

Transport -unequal movement-

Numeracy

Accelerating global warming

Transport is responsible for pumping out millions of tonnes of carbon dioxide (CO₂) into the atmosphere. CO₂ is the main 'greenhouse gas' scientists say is responsible for global warming and climate change.

Global warming is happening

Scientific processes and weather records provide clues as to what is happening. Since the beginning of the industrial revolution 200 years ago the use of fossil fuels - namely coal and oil - has increased rapidly. The result is that concentrations of CO₂ in the atmosphere have risen by a third. CO₂ forms a 'blanket' around the planet, trapping heat reflected from the earth's surface. The greater the quantity of CO₂, the thicker the blanket and the more heat that is trapped.

Temperatures are rising more quickly than they have at any time in the last 10,000 years: 2000 to 2010 was the warmest decade on record and 2012 is set to be the hottest year since temperature records began. Sea levels have risen by between 10 and 25 cm in the last 100 years due to sea water volume increases and melting polar ice caps. Summer Arctic sea ice melt, which reached new records during the summer of 2012, is evidence of a warming planet. Scientists say that we need to limit global temperature rise to 2°C to prevent serious social, economic and environmental problems in the next 50 years but warn we are running out of time to ensure this limit is met.

So what has it all got to do with transport?

Motor vehicles are the fastest growing source of CO₂ emissions in the UK today. There are now 30 million cars on the roads in the UK,; one car for every two people. This compares with one car for every 200 people in Sudan. While many people in the South, particularly women and children, walk miles each day, often carrying great loads of wood or water, half of all UK journeys under two miles are made by car. These journeys would be ideal for walking and cycling.

Since the 1970s the proportion of children walking to school has declined from one in three to one in nine. As traffic gets worse parents are more worried about letting their children go to school on their own due to fears over safety and are more likely to take them in the car, perpetuating a vicious circle.

Increases in car dependency have had a detrimental effect on children's physical and emotional health. Pollution from traffic aggravates asthma, and levels of obesity in children are on the rise. Traffic filled streets deny children valuable opportunities for outdoor play and social interaction. Just five countries/regions of the world (China, USA, Europe, India and Russia) account for two-thirds of CO₂ emissions. Yet the poorer countries of the South who have much lower emissions are most at risk from global warming and climate change. Poverty makes people more vulnerable to natural changes as they don't have the resources to adapt. They are also less able to deal with natural disasters - 96% of all deaths from natural disasters happen in the countries of the South.

Understanding the link between our transport choices and decisions in the UK and global warming and climate change is essential in facing up to our responsibility towards the majority of people who live in the countries of the South.

Getting to school: love it or loathe it?	Numeracy Transport	
A numeracy activity examining how children travel to school and the associated problems	45 mins	Year 3 and 4

Suggested lesson structure - This activity aims to involve children in meaningful research which could ultimately be used to inform those in positions of influence such as the School Council, governors or the Local Authority to address the problems and dangers faced by children travelling to school. Children are asked to design a survey choosing appropriate format, style and questions; to select and present the information in ways that are clear and meaningful and to interpret the information drawing conclusions which could be used to inform others.

Mental or oral work - The lesson could begin with oral work which reinforces knowledge of multiplication facts. Games such as 'fizz-buzz' can be used where children sit in a circle, going through numbers but saying 'fizz' when they get to a number in the 5 times table, 'buzz' for a number in the 10 times table and 'fizz-buzz' when they get to a number in both.

The main teaching activity - The activity requires preliminary work outside the numeracy lesson. The planning, design and completion of the questionnaire should be discussed and completed before the lesson. Results/totals etc. should be collated so that the numeracy lesson can be used for the 'second challenge': organising, presenting and interpreting the collected data.

