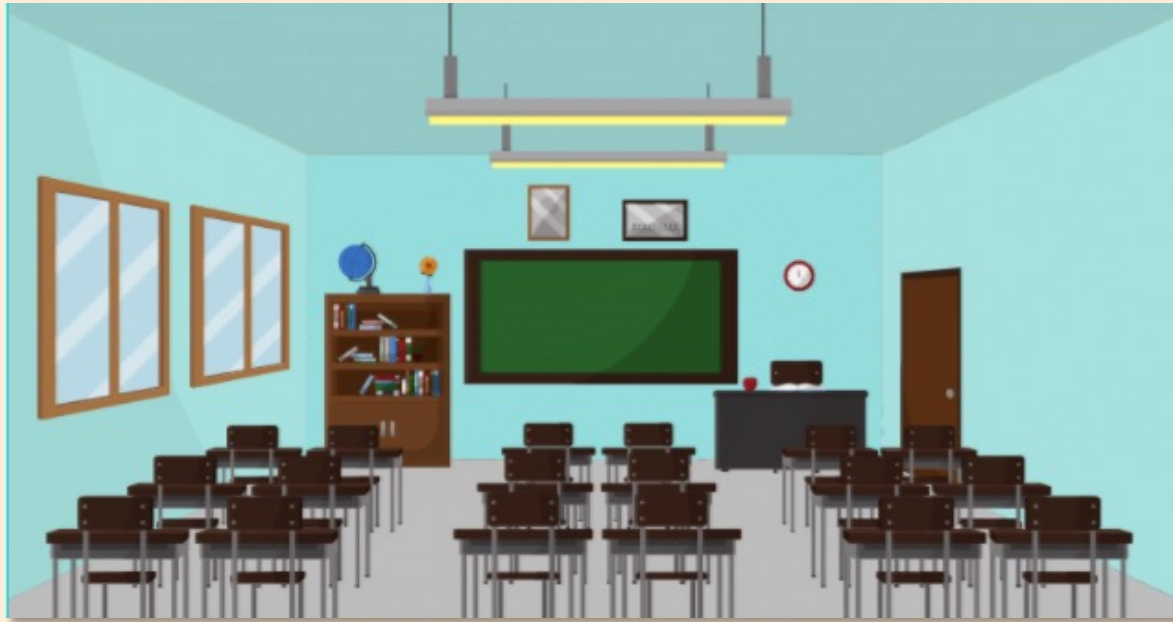
Abbie gazed out of the classroom window. It was a dull, cloudy day, which made it quite dark inside the classroom, and Mr Prentice hadn't put any lights on. Abbie couldn't wait to get out into the playground at lunch break. Only twenty minutes of maths to go, she thought. Hope I can manage to stay awake.

Discussion

In groups, discuss the situation in Abbie's class and suggest possible causes of the problem.



Environmental Factors

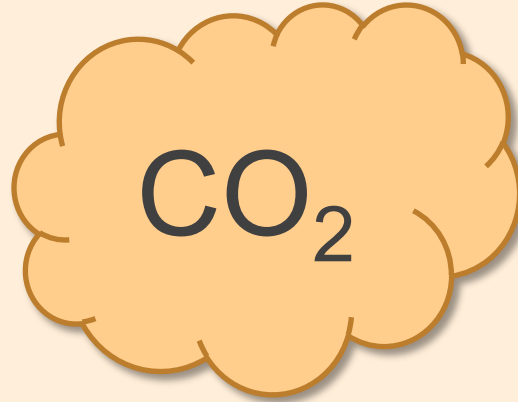


Temperature



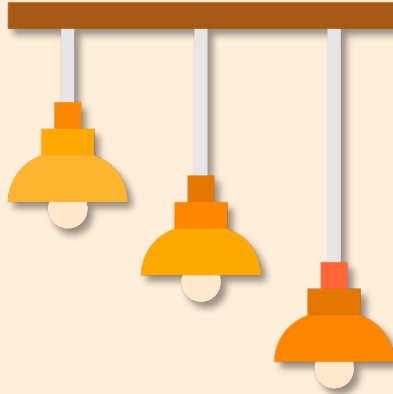
The warmth or coolness
of the classroom

Carbon Dioxide



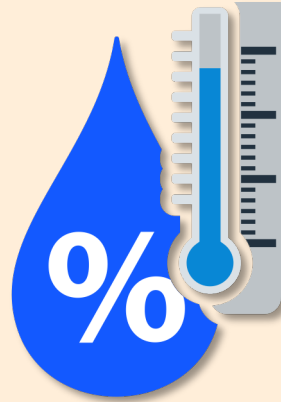
The amount of CO_2 in the
classroom air

Light



**The brightness or darkness
of the classroom**

Humidity

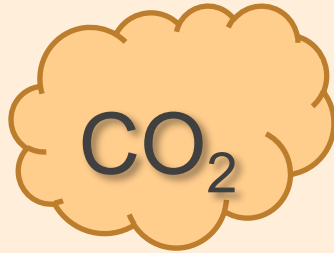


The dryness or wetness
of the classroom air

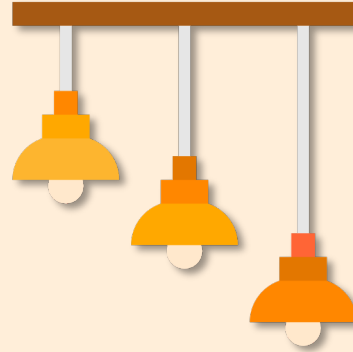
Units of Measurement



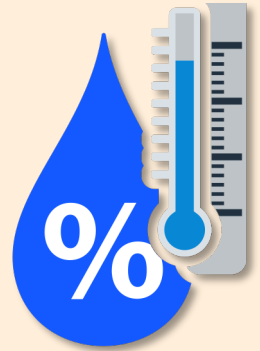
?



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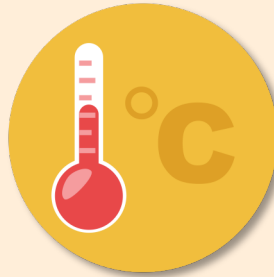


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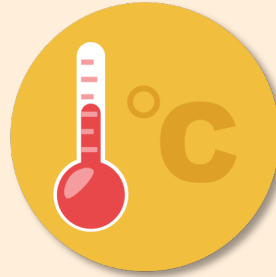
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Temperature



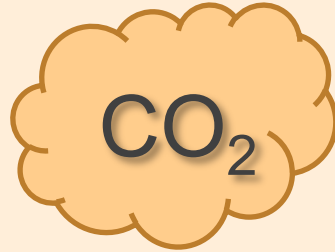
?

Temperature



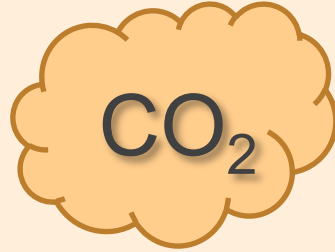
Degrees Celsius

Carbon dioxide



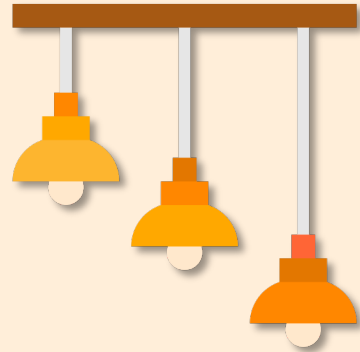
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Carbon dioxide



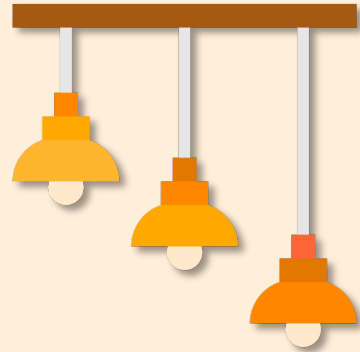
Parts per Million (ppm)

Light



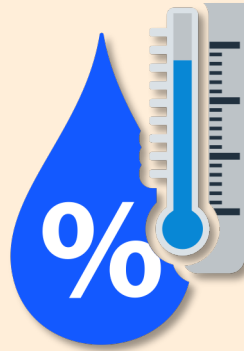
?

Light



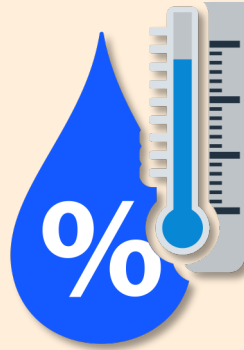
Lux

Humidity



?

Humidity

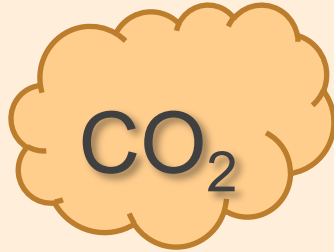


% water in air

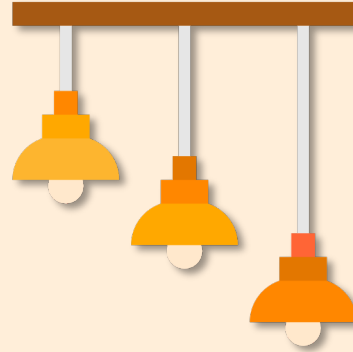
Units of Measurement



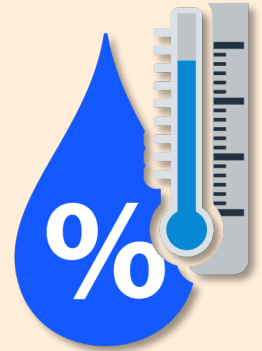
Degrees Celsius



Parts per million
(ppm)



Lux



% water in air

Questions

What are the sources of CO₂ within the classroom?

Is CO₂ harmful?

What causes increases and decreases in classroom temperature?

How is classroom temperature controlled?

What are the sources of light within the classroom?

How is the level of light in the classroom controlled?

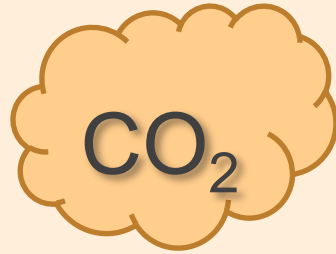
What causes increases and decreases in classroom humidity?

Environmental Factors

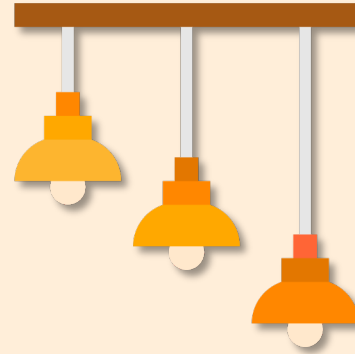
In groups, discuss how each environmental factor might affect learning.



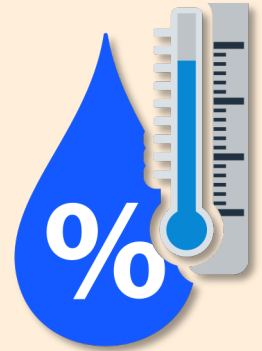
Temperature



Carbon Dioxide



Light



Humidity

Activity 2

Investigating Environmental Factors



Learning intention

We are learning how environmental factors, such as temperature, light and CO₂ can affect children's learning.

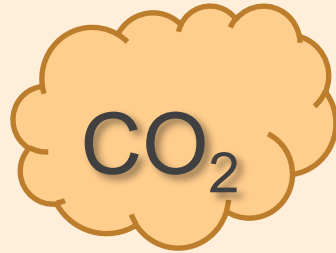
Success criteria

- We can find evidence which shows how environmental factors affect learning
- We can share and present our findings
- We can work well ingroups

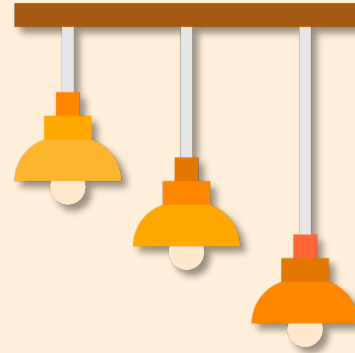
Group work: Using the Internet, find evidence which shows how each of these 4 environmental factors affects learning.



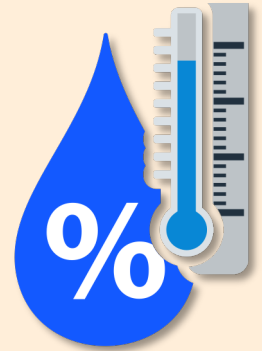
Temperature



Carbon Dioxide



Light



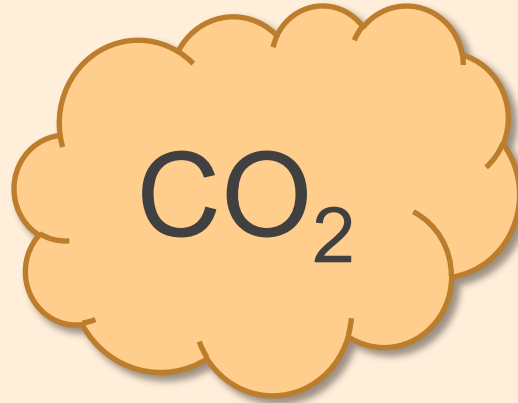
Humidity

Temperature



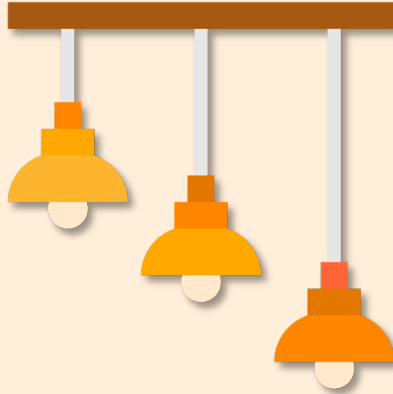
What evidence is there to show how room temperature affects the ability to learn?

