

**ASSESSMENT OF SCIENCE AND TECHNOLOGY
ACHIEVEMENT PROJECT
(ASAP)**

Science and Technology Exemplars

**Grade 3: Energy and Control – Forces and
Movement**

Exemplar Task (3ECPT01/Feb 2002)

Make it Move



Preface

This task is one of a series developed by the Assessment of Science and Technology Achievement Project (ASAP), which are being used for the ASAP Science and Technology Exemplars Project.

This task is organised in three parts:

- A. Task Overview
- B. Student task sheet – designed to be photocopied for the students
- C. Teacher Information – providing essential information relating specifically to this task

For further information, contact the ASAP office at 416-736-5006 or email:
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Task Overview



Description of the Task

In this task students are asked to design and build a vehicle that can be moved by pushing or pulling. Once they have built their vehicle they are asked to test it. They may need to modify their design and re-test their vehicle. Once they have built their vehicles students will be provided with additional materials with which to investigate how to change the speed of their vehicle.



Recommended Materials & Equipment

Part A: Vehicle Construction

Empty thread spools	wooden wheels	cardboard and cereal boxes
Dowel or kabob skewers	plastic tubs and lids	masking tape
Rubber bands	glue	scissors
Magnets	Clock or stopwatch	
Found materials		

Part B: Vehicle Control

Wooden board for ramp, carpet pieces, sandpaper, Smooth vinyl or plexi-glass, Cardboard pieces, Loads (10g masses or film canisters with sand inside)



Suggested Timeline

Part A: Design:

- 2 – 3, 30 min sessions for vehicle design, plan (p. 5, 6 & 7)
- an extended period (may be broken up) for construction, testing and possible modifications (p.8)

Part B: Inquiry

- 1 - 20 min session to hypothesize (predict) and plan for changing speed (p. 9)
- 2 - 30 min sessions Changing the speed of a moving vehicle (p.10)
- 30 min reflection (p. 11)



Suggested Grouping

Groups of three



Safety First

Students should be familiar with using the equipment required for the task. They should also be warned to take care with sharp equipment. If **kabob skewers** are used as axles they should have the sharp end removed by the teacher prior to the task.

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Make it Move

Student Task Sheets

Make it Move!

Part A: Design and Build a Vehicle

You are going to design and build a vehicle that can be moved on a variety of surfaces.

Part B: Investigate the Vehicle

You will explore ways to change the speed of your vehicle when it is moving.

Part A: Vehicle Design and Build

1. Look at the materials that you might be able to use.
2. Sketch at least two different vehicles that you might want to make with the materials using the space on the next page for your designs

Sketch 1

Sketch 2

3. Choose one of your sketches. Make a drawing and label the moving parts on your vehicle.



Explain why you chose this vehicle.

My plan:

4. List the steps you will take to build your vehicle:

- Collect materials

- _____
- _____
- _____
- _____

5. Build your vehicle

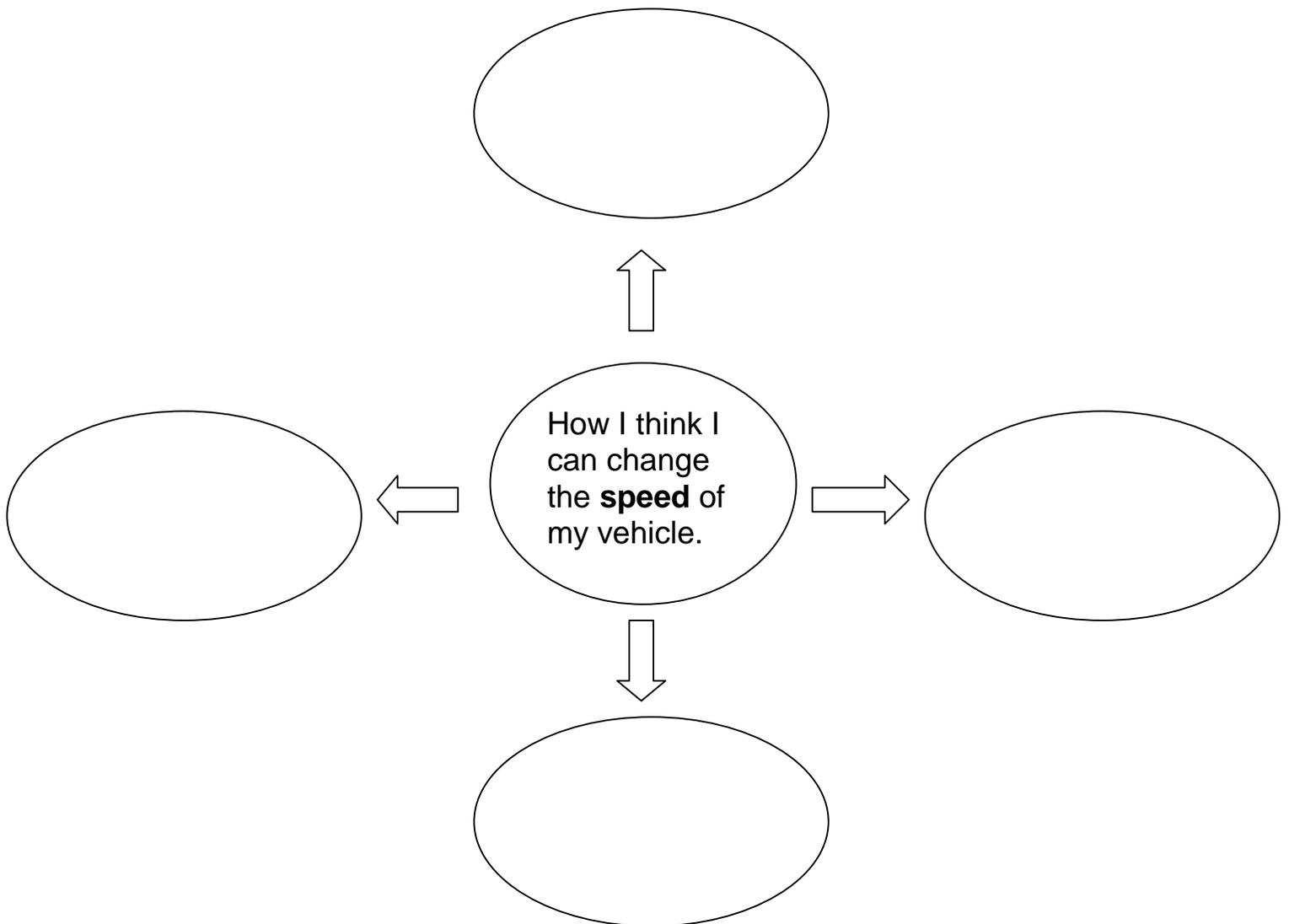
6. How will you test it?

PART B: Vehicle Investigation

You are going to investigate ways to change the speed of your vehicle when it is moving.

My prediction

7. Suggest ways that you think you can change the speed of your vehicle



My Results:

8. Use the predictions from your web and put them in the chart below.
9. Test each prediction and explain what happened.

How I think I can change the speed	Tell what happened when you tried to change the speed

10. Think about how what you have learned from this activity.
What forces make your vehicle:

a) keep going fast?

b) slow down quickly?

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Teacher Information Sheets

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This task assesses the following **specific expectations**:



Understanding Basic Concepts

- **identify force as a push or pull by one body on another**



Developing Skills of Inquiry, Design and Communication

- **investigate the ways in which different forces can change the speed or direction of a moving object**
- ask questions about and identify needs and problems related to the behaviour of different forces in their immediate environment and explore possible answers and solutions
- plan investigations to answer some of these questions or solve some of these problems, and explain the steps involved
- **use appropriate vocabulary in describing their investigations, explorations or observations**
- **record relevant observations, findings and measurements using written language, drawings, charts and graphs**
- **communicate the procedures and results of investigations for specific purposes and to specific audiences, using drawings, demonstrations, simple media works, and oral and written descriptions**
- **design and construct a device that uses a specific form of energy in order to move**



Relating Science and Technology to the World Outside the School

- **describe the visible effects of forces acting on a variety of everyday objects**
- identify surfaces that affect the movement of objects by increasing or decreasing friction

Teaching guidelines

Teachers should ensure that there is a selection of different materials for students to build their vehicles. Students should use different areas of the school with different floor covering to investigate the way their vehicle changes speed when it moves across different surfaces.



Prior knowledge and skills

Students should have been taught that forces are pushes and pulls and that these forces can make objects move.

Students should have had an opportunity to investigate and observe the way common objects move when they are affected by different forces.

Examples are:

- a toy car moves forward when pushed
- a ball falls to the ground when dropped
- a bike moves forward when you push on the pedals
- a hockey puck moves when you hit it with a hockey stick
- a ping pong ball moves when blown on



Students should have been introduced to the following science and technology terminology:

- force
- push
- pull
- friction
- speed

Students should have been taught that friction is a force between two surfaces rubbing together.