It is clear that this activity requires children to have previous knowledge of pictograms, bar charts and Venn diagrams as they will be challenged to select the appropriate means of representing the data. This could be considered in groups or pairs and the different ways of presenting data could be discussed. The following are possible examples:

- Creating 'side by side' bar charts for each mode showing how many children travel to school by that method compared to how many would like to travel that way.
- Categorising problems associated with each mode and showing how many children are affected by each problem through bar charts. Such problems might include traffic congestion, air pollution, danger due to traffic, not being able to meet and talk to friends, no cycle lanes etc.
- Venn diagram showing the number of children using more than one mode of transport

It is clear that this activity allows for differentiation. Less able pupils could use simple pictograms of how many children use each mode while more able pupils could do the comparative 'side by side' bar charts.

Plenary session - During the plenary, children could share their charts and diagrams and consider what conclusions can be drawn from the results. They should also consider who the information could be sent to and how it could be used to influence school or local transport policy. Ultimately the children or a group of children could draw up a report with charts to be presented to influential bodies within the school or local community.

How do you travel to school?

First challenge

Design a questionnaire to give each child in a group or class in your school which provides the following information:

- How do you usually travel to school?
- What do you think are the problems or difficulties with the way you travel to school?
- How would you prefer to travel to school if you had a free choice?
- What stops you from travelling to school the way you would like to?

Things to think about!

- Will the questionnaire have multiple choice answers, tick box answers or YES or NO answers?
- What will children be asked to write down?
- What should children write if they travel to school by more than one way, e.g. walk in the morning and get a lift in a car at the end of the day?

Second challenge

Decide how you will organise and present the results of the questionnaires.

- You could use pictograms, bar charts or Venn diagrams to display the information you have collected from the questionnaires.
- What do your results show?
- Can your results answer these questions:
 - Do most children travel to school the way they want to?
 - What are the main reasons for children not travelling to school the way they would like to?
 - What are the main problems children have with the way they travel to school?

The Walking Bus - Below is a series of calculation puzzles based on the concept of the walking bus. The mathematical questions will provide an opportunity for children to learn about the features and advantages of a walking bus, an idea that is used by many primary schools across the UK.

What is a walking bus? - Put simply, the walking bus is a line of children, walking in pairs to school along a set route with an adult 'driver' at the front and 'conductor' at the back. The bus creates a formal system which allows volunteers to walk larger numbers of children to school safely. Like a bus there are scheduled stops where children are picked up at specific times. So, like a bus, you can miss it! Unlike a bus, it is free, healthy and totally non-polluting! The school run accounts for 1 in 5 journeys at morning peak time contributing massively to air pollution and congestion, particularly in urban areas and around school gates. So walking buses are one very effective way of reducing congestion and pollution and improving health and safety.

The Walking Bus Challenge

40 children use the Green Lane Primary school walking bus.

1. At the first stop 8 children join the bus. How many remain to be collected?
2. Children walk in pairs on the bus. After the second stop, the bus has 18 children. How many pairs will there be?
3. One adult is needed for every 8 children. At the third stop another 6 children join the bus. How many adults are needed by the time the bus leaves the third bus stop?
4. The final group of children join the bus at the fourth stop. How many children will join the bus at the fourth stop?
5. How many adults are needed for the final part of the journey to school?
6. How many feet does the walking bus have when it arrives at school? (Don't forget the adults!)

Answers: 1: 38 2: 9 3: 3 4: 16 5: 5 6: 90

Further activities and ideas

- Ask children to map their route to school using a large map of the local area. Using this information plan a walking bus route; identify suitable places to have 'bus stops'
- Try out identified routes as a class and identify any problems with the route
- Design and produce a timetable for the proposed route to and from school
- Design tickets for the walking bus
- Think of a series of rules of behaviour to ensure safety on board the bus
- Design a logo, posters and other promotional material for the walking bus

Further details on the concept of the walking bus and details on how to set one up in your school can be found in *The walking bus - a safe way for children to walk to school*, published by Friends of the Earth http://www.foe.co.uk/resource/factsheets/walking_bus.pdf