Carbon Dioxide



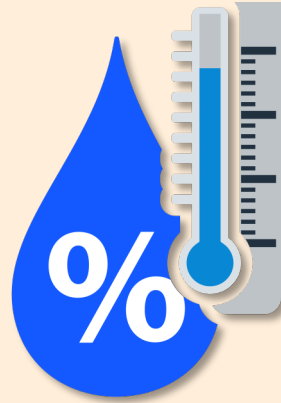
What evidence is there to show how carbon dioxide levels affect the ability to learn?

Light



What evidence is there to show how light levels affect the ability to learn?

Humidity



What evidence is there to show how humidity affects the ability to learn?

Share and present your research findings to the class.

Activity 3

Data About Buildings



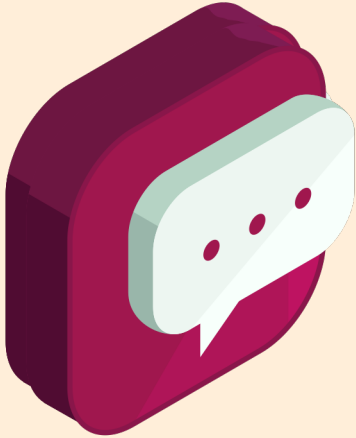
Learning intention

We are learning how sensors can record environmental data about a building.

Success criteria

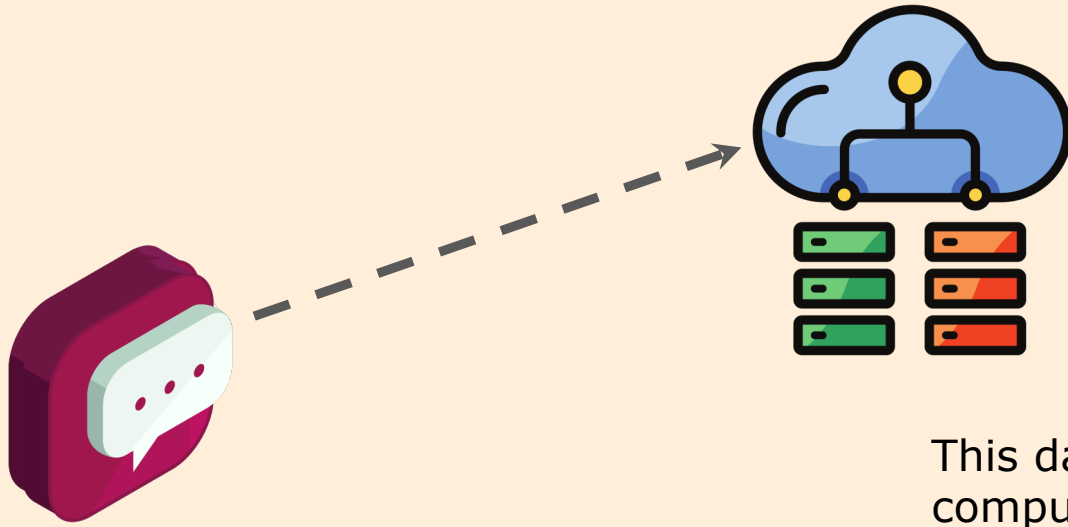
- I can describe types of building data recorded by a sensor.
- I can say why data about buildings is helpful.
- I can analyse environmental data about a classroom.

Sensors

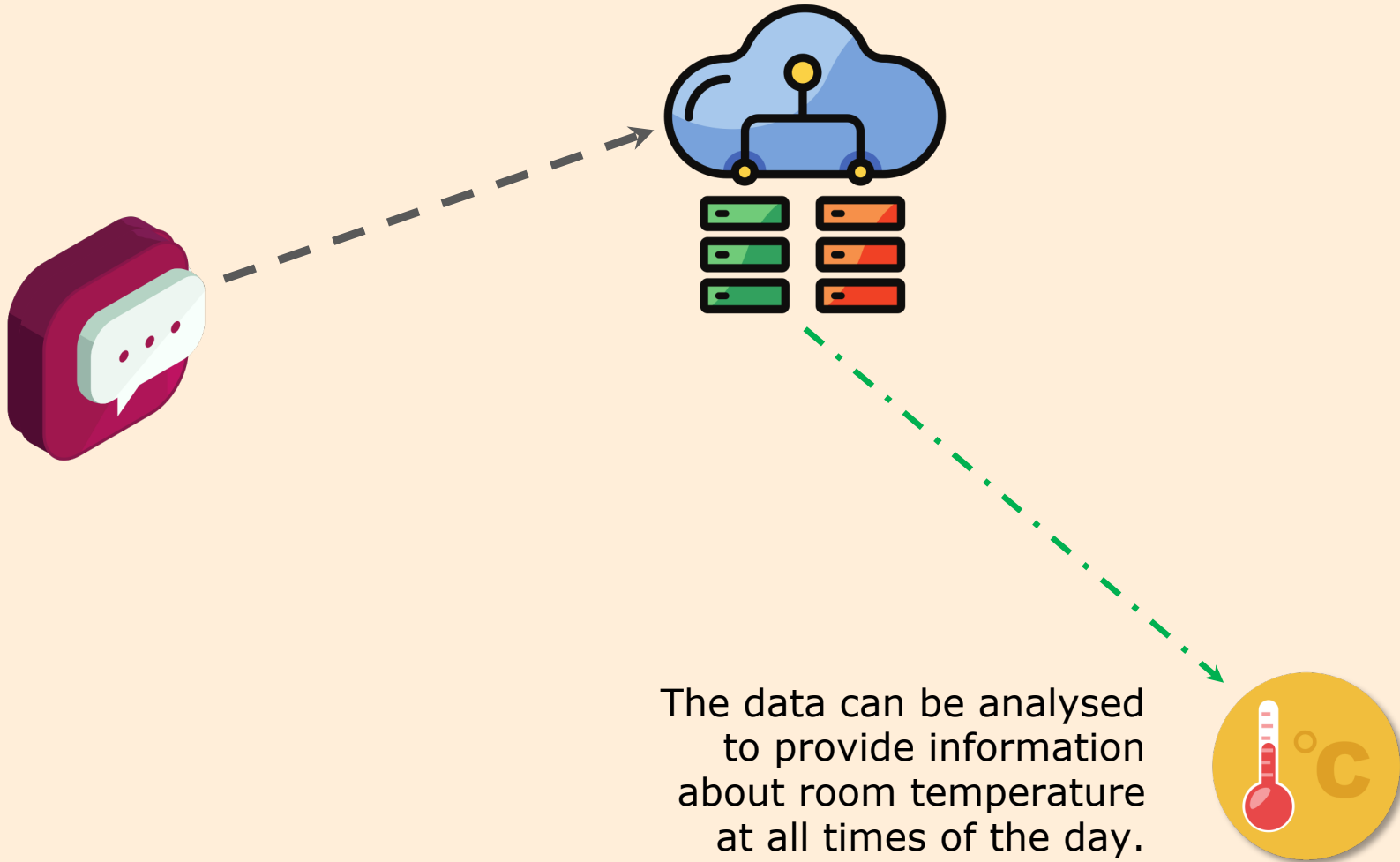


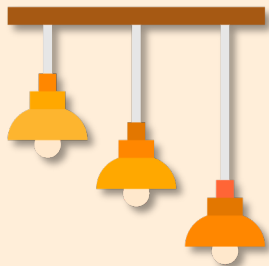
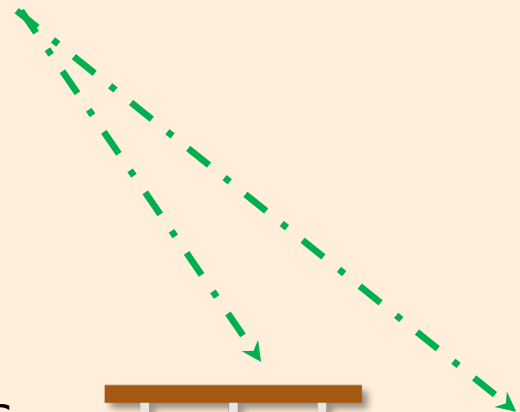
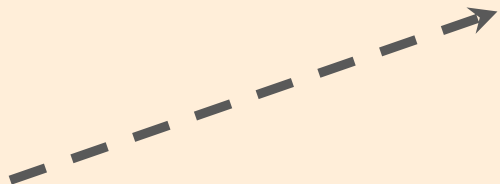
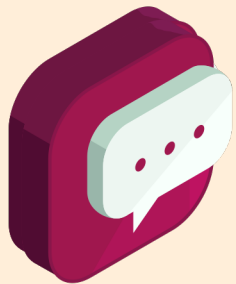
A smart sensor is a digital device that can track and record data about a building. For example:

- Temperature of rooms
- Levels of carbon dioxide
- Lighting levels
- Humidity levels
- Air pressure
- Water quality

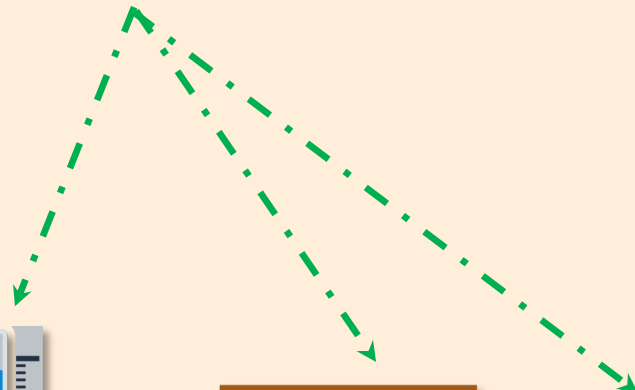
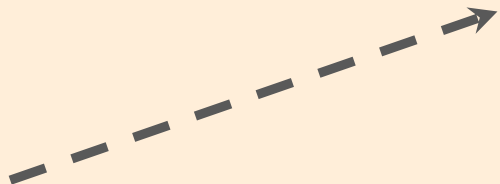
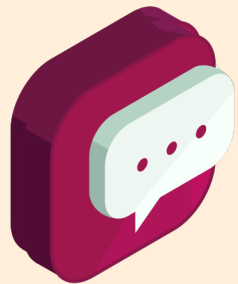


This data uploaded to Cloud-based computers where it is stored.

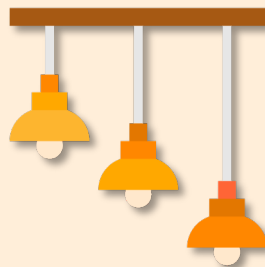
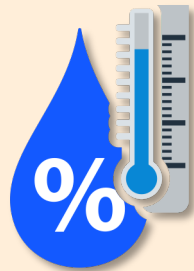


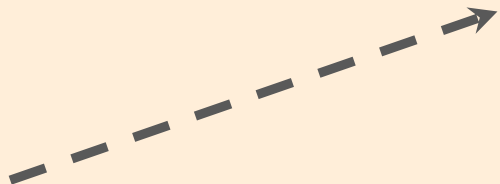
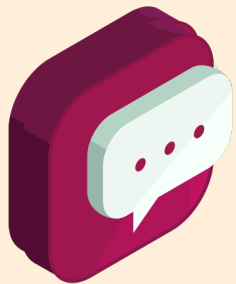


The data shows
information about room
lighting during the day.

