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| **Use the Speed Equation to Calculate Journey Times** |
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| Calculate journey times from one country to another |
| **Subject(s):** Mathematics, Science**Approx time:** 35 mins |  | **Key words / Topics:** * Topic: Transport
* Speed
* Distance
* Sustainability
* Renewable
* Non-renewable
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| **Suggested Learning Outcomes**  |  |  |
| * To calculate time using the speed equation
* To identify issues surrounding global transport
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| **Introduction** |  |  |
| A costly, and sometimes very long, aeroplane journey is currently your only option if you intend to travel a long distance. However, what about in the future? One method that has been proposed is the vacuum tube train. This may be able to reach speeds of 4,000 mph, but is it a realistic option? |
| **Purpose of this activity**In this activity students use the speed equation to calculate how long it takes to travel to destinations around the globe from the UK via today's global transport options. They are then introduced to a new concept to global travel: the vacuum tube train - will this solve some of the problems they identified? |
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| **Activity** |  | **Teacher notes** |
| Introduce the term 'global transport' and ask students to name some methods that they can think of e.g. aeroplanes, cruise liners, trains. Students then work in pairs or small groups to complete the tasks on handout **Journey times A or Journey times B.**  (*10 mins)*Go through their answers, checking they are correct. Discuss their choices of transport for question two and see if the class agree with each other's choices. *(5 mins)*Show slide 2 of the handout **What is the future?** Ask groups to discuss the opinions of the people and then write their own comment. Ask some groups to share their comment. (*10 mins)*A form of transport that they might not have considered as being global is the train. Discuss why trains are not generally used now to travel long distances (they are relatively slow). Introduce the class to high speed trains which are currently being developed by watching the film 'Trains and technology'. Introduce a new idea for global transport: vacuum tube trains by viewing the video clip from the additional websites. After watching, ask students if they think this will solve some of the problems they identified and how realistic they think it is as a future global transport option. (*10 mins).* |  | Handout **Journey times A** is for higher ability students and **Journey times B** is for the less able. Students completing handout **Journey times A** may have to be informed/reminded of the speed = distance / time equation and how to use it to calculate the journey times. You may like to show them how to use a formula triangle.Please note that some options for travel are not available e.g. boat to Delhi.Use this discussion to introduce ideas about the environmental, economic, ethical and social impacts of each type of global transport. For example, comparing fuel efficiencies, impact for infrastructure on the environment and how polluting they are. This can be shown as a presentation to the whole class or printed out and each group given a sheet to write their comment on. In this film, the technical director of HS2 discusses the benefits of high speed train travel. |
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| **Differentiation** |  |  |
| **Basic** |  | **Extension** |
| Students complete handout **Journey times B** which guides them through how to do the calculations. Before they start you could show students the location of the cities on a map. |  | Students complete handout **Journey times A.** Before they start initiate a discussion about how accurate they think the distances and speeds are. Some issues are that the journeys between Northern Ireland and the rest of the UK do not include the time and speed of the ferry crossing, train journeys do not include time taken to change trains at stations and the speeds for each type of transport are averages. |
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| **Resources** |  | **Required files** icon-docicon-pdficon-ppt |
| * Projector/whiteboard
* Calculators
 |  | icon-doc **Journey times A**icon-doc **Journey times B**icon-ppt**What is the future?** |
| **Additional websites** |  |  |
| * Trip distance calculator (<http://www.tripstance.com/uk-distances/united-kingdom/>): You could get students to use this website to find out distances to the cities mentioned in handout **journey times** from your nearest town.
* Vacuum tube train model (<https://www.youtube.com/watch?v=VZW-X_Lk3vM>): Demonstration of a model of a vacuum tube train.
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| **Related activities (to build a full lesson)** |  |  |
| **Starter*** ACTIVITY: Around the world
* FILM: Trains and Technology

**Main*** ACTIVITY: Train design
 | **Extension*** ACTIVITY: Overcoming friction
* FILM: The Future of Trains

**Plenary*** As discussed in **Overcoming friction**. Students write a short

 email to a newspaper. |

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| **The Engineering Context** film |
| * **The story:** Trains and Technology
* **The story:** The Future of Trains
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| **Curriculum links** |
| **England: National Curriculum**Science* KS3 3a, 4b, 26a
* KS4 4a, 4b

Design & Technology* KS3 3b, 3d

Mathematics* KS3 1a, 1b, 1g, 2f, 3a, 3b, 4a, 4d, 4l, 4m, 4o, 6a, 6j
* KS4 2.2m, 2.3b
 | **Northern Ireland: Curriculum**Science & Technology (Objective 1) Developing pupils' Knowledge, Understanding and Skills* Learn about: the environment and human influences

Mathematics and Numeracy (Objective 1) Developing pupils' Knowledge, Understanding and Skills* The application of mathematical skills to real life and work situations
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| **Scotland: Curriculum for Excellence**Sciences* SCN 4-07a

Numeracy and mathematics* MNU 3-10a, MNU 4-10b
 | **Wales: National Curriculum** Science* KS3 Skills (Communication 3)
* KS3 Range (Interdependence of organisms 6)

Mathematics* KS3 Skills (Solve mathematical problems)
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| **GCSE Science**AQA Combined Science Trilogy* 6.5.4.1.2

AQA Combined Science: Synergy* 4.7.1.2

Edexcel Combined Science* Physics: 2.6

Eduqas Combined Science* 2.3: 4.1d

OCR Gateway Science: Combined Science A* P2.1b, 2.1h

OCR 21st Century Science: Combined Science B* P4.2: 1, 3
 | **GCSE Physics**AQA Physics* 4.5.6.1.2

Edexcel Physics* 2.6

Eduqas Physics* 4.1d

OCR Gateway Science: Physics A* P2.1b, 2.1h

OCR 21st Century Science: Physics B* P4.2: 1, 3
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| **GCSE Mathematics**AQA Mathematics* A2, A3, A5

Edexcel Mathematics* A2, A3, A5

Eduqas Mathematics* FA2, FA3, FA5, HA2, HA3, HA5

OCR Mathematics* 6.01a, 6.02b, 6.02c
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| **Assessment opportunities** |
| * Checking answers from handout **Journey times A or Journey times B** will provide an opportunity to assess numeracy skills
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| **Personal, learning & thinking skills (PLTS)** |
| * Team workers
* Effective participators
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