	Knowledge and Understanding		Skills		Values and Attitudes
<input checked="" type="checkbox"/>	Social justice and equity	<input type="checkbox"/>	Critical thinking	<input type="checkbox"/>	Sense of identity and self-esteem
<input type="checkbox"/>	Diversity	<input checked="" type="checkbox"/>	Ability to argue effectively	<input type="checkbox"/>	Empathy and sense of common humanity
<input type="checkbox"/>	Globalisation and Interdependence	<input checked="" type="checkbox"/>	Ability to challenge injustice & inequalities	<input checked="" type="checkbox"/>	Commitment to social justice and equity
<input checked="" type="checkbox"/>	Sustainable development	<input checked="" type="checkbox"/>	Respect for people and things	<input type="checkbox"/>	Valuing and respecting diversity
<input type="checkbox"/>	Peace and conflict	<input type="checkbox"/>	Co-operation and conflict resolution	<input checked="" type="checkbox"/>	Concern for the environment and commitment to sustainable development
				<input checked="" type="checkbox"/>	Belief that people can make a difference

Doing the school run	Numeracy Transport	
A numeracy activity comparing children's actual and desired mode of transport to school	45 mins	Year 5 and 6

Suggested lesson structure - Mental or oral work

The main activity assumes some previous knowledge of, and work with, percentages. The lesson could begin by asking children to find simple percentages of whole numbers as a way of consolidating previous learning. Pupils could be asked to recap different calculation strategies e.g. 10% of 240 is 24 so 20% must be double that (48) and 40% double again; 25% is a quarter, so divide by 4 (60) and 75% is three quarters which is one quarter X 3 etc. The more complex calculations that the main activity requires could then be explored, e.g. 36% of 300 could be calculated as $(30\% \times 3) + (6\% \times 3)$

The main teaching activity

The aim of the main activity is to apply percentage calculations to a real life survey comparing actual and desired mode of travel to and from a London primary school. The piecharts and questions may be photocopied.

Less able children could work on the activity with teacher support and focus on the first question applied to both pie charts. More able children could focus on Questions 2 & 3 and in groups consider some of the points for discussion. They could then feed back their thoughts in the plenary session.

Plenary session

The main purpose of the plenary session will be to explore the calculation strategies used in the numeracy questions.

It is also important that there is an opportunity, either during the plenary session or at another time, to examine some of the points for discussion. The main aims of this will be to examine:

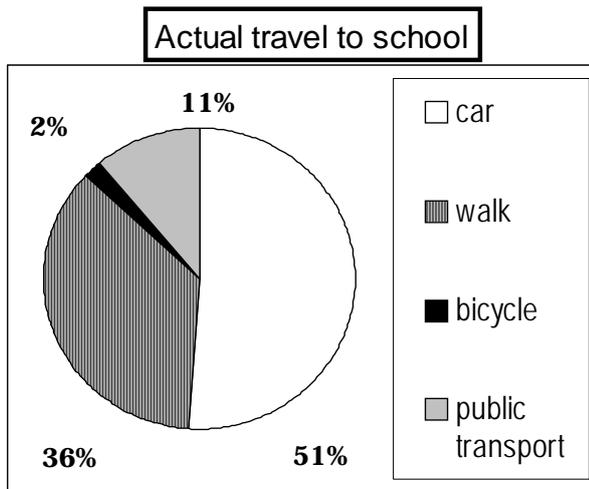
- the restrictions and constraints to children travelling to school by their preferred mode of transport
- the benefits to the environment and to health through travelling to and from school by walking and cycling
- the dangers associated with walking and cycling due to heavy levels of fast moving traffic and the lack of adequate and safe features such as pedestrian routes, road crossings, speed restrictions, traffic calming and segregated cycle lanes
- The environmental and social benefits of travelling to school by public transport rather than by car

For rural schools with wide catchment areas walking and cycling may not be feasible. However, the discussion could still explore ways of reducing car journeys - by car sharing or through providing a school bus for example. It would also be a good opportunity to inform children that many children in the countries of the South walk long distances to and from school: it is not unusual for children to walk 10 km each way.