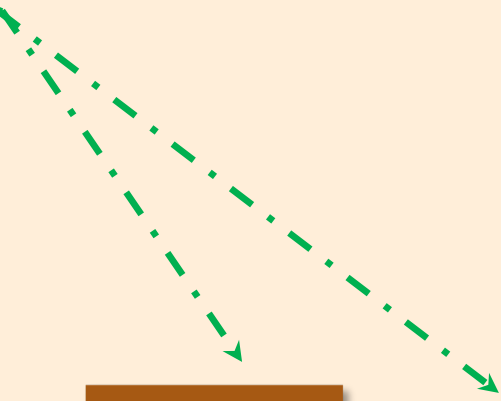
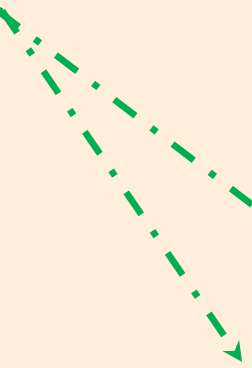
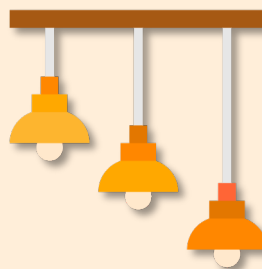
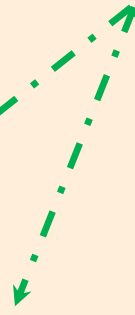
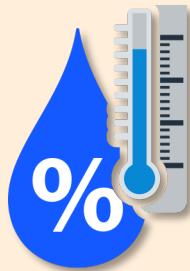
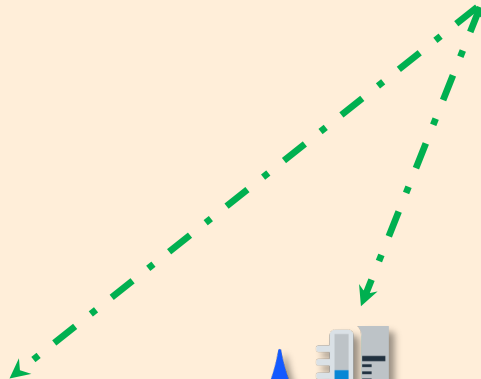
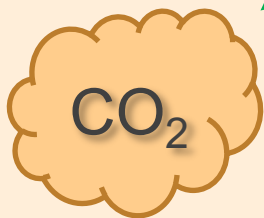


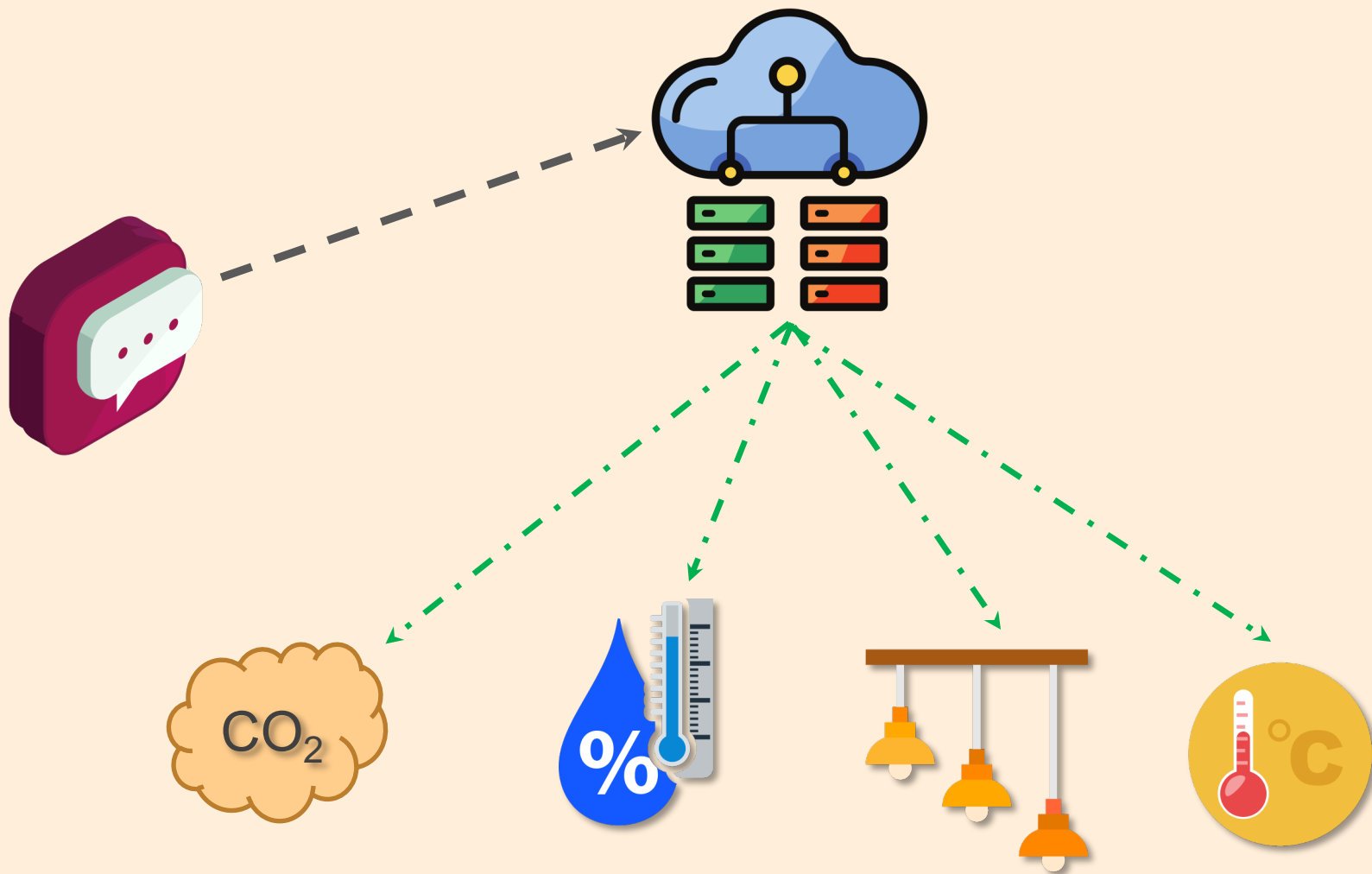
Humidity data may be analysed to show the amount of water in the air.



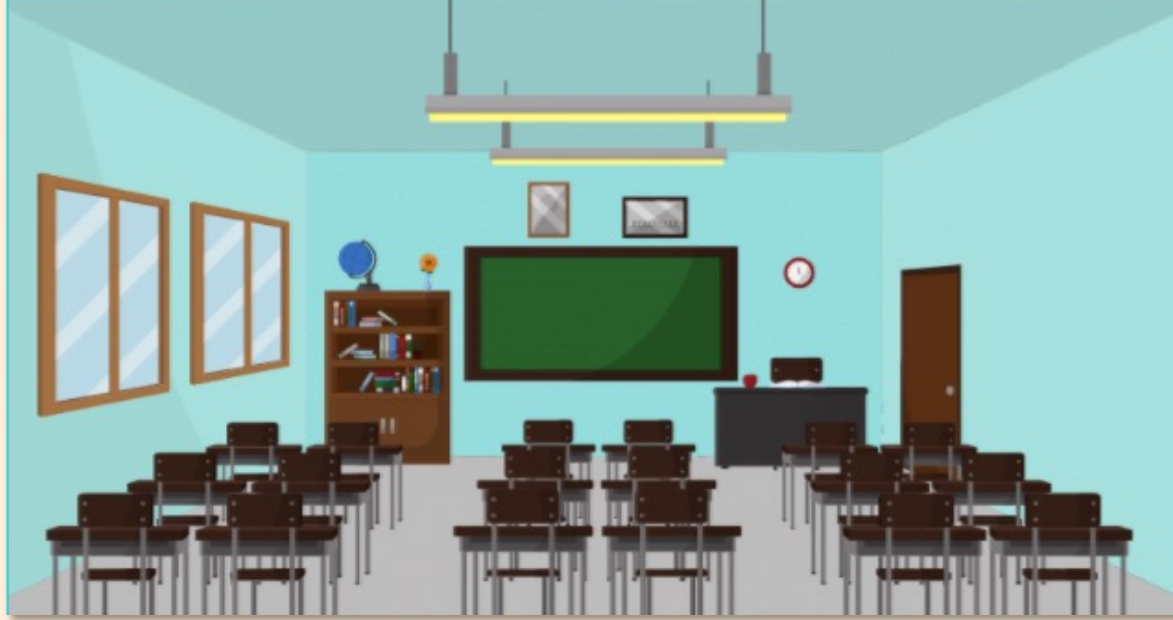


CO₂ levels may be analysed.

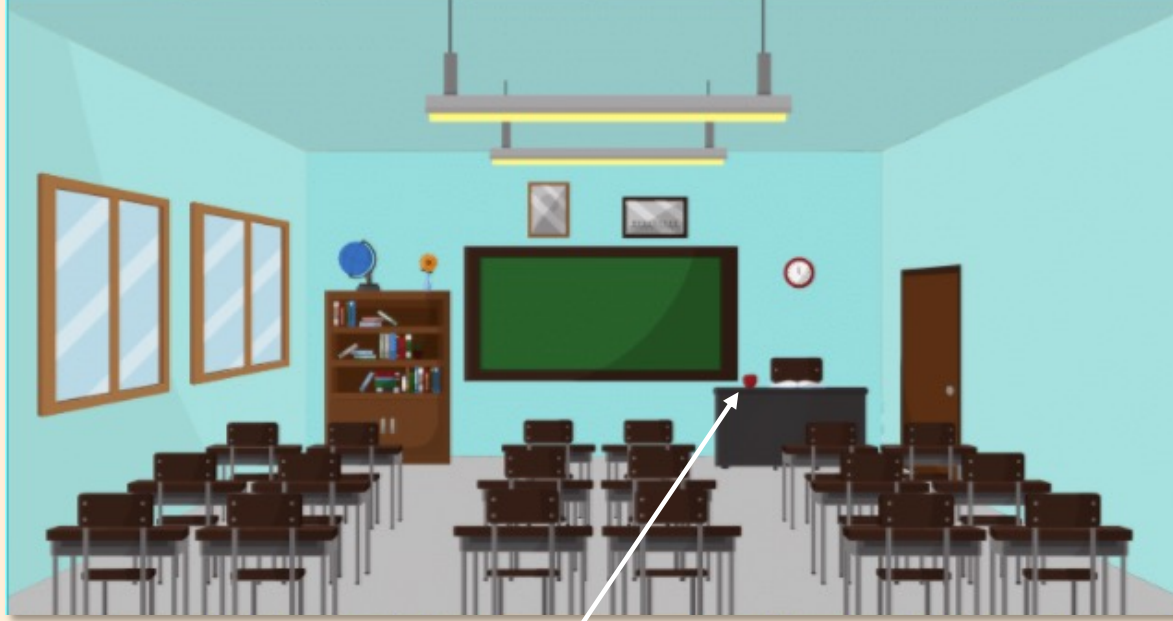




Suggest why the information recorded by smart building sensors is valuable and how it may be used.



Here is Abbie's classroom at Cladach Primary School. Can you spot the smart building sensor?

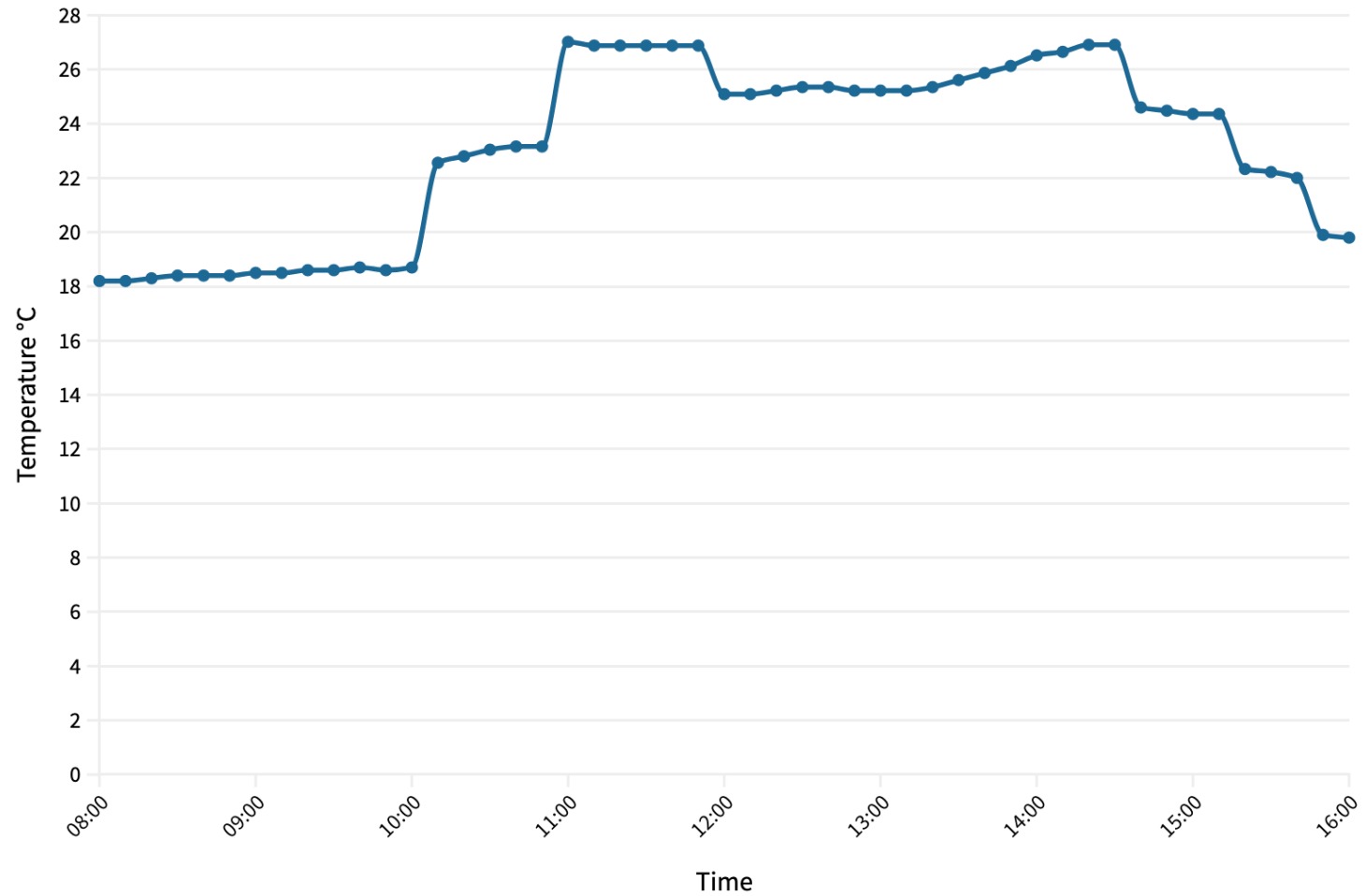


The sensor sits on the teacher's desk.

