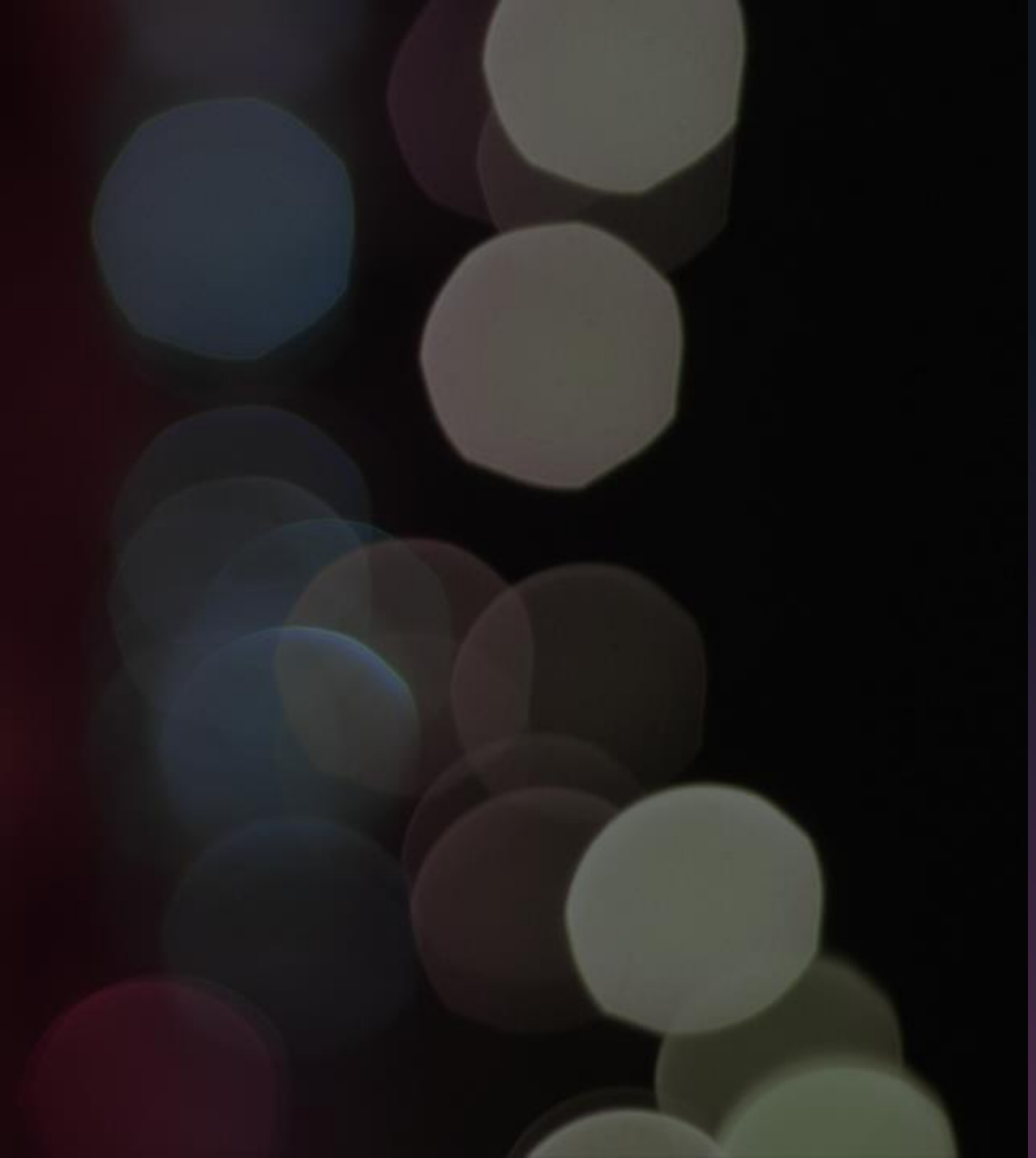
IoT – What's the Deal?

The Internet of Things (IoT) project aims to support children to engage with, and develop their understanding of, data and its uses in the everyday world. The University of Edinburgh has provided schools with sensors that gather different types of data; light, humidity, Carbon Dioxide (CO_2), temperature, motion, air pressure and particulate matter. This data is collated and uploaded to the university server, where learners can interpret and analyse the data.

Below are activities in suggested four lesson blocks. The initial focus is gaining an understanding of what IoT is. Learners then consider how sensors are being used in industry, with AI, how they can capture or use their own data through coding and Micro:Bits. These activities and lessons can be interspersed with further research and exploration dependant on Learner interest and to develop pupil-led projects.



Lesson 1:

What is IoT?

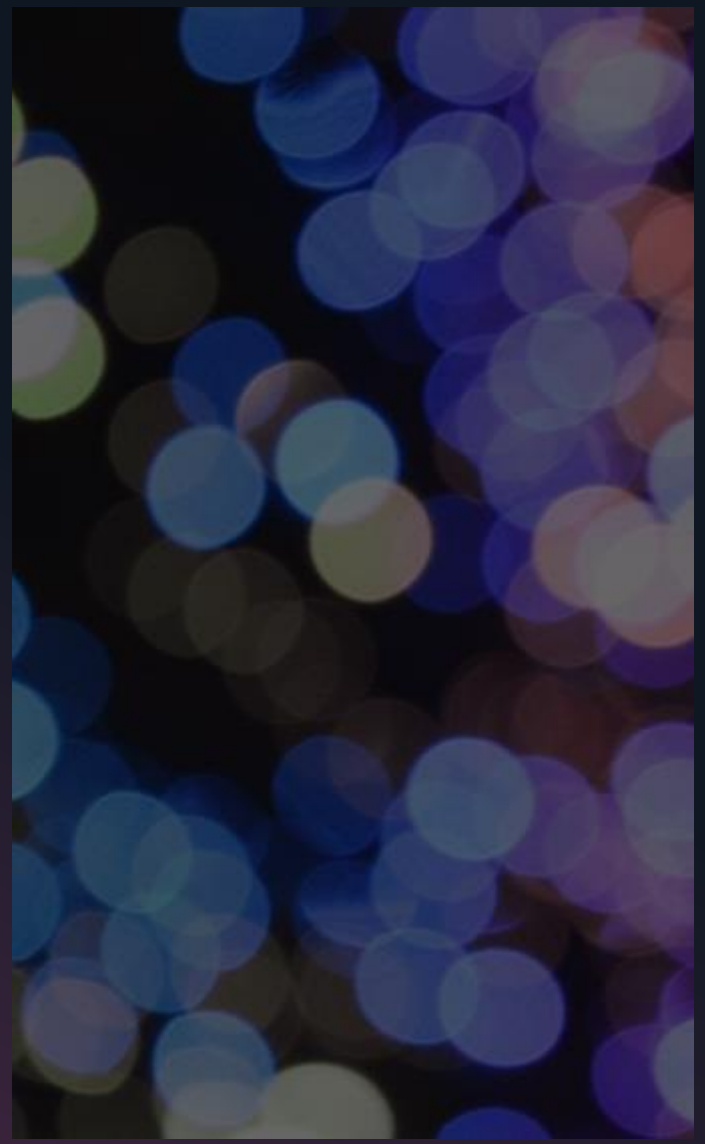
This introductory session is about setting the scene for IoT. We will learn about sensors that gather live data in our everyday lives and how this is linked to a more global IoT network.

Learning Intention:

We are learning about the importance of data collection and analysis.

Success Criteria:

- I can explain a definition of the Internet of Things.
- I can analyse use of Connected Devices
- I can discuss and share my IoT research with others



Key Questions:

Ample time should be allotted to complete research on the concept of IoT.

- What does Internet of Things mean?
- How do you know if a device is connected to the Internet?
- Do you have any IoT devices at home?
- How can you control IoT devices?
- Are you surprised by certain devices being part of the IoT network?
- Were you already aware that certain devices were part of IoT?

Learners can develop their own questions on this topic to be included here.

Editable Slide:

- Depending on writing and literacy focus learners could write notes on their research, create a Sway, Video, news report, collaborate on an online platform such as Teams, Google Classroom, Padlet, Mural, etc.
- At the end of the lesson learners should share their learning and give other's the opportunity to make notes and/or further their own understanding through peer discussion.

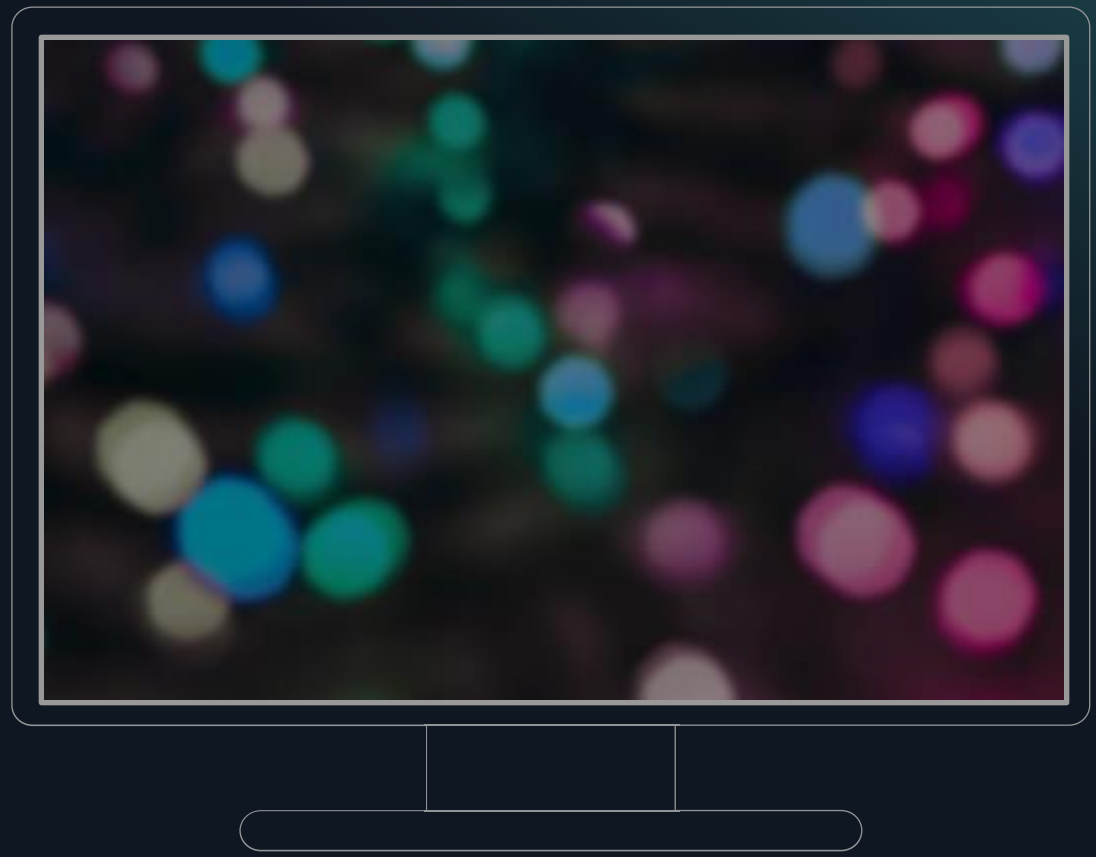
Pupil Participation:

- How would your learners like to display their own learning?
- Would Group or individual work suit your learners best?
- Did any pupil developed questions particularly inspire rich discussion, productive struggle and open-ended thinking?