Students should have been taught that smooth, shiny surfaces have less friction and rough surfaces have more friction.

Students should also be familiar with:

- design skills of designing, building, testing, modifying and re-testing
- inquiry skills of predicting, planning, observing and interpreting results
- appropriate and safe use of equipment and materials



Introductory activities

- Display the materials and equipment for the students. Tell them that they can use these and other found materials to design and build their vehicle (to move across various surfaces) and plan and carry out their investigation of its motion. Discuss the first two pages of the student sheets with the class.
- Show students the ramp from which their vehicle will be released (Approximately 1m long and an approximately 30 cm height at one end). The height may be changed for their investigation if the students indicate that that is one of the predictions they want to investigate.
- Brainstorm with the whole class possible considerations they may have when designing the vehicle. Allow the students to respond with ideas
- Recap and discuss the ideas relating to forces such as pushes, pulls (in as many concrete examples as possible) and friction and how they might relate to the task.
- Read the scenario to the whole class, this may have to be repeated with individual students. Review appropriate vocabulary. Cards with words could be displayed around the class.
- Collect materials and tools, and begin building once the teacher has checked the plans
- Brainstorm ways of speeding up/slowing down objects that are pushed or pulled
- Discuss completion of the visual organiser and investigation with the students.
- Complete task
- Discuss the assessment criteria with the students.
- Clarify how each student will be presenting his/her work

RUBRIC FOR GRADE 3: MAKE IT MOVE

Knowledge/Skills	Level 1 The student:	Level 2 The student:	Level 3 The student:	Level 4 The student:
Understanding of basic concepts <ul style="list-style-type: none"> identifies and describes forces can change the motion of an object 	<ul style="list-style-type: none"> rarely identifies a force as a push or a pull and rarely shows how a force can change the speed of their vehicle 	<ul style="list-style-type: none"> sometimes identifies a force as a push or a pull and shows how a force can change the speed of their vehicle 	<ul style="list-style-type: none"> often identifies a force as a push or a pull and shows how a force can change the speed of their vehicle 	<ul style="list-style-type: none"> clearly and effectively identifies a force as a push or a pull and clearly shows how a force can change the speed of their vehicle
Inquiry Skills <ul style="list-style-type: none"> investigates forces that can affect the way their vehicle moves 	<ul style="list-style-type: none"> applies few of the required skills and strategies (ask questions, predicts and tests the way forces interact with their vehicle) 	<ul style="list-style-type: none"> applies some of the required skills and strategies (ask questions, predicts and tests the way forces interact with their vehicle) 	<ul style="list-style-type: none"> applies most of the required skills and strategies (ask questions, predicts and tests the way forces interact with their vehicle) with considerable accuracy 	<ul style="list-style-type: none"> consistently applies the required skills and strategies (ask questions, predicts and tests the way forces interact with their vehicle) with considerable accuracy
Design skills <ul style="list-style-type: none"> designs and builds a vehicle to meet a specific need uses tools, equipment and materials safely and appropriately 	<ul style="list-style-type: none"> develops and builds a vehicle that infrequently follows a plan needs frequently reminders to use tools safely and materials appropriately 	<ul style="list-style-type: none"> develops and builds a vehicle that follows a reasonable plan uses some tools, equipment and materials safely and appropriately 	<ul style="list-style-type: none"> develops and builds a vehicle that follows an appropriate and clear plan mostly uses tools equipment and materials safely and appropriately 	<ul style="list-style-type: none"> develops and builds a vehicle that follows an effective and clear plan always uses tools, equipment and materials safely and appropriately
Communication of required knowledge <ul style="list-style-type: none"> uses science and technology terminology 	<ul style="list-style-type: none"> communicates with limited clarity and precision rarely uses science and technology terminology in context 	<ul style="list-style-type: none"> communicates with some clarity and precision sometimes uses science and technology terminology in context 	<ul style="list-style-type: none"> communicates clearly and precisely through most of the task often uses science and technology terminology in context 	<ul style="list-style-type: none"> communicates clearly and precisely through all of the task always uses science and technology terminology in context
Relating science and technology to each other and the world outside the school <ul style="list-style-type: none"> describes how forces affect their vehicle 	<ul style="list-style-type: none"> describes the visible effects of forces acting on their vehicle with considerable misunderstanding 	<ul style="list-style-type: none"> describes the visible effects of forces acting on their vehicle with some misunderstanding 	<ul style="list-style-type: none"> clearly describes the visible effects of the forces acting on their vehicle 	<ul style="list-style-type: none"> clearly and concisely describes the visible effects of the forces acting on their vehicle