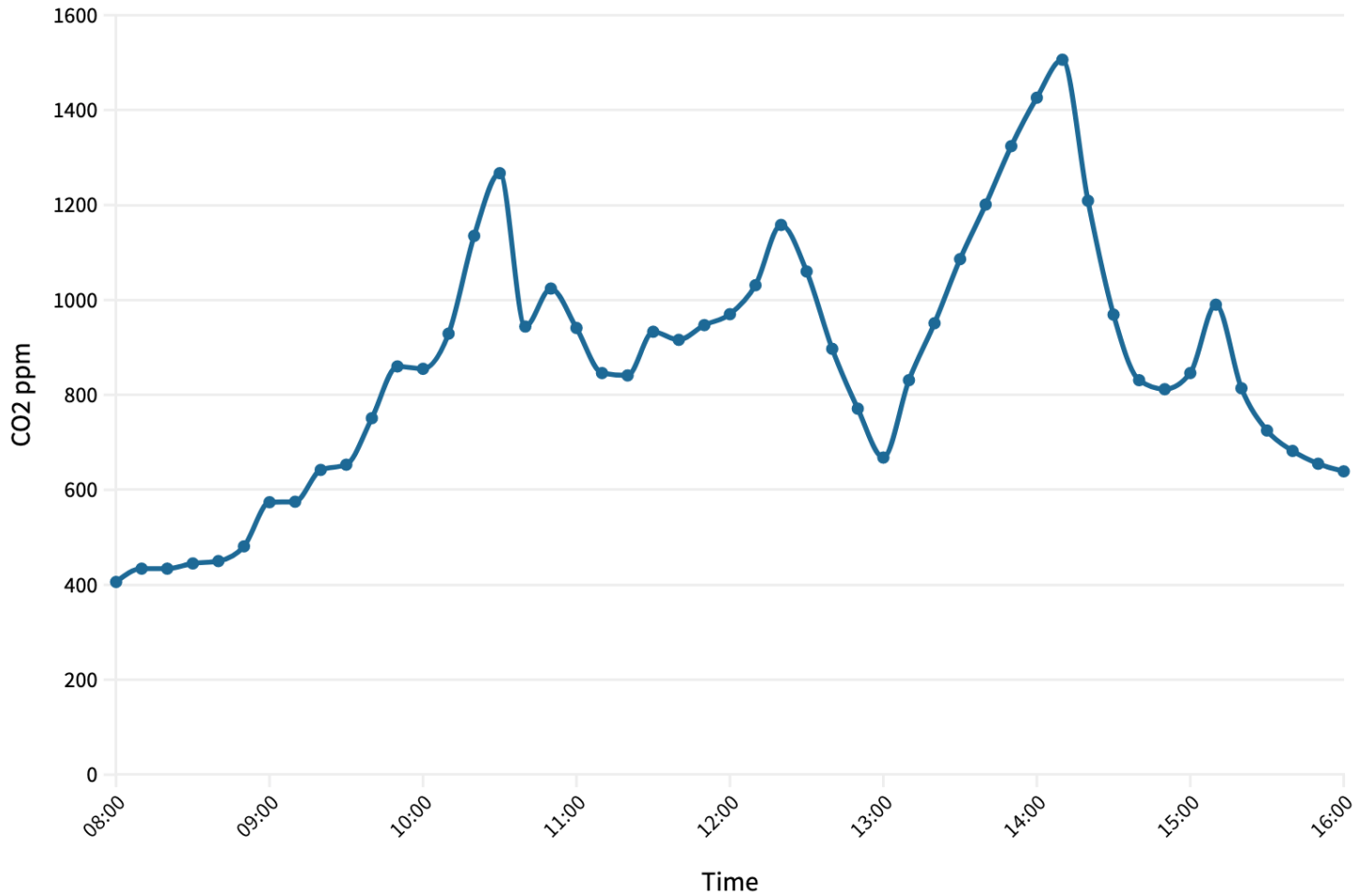
We are now going to look at data recorded by the sensor in Abbie's classroom for a single day.

- Discuss what the data shows
- Identify changes to the data during the day
- Suggest reasons for the changes in the data

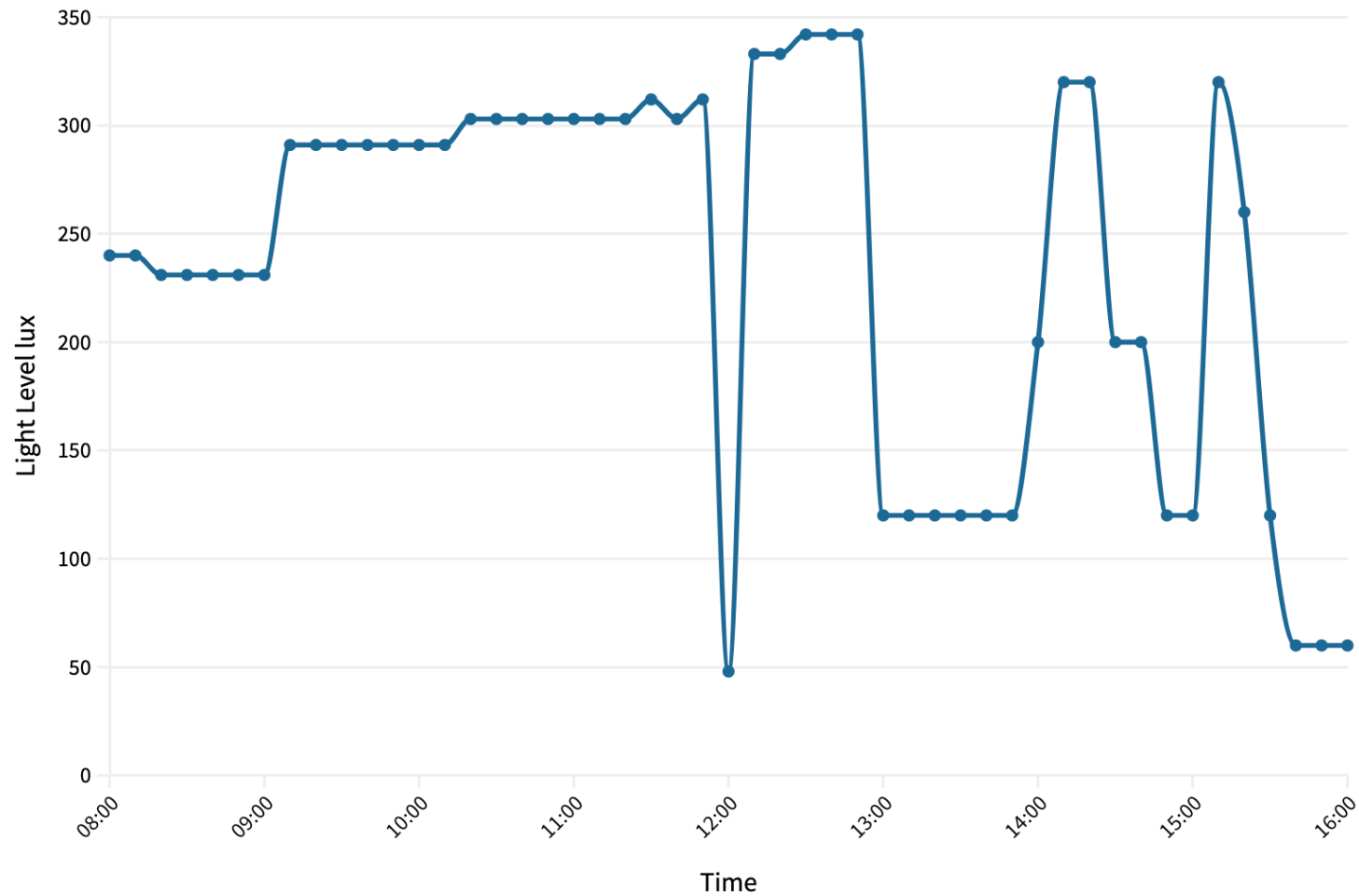
Temperature in P6 Cladach Primary School



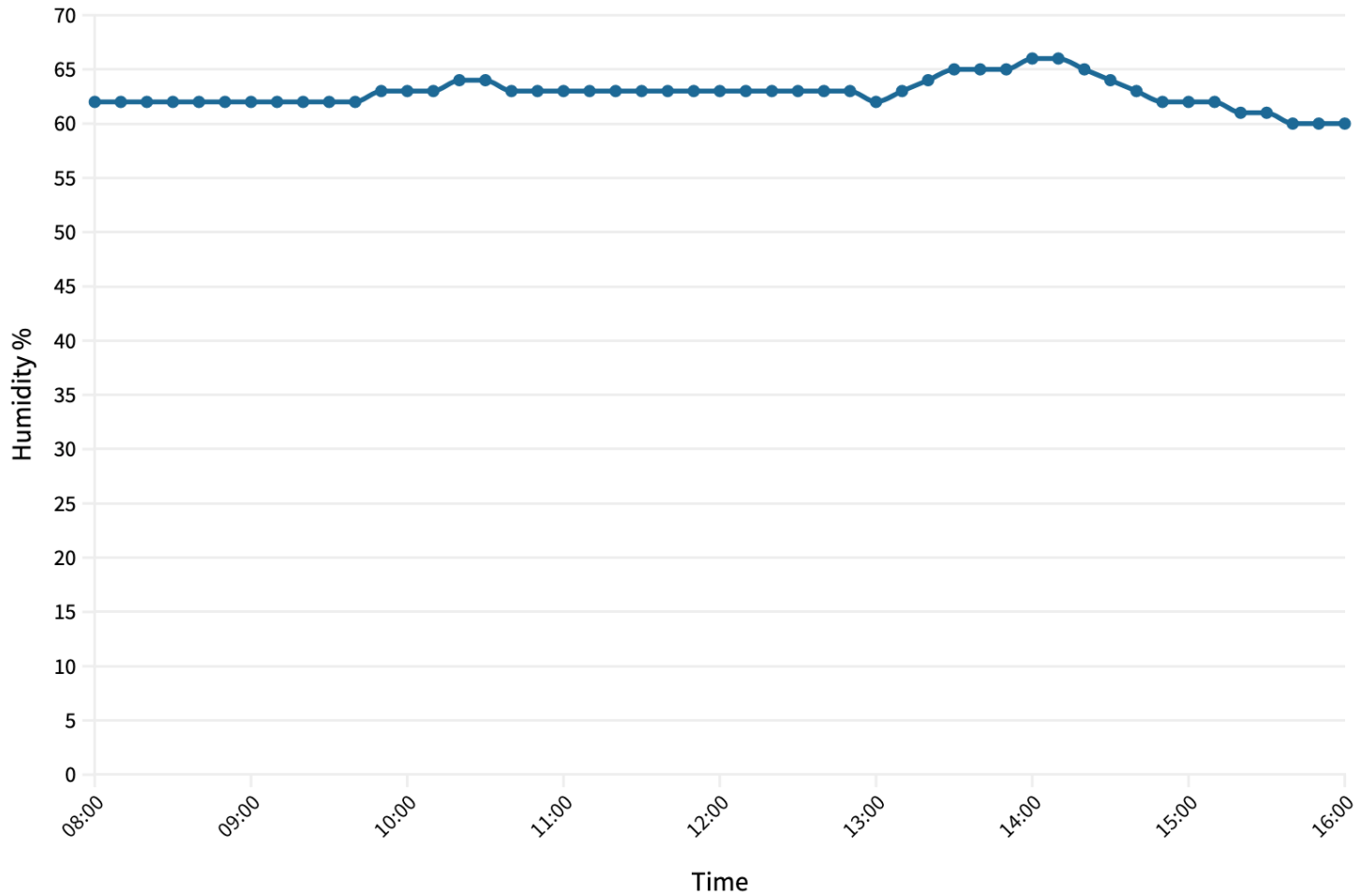
CO2 in P6 Cladach Primary School



Light Level in P6 Cladach Primary School



Humidity in P6 Cladach Primary School



Share your findings with the class.

Activity 4

Investigating our Learning Environment



Learning intention

We are learning how to plan and carry out an investigation into our classroom environment using the PPDAC model.

Success criteria

- I can identify the problem to be investigated.
- I can plan an investigation.
- I can describe how our sensor will provide us with data.
- I can rate my own learning state.
- I can work well in groups.

Investigation

- 1 We want to find out how our classroom environment affects our learning.

Investigation

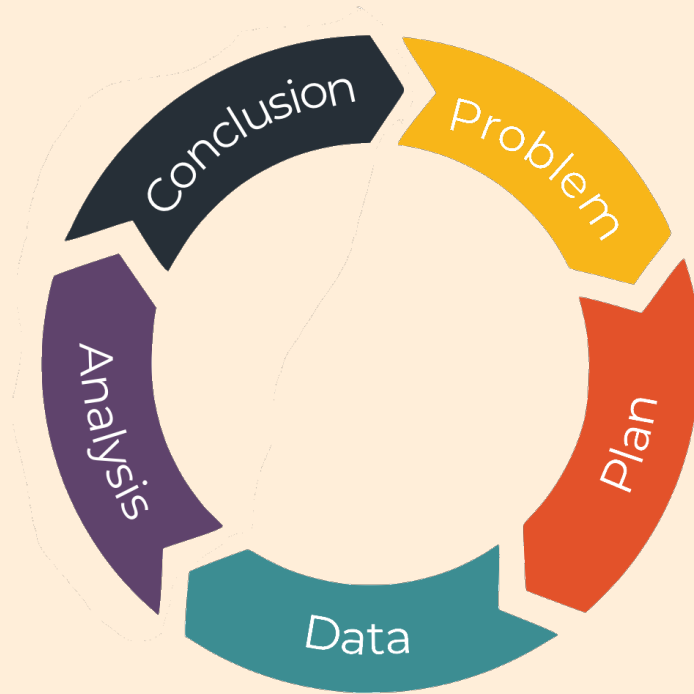
1 We want to find out how our classroom environment affects our learning.

