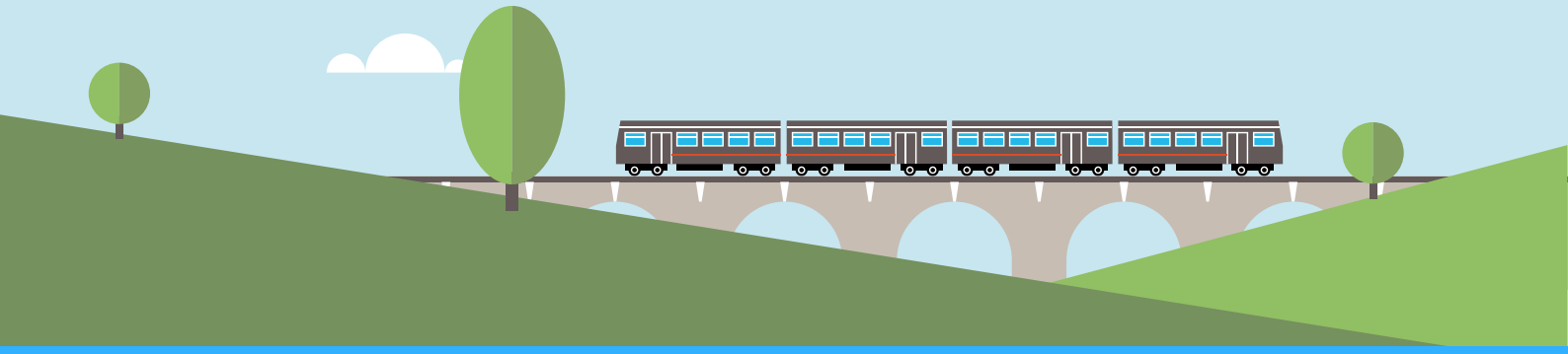
DiNGDiNG.ORG.UK

Little Planet



Teachers Lesson Plan - Key Stage 3

www.littleplanet.org.uk

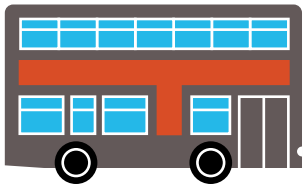
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Little Planet
Key Stage 3 Resource

The combustion of petrol and diesel to transport people is one of the largest human sources of CO2 emissions today. Little Planet is an interactive site that gives pupils the opportunity to investigate the impact on CO2 emissions of the journeys they make. They have the opportunity to compare different types of transport and determine how these, along with other variables, contribute to greenhouse gas emissions.

The learning combines the impact of the choices we make on environmental issues, with understanding statistics and using datahandling software.

The activities listed are designed to be used with Key Stage 3 pupils. To access all activities, pupils will need access to the internet on a computer or tablet and datahandling software, for example a spreadsheet. They will also need access to weighing scales.





National Curriculum Links

NB All links and quotations are taken from -
The national curriculum in England Framework document September 2013

Mathematics

Working mathematically through the mathematics content, pupils should be taught to:

- move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs]

Solve problems

- begin to model situations mathematically and express the results using a range of formal mathematical representations

Mathematics & ICT

Calculators should not be used as a substitute for good written and mental arithmetic. In secondary schools, teachers should use their judgement about when ICT tools should be used.

Human and physical geography

Pupils should be taught to:

- understand how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems

Science

Analysis and evaluation

- apply mathematical concepts and calculate results
- present observations and data using appropriate methods, including tables and graphs
- interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions
- present reasoned explanations, including explaining data in relation to predictions and hypotheses
- evaluate data, showing awareness of potential sources of random and systematic error
- identify further questions arising from their results

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244223/PRIMARY_national_curriculum3.pdf