Plenary

Learners should summarise their learning from this session and then consider the following statement:

IoT is omnipresent in today's world



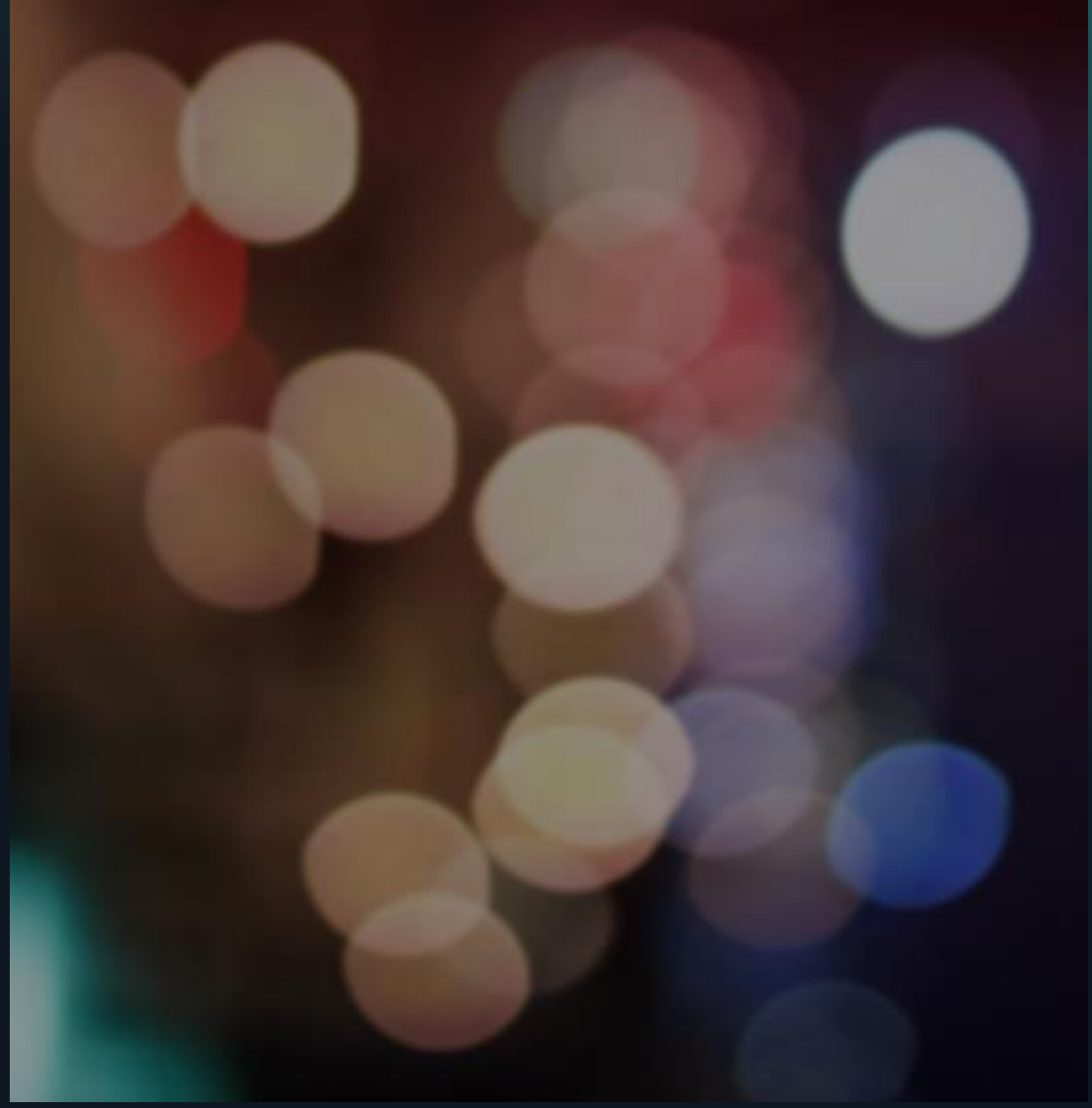
Plenary Prompts:

IoT is omnipresent in today's world because:

- We have all used IoT today by….
- Towns/cities are filled with IoT. E.g.
- IoT has helped me today through…

IoT is not omnipresent in today's world because:

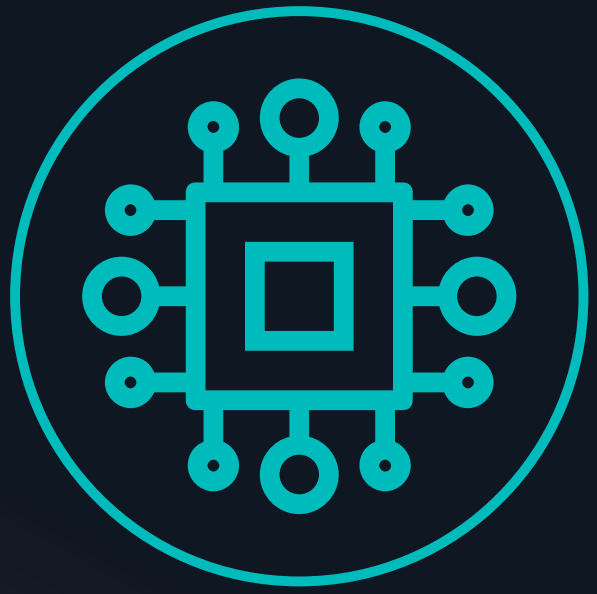
- I haven't used IoT devices today by not…
- There are certain areas of the World without internet connection such as…



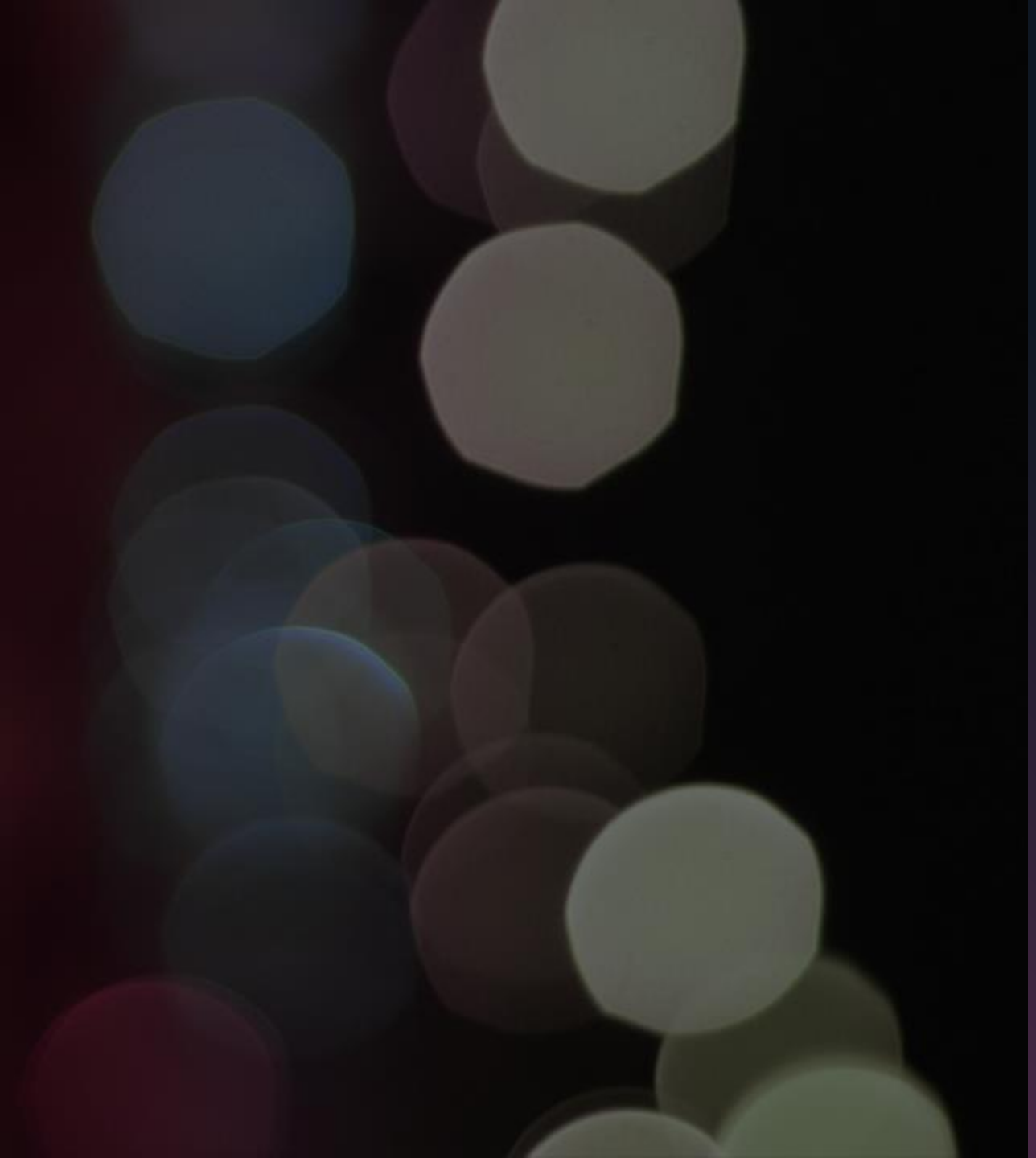
What is Internet of Things?