2 We want to find out if making changes to our environment improves our learning.

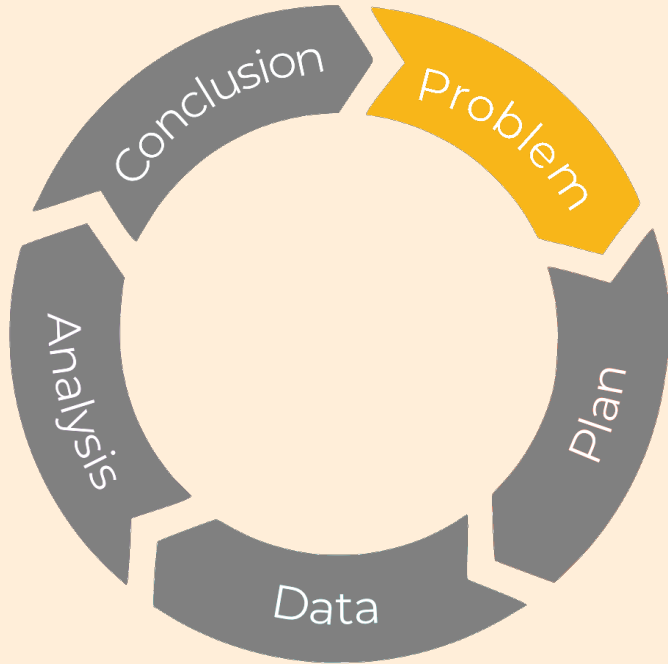
The PPDAC Method

We are going to investigate using the PPDAC method.

The PPDAC Method

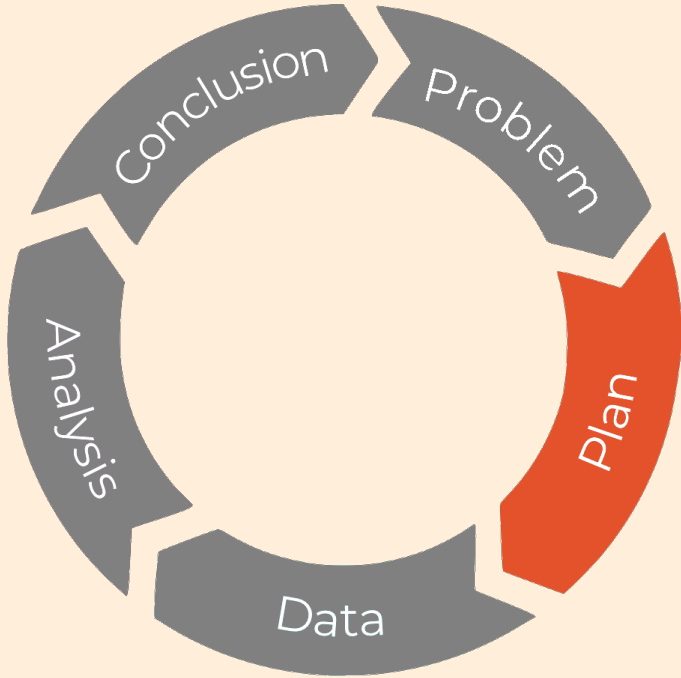


The Problem



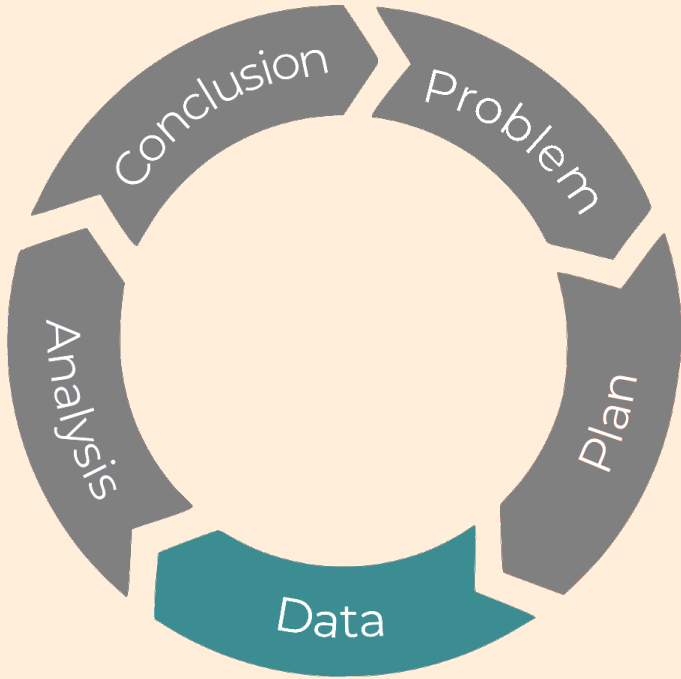
We want to know how our classroom environment affects our learning.

The Plan



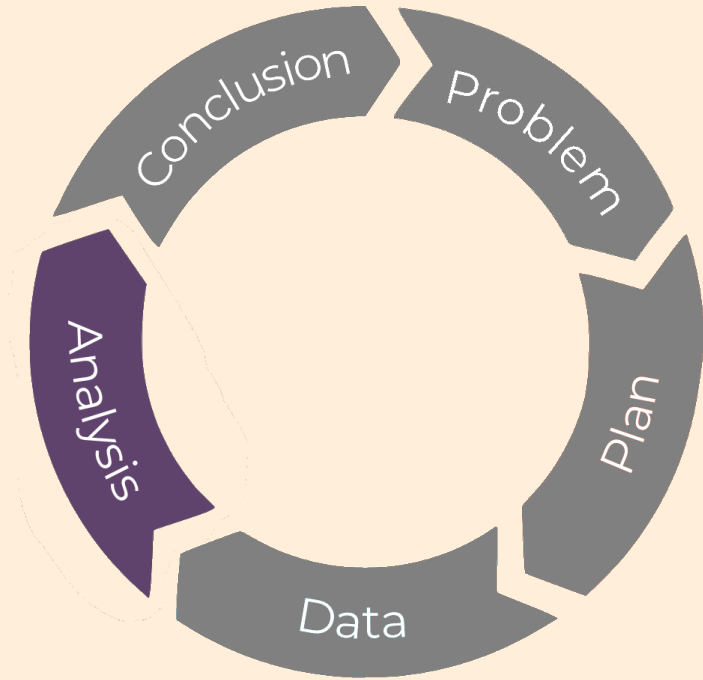
We will plan an investigation to discover how our classroom environment affects our learning.

Data



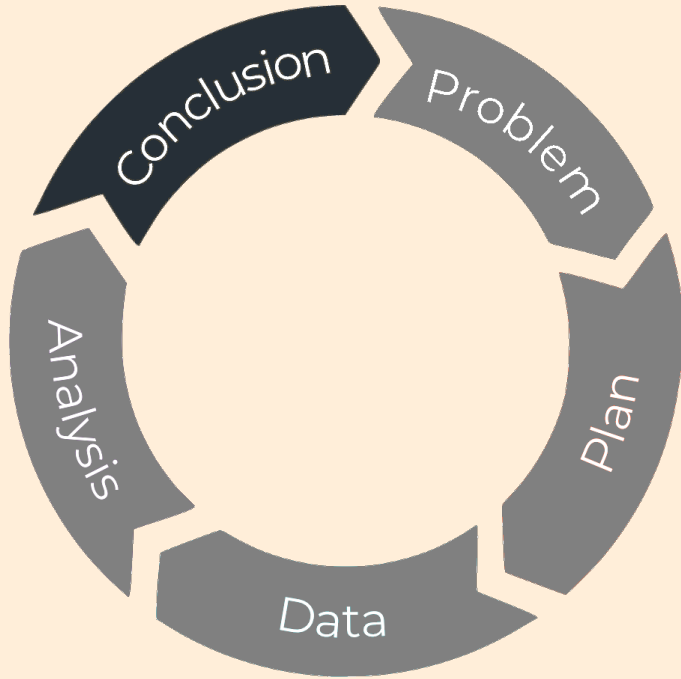
We will identify and gather data which will provide information about our classroom environment.

Analysis



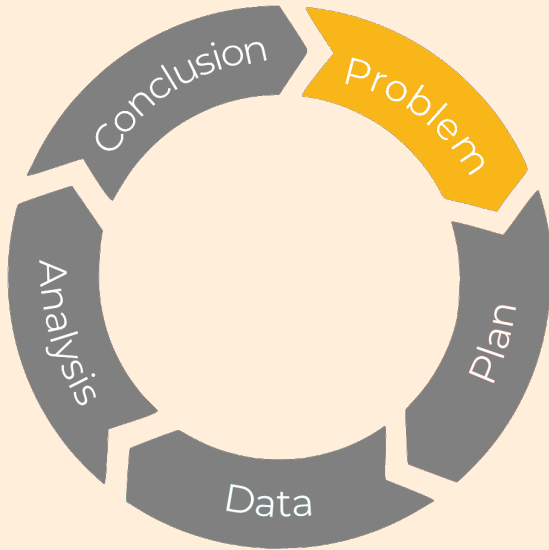
We will analyse the data to understand how different environmental factors affect our learning.

Conclusion



We will draw conclusions from our investigation.

The Problem



We want to find out how our learning is affected by:

- CO₂ levels in our classroom.
- The temperature of our classroom.
- Lighting in our classroom.
- Humidity or dryness in our classroom.

How can we find out?



Smart Sensor



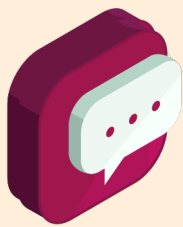
We will use an Elsys ERS Smart Building Sensor to capture data about our classroom environment.

- Levels of CO₂ (ppm)
- Temperature (Celsius)
- Levels of lighting (Lux)
- Humidity (% water in air)

Smart Sensor

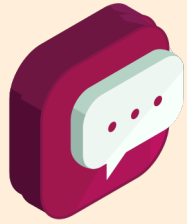


Where in the classroom would be the best location for the sensor?



Our sensor

University of Edinburgh

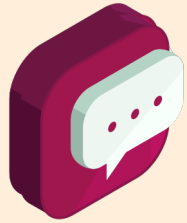


Uploads data

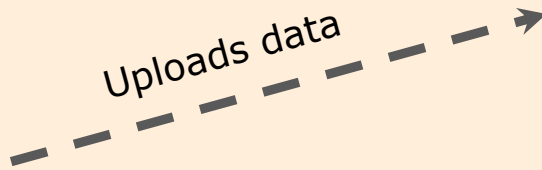


Our sensor

University of Edinburgh



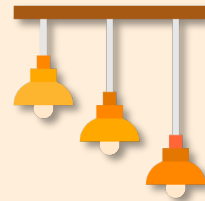
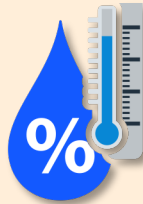
Our sensor



Uploads data



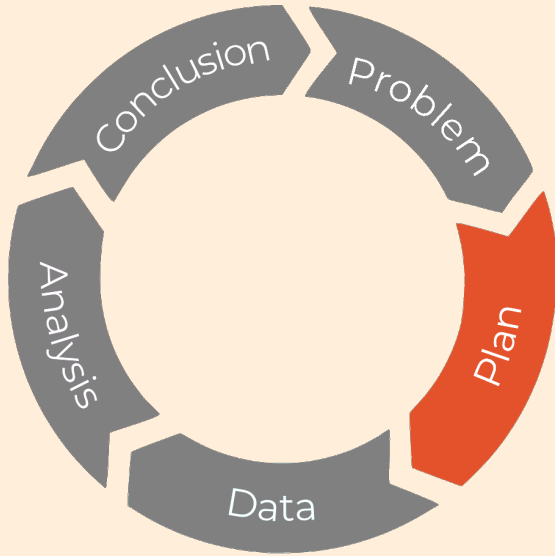
Our Dashboard



Okay, so we have a way of getting data, but how do we link it to our learning?



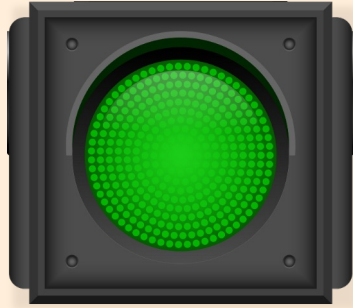
The Plan



We are going to measure how ready we are to learn at different times of day using a traffic light rating method.

Ready for Learning?

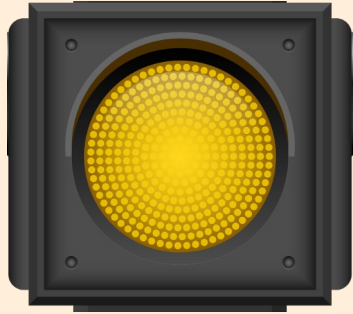
Green



- I am able to concentrate and take in new information well.
- I feel bright, energetic and positive.

