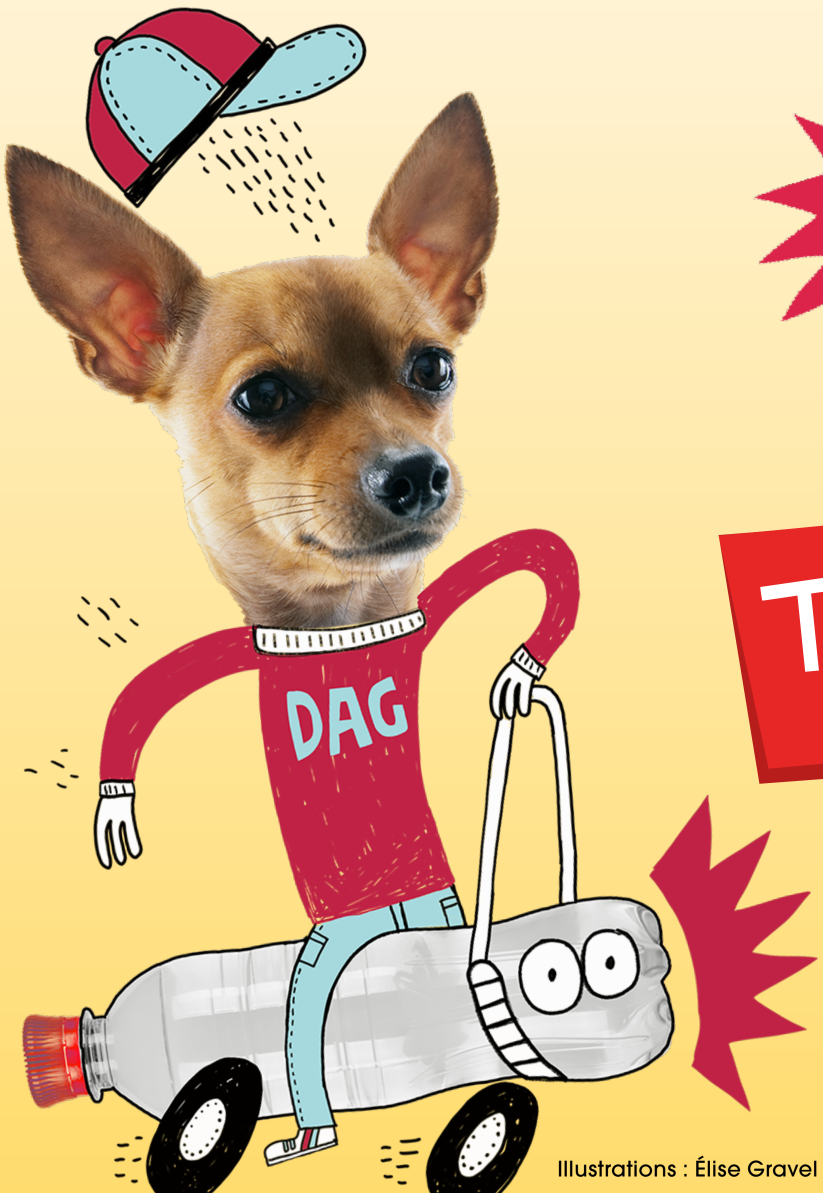
junior tech challenge

The practical side of science and tech

READY, SET, ROLL!



Teacher's Guide

3rd cycle

Edition 2018–2019

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General Information

This document is intended to support Intensive English teachers who wish to experience the Junior Tech Challenge with their students in English. A Teacher's Guide, a Student Book, a PowerPoint Presentation and an Excel table of results are available at no charge at http://www.technoscience.ca/. The original version of the technology challenge and other teaching tools are available in French at http://www.technoscience.ca/.

Introduction for Intensive English Teachers

Every year, elementary students across Québec participate in the Junior Tech science challenge at their schools and at regional events. This challenge helps initiate students into the wonders of science and technology and allows them to have fun while developing their creative spirit. The Junior Tech challenge is an original and hands-on class project as well as a learning and evaluation situation (LES).

Five challenges are presented and used alternately, every year. Pedagogical tools are provided to support students in meeting each challenge. The tools and documents provided may be adapted according to your pedagogical goals. With each new edition of the challenge, we improve on the rules and the tools so that they best meet your needs.

Teachers of Intensive English can use this challenge to develop Competency 1, To interact orally in English, while the students participate in hands-on activities that are motivating and challenging. The challenge can be experienced in these ways: in your classroom only, in the school board's annual science competition, or in the regional final. Other teachers from your school may also be participating, so you can select the best teams out of the participating classes.

Ready, Set Roll! Returns… and it's even better!

The Ready, Set, Roll! Junior Tech challenge returns with an interesting twist. In this edition, the vehicle must roll down an inclined plane and stop as close to the target as possible. Different levels of difficulty are proposed for students from cycles 1, 2, and 3.