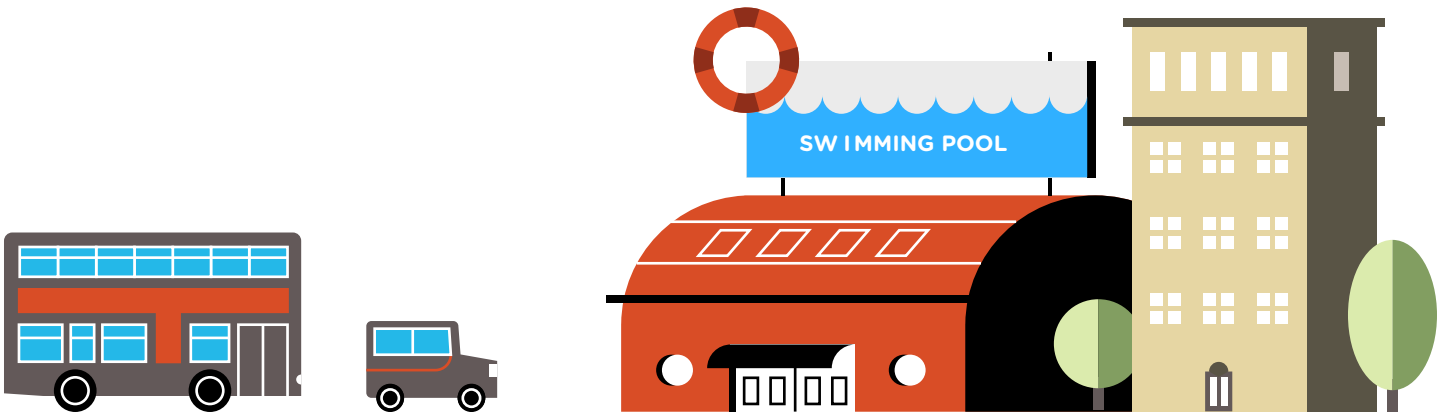


Chemistry

Pupils should be taught about:

Earth and Atmosphere

- the composition of the atmosphere
- the production of carbon dioxide by human activity and the impact on climate



Session 1

Learning Objectives

- Investigate online simulations

Activity

Show pupils how to access the 'Little Planet' site. Show them how to change the variables available.

- Where do you want to go?
- Distance.
- How do you get there?
- How often?
- Just you?

Allow the pupils around 10 minutes to experiment with the site.

Key questions

- What information does the site give us?

This is an appropriate time to talk to the pupils about CO2 emissions. They should understand that although CO2 occurs naturally in the Earth's atmosphere, emissions from human activity such as travelling by car etc. adds to the amount of CO2 found naturally. They should understand that this has an impact on our climate. Pupils should also understand the way that CO2 emissions are measured. The amount of carbon dioxide (CO2) emitted from vehicle is calculated in grams per kilometre (g/km).

These sites provide further information along with games and quizzes to help pupils learn about global warming and carbon footprint.

http://www.clean-air-kids.org.uk/globalwarming.html
http://ecoagents.en.eea.europa.eu/

[Correct at the time of writing, 2013]



Session 2

Learning Objectives

- Investigate comparable statistics by changing one variable on the system.
- Create a bar chart to help determine the consequence of changing the variable.
- Begin to recognise the impact our choice of transport has on the environment.

Activity

Remind the pupils of the concept of a fair test. Discuss that in order to compare statistics, all but one variable must remain constant.
Set the pupils a challenge. You might want to use the suggested challenge on Appendix 1. The challenge uses the website to determine CO2 emissions where only the form of transport is altered. All other variables remain the same. You might want to discuss why this challenge is a useful exercise, even though some of the journeys are unlikely to be realistic e.g. travelling 5 miles by train.

Key Questions

- What does this challenge tell us about different forms of transport?
- What does this challenge tell us about CO2 emissions?
- What does this challenge tell us about the impact of our choice of transport on the environment?
- How should the family try to travel to the local shops and why?
- Is going by tram better than a small car? Why?
- From the graph, work out which is environmentally more damaging - a 4x4 or a small car. Why do you think this is?
- Why may the family decide not to walk to the local shops?
- Why do some people choose to go by car rather than take public transport?
- What are the advantages of going by public transport as opposed to a car or 4x4?
- What are the advantages of going by 4x4 as opposed to public transport?
- How does the bar chart make it easier to decide which form of transport creates the most CO2?
- All the CO2 emissions are given on the site as kg per/year. Convert the answers to your challenge in kg per week.
- Find out what an eco car is. How does it differ from a normal car?





Session 3

Learning Objectives

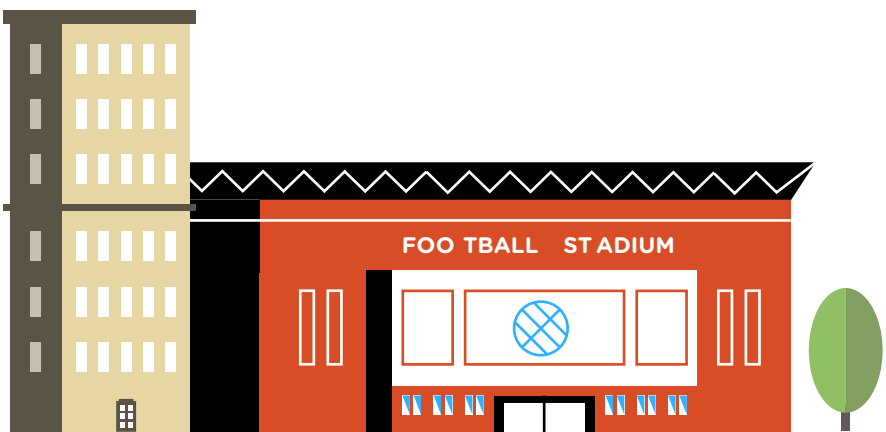
- Investigate comparative statistics by changing one variable on the system.
- Create a bar chart to help determine the consequence of changing the variable.
- Predict results.
- Check results by carrying out similar investigations.