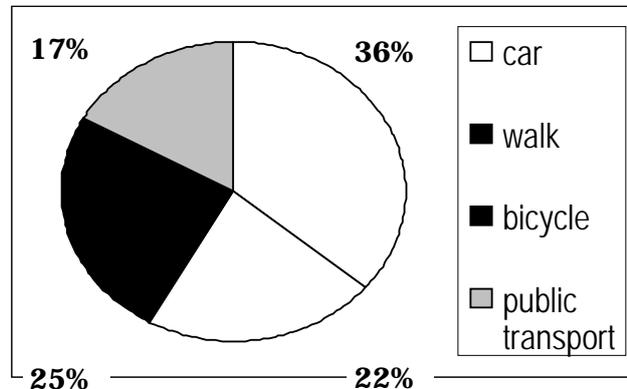
The results of any survey carried out in your school many of course be different from the results of the London school. More children may reveal a preference for travelling by car than actually do, for example. A full school survey may reveal differences of preference between classes and age groups. Such information will provide an ideal opportunity for challenging children, encouraging them to think critically and raising with them the health, environmental and social implications of the way we choose to travel.

Do we get to school the way we want to?

The pie charts below show information collected from a real London school. They compare how children would like to travel to school with how they actually travel to school.



How children would like to travel to School



Questions based on the pie charts

- This school in London has 200 pupils. Using the pie charts above, calculate how many children:
 - Travel to school by car
 - Travel to school by public transport
 - Travel to school by bicycle or on foot
- How many more children would like to come to school by bicycle than actually do come to school by bicycle?
- What is the difference between the number of children travelling to school by car and those who would like to travel to school by car?

Extension activity

Survey one class in your school to compare how children actually travel to school and how they would like to travel to school. Use a computer to produce two pie charts to show the results of your survey. What conclusions can be drawn from the charts?

Points for discussion

With a partner or in a small group discuss the following:

- What reasons do you think may prevent more children coming to school by bicycle?
- List the changes you think would be necessary before more children are able to travel to school by bicycle.
- List some reasons why you think fewer children would like to walk to school than actually do?
- List some reasons why you think fewer children would like to travel to school by car than actually do?
- If a pie chart were drawn for how children travel to a village school in Africa, how different do you think it would look from the one for the school in London?
- If children could travel to this London school the way they wanted, would it be better or worse for the environment? Explain why.

Recreating the Greenhouse Effect

This science experiment demonstrates the greenhouse effect caused by carbon dioxide (CO₂)

What you will need

- Two identical glass jars
- Cold water
- An even number of equally sized ice cubes
- One clear plastic bag, plastic cube/box, or larger jar
- Thermometer

What to discuss

- The aim of the experiment: to investigate whether the greenhouse effect can be created in the classroom
- How the experiment will be conducted
- The concept of a 'fair test' and the series of measures which need to be taken in order to ensure that the experiment is fair
- predictions and justifications: what will happen to each jar of water and why

What to do

- Fill the two identical jars with an equal amount of water, approximately half full
- Add an equal number of ice cubes to each jar
- Create a 'greenhouse' around one jar, by placing a clear plastic bag around it or by placing a larger jar upside down over the top of it, or transparent plastic cube etc.
- Leave both jars in the sunshine for one hour
- Observe how quickly the ice melts in each jar
- Measure the temperature of the water in each jar after an hour.

Follow up work

- ⇒ Draw a diagram to show how the greenhouse effect works. See suggested resources below for further details.
- ⇒ Explain that CO₂ creates a 'blanket' around the earth and is similar in its effect to a cover around the jar. The 'greenhouse jar' lets in the sun's light energy and some of its heat energy, heating the air around the jar. This heat is trapped by the cover and so heats the water quicker than in the jar with no cover to trap the heat.
- ⇒ Discuss the implications of the greenhouse effect on the climate, and the detrimental impacts scientists now believe this effect is having, e.g. more violent storms, floods, droughts, destruction of wildlife habitats, e.g. coral reefs, arctic regions etc.
- ⇒ Discuss the issues leading to the increase of CO₂ in the atmosphere and subsequently the greenhouse effect, i.e. the burning of fossil fuels such as coal, oil and natural gas.
- ⇒ Discuss what actions could be taken personally, locally and globally to reduce CO₂ emissions and therefore help to reduce the greenhouse effect.

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