Teaching tools available

You will find all these tools at https://technoscience.ca/ to help you maximize your experience:

- Rules Booklet
- Teacher's Guide for Intensive English
- Student Booklet
- Slide Presentation
- Junior Tech Challenge Diploma
- Excel Table of Results

Preparatory Activities

The preparatory activities were developed to help the students get ready to design a vehicle that would roll down an inclined plane and stop as close to a target as possible. They are presented in the Teacher's Guide and the Student Booklet, ready to print as needed.

These activities aim to help the students acquire scientific concepts related to the challenge. They also develop strategies that support students in the development of science-specific competencies.

For ESL, Competency 1 (To interact orally in English) is developed while the students are participating in the activities and planning their design.

Although the activities can be carried out independently, they can lose their meaning if they are not developed in a meaningful context in which students can reinvest their knowledge in an authentic production.

Intentions for Intensive English

The students will have the opportunity to:

- Develop Competency 1 through challenging hands-on activities
- Review and consolidate science knowledge in an English-language context
- Participate in a school-wide competition or regional event

From a LES for the Classroom to the Regional Final

The Junior Tech challenge is a chance for students to experience an active discovery process in science and technology in the classroom. It's also an opportunity to experience something unique by participating in one of the many levels of competition.

The ultimate experience?

Participating at the regional final!

Here are the different levels of finals possible:

In-Class Final	In the Class Final the winners are determined in each class only.
School Final	The School Final will determine the student representatives of each cycle who will go to the School Board Final– or directly to the Regional Final if there is no School Board Final.
School Board Final	Final by cycle organized by the school board – organized independently or in collaboration with an organization that is affiliated with Réseau Technoscience. If your school board organizes a final, you will be invited to register your students to the School Board Final before the Regional Final.

Note: During the regional finals, the challenges can be presented in a different format. The students will be required to change their strategy on site to adapt to this new format. No advanced preparation is needed, but extra time will be allotted to students, if required, to make the necessary changes.

Overview of the Design Process

All resources can be found at https://technoscience.ca/ (Défi apprenti génie section).

Pedagogical Intention	Time	Pedagogical Resources
Preparation		
Present the Challenge: The teacher presents the main constraints for the design and construction of the vehicle.	15 minutes	• Slides 1 - 9
Activity 1 Let's Get Moving! • To introduce the principles of operation of axles and wheels. • To identify the parts of a simple rolling machine. • To identify the most effective features of a simple rolling machine.	75 minutes	• Teacher's Guide, p. 10 - 13 • Student Book, p. 4 • Slides 10 - 24
Activity 2 It's Rolling! Experimental Situation 1: Higher Goes Farther Experimental Situation 2: Heavier Goes Farther • Allow students to experience each step of The General Learning Process in Science and Technology. • Control the experimental perimeters by studying only one factor at a time (height, mass). • Recognize the importance of doing several tests to check replicability. • Allow the students to predict and control the distance traveled by his/her vehicle by varying elements such as position on the plane, mass, etc.		• Teacher's Guide, p. 14 - 16 • Student Book, p. 7 - 11, and 3

Overview of Design Process (continued)

Pedagogical Intention	Time	Pedagogical Resources
Activity 3 Let's Create Friction! • To help slow down a vehicle travelling on an inclined plane by applying friction to its wheels. • To control the vehicle to help it reach its target after being released from a specific distance. • To use a diagram to show where the vehicle stops at each trial.		• Teacher's Guide p. 17 - 20 • Student Book p. 12 - 13
Carrying out the challenge		
You're Ready for the Challenge! • In teams of two, students create their vehicle for the challenge. • The teacher presents the rules of the competition, and the students test out their vehicle in class.	120 minutes	• Teacher's Guide, p. 21 - 22 • Student Book p. 14 - 17
Integration		
Analysing My Performance • Review the pedagogical intentions and the design process.	15 minutes	• Teacher's Guide, p. 23 • Student Book, p. 18 - 19
School Final		
Putting on a School Final! • It's the big day! If you wish to put on a final for more than one class, you can keep the same schedule of events as suggested in the rules, or you can adjust the time according to the students' needs.		• Rules Booklet

Scientific Terms

See Appendix 1: Resources for Students

CHASSIS : The supporting frame of a vehicle.

AXLE : The supporting frame of a vehicle.

FRICTION : An object in motion on a surface remains in motion at a constant speed unless acted upon by an outside force that diminishes its speed. An example of a force that will diminish the speed of an object in motion, is the friction between an object and the surface on which it is rolling.

Some common situations involving friction: friction allows a tractor's caterpillar track to climb uphill without slipping, it allows car tires to adhere to the pavement, and allows us to walk on the sidewalk without falling. In contrast, it is a lot harder to drive on ice than on the ground because there is a lot less friction on ice!

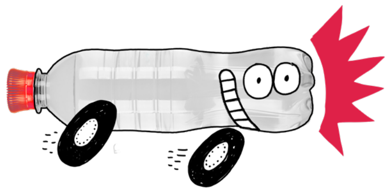
ROTATION : A rotation is the movement of an object that turns on its axis.