Ready for Learning

Amber



- I am able to concentrate and take in new information quite well.
- My energy levels and motivation are okay, but could be better.

Ready for Learning?

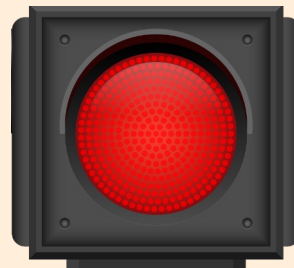
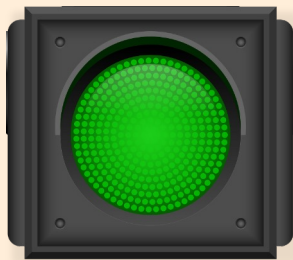
Red



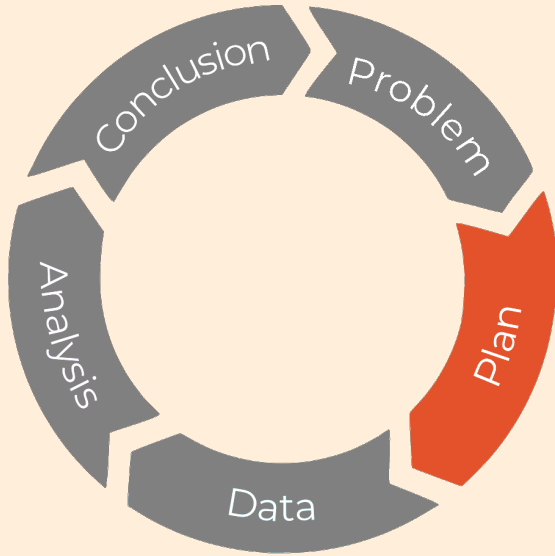
- I don't feel able to concentrate or take in new information well.
- I feel drowsy, a bit lazy and negative about my learning.

Are you **ready to learn** at the moment?

Which are you ?



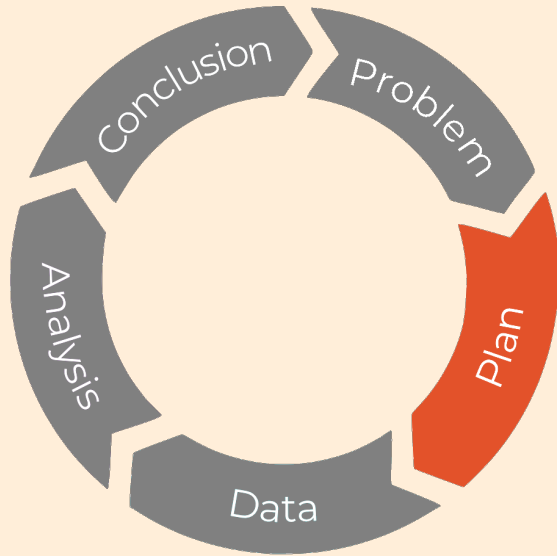
Our Plan



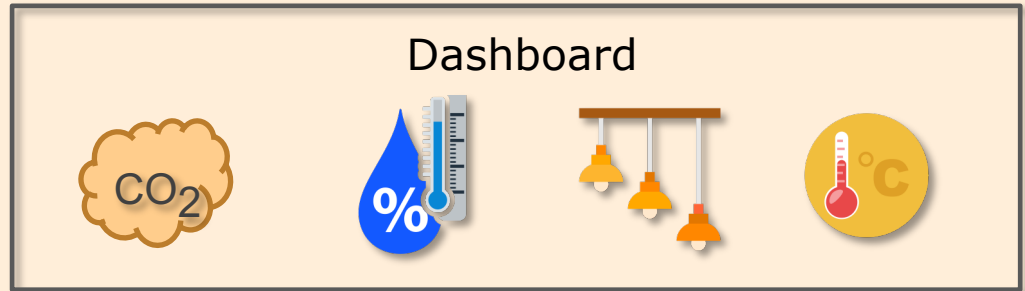
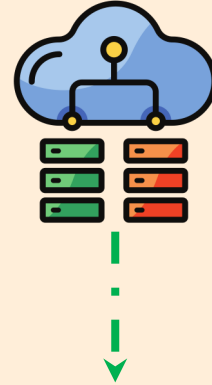
We are going to check if we are ready to learn (red, amber or green) every school day over the next 4 weeks.

We will check at different times of day.

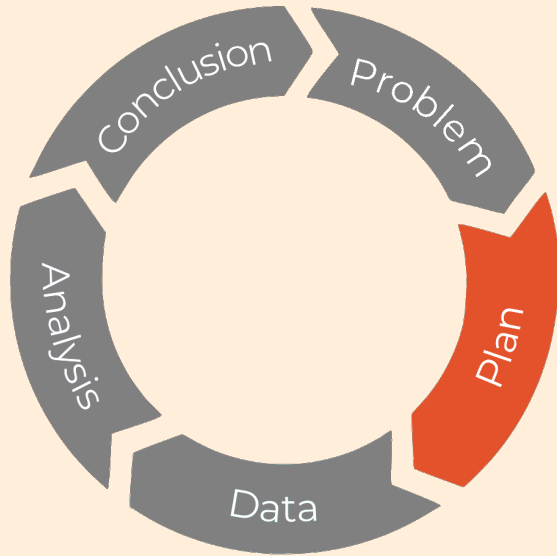
Our Plan



We will compare if we are ready to learn with the data on our sensor dashboard.

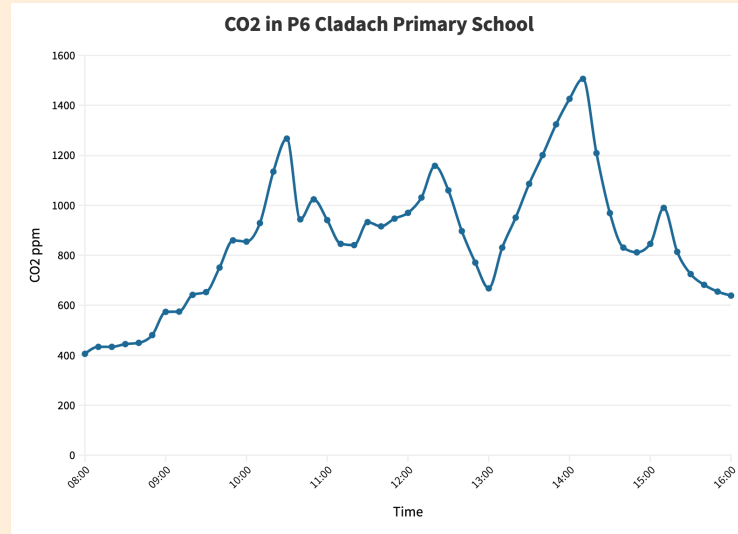


Our Plan

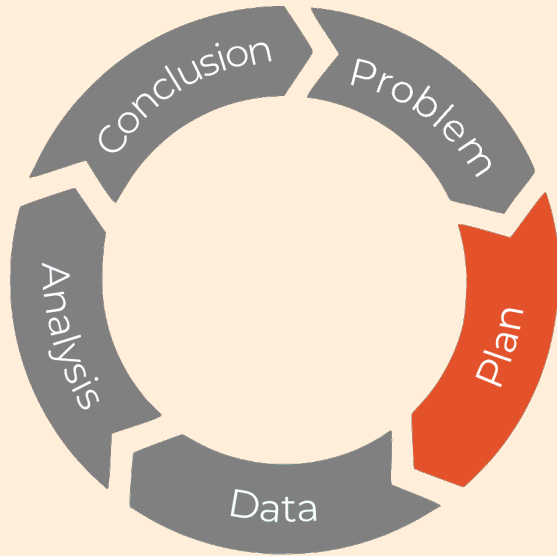


We will find out if there is a connection between being **ready to learn** and environmental factors in the classroom.

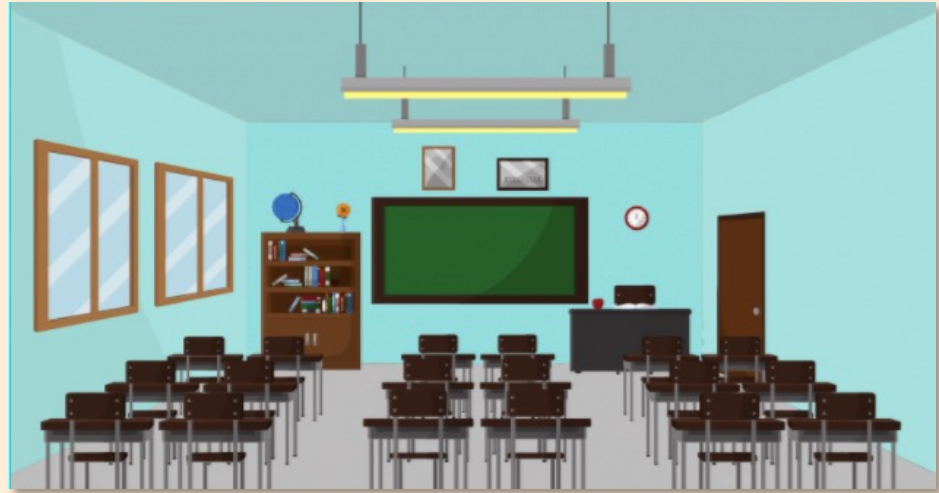
This will tell us if environmental factors such as temperature, CO₂, light levels and humidity affect our learning.



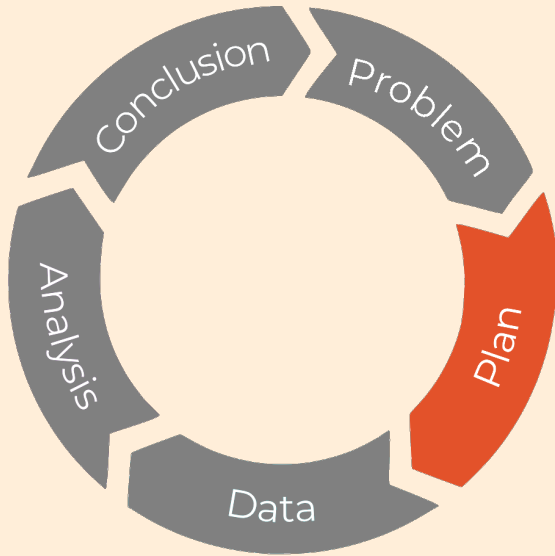
The Plan



When we've discovered if there's a link between environmental factors and being ready to learn, we will make changes to our classroom environment.



The Plan



We will find ways to alter room temperature.

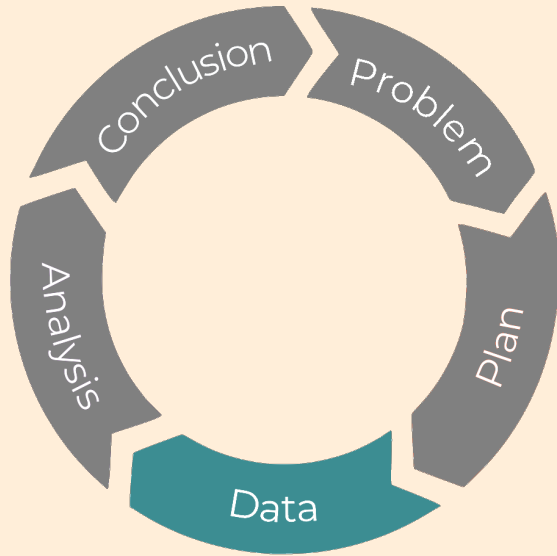
We find ways to alter CO2 levels.

We will alter light levels.

We will find ways to alter humidity.

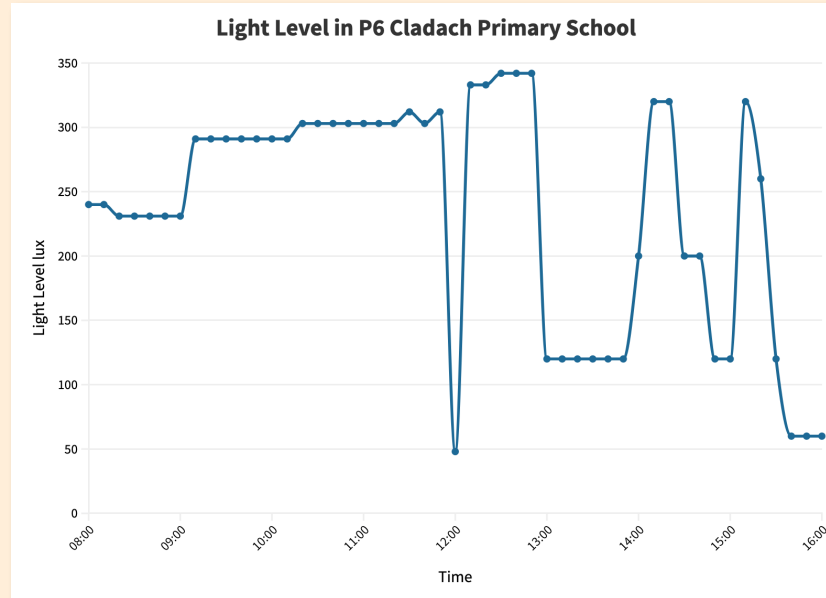
We will continue to check if we are ready to learn at different times every day.