Activity

Ask pupils to consider their results from Session 2. They are going to generate similar statistics, this time comparing forms of transport over a 10 mile journey. Ask them to record the CO2 emissions and show their results on a bar chart. You might want to use the suggested challenge on Appendix 2. Then draw a bar chart showing both sets of statistics on it to make comparisons easier. Pupils then predict results if a journey is 15 miles and test these predictions.

Key questions

- How much have CO2 emissions changed by?
- Are the results what you expected them to be?
- How does drawing the bar chart help us understand the data?
- All the CO2 emissions are given on the site as kg per/year. Convert the answers to your challenge in kg per week.
- Calculate the percentage increase in CO2 emissions from travelling by bus to travelling by a 4x4.
- Calculate the percentage decrease in CO2 emissions from a 4x4 to going by an eco car.



Session 4

Learning Objectives

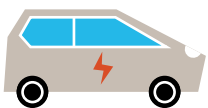
- Devise an investigation to determine the effect of different variables on CO2 emissions.
- Investigate comparative statistics by changing one variable on the system.
- Create a bar chart to help determine the consequence of changing the variable.
- Predict results.
- Check results by carrying out similar investigations.
- Consider what consequences to CO2 emissions and the environment our travel choices can have.

Activity

Ask pupils to consider each of the variables on the 'Little Planet' site. They have already determined which type of transport creates the most CO2. Tell them that they are now going to investigate how the other variables affect CO2 emissions. You might want to use the suggested challenge on Appendix 3.

Key questions

- Were you able to predict any of the results before they were displayed?
- Were your predictions correct (or nearly correct)?
- Which factors effect CO2 emissions the most? Can you think of any reasons for this?
- Can you think of any other factors that might affect CO2 emissions (e.g. congestion, driving style, luggage)?





Session 5

Learning Objectives

- Weigh familiar objects found in the classroom.
- Use a range of calculation strategies to calculate how many of these objects equate to different CO2 emissions.

Activity

Pupils will have realised that CO2 outputs on the site are compared to the weight of everyday objects e.g. paperclips, pianos, pieces of Lego. Ask pupils to weigh objects found in the classroom and calculate how many equate to a particular journey. You might want to use the suggested challenge on Appendix 4.

Key questions

- How did you calculate the solution?



Session 6

Learning Objectives

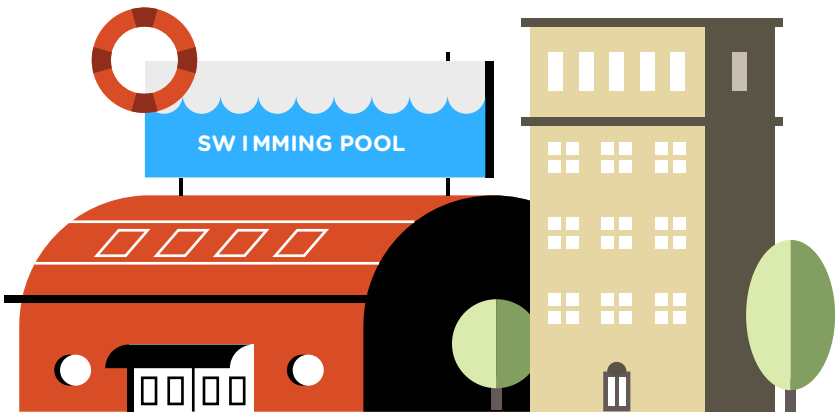
- Determine averages.
- Create cumulative frequency graphs to show the results.
- Consider the impact our journeys have on the environment.

Activity

Pupils determine how much CO2 is generated per year by an 'average' person. You might want use the suggested challenge on Appendix 5. You may need to help pupils work out the CO2 emissions for the school journey (annual CO2 emissions, divided by 365 and then multiplied by 190).