WHEEL : The wheel is considered one of the most important inventions. It revolutionized work by helping to transport heavy loads. The wheel is used in almost all vehicles and in several objects of everyday life.

The wheel is a disc that rotates on its axis through its center. The wheel is a simple machine since it has an axle that allows it to turn on itself.

Activity 1

Let's Get Moving!



Pedagogical Intention

- Introduce students to the principles of the design and creation of the axle and the wheel.
- Assist students in identifying the main parts of the axle and wheel (simple rolling machine).
- As a class, identify the characteristics of the most efficient wheel designs.

Strategies (Progression of Learning for Science and Technology)

Exploration strategies:

- Exploring various ways of solving the problem
- Anticipating the results of his or her approach
- Imagining solutions to a problem in light of his or her explanations
- Examining his or her mistakes in order to identify their source

Communication strategies:

- Exchanging information
- Comparing different possible explanations for or solutions to a problem in order to assess them (e.g. full-group discussion)

Approaches to wheel designs

- Use the vehicle in different directions
- Add weight to the vehicle
- Use 2 or more axles
- Change the number of wheels used
- Use single or double wheels
- Etc.

Vocabulary to Explore

Wheel, axle, frame or chassis, friction, rotation, axis

See definition

Wheel, axle, frame or chassis, friction, rotation, axis

See definitions on p. 9 of the Teacher's Guide.

Materials

- Slide presentation (11-24)
- Student Book p. 4
- Tools to make holes in the wheels ie. hammer and nail, crankshaft, etc.
- The teacher, a parent, or a volunteer adult can be asked to use an electric drill to make holes in caps or corks where students have designated them to be.

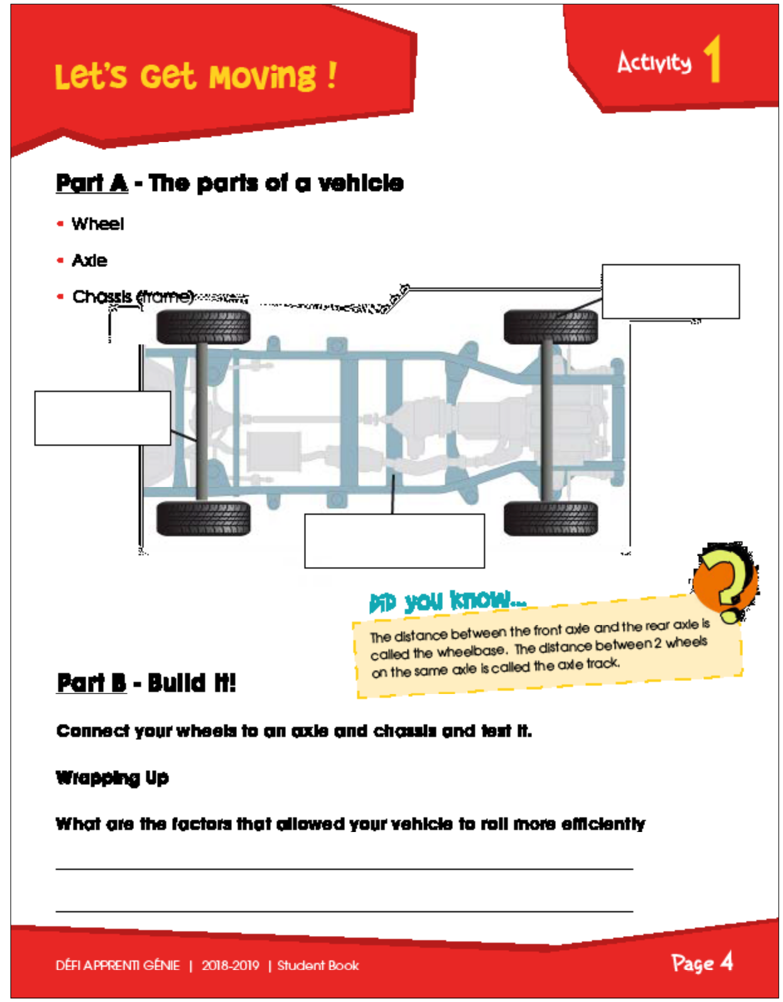
Some Suggestions for materials:

Chassis	Wheels	Axles	Wheel Fasteners
Cardboard	Any kind of bottle cap	Straws	Nuts and bolts
A thin, long box	Any kind of lid	Wooden skewers	Brass fasteners
Milk or juice carton	Spools or bobbins	Dowels	Corks
Corrugated plastic sheets (Coroplast)	Corks	Pencils	Pipe-cleaners, nails, and beads (glued with a hot glue gun or model-ing clay)
Rectangular styrofoam (meat) tray	Old CDs	Empty pen or marker tubes	Adhesive tape or masking tape
Thin pieces of wood		PVC tubes	Plasticine
			Hot glue
			White glue

Procedure

<u>Part A -</u> The parts of a vehicle:

- Ask students to bring toys with wheels to class. As a group, examine the different kinds of wheels on the toys. Make sure to have toys that have wheels attached to the axle, and others where the wheels are attached directly to the frame (chassis).
- Ask students their opinions as to what they think make the vehicles roll.
- Watch the part of the slide show, entitled, Activity 1: Let's Get Moving! with the students (Slide 11).
- Ask students to use the slide presentation to help them complete <u>Part A</u> on p. 4 of their Student Booklet.
- Correct the page with the class and discuss the possible functions of the parts in the diagram.