The Plan

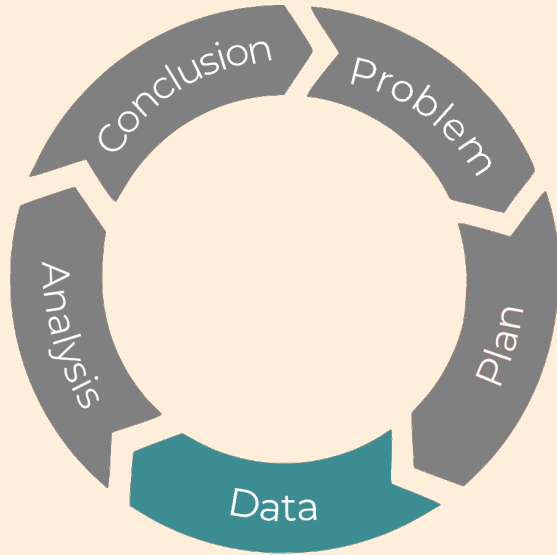


We will review the data on our dashboard each week.

We will analyse data to see how the changes we make to our classroom environment affects us being ready to learn.



The Plan



We will draw conclusions from our investigation about how environmental factors affect our learning.

We will have the evidence we need to help us improve our learning environment.



Activity 6

Analysing Dashboard Data



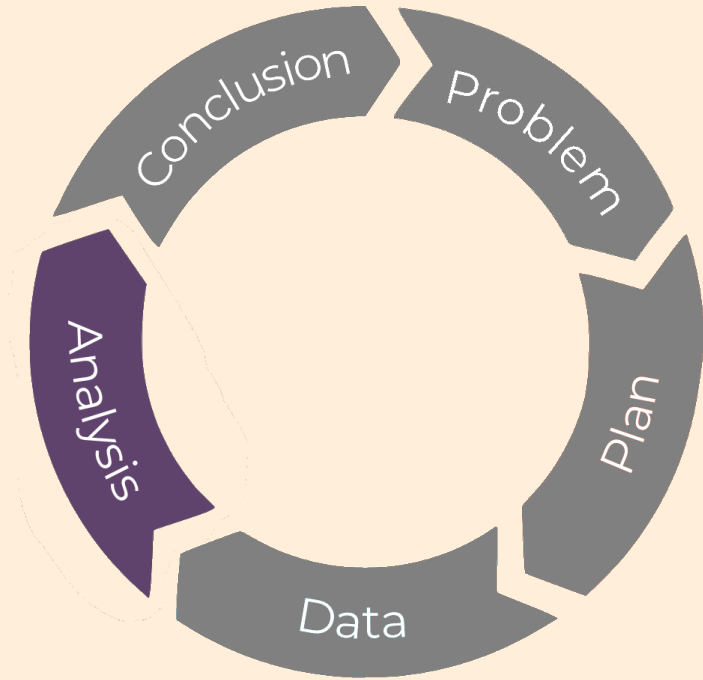
Learning intention

We are learning how to analyse sensor data about our classroom.

Success criteria

- I can identify changes to classroom data, such as temperature, CO2 and light levels.
- I can suggest possible reasons for changes data during the school day.
- I can make connections between classroom data and my learning state.

Analysis



We will analyse the data to understand how different environmental factors affect our learning.

Analysing the Dashboard

What is the dashboard telling us about the temperature of our classroom?

At what times of day is room temperature highest and lowest? Can you spot trends?

Suggest possible reasons for the changes in room temperature.

Can we detect any links between room temperature and our Learning State ratings?



Temperature

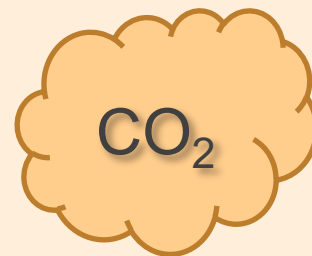
Analysing the Dashboard

What is the dashboard telling us about CO₂ levels in our classroom?

At what times of day are CO₂ levels highest and lowest? Can you spot trends?

Suggest possible reasons for the changes in CO₂ levels.

Can we detect any links between CO₂ levels and our Learning State ratings?



Carbon dioxide

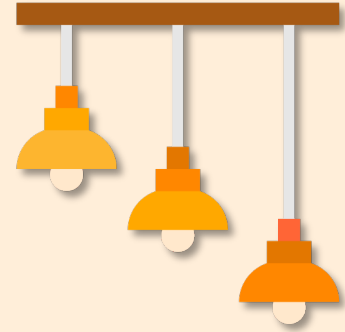
Analysing the Dashboard

What is the dashboard telling us about light levels in our classroom?

At what times of day are light levels highest and lowest? Can you spot trends?

Suggest possible reasons for the changes in light levels.

Can we detect any links between light levels and our Learning State ratings?



Light levels

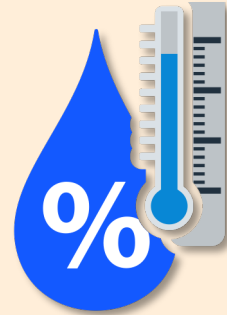
Analysing the Dashboard

What is the dashboard telling us about the humidity of our classroom?

At what times of day is the humidity of the room highest/lowest? Can you spot trends?

Suggest possible reasons for the changes in humidity.

Can we detect any links between humidity and our Learning State ratings?



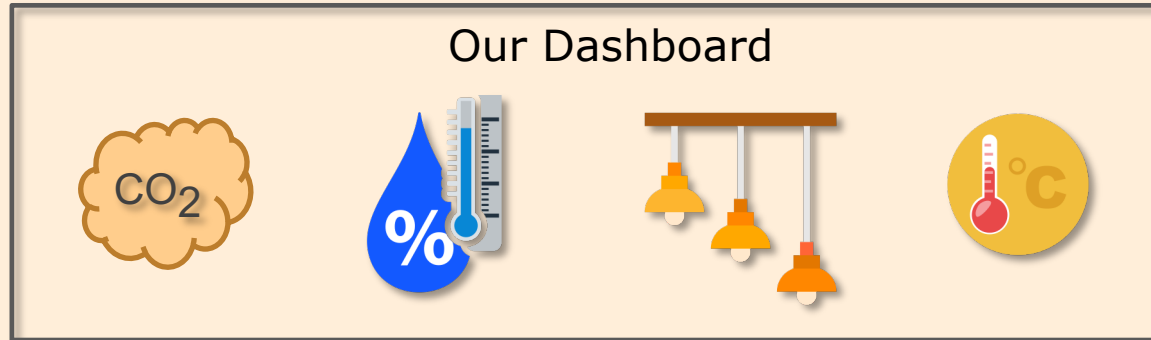
Humidity

Analysing the Dashboard

In groups, discuss what we've learned from our analysis of dashboard.

Agree possible explanations for changes to sensor data during the day.

Describe how changes to our classroom environment affects our learning.



Activity 7

Changing our Learning Environment



Learning intention

We are finding out if making changes to our classroom improves our learning environment.

Success criteria

- I can identify *optimal* conditions for learning.
- I can suggest changes that will improve our learning environment.
- I can analyse data to see the effects of these changes.

Optimal Temperature

How does classroom temperature affect our learning? What room temperature is best for learning (optimal temperature)?

How can we achieve optimal temperature in our classroom? What changes could we make?

How will we know if these changes improve our learning?



Optimal
Temperature

Improving Air Quality

What do we know about how CO₂ levels in our classroom affect our learning?

What changes could we make to reduce CO₂ in our classroom and improve air quality?

How will we know if these changes improve our learning?



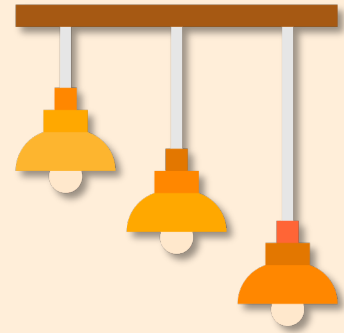
Optimal Air
Quality

Optimal Light Level

How does lighting affect our learning? Is there a lux level that is best (optimal) for learning?

How can we achieve optimal lighting in our classroom? What changes could we make?

How will we know if these changes improve our learning?



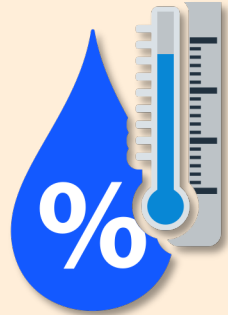
Optimal
Lighting

Optimal Humidity

How does humidity affect our learning? Is there a humidity level that is best (optimal) for learning?

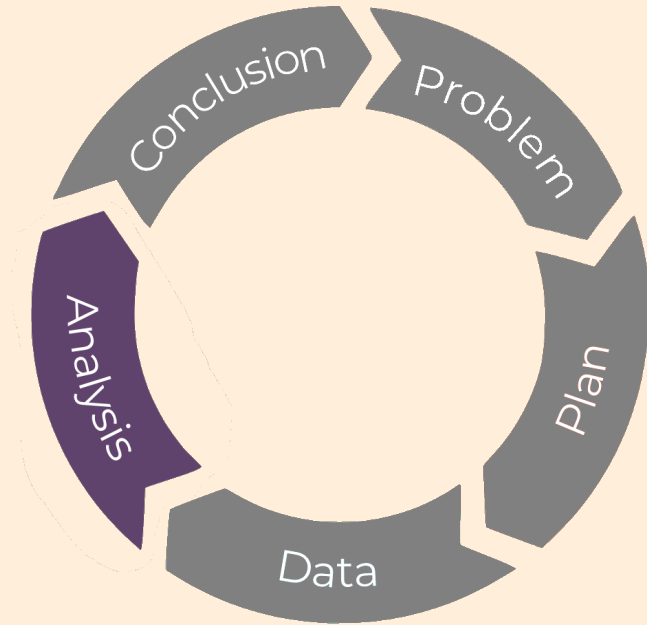
How can we achieve optimal humidity in our classroom? What changes could we make?

How will we know if these changes improve our learning?

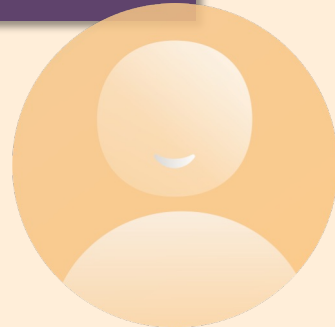


Humidity

Analysis



We'll analyse data to see the effects of these changes on our classroom environment.



Activity 8

Can plants improve our learning environment?



Learning intention

We are investigating the effect of plants on air quality in our classroom.

Success criteria

- I can plan an investigation to see how plants affect air quality in our classroom.
- I can analyse data to see the impact of plants on CO₂ levels.

Optimal Air Quality

What do we know about how air quality affects our learning?

What changes could we make to improve air quality in our classroom?

How will we know if these changes improve our learning?



Optimal Air
Quality

Can plants improve quality in our classroom?

Use the Internet to find out if plants can help
create a better learning environment.



Can plants improve quality in our classroom?

Use the Internet to find out if plants can help create a better learning environment.

Find out how plants reduce levels of Carbon dioxide.



Can plants improve quality in our classroom?

Use the Internet to find out if plants can help create a better learning environment.

Find out how plants reduce levels of Carbon dioxide.

Are there certain plants which are particularly effective in reducing levels of CO₂?



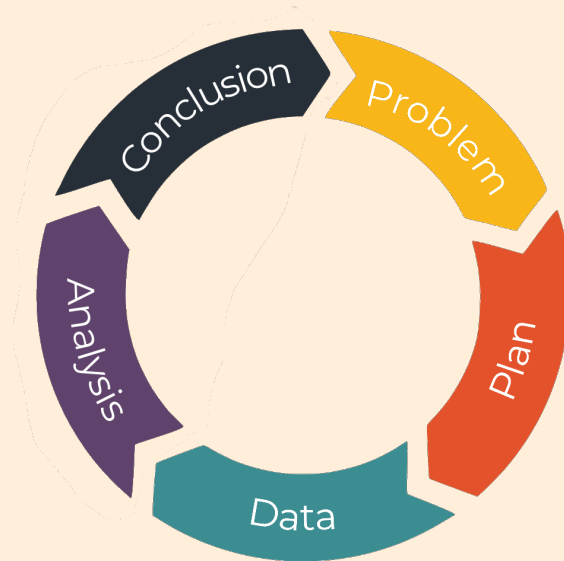
Can plants improve quality in our classroom?

Working in groups, plan an investigation to discover if plants can improve our learning environment.



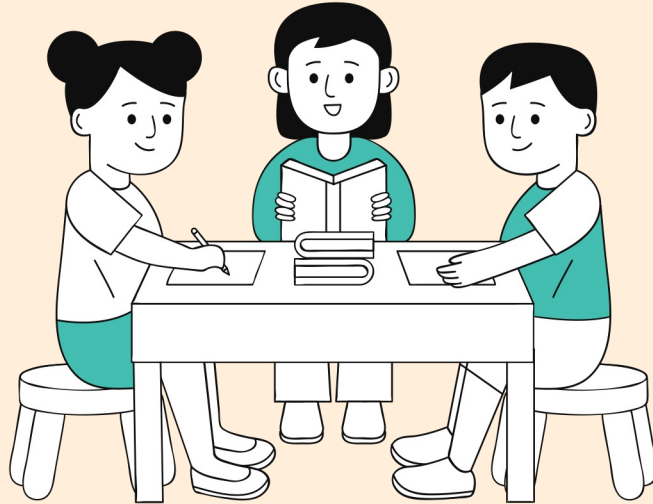
Can plants improve quality in our classroom?