Click below or copy hyperlink for an explanation of IoT from the BBC:

Click Here



https://www.bbc.co.uk/news/av/technology-36912701



Lesson 2:

IoT and My School

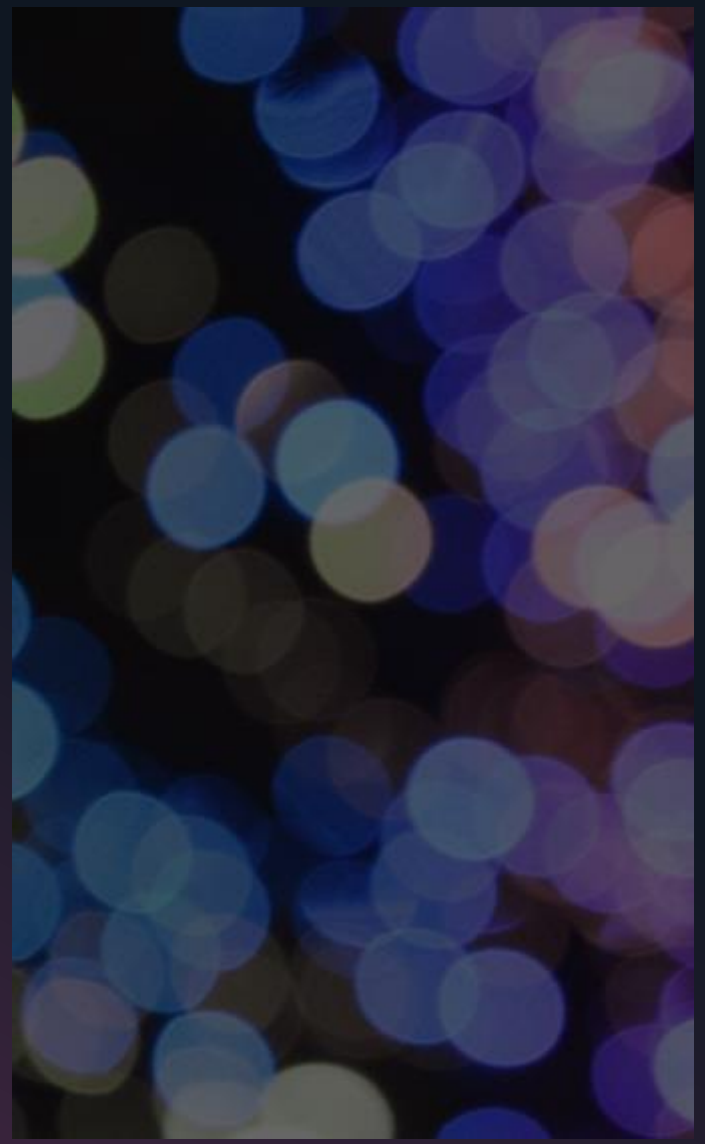
Lesson Two develops understanding around using data to monitor school environments. Pupils will learn about sensors that gather live data in their own classroom. Pupils then compare this information to live data gathered from other schools in Scotland.

Learning Intention:

We are learning about the importance of data collection and analysis.

Success Criteria:

- I can say how data can be used to develop learning environments.
- I can analyse data from my school.
- I can compare data from different settings.



Research and Explore:

Ample time should be allotted to complete research on datasets from your school, area and further afield.

- Learners should be provided with free time to explore the live data for the their own classroom and schools in their wider area/nationally.
- Learners should be encouraged to find interesting data points and make inferences and be ready to share them with the class.

Learners can develop their own questions on this topic to be included here.

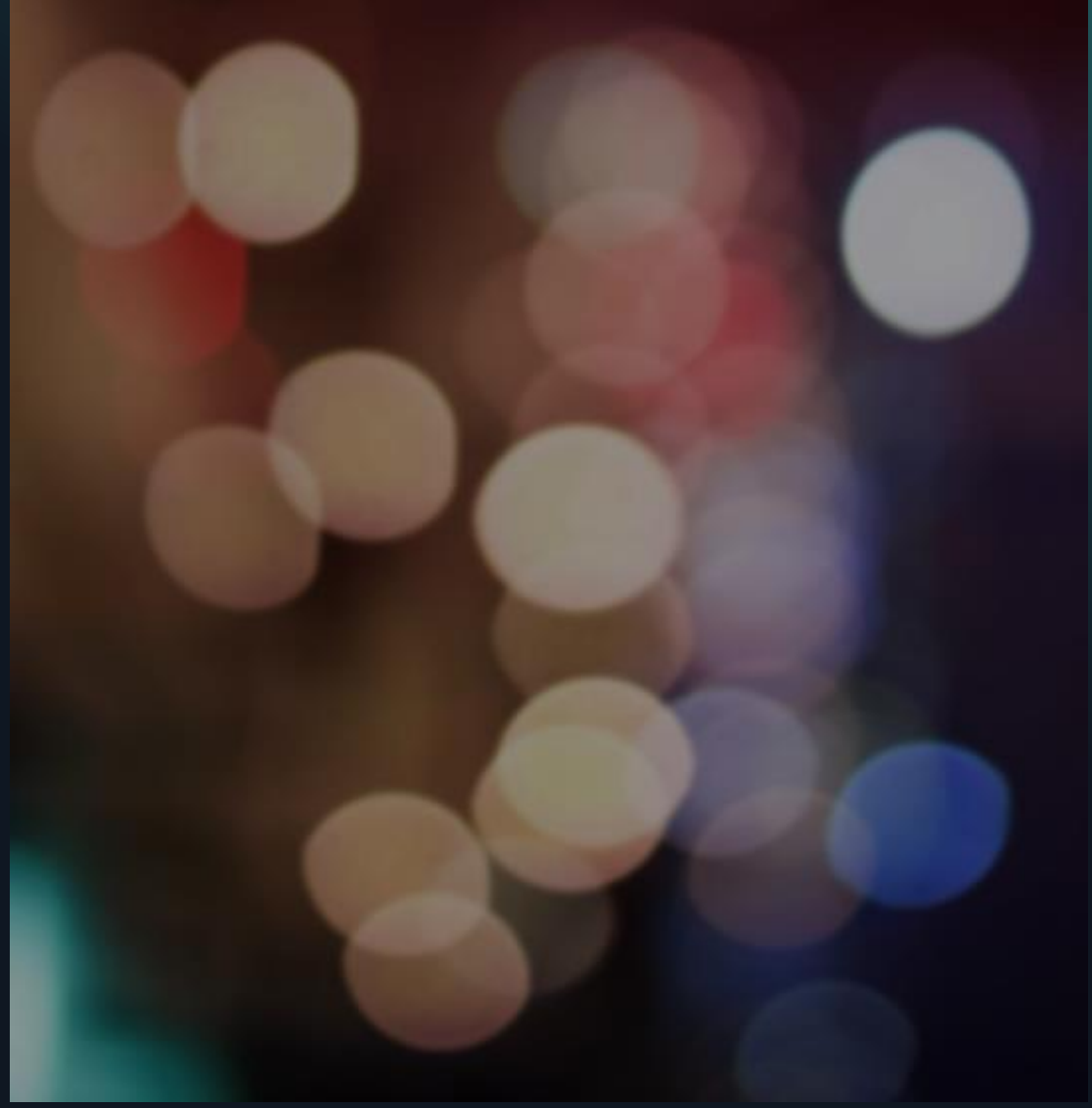
Discussion Prompts:

Possible similarities

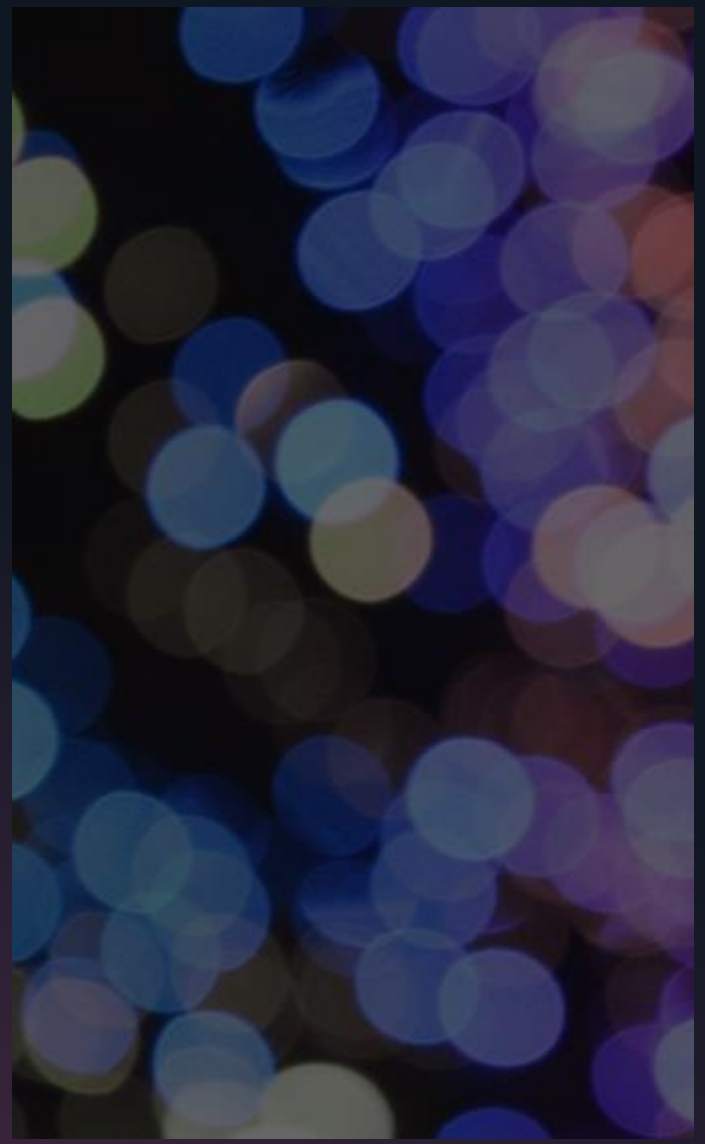
- They show the same date and time period.
- They all have time at zero.
- They all follow the same "bell curve".
- They all have an X-axis and a Y-axis

Possible differences

- The Scale is different.
- The Range is different.
- Classrooms with relative highest/lowest Lux, CO2, Motion, Temperature, Humidity.
- The Sensors are in different locations nationally and within school buildings.



Encourage annotations on the data sets, discussions and explanations why – there are no right or wrong answers when it comes to data analysis.



Research and Explore:

Ample time should be allotted to complete research on which dataset/data point is a learner's favourite.