Let's Get Moving !

Activity 1

Part A - The parts of a vehicle

- Wheel
- Axle
- Chassis (frame)

Part B - Build it!

Connect your wheels to an axle and chassis and test it.

Wrapping Up

What are the factors that allowed your vehicle to roll more efficiently

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<u>Part B</u> - Build it!

1- Present slides 12-14. Elicit answers from the students and discuss which materials could be used for the wheels and the axles (Teacher's Guide p. 11).

2- Present slide 15 and discuss the questions presented in the slides:

- How would you connect the wheels to each other?
- How would you connect the axle to the wheels?
- How would you connect the axle and the wheels to the vehicle?

3- Present slides 16-21. Examples of possible wheel construction will be proposed in these slides. You can choose to show these before, during or after the discussion:

- Ask students to identify the differences in the rolling systems provided in these slides.

Part B - Build it! (continued)

4- Present slide 22, Build It! In teams of 2, students will connect wheels and axle (of their toy cars) to a chassis and test it. They can experiment with wheels and axles of different sizes:

- Midway through the activity, present students ideas to the class, as well as the slides presenting possible models of wheels that can be built by the students.
- Students will compare their creations with those of their classmates.

5- By experimentation and manipulation, students will draw the following conclusions:

- The wheels must be the same size, and the axles must be the same size.
- The axle must be attached to the center of the wheel.
- The wheel must be properly secured to the axle.
- The wheels must be able to rotate easily with the least amount of friction.

6- Present sliders 23 - 24, What Happens When…. Discuss which steps the students took to improve the performance of their vehicle.

What Happens When…

- The wheels are not properly secured to the axle?
- The axle is not secured to the center of the wheel?
- The axles are not the same length?
- The axles are not placed parallel?
- The wheels on an axle are not the same size?
- The wheels are different thicknesses?
- The wheels are different sizes?

Wrapping-up

- Ask students to answer the question on page 4 of their Student booklet.
- Review the activity and the possible solutions for creating the most efficient vehicle.

Activity 2
It's Rolling!

Pedagogical Intention

- Allow students to experience each step of The General Learning Process in Science and Technology.

  See Appendix 2 or Student Booklet p. 3
- Control the experimental perimeters by studying only one factor at a time (height, mass)
- Recognize the importance of doing several tests to check replicability.
- Allow the students to predict and control the distance traveled by his/her vehicle by varying elements such as position on the plane, mass, etc

Strategies (Progression of Learning for Science and Technology)

- Exploration Strategies:
  - √ Becoming aware of his or her previous representations
  - √ Anticipating the results of his or her approach
  - √ Using different types of reasoning (e.g. induction, deduction, inference, comparison, classification)
- Strategies for recording, using and interpreting information:
  - √ Using a variety of observational techniques and tools
  - √ Using different tools for recording information (e.g. diagrams, graphs, procedures, notebooks, logbook)

Materials

- Student Booklet, p. 2
- Student Booklet p. 4 - 8
- Appendix 2 : Setting Up the Competition Area and Inclined Plane

Teams of two will need:

- A panel with a thin rim serving as an inclined plane (see the material for Activity 3)
- An object to raise the panel being used as an inclined plane
- A tape measure
- A small vehicle (a toy car or truck) on which a light weight (mass) can be added
- A scale

1 – Higher Goes Farther!

- Before starting this activity, build the inclined plane and test the vehicles on the inclined planes. See Appendix 3.
- Depending on the models chosen and the material and angle of the inclined plane, the vehicles will travel a certain distance. At the end of the activity, the following hypothesis will be tested: The vehicle will travel a distance of more than 10 cm when released from a higher starting position.
- Make sure to organize the space in the classroom to have enough room for this activity.