Key questions

- What is the total number of CO2 emissions that Rebecca's journeys produce in a year?
- What is the average number of CO2 emissions that Rebecca's journeys produce in week?
- What is the average number of CO2 emissions that Rebecca's journeys produce in a day?
- Can you suggest some ways that Rebecca might reduce her CO2 emissions?
- Think about the journeys you make each year. Complete a table similar to that for Rebecca.
- What is the total number of CO2 emissions that your journeys produce in a year?
- What is the average number of CO2 emissions that your journeys produce in week?
- What is the average number of CO2 emissions that your journeys produce in a day?
- Can you think of some ways that you might reduce your CO2 emissions?



Appendix 1

Bobby wants to travel from his house to the local shops with his family. There are four of them in the family altogether.

The shops are 5 miles away and they go once each week. Investigate the CO2 emissions that would be generated if they use each of the forms of transport available.

Record the amount of CO2 emissions in kg per year on the table below:

Type of transport	CO2 emissions
Walking	
Cycling	
Bus	
Small Car	
4x4	
Eco Car	
Family Car	
Tram	

Extension activity

You might decide to go straight to this part of the activity without completing the table above.

Enter the data onto a spreadsheet or other datahanding software and use the table to create a bar chart.

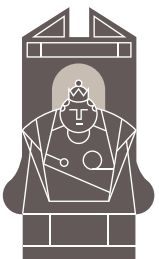
Key Questions

Answer the following questions:

- What does this challenge tell us about different forms of transport?
- What does this challenge tell us about CO2 emissions?
- What does this challenge tell us about the impact of our choice of transport on the environment?
- How should the family try to travel to the local shops and why?
- Is going by tram better than a small car? Why?
- From the graph, work out which is environmentally more damaging - a 4x4 or a small car. Why do you think this is?
- Why may the family decide not to walk to the local shops?
- Why do some people choose to go by car rather than take public transport?
- What are the advantages of going by public transport as opposed to a car or 4x4?
- What are the advantages of going by 4x4 as opposed to public transport?
- How does the bar chart make it easier to decide which form of transport creates the most CO2?
- All the CO2 emissions are given on the site as kg per/year. Convert the answers to your challenge in kg per week.
- Find out what an eco car is. How does it differ from a normal car?







Appendix 2

Bobby wants to travel from his house to the local shops with his family of four. The shops are 10 miles away and they go once each week. Investigate the CO2 emissions that would be generated if they use each of the forms of transport available.

Record the amount of CO2 emissions in kg per year on the table below:

Type of transport	CO2 emissions
Walking	
Cycling	
Bus	
Small Car	
4x4	
Eco Car	
Family Car	
Tram	

Extension activity

You might decide to go straight to this part of the activity without completing the table above.

Enter the data onto a spreadsheet or other datahanding software and use the table to create a bar chart.

Compare your results to those from Session 2 when the family travelled just 5 miles. Create a bar chart that shows both sets of data on it.

Answer the following questions

- How much have CO2 emissions changed by?
- Are the results what you expected them to be?
- How does drawing the bar chart help us understand the data?
- All the CO2 emissions are given on the site as kg per/year. Convert the answers to your challenge in kg per week.
- Calculate the percentage increase in CO2 emissions from travelling by bus to travelling by a 4x4.
- Calculate the percentage decrease in CO2 emissions from a 4x4 to going by an eco car.

Predict the results if the journey is 15 miles. Test your predictions. Are they what you think they would be? Show the results on a chart.

Appendix 3

Each year, Ruby travels to each of these places once. They are all 30 miles away from her house and she has a small car. Does her destination change the CO2 emissions of her car? You can use this table to record your results if you want to. Predict your answers first and draw a graph to show the results.

Type of transport	CO2 emissions
Cinema	
Swimming Baths	
Theme Park	
Football Stadium	
City Shops	

Ajay wants to travel by tram to see his grandmother 40 miles away. He changes the frequency that he travels. How does this affect CO2 emissions? Can you predict the changes that we might see? Draw a graph to help understand the data.

Jason wants to travel to a concert by train. The journey is 50 miles away. How does the number of people travelling with him change the CO2 emissions? Predict your answers first and draw a graph. You can pretend that the whole world will travel with him if you like!

Answer the following questions

- Were you able to predict any of the results before they were displayed?
- Were your predictions correct (or nearly correct)?
- Which factors effect CO2 emissions the most? Can you think of any reasons for this?
- Can you think of any other factors that might affect CO2 emissions (e.g. congestion, driving style, luggage)?



Appendix 4

John wants to go to the cinema 20 miles away with his family of four. He goes there once a month and always travels by tram. This creates 55kg of CO2 – you can check this on the Little Planet website.

If an apple weighs 100g, how many apples are equivalent in weight to the CO2 emissions for this journey?