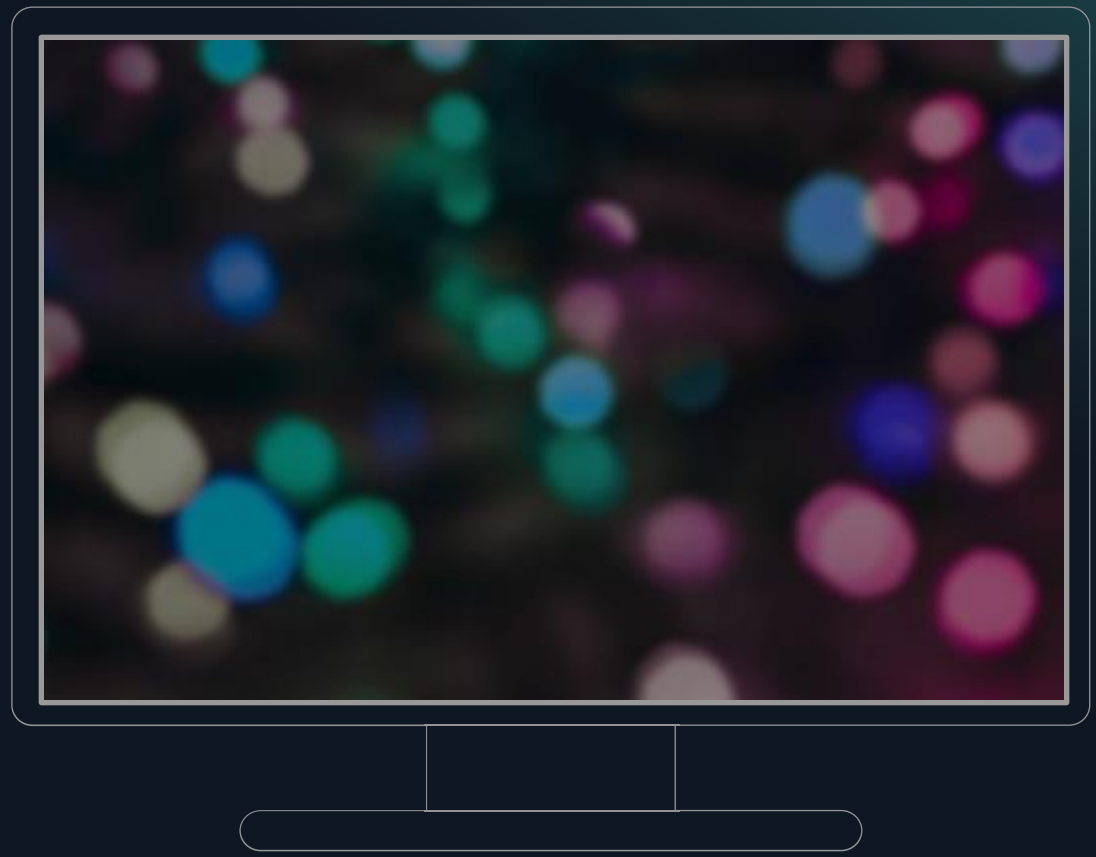
- Learners are now tasked with deciding where they would like to place or hide sensors around their school and putting forward to best argument as to why the sensor must be placed here.

- This thinking could lead to learners/adults hiding the sensors in their own school building, asking learners to guess where it is hidden and explain how they used the data to decide where it is hidden.

Plenary

Learners should summarise their learning from this session and then consider the following statement:

This data is my favourite because…



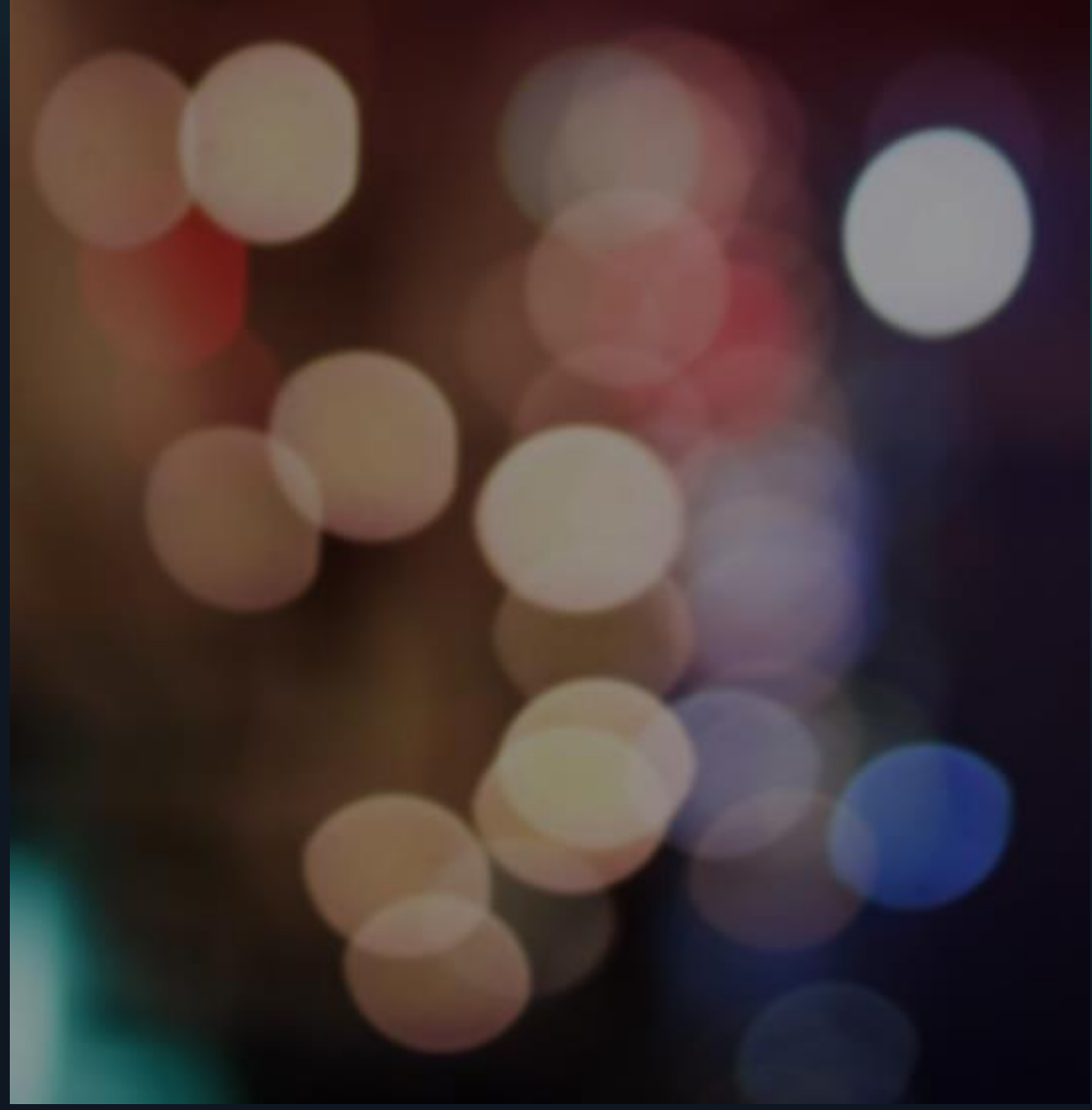
Plenary Prompts:

This data is my favourite because:

- It shows that our Teacher entered and left our classroom at this time…
- It shows the times of sunrise and sunset were…
- I can see the highest/lowest temperature today was at…

I would like to learn more about this data because:

- I don't know why I see X at this time/in this place.
- I wonder if I can improve the humidity/Lux levels/CO2 Levels.