Procedure

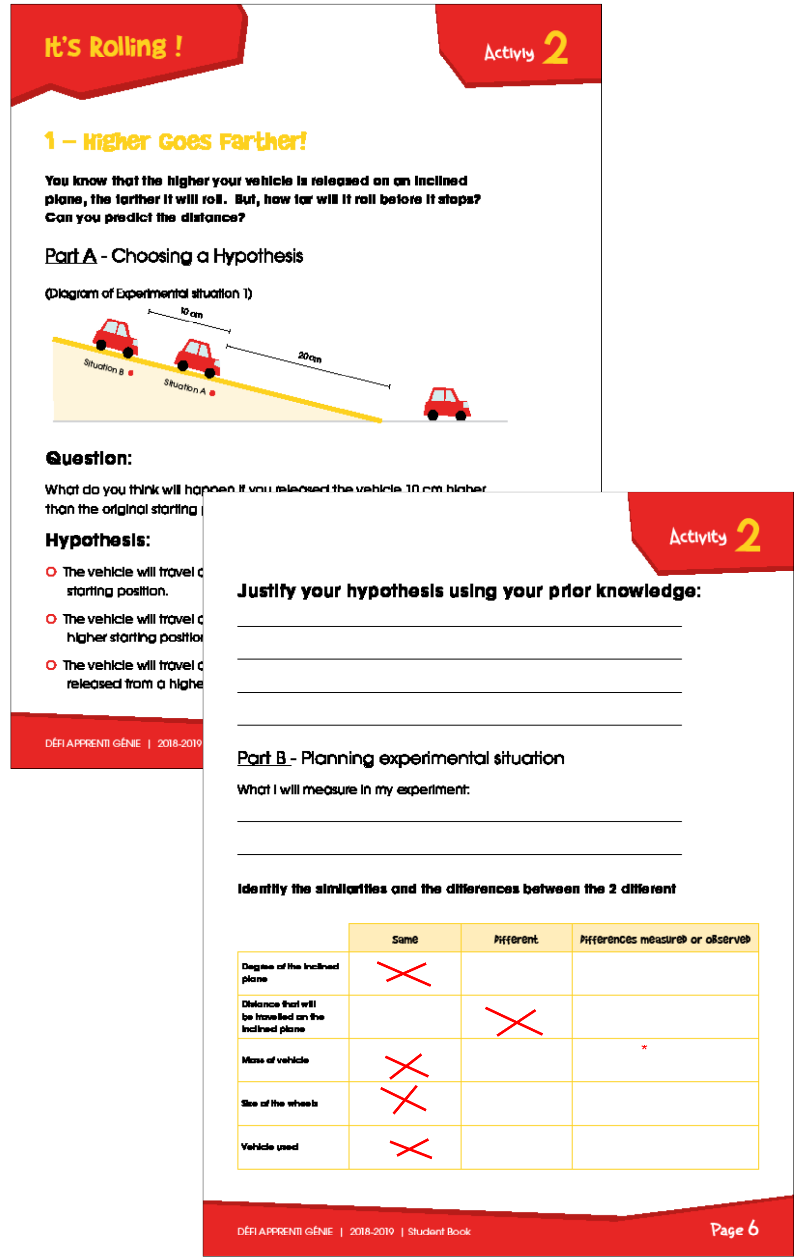
Part A - Choosing a Hypothesis (Student Booklet p. 5)

- Present diagram in Student Booklet p. 5 to students.
- Discuss the questions.
- Ask students to predict an outcome by choosing a hypothesis, and justifying it.
  - The student will choose one of the three hypotheses. They will have a chance to review cycle 1 math symbols; <10 cm, >10 cm, =10 cm.
  - Students must justify their hypothesis by using prior knowledge, an everyday experience, reasoning, fact or observation. It is not necessary to correct their hypothesis.

Part B- Planning experimental situation (Student Booklet p. 6)

Students will measure the distance traveled on the ground by their vehicle.

While completing the table, the student must be aware that they are controlling one single element: the distance travelled by the vehicle on the inclined plane.


It's Rolling !

Activity 2

1 – Higher Goes Farther!

You know that the higher your vehicle is released on an inclined plane, the farther it will roll. But, how far will it roll before it stops? Can you predict the distance?

Part A - Choosing a Hypothesis

(Diagram of Experimental situation 1)

Question:

What do you think will happen if you released the vehicle 10 cm higher than the original starting

Hypothesis:

- The vehicle will travel starting position.
- The vehicle will travel higher starting position
- The vehicle will travel released from a highe

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Activity 2

Justify your hypothesis using your prior knowledge:

Part B - Planning experimental situation

What I will measure in my experiment:

Identify the similarities and the differences between the 2 different

	Same	Different	Differences measured or observed
Degree of the inclined plane	X		
Distance that will be travelled on the inclined plane		X	
Mass of vehicle	X		*
Size of the wheels	X		
Vehicle used	X		

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* The vehicule is going to travel 10 cm further.