Remember the PPDAC investigation model.



Activity 9

Drawing conclusions
from our investigation



Learning intention

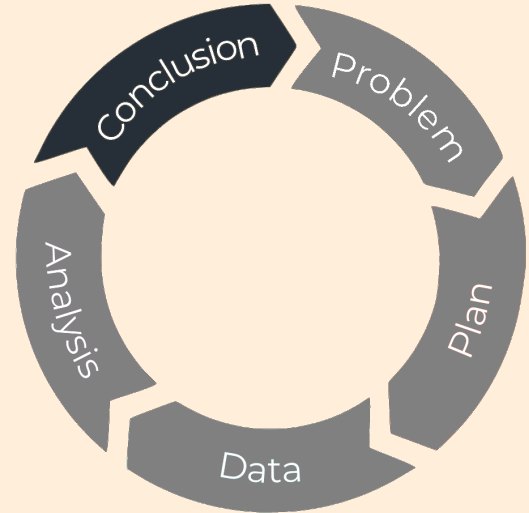
We are drawing conclusions from our learning environment investigation.

Success criteria

- I can summarise the main findings of our investigation .
- I can draw conclusions from our investigation

Conclusions

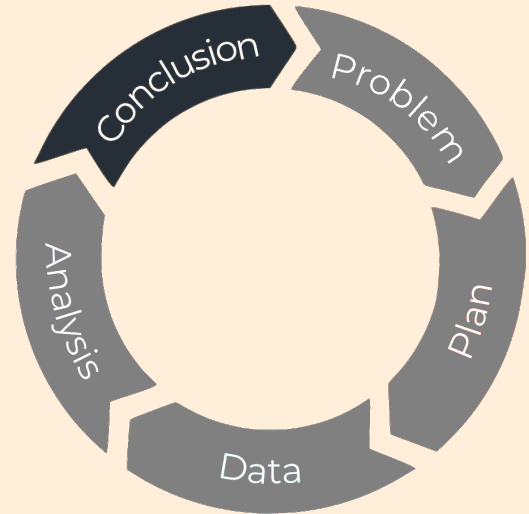
What have we learned about how environmental factors affect learning?



Conclusions

What have we learned about how environmental factors affect learning?

How is our learning affected by temperature, lighting, CO₂ and humidity?

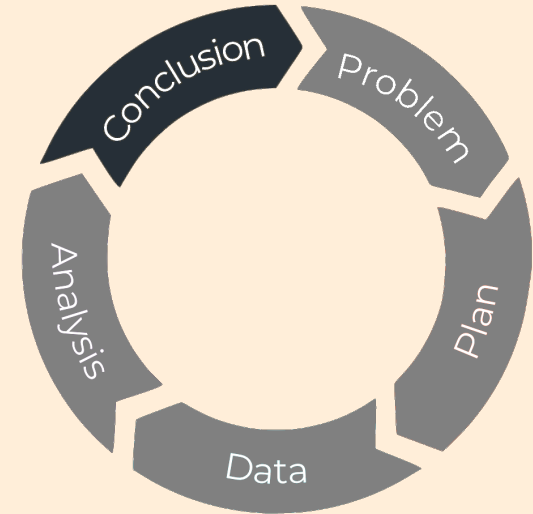


Conclusions

What have we learned about how environmental factors affect learning?

How is our learning affected by temperature, lighting, CO₂ and humidity?

How did the changes we made to our classroom affect our learning environment? Did our learning improve?



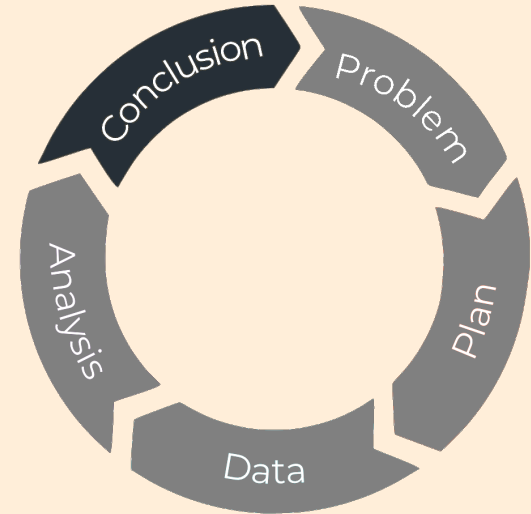
Conclusions

What have we learned about how environmental factors affect learning?

How is our learning affected by temperature, lighting, CO₂ and humidity?

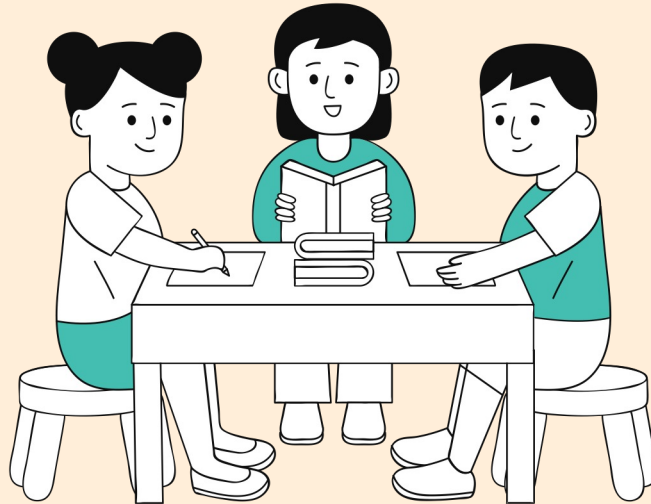
How did the changes we made to our classroom affect our learning environment? Did our learning improve?

What conclusions can we draw from our investigation?



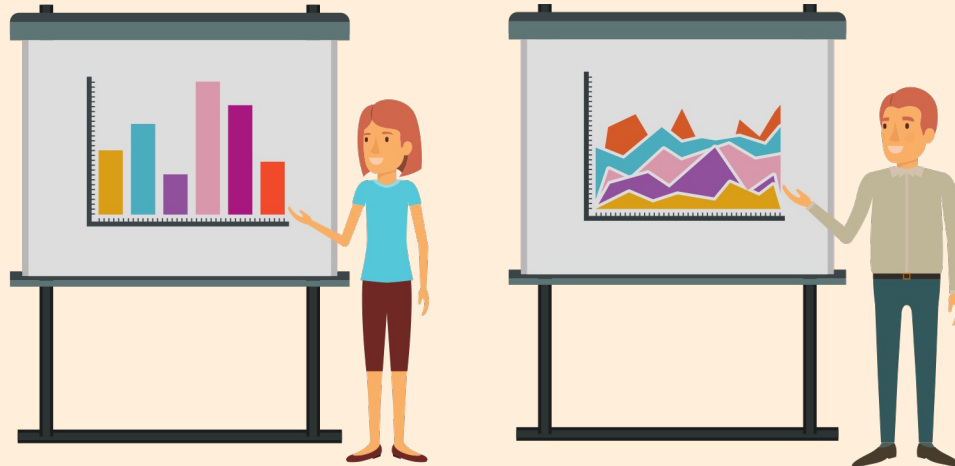
Writing up your Conclusions

In groups, discuss what has been learned from the investigation. Write a list of conclusions which help sum up our findings.



Activity 10

Make a presentation about
our investigation



Learning intention

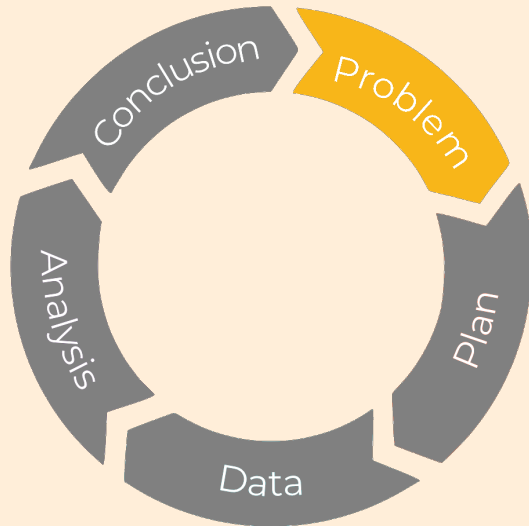
We will create a presentation about our investigation and share it with the class.

Success criteria

- I can describe the problem to be investigated.
- I can describe how we planned the investigation.
- I can describe the role of data in our investigation.
- I can describe how we analysed the data.
- I can describe the main conclusions of our investigation.

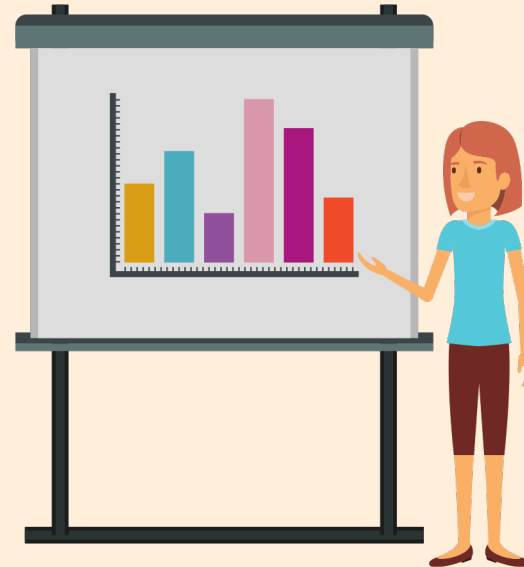
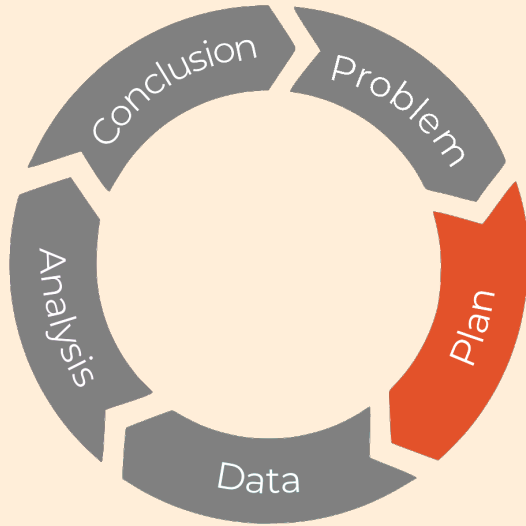
The Problem

Describe the problem to be solved at the start of the investigation.



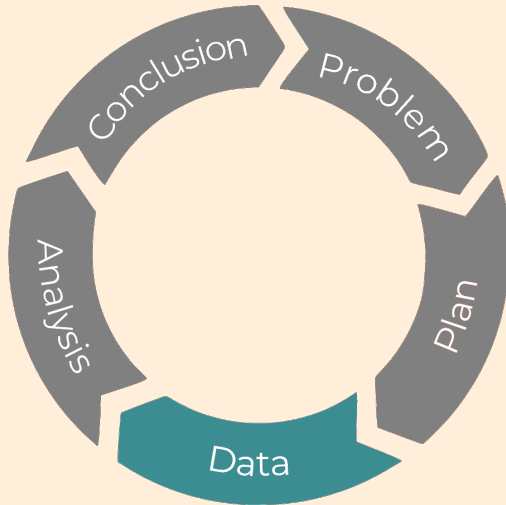
The Plan

Describe how you planned the investigation.



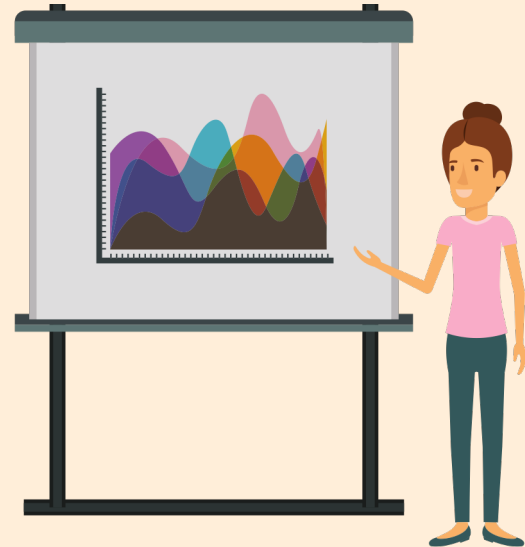
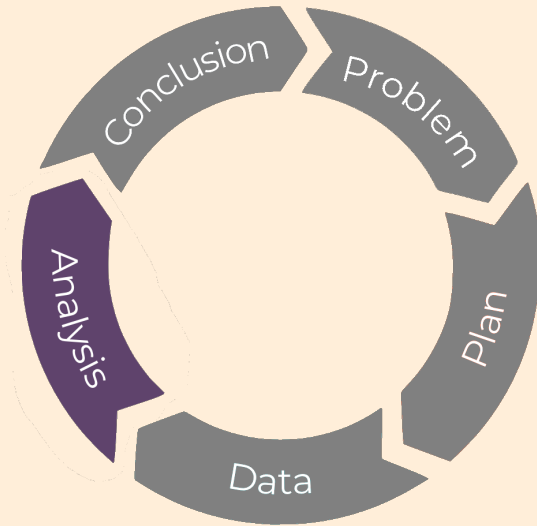
The Role of Data

Describe how you collected and analysed data as part of the investigation.



Analysis

Describe how you analysed data and what your analysis showed.



Conclusion

Summarise your main findings and the conclusions drawn from the investigation.