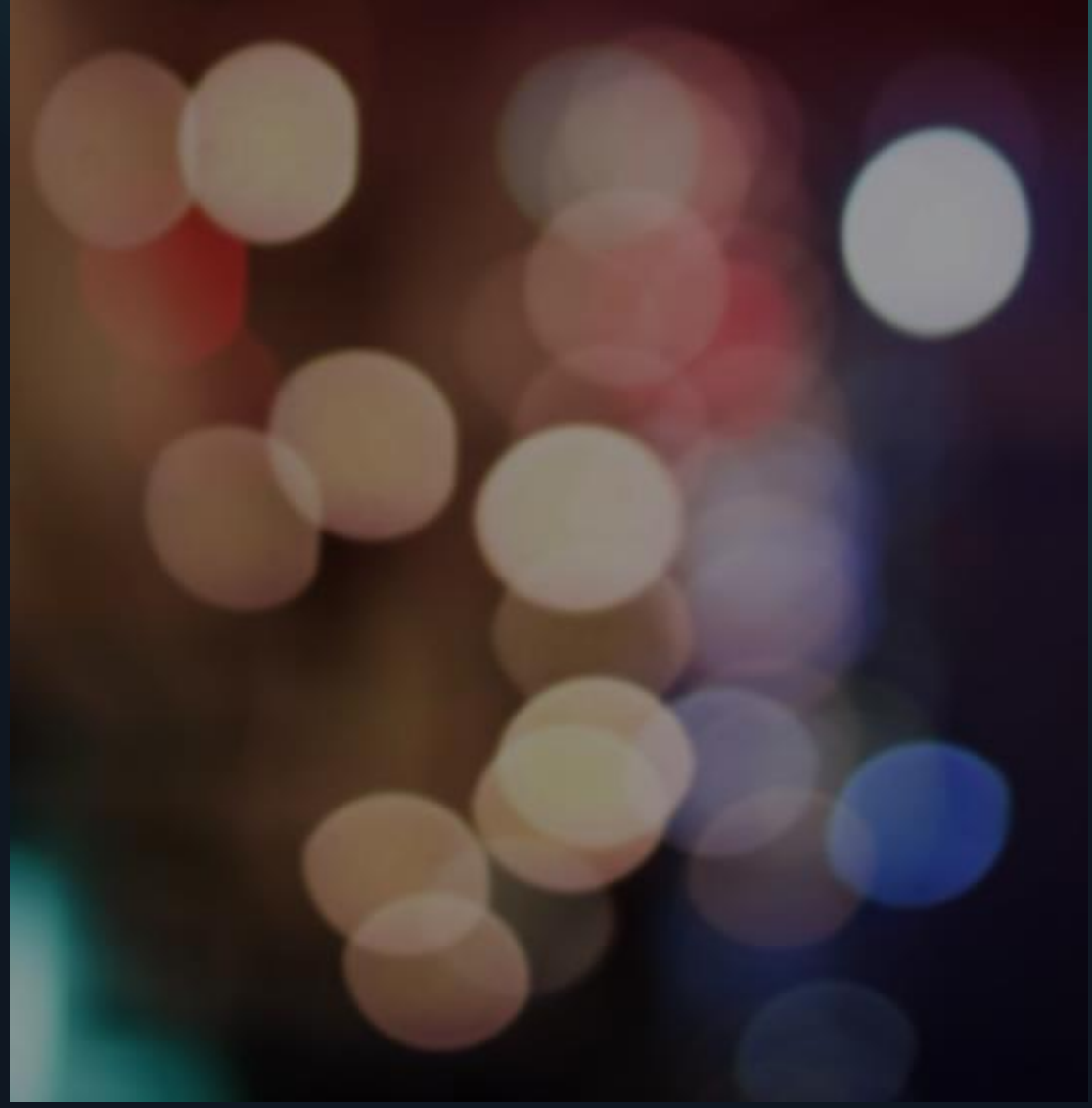


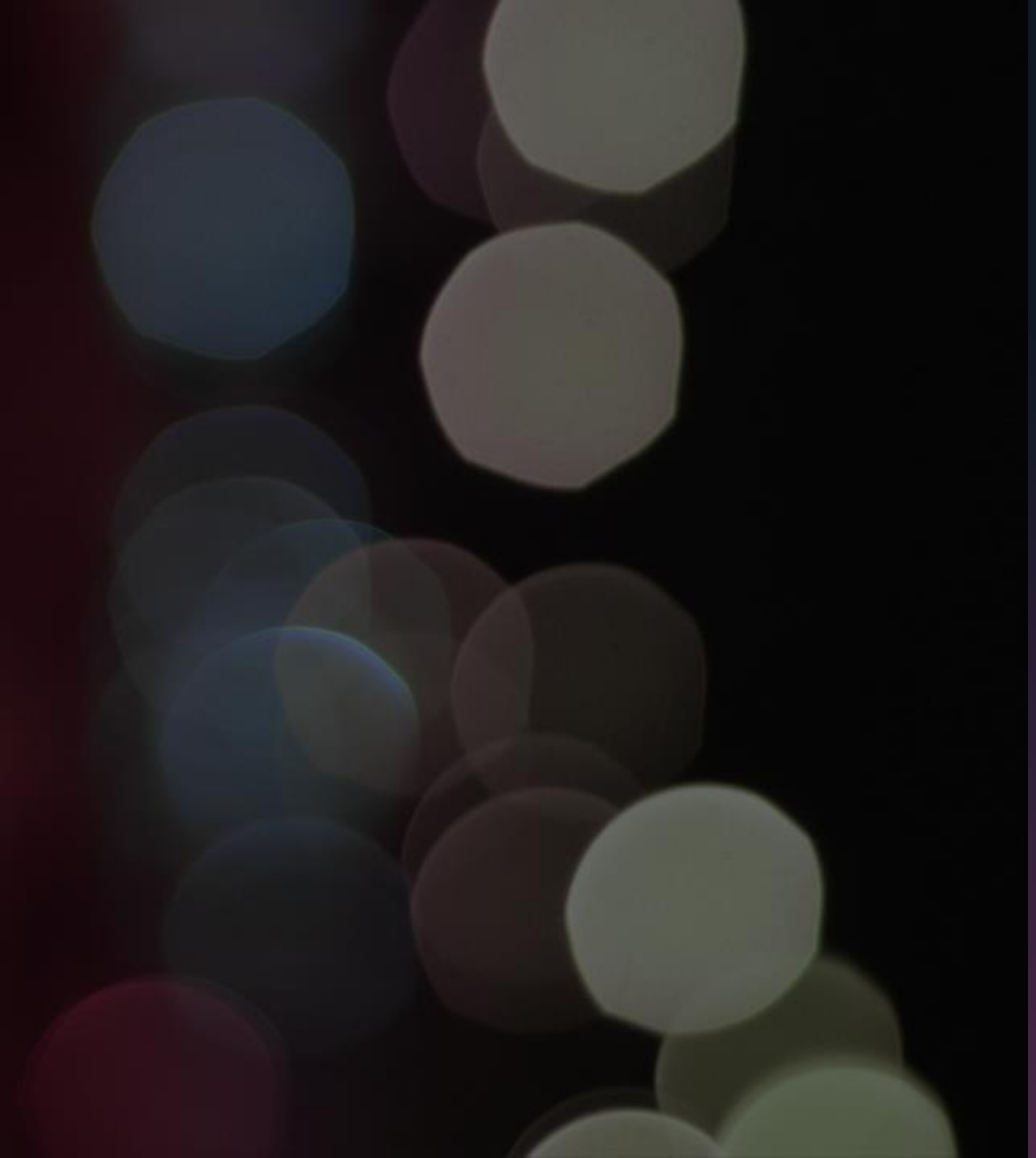
Plenary Prompts:

I think the sensor should be placed here because:

- It will show if the levels of CO2 are safe during indoor PE.
- It will show motion for the highest number of learners in the school day.
- It will help use to improve our learning environment/timetable during the school day.

Learners should be invited to include their own prompts below:





Lesson 3:

IoT and Industry

The use of IoT and Data in industry to develop efficiency, improve conditions or even reduce emissions.
Learning about sensors gathering live data in industry/commercial settings.

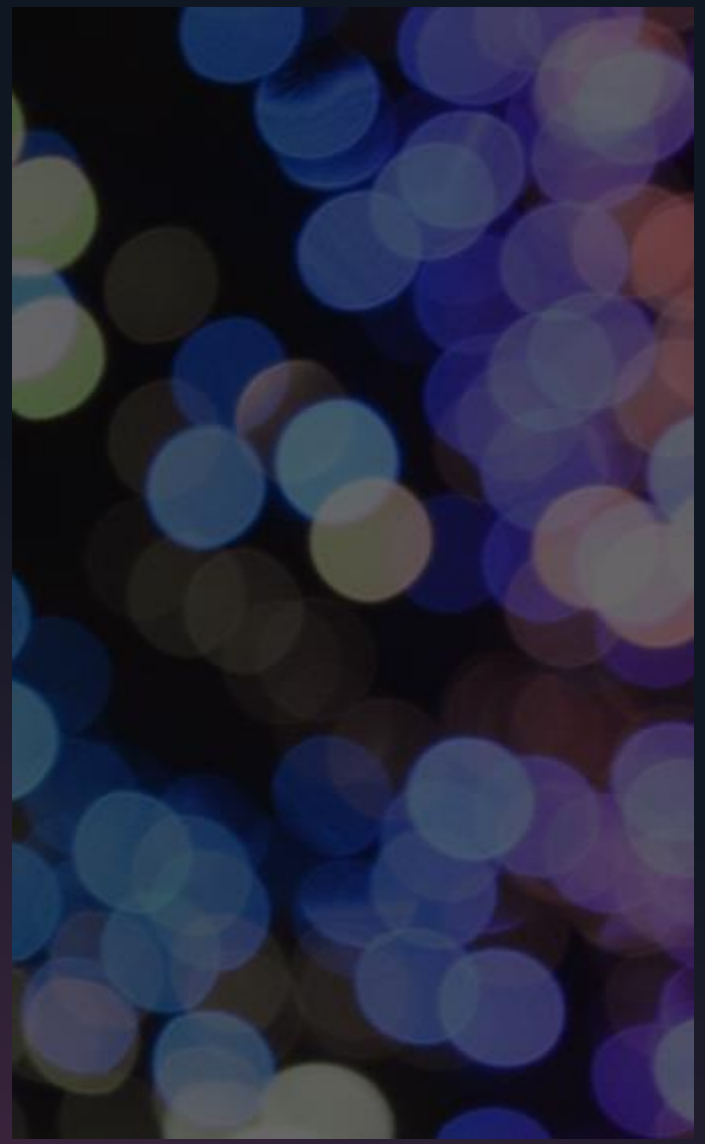
Comparisons between data from various sources to further explore Industry Internet of Things (IIoT) and Commercial applications.

Learning Intention:

We are learning about the importance of data collection and analysis.

Success Criteria:

- I can say how data can be used to develop industry and commerce.
- I can show how data analysis can be applied.
- I can show how to use data to improve industry/commercial environments.

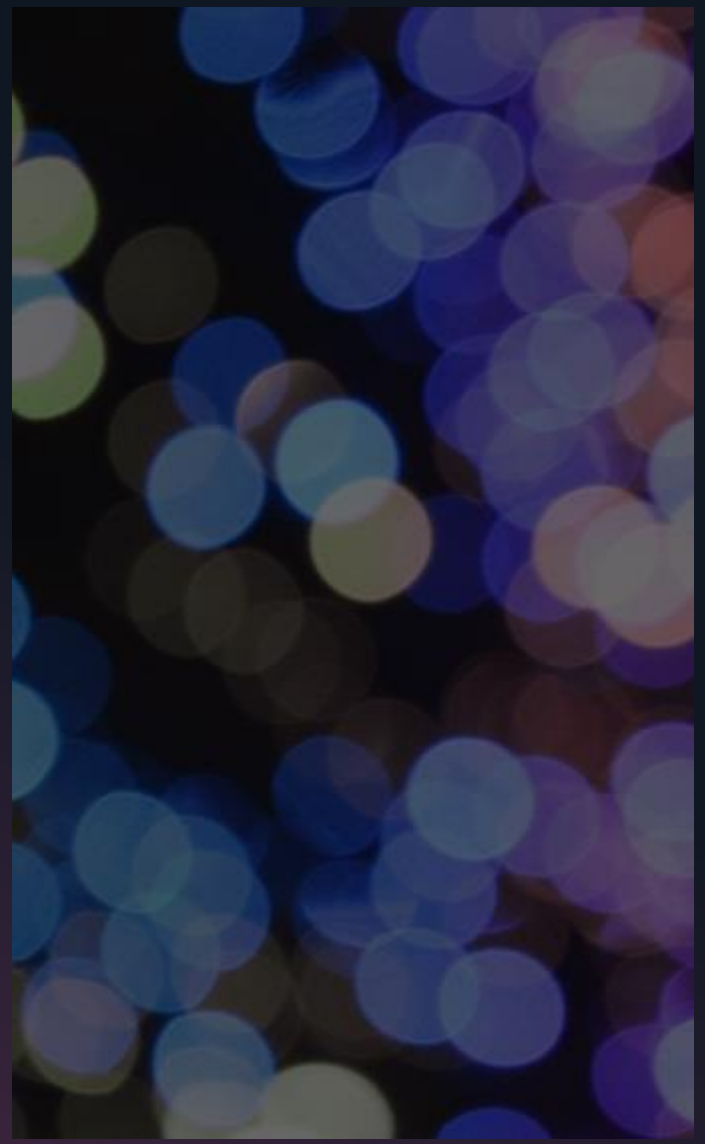


Research and Explore:

Ample time should be allotted to complete research on preferred examples of Industry/Commercial IoT

- Dynamic Positioning on large sea/ocean-going vessels to ensure a ship stays in the exact position it should be using automation and AI.
- IoT agriculture sensors that can be attached animals on a farm to monitor their health and wellbeing, and physical location.
- Biscuit factories ensuring that each biscuit is perfect through IoT technology.
- Football players wearing IoT devices to improve performance and monitor health.
- IoT sensors inside rugby balls.