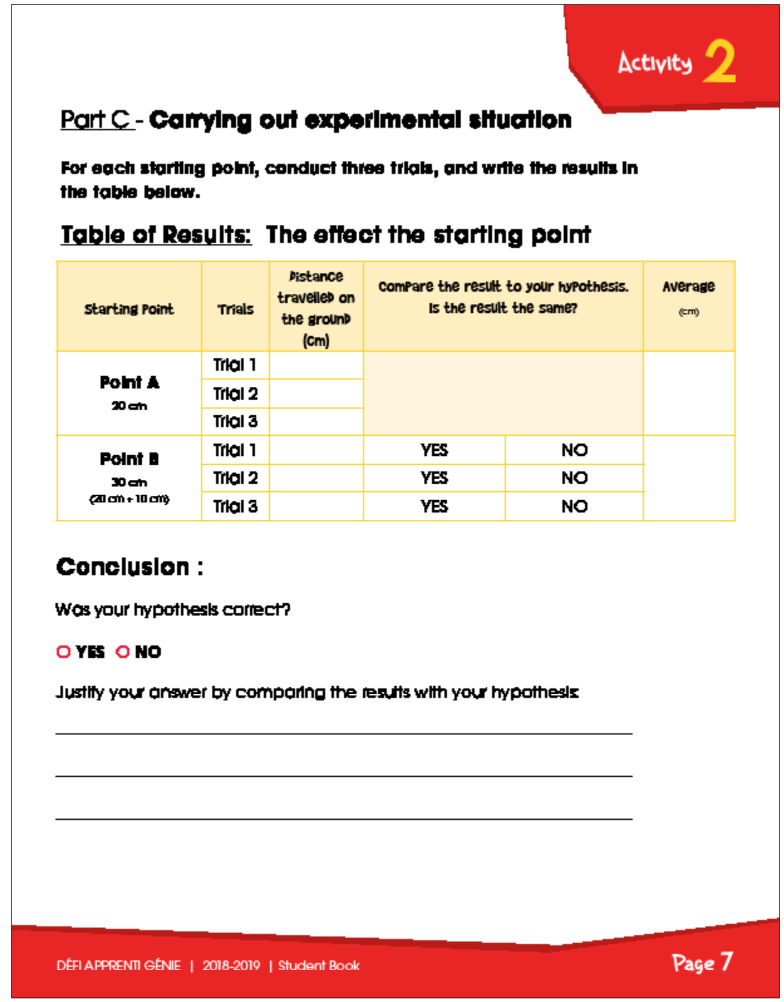
Part C - **Carrying out experimental situation (Student Booklet p. 7)**

- Before starting the activity, take time to discuss the elements of the Table of Results.

Suggested discussion questions:

- √ What is data? *Data is information collected during an experiment.*
- √ Why do we organize data in a table? *To better understand what is happening in the experiment.*
- √ What is the difference between Situation A and Situation B? *In Situation A, the vehicle is released at the starting point, while in Situation B, the vehicle is released 10 cm after the starting point.*
- √ Why do we do several tests? *Because the results will not always be the same.*
- √ How do you calculate the average? (Cycle 3 math notion) *Add the 3 results, and divide by 3.*

- Ask students to complete the Table of Results and the conclusion.



Activity 2

Part C - **Carrying out experimental situation**

For each starting point, conduct three trials, and write the results in the table below.

Table of Results: The effect the starting point

Starting Point	Trials	Distance travelled on the ground (cm)	Compare the result to your hypothesis. Is the result the same?		Average (cm)
Point A 20 cm	Trial 1				
	Trial 2				
	Trial 3				
Point B 30 cm (20 cm + 10 cm)	Trial 1		YES	NO	
	Trial 2		YES	NO	
	Trial 3		YES	NO	

Conclusion :

Was your hypothesis correct?

○ YES ○ NO

Justify your answer by comparing the results with your hypothesis.

____

____

____

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Wrapping-up

- The teacher explains that it was possible to arrive at a valid conclusion because:
  - √ One factor was controlled at each trial while the others remained the same (constant).
  - √ Several tests were carried out.

2 – Heavier Goes Farther!

- Repeat the experiment by changing the mass of the vehicle instead of the starting point.

Enrichment

- Repeat the experiment using different masses.
- If time permits, repeat the experiment choosing a different factor (ex: size of the wheels).

Activity 3
Let's Create Friction!

Pedagogical Intention

- To help slow down a vehicle travelling on an inclined plane by applying friction to its wheels.
- To control the vehicle to help it reach its target after being released from a specific distance.
- To use a diagram to show where the vehicle stops at each trial.

Strategies (Progression of Learning for Science and Technology)

- Exploration Strategies:
  - √ Distinguishing between the different types of information useful for solving the problem
  - √ Drawing a diagram for the problem or illustrating it
  - √ Anticipating the results of his or her approach
  - √ Taking into account the constraints involved in solving a problem or making an object (e.g. specifications, available resources, time allotted)
  - √ Using different types of reasoning (e.g. induction, deduction, inference, comparison, classification)
  - √ Using empirical approaches (e.g. trial and error, analysis, exploration using one's senses).

- **Strategies for recording, using and interpreting information:**
  - √ Using a variety of observational techniques and tools
  - √ Using different tools for recording information (e.g. diagrams, graphs, procedures, notebooks, logbook)

- **Communication Strategies:**
  - √ Organizing information for a presentation (e.g. tables, diagrams, graphs)
  - √ Comparing different possible explanations for or solutions to a problem in order to assess them (e.g. full-group discussion)

Materials

- Student Book, p. 12-13

Teams of two will need:

- A toy car, a truck etc.
- An inclined plane (choose between using the same one as in the challenge, or create a smaller one) see dimensions on p. 19
- Sticky tack
- Wooden coffee stirrers cut approximately 2 cm long
- A measuring tape (approximately 3 m)
- Masking tape

