

Rubber Band Powered Car

Key Stage: 2

Strand:

Mathematics: Measures (Learning Unit: Speed)

General Studies: Science and Technology in Everyday Life
(Core Elements: efficient transfer of energy and the interaction between energy and materials)

Objectives:

- (i) To consolidate the concept of speed
- (ii) To use “metres per second” (m/s) and “kilometres per hour” (km/h) as the unit of speed
- (iii) To recognise efficient transfer of energy and the interaction between energy and materials
- (iv) To design and build models by using different materials and to test selected functional characteristic of the model built with the chosen materials

(may collaborate with General Studies)

Prerequisite Knowledge: Understanding the relationship among speed, time and distance

Resources Required: Worksheets, stopwatches, measuring tapes and calculators

Related Links: Scientific Investigation Series - Potential Energy Car
www.hkedcity.net/edb/teachingresources/project/?p=science&path=/car
Scientific Toy DIY- Rubber Band Powered Car
sites.google.com/site/sciencemagician/ke-xuediy/xiang-pi-jin-dong-li-c-he-guang-die-che

Description of the Activity:

Activity 1

To consolidate students' concept of speed by teacher's questions raised.

Questions for discussion:

1. If A and B run 100 metres in 20 seconds and 30 seconds respectively. Who runs faster on average?
2. If C and D run 50 metres and 60 metres in 10 seconds respectively. Who runs faster on average?
3. What is the relationship between time and speed if they run the same distance?
What is the relationship between distance and speed if they run at the same time?
4. What information must be obtained to determine their running speed if they do not start in the same place?

Notes for Teachers:

Students are divided into groups and provided the related links. They could prepare and make the rubber band powered car prior to the lesson.



Activity 2

1. The teacher read out Part 1 of Worksheet as an introduction. Students are grouped in pairs. Students discuss the ways to compare 2 persons' speeds when the distances they run and the time they spend are different. The teacher guides students to find the formula which is used to calculate the average speed.
2. Each group is given the Worksheet. Students complete Part 1 of Worksheet and present the results.
3. Students collect the data and complete Part 2 of Worksheet by using their rubber band powered cars.

Questions for discussion:

1. If we obtain the distance an object moves and the time it spends to move, how can we calculate the average distance it moves in 1 second?

2. How can we calculate the average time it spends to move 1 metre?
3. Which method do you like to use to compare their speeds? Why?
4. The distances the cars of two groups run and the time they spend are different. How can you compare their speeds?

Notes for Teachers:

1. Activities aim at measuring the speed of their rubber band powered cars, not the speed racing. There is no need to arrange each car starting at the same place and same time.
2. The teacher can remind students to refer to the design and materials used by each other groups in order to improve their own rubber band powered car.

Activity 3

To discuss with students the energy conversion and the ways to improve the structure of the car.

Questions for discussion:

1. When a student is scrolling the rubber band, what kind of energy is stored?
2. When students put their cars on the ground and release the wheels, what kind of energy will be converted from the energy stored in the rubber band? What is the relationship between this kind of energy and the speed of their cars?
3. How to increase the speed and running time of the rubber band powered car?

Notes for Teachers:

1. To save time, the teacher may allow students to complete Part 2 of Worksheet using a calculator.
2. The teacher can remind students how to use the stopwatch and measuring tape for measurement.

Integration and Application:

Science Education: Conversion of energy

Technology Education: Model design and choosing appropriate materials

Mathematics Education: Concept of speed and measurement of speed

This example mainly involves the following generic skills:

1. Collaboration Skills
 - Collaborate in groups
 - Share responsibilities and understand the roles of individual members in the construction of the rubber band powered car
2. Creativity
 - Improve and refine the designs of the rubber band powered car
3. Problem solving Skills
 - Propose different solutions to increase the speed and running time of the rubber band powered car
 - Try out and improve the solutions through different experiments

Worksheet

1. The running records of Student A and Student B are as follows:

| | Distance | Time |
|---|-----------------|-------------|
| A | 100 m | 20 s |
| B | 150 m | 25 s |

How to compare the speed of A and B?

| method 1 | method 2 |
|--|--|
| A has run _____ m in 1 second on average. | A has spent _____ s to run 1 m on average. |
| B has run _____ m in 1 second on average. | B has spent _____ s to run 1 m on average. |
| Student _____ runs faster, because on average the distance he/she runs is _____ in 1 second. | Student _____ runs faster, because on average he spends _____ time to run 1 m. |
| Which method do you like to use to compare their speeds? Why? | |

2. Complete the following table and calculate the speed of rubber band powered car.

| Distance (m) | Time (s) | Speed (m/s) |
|---------------------|-----------------|--------------------|
| | | |
| | | |
| | | |

Remark: The speed calculated can be rounded off to 1 decimal place.