Learners can develop their own IIoT examples to be included here.



Research and Explore:

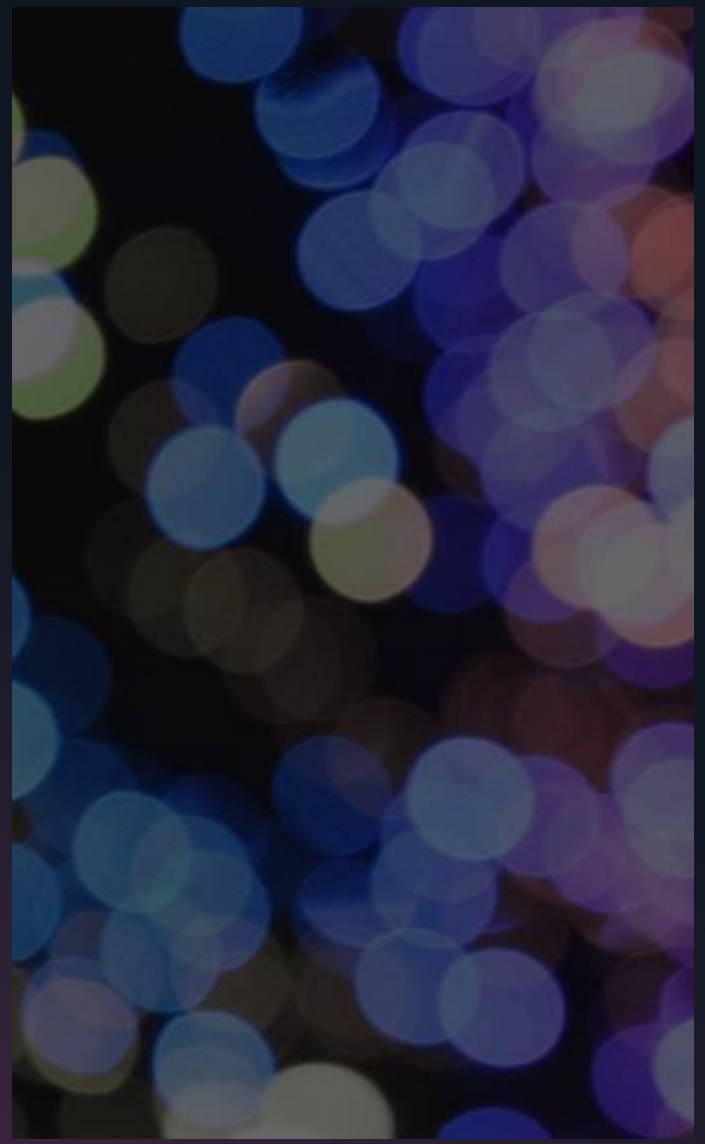
Ample time should be allotted to complete research on preferred examples of Industry/Commercial IoT

'Inside the Factory' offers insight into making certain foodstuffs – this needs to be accessed via BBC iPlayer and is not suitable for all learners.

Click here or use the following link to find out more:

https://www.bbc.co.uk/programmes/b07mddqk/episodes/player

Learners can develop their own IIoT examples to be included here.



Research and Explore:

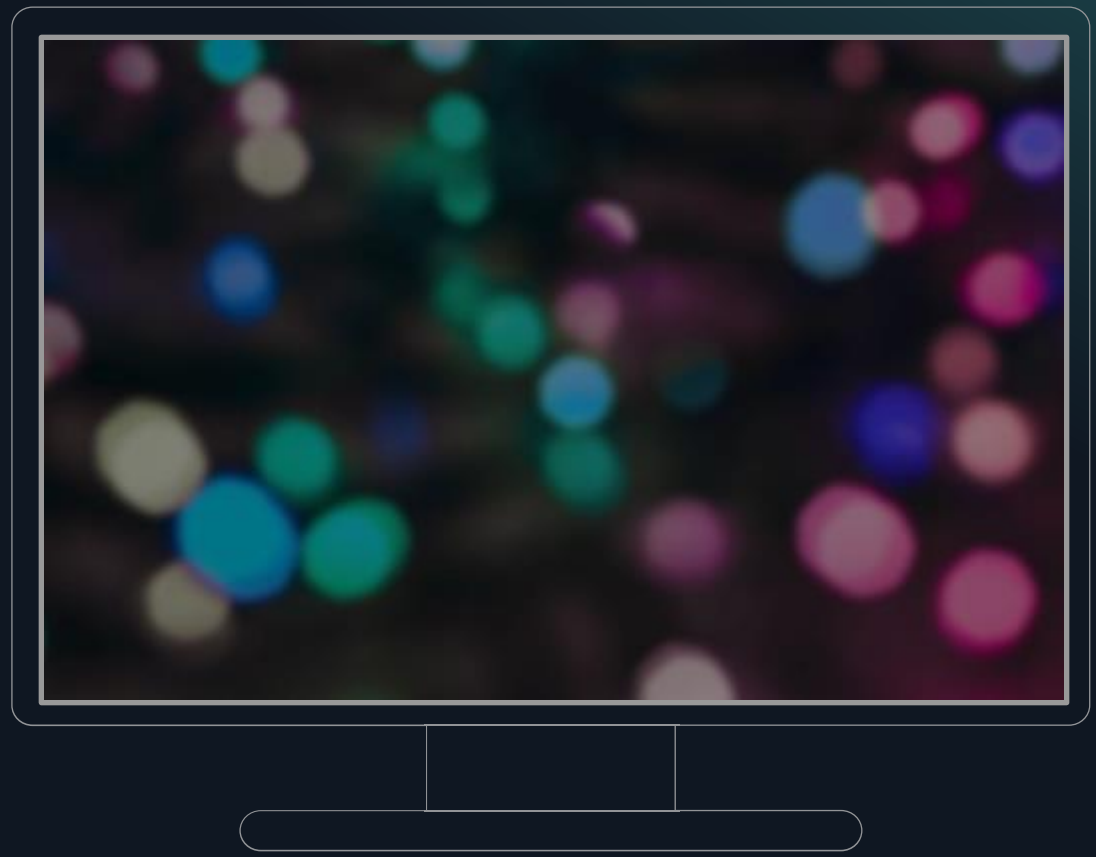
Ample time should be allotted to complete research on IIoT

- Develop/design your own industrial machine, inspired by research, which uses IoT to support core functions.
- Create an exhibition in the classroom or in the wider school setting to exhibit these machines and illustrate their functions.

Plenary

Learners should summarise their learning from this session and then consider the following statement:

IoT is necessary in all industries because…



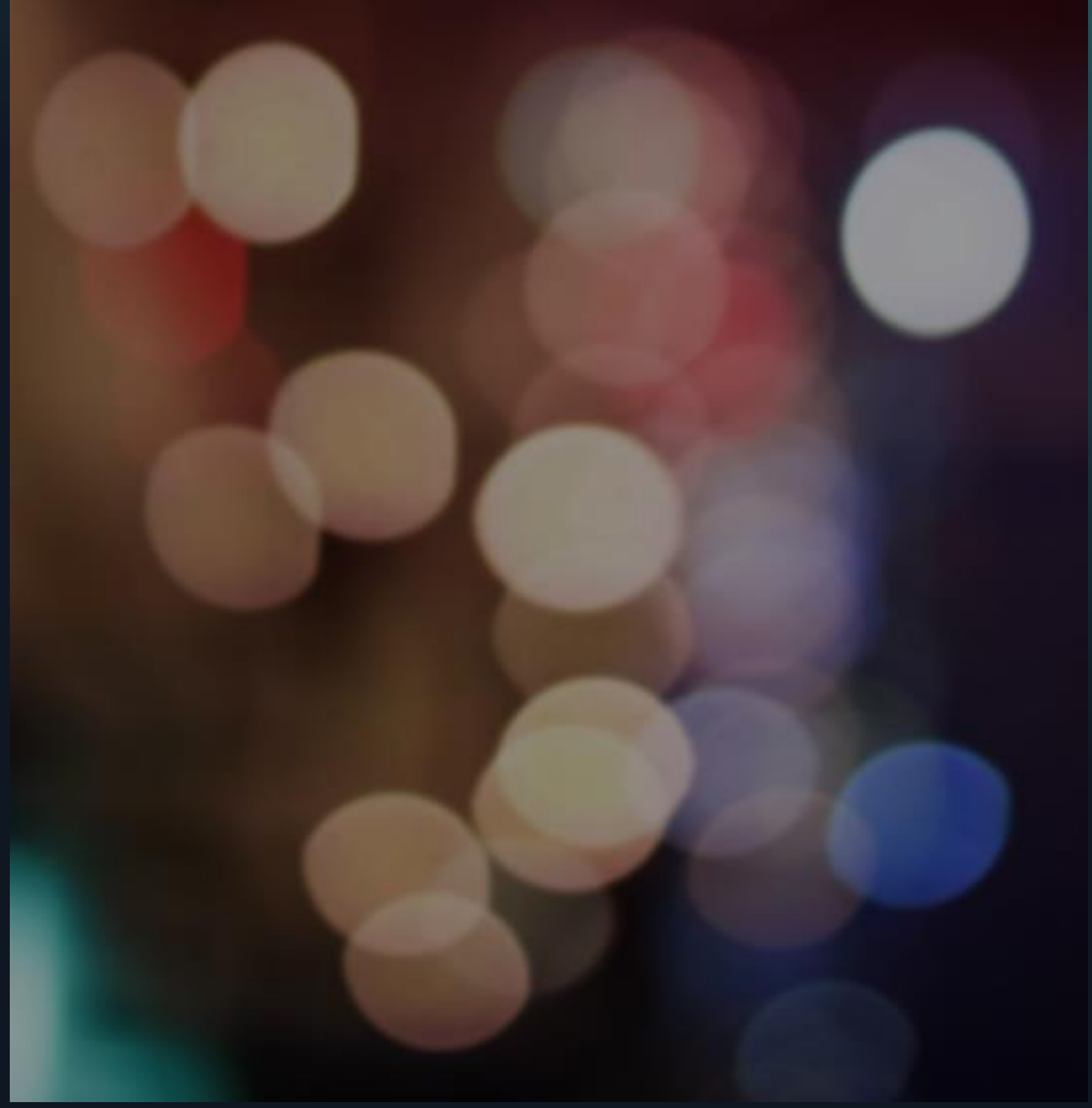
Plenary Prompts:

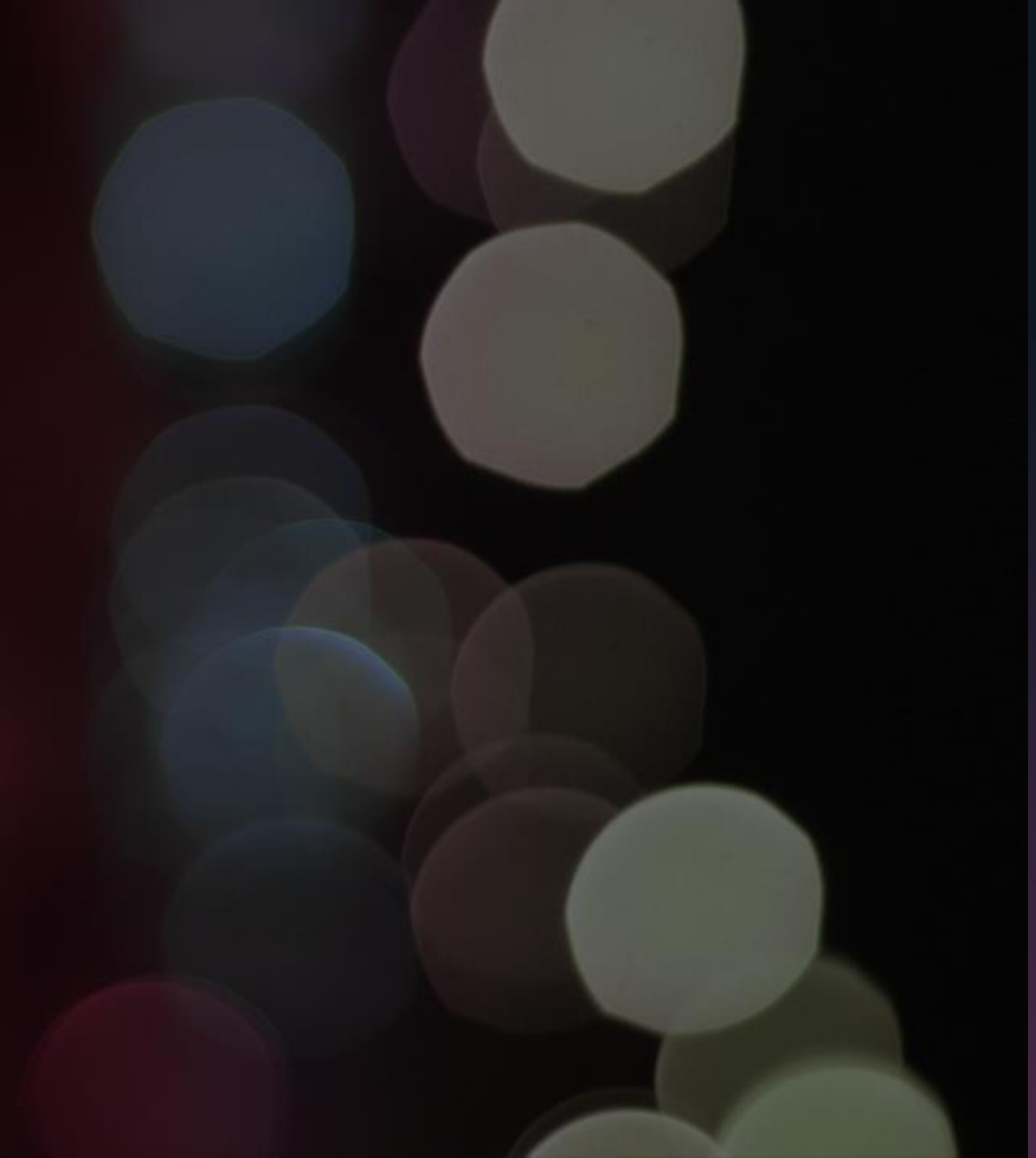
IoT is necessary in all industries because:

- It supports efficiency by…
- It develops uniformity…
- It helps the environment through reducing unnecessary emissions…
- AI is the future of industry.

IoT is not necessary in all industries because:

- It takes jobs from humans.
- AI cannot ‘feel’ like humans can.
- The ease in accessing data worldwide can be a security issue.





Lesson 4:

Micro:Bits and IoT

Data Collection through coding sensors.

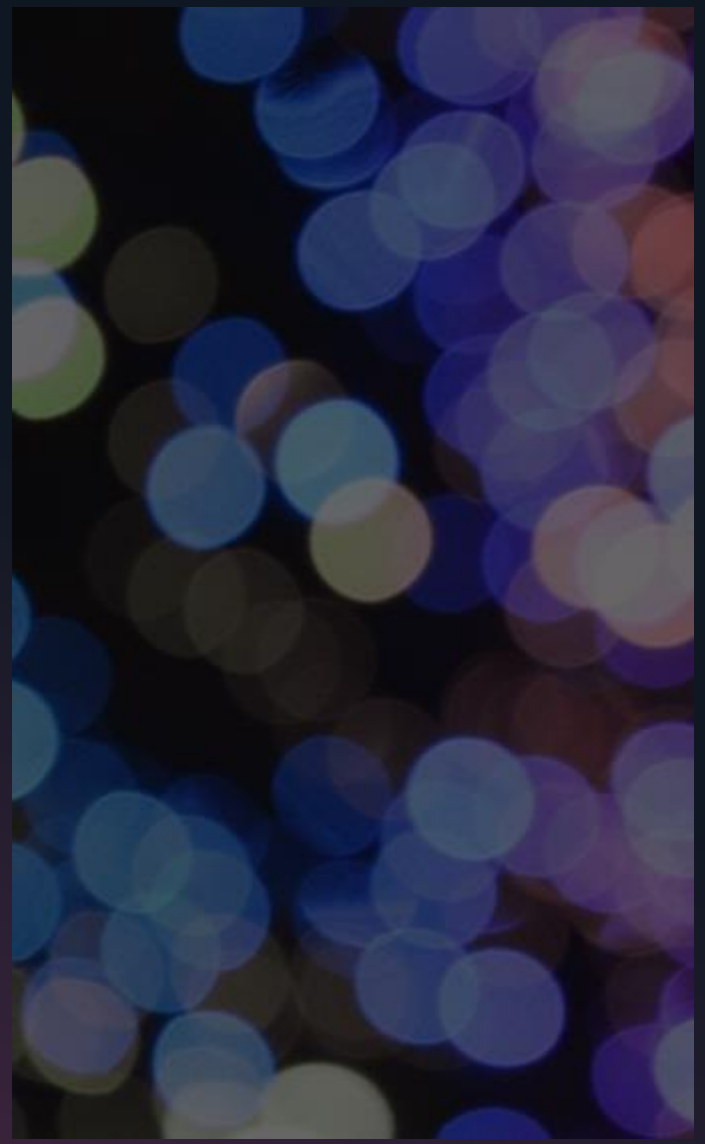
Learners can subsequently compare the data they have collected to live data gathered from their own classrooms, to explore how they can maintain a better learning environment.

Learning Intention:

We are learning about the importance of data collection and analysis.

Success Criteria:

- I can say how data can be used to develop industry/working environments.
- I can analyse data from my school.
- I can compare data from different settings.

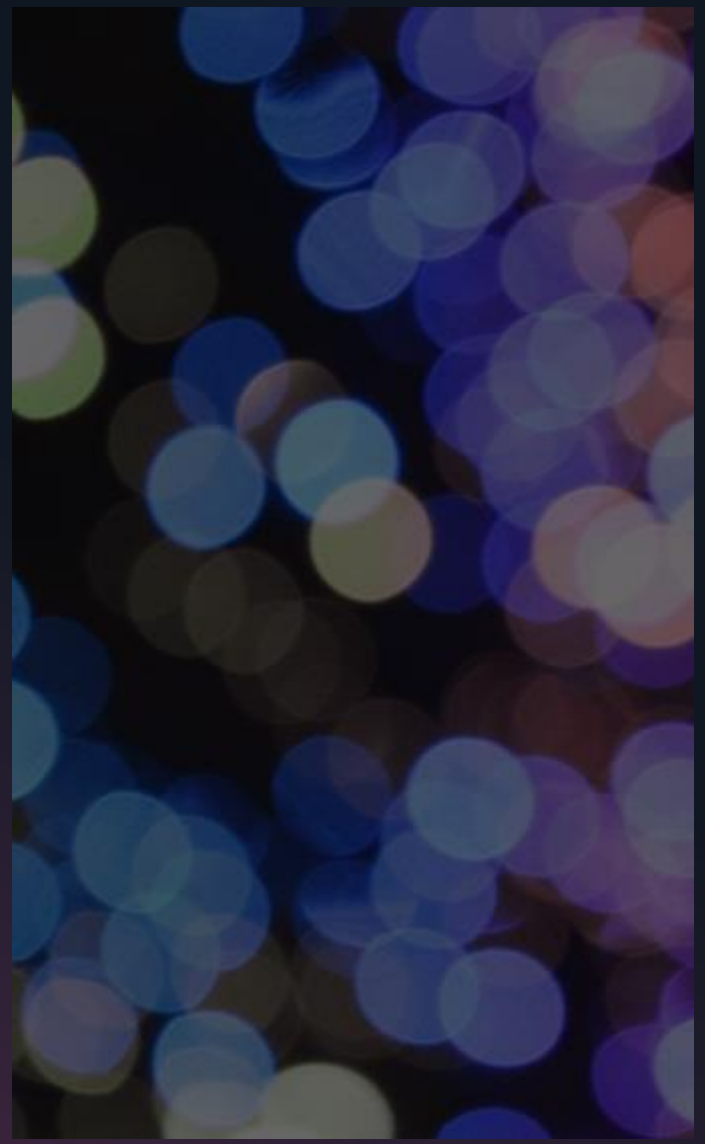


Research and Explore:

Using and Coding Micro:Bits

There are two beginner coding step counters for Micro:Bits which you can find by clicking here or clicking here. Alternatively you can paste the following URL into your web browser:

- https://microbit.org/projects/make-it-code-it/step-counter/
- https://microbit.org/projects/make-it-code-it/low-energy-step-counter/



Key Questions:

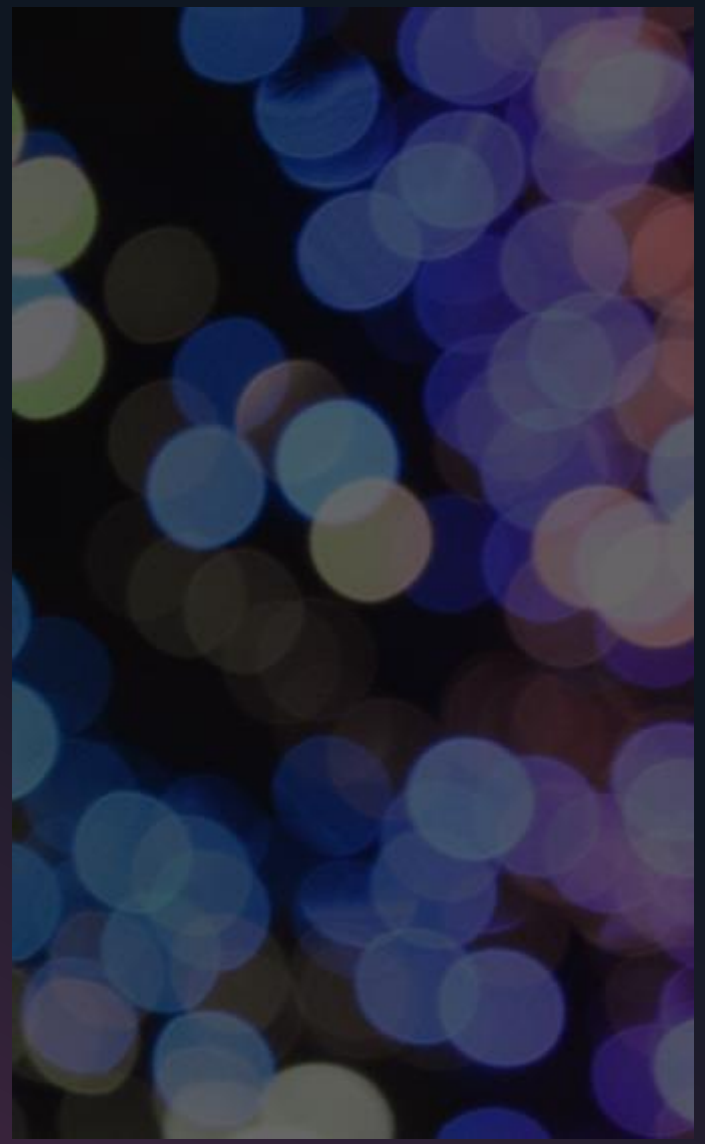
As you familiarise yourselves with the step-counters.

How many steps are there between the gym hall and our classroom?

Can you use the fewest steps to get around our classroom and the most?

Does everyone take the same number of steps when they cover certain distances?

Can you think of your own questions at this time?



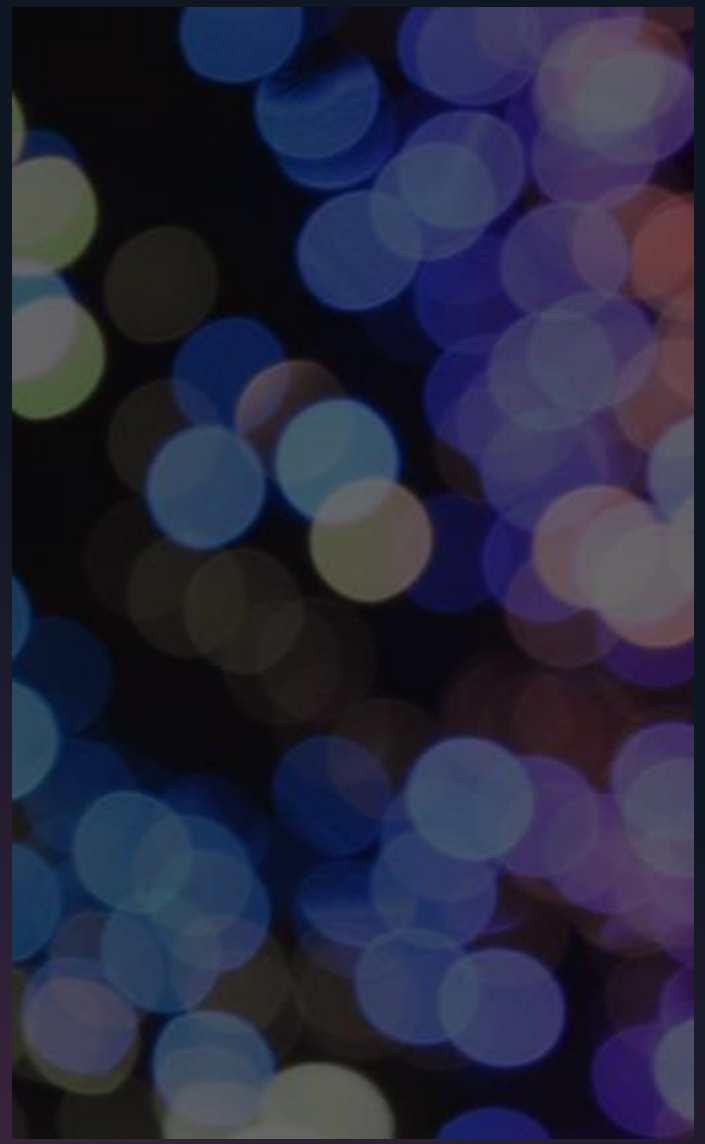
Research and Explore:

Use your Step-Counters alongside your sensors.

Use these Micro:Bit step counters in the same locations as the sensors.

Collect a range of different step counter data sets and display these graphically either in bar graphs or using other methods.

Compare graphs to peers' graphs.



Research and Explore:

Use your Step-Counters alongside your sensors.

Compare the data collected from the Micro:Bits to the IoT sensor data from the same location.

Begin an investigation into:

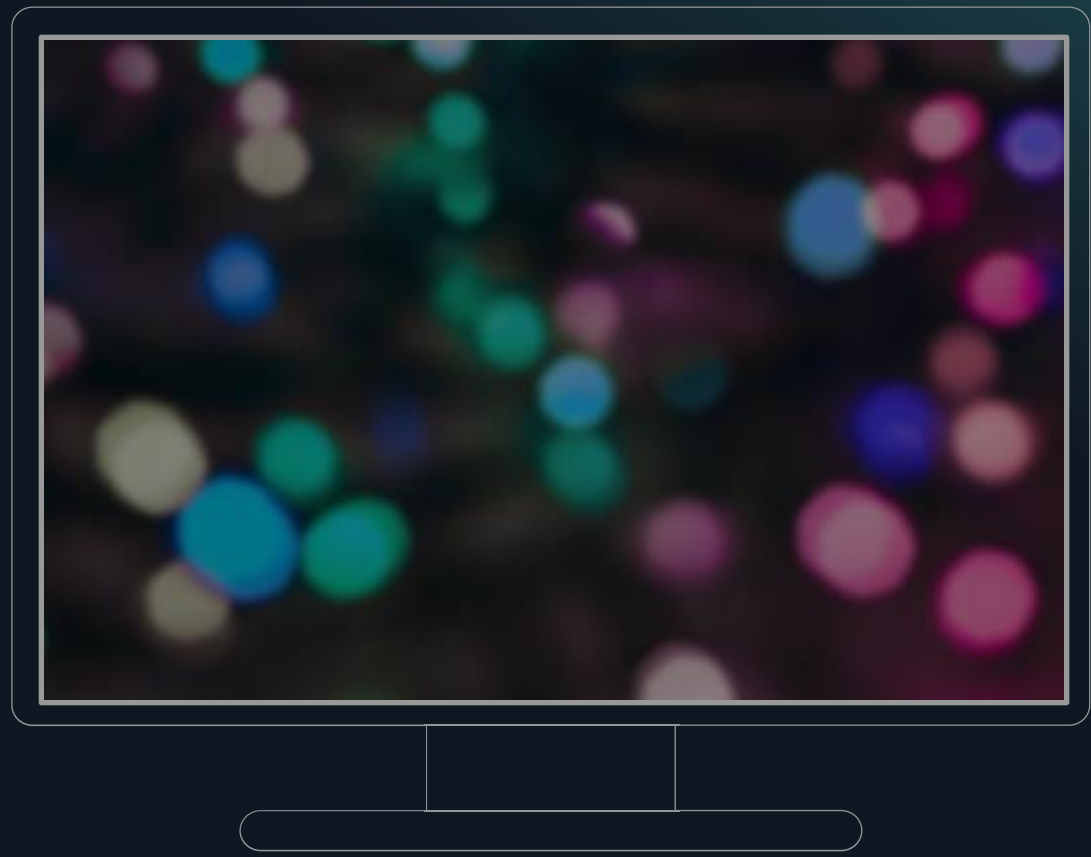
- *Does my pedometer number increase in direct proportion to the Motion Detection?*
- *Can this be linked to CO_2 and if so, how?*

Learners are welcome to develop their own avenues for research on this topic but should be mindful of the question: *How can I make this a fair test?*

Plenary

Learners should summarise their learning from this session and then consider the following questions:

- How can I make this a fair test?
- Does my pedometer number increase in direct proportion to the Motion Detection?
- Can this be linked to CO2 and if so, how?



Curricular Links

Numeracy & Maths

Literacy

Technology

Social Studies

Numeracy & Maths

MNU 2-10b I can carry out practical tasks and investigations involving timed events and can explain which unit of time would be most appropriate to use.

MNU 2-20a Having discussed the variety of ways and range of media used to present data, I can interpret and draw conclusions from the information displayed, recognising that the presentation may be misleading.

MTH 2-21a I can display data in a clear way using a suitable scale, by choosing appropriately from an extended range of tables, charts, diagrams and graphs, making effective use of technology.

Curricular Links

Numeracy & Maths

Literacy

Technology

Social Studies

Literacy

ENG 2-27a I am learning to use language and style in a way which engages and/or influences my reader.

LIT 2-02a When I engage with others, I can respond in ways appropriate to my role, show that I value others' contributions and use these to build on thinking.

LIT 2-14a Using what I know about the features of different types of texts, I can find, select and sort information from a variety of sources and use this for different purposes.

LIT 2-25a I can use my notes and other types of writing to help me understand information and ideas, explore problems, make decisions, generate and develop and develop ideas or create new text. I recognise the need to acknowledge my sources and can do this appropriately.

LIT 2-26a By considering the type of text I am creating, I can select ideas and relevant information, organise these in an appropriate way for my purpose and use suitable vocabulary for my audience.

LIT 2-29a I can persuade, argue, explore issues or express an opinion using relevant supporting detail and/or evidence.

Curricular Links

Numeracy & Maths

Literacy

Technology

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Technology

TCH 2-03b Throughout all my learning, I can use search facilities of electronic sources to access and retrieve information, recognising the importance this has in my place of learning, at home and in the workplace.

TCH 2-12a I can extend my knowledge and understanding of engineering disciplines to create solution.

TCH 2-15a I can create, develop and evaluate computing solutions in response to a design challenge.

Curricular Links

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Social Studies

SOC 3-08a I can identify the possible consequences of an environmental issue and make informed suggestions about ways to manage the impact – if researching around farming/industrial applications of IoT.