Procedure

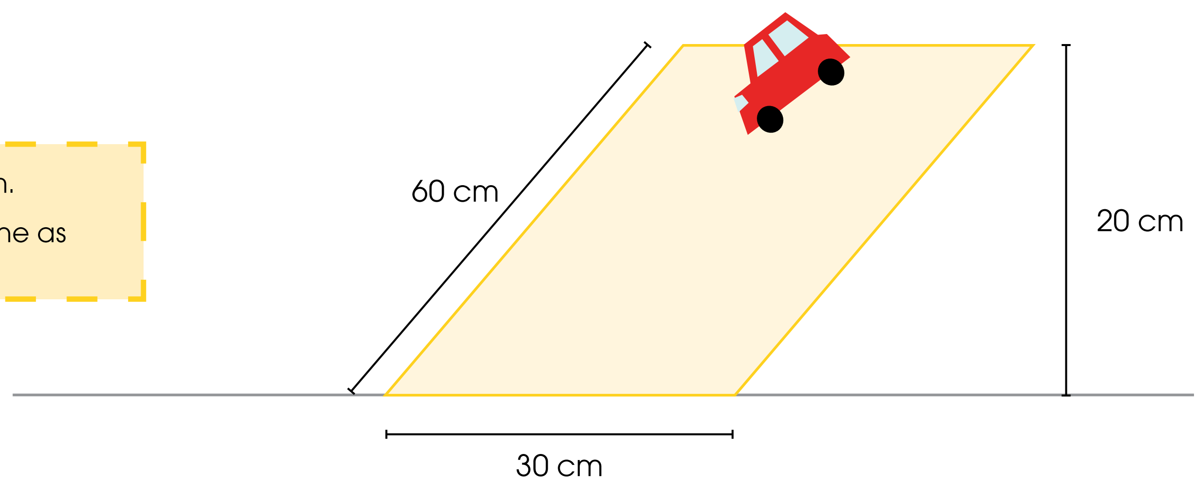
Setting up the activity

(**see diagram below, and the example in Student Booklet p. 12**)

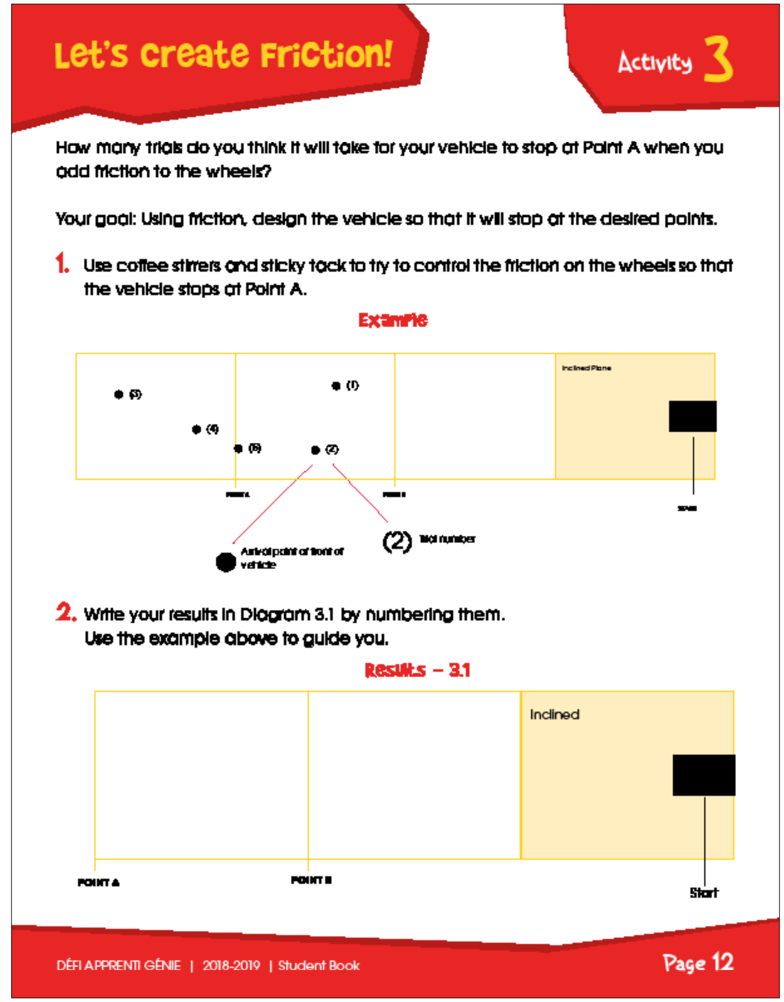
1. Install the inclined plane in the classroom.
2. As a group, choose the vehicles that are successful in reaching a distance of at least 1,5 m when released from the highest point of the inclined plane.
   ***Please note that the proportions on the diagram are not to scale.
3. Establish points A and B (Student booklet p. 12):
   a. Point A represents approximately 2/3 of the distance all the vehicles have traveled.
   b. Point B represents approximately 1/3 of the distance all the vehicles have traveled.
   c. It is not necessary to be precise in the measurements; it is sufficient to establish the 2 points and mark them on the ground. For example, if the majority of vehicles reaches 1,5m, Point A will represent 2/3 of 1,5m (1m) and Point B 1/3 of 1,5m (50 cm). It is possible that the points vary depending on the vehicles used.