Find out how much CO2 is created on one of the journeys that you make e.g. travelling to school each day, going to the theme park once a year with your family, going to the swimming baths with your class each week.
Find an object in the classroom and weigh it.

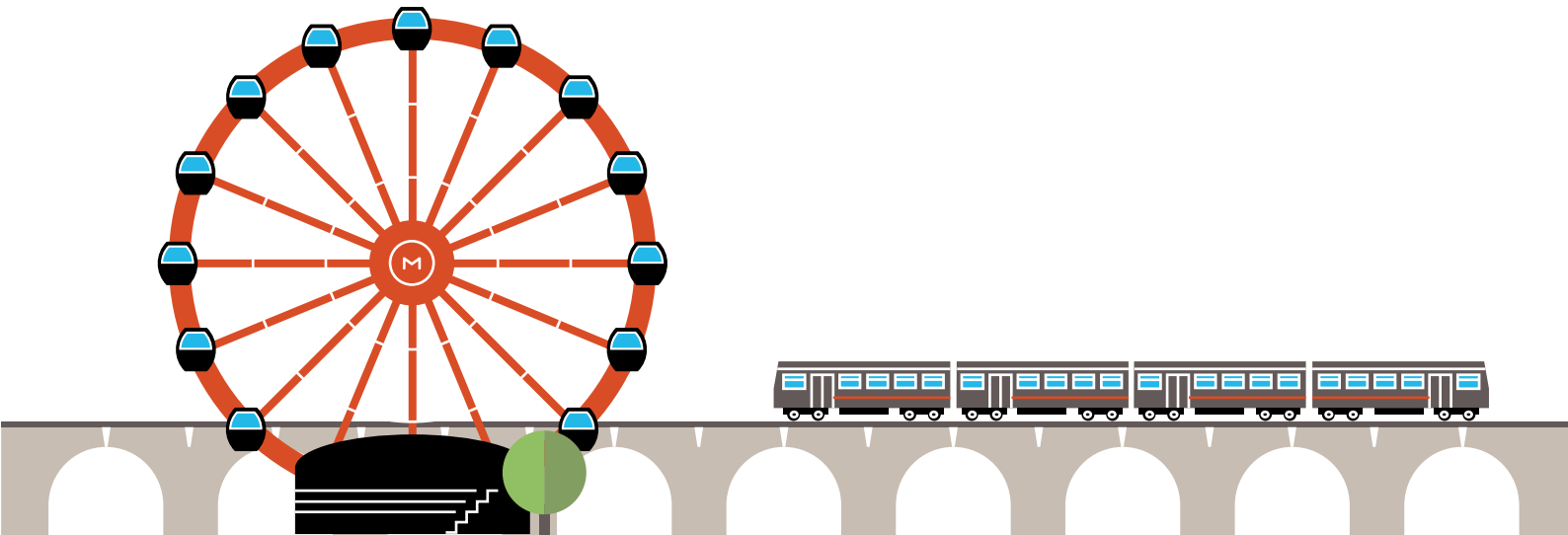
Work out how many of these objects are equivalent in weight to the CO2 emissions for this journey.

Can you find another everyday object that we could use to compare this journey?

How many of this everyday object equate to the CO2 emitted for the journey?

Answer these questions

- How did you calculate the solution?



Appendix 5

Rebecca makes the following journeys in a year. Use the site to find out what her annual CO2 emissions are.

Where to	Distance	How often	How	How many people	CO2
Grandparents	45 miles	Once a week	Tram	5	
Friends	½ mile	Every Saturday	Walk	1	
Shopping	10 miles	Twice each week	Small Car	4	
Theme Park	60 miles	Twice each year	Family Car	5	
Concert	200 miles	Once each year	Train	12	
Swimming	10 miles	Once each week	Family Car	4	
Park	15 miles	Every Sunday	4x4	4	
School	5 miles	Daily (there are 190 school days a year)*	Small car	3	

* You will need to do some additional calculations to find the CO2 emissions.
Talk about this with you teacher first.

- Create a cumulative frequency graph to show the results.
- What is the total number of CO2 emissions that Rebecca's journeys produce in a year?
- What is the average number of CO2 emissions that Rebecca's journeys produce in a day?
- Can you suggest some ways that Rebecca might reduce her CO2 emissions?

Think about the journeys you make each year. Complete a table similar to that for Rebecca.

- What is the total number of CO2 emissions that your journeys produce in a year?
- What is the average number of CO2 emissions that your journeys produce in a day?
- Can you think of some ways that you might reduce your CO2 emissions?