The vehicle must reach at least 1,5 m.

Note: Raise or lower the inclined plane as



4. Discuss the following questions with the class:
   - √ In your opinion, is it possible to control the distance the vehicle travels? If yes, how?
   - √ What is friction?
   - √ Can you give examples of friction?
   - √ How can friction be used to stop the vehicle at Point A and Point B?



Let's create Friction!

Activity 3

How many trials do you think it will take for your vehicle to stop at Point A when you add friction to the wheels?

Your goal: Using friction, design the vehicle so that it will stop at the desired points.

1. Use coffee stirrers and sticky tack to try to control the friction on the wheels so that the vehicle stops at Point A.

2. Write your results in Diagram 3.1 by numbering them. Use the example above to guide you.

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PART A

1. Using friction, design the vehicle so that it will stop at the desired points.
   a. Place a ball of sticky tack near the wheels on the chassis of the toy.
   b. Place a 2 cm coffee stirrer on the sticky tack so that the stick rubs gently on the wheel.
2. Use diagram 3.1 to note where the vehicle stops.
   a. Release the car on the inclined plane.
   b. Note the position the car stops by adding a dot with the trial number to the diagram 3.1.
   c. Change the position of the coffee stirrer until the vehicle reaches Point A.
   d. It is possible to control the friction on more than one wheel by adding more coffee stirrers and sticky tack.

PART B

Now add friction to the wheels so that the vehicle stops at Point B. Use Diagram 3.2 to note your results.

Wrapping-up

Review the results with the students. Discuss other ways friction can be used to slow down the vehicle.

You're ready for the CHALLENGE!

Objectives

The teacher will...

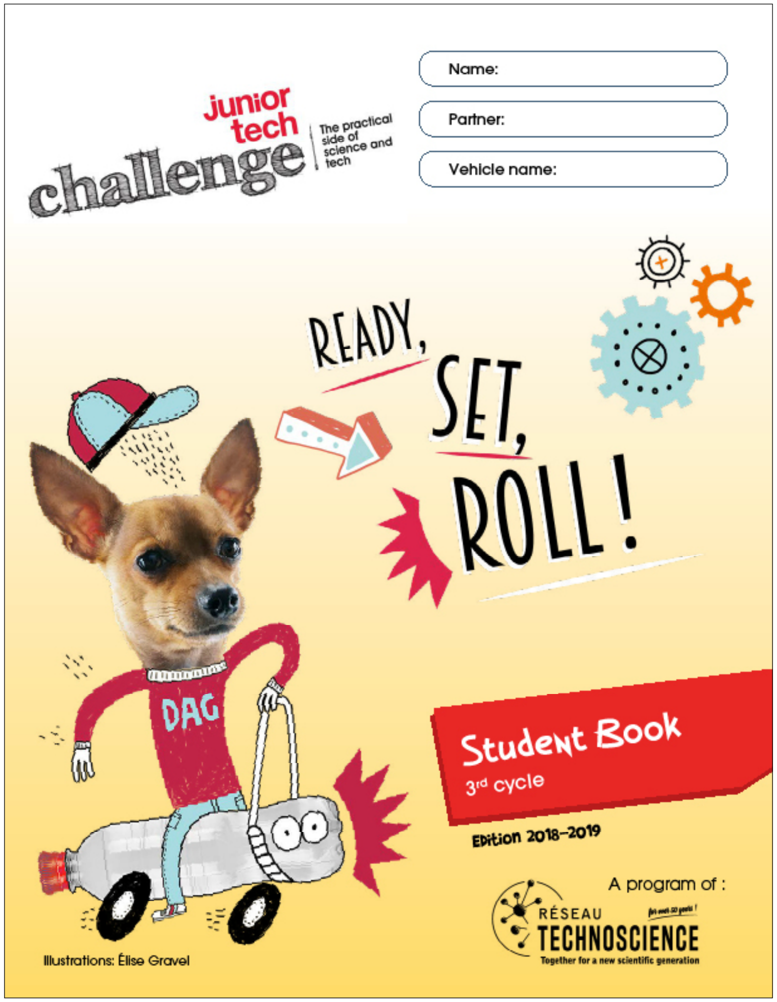
- Create teams of 2.
- Review the rules of the competition.

The students will...

- Prepare the classroom where the vehicles will be tested.
- Build, test, and improve their vehicle in teams of 2.
- Compare the performance of the different vehicles created.

Materials

- Rules
- Student Booklet p. 14-19
- Competition area
- Materials and tools chosen to build the vehicle



The challenge!

Procedure

PART A - The Challenge! (Student Booklet p. 14-16)

Before creating their prototype, students must:

- Choose and take note of the materials they will use.
- Draw multiple sketches of their prototype.
- Review the rules.

PART B - The trials (Student Booklet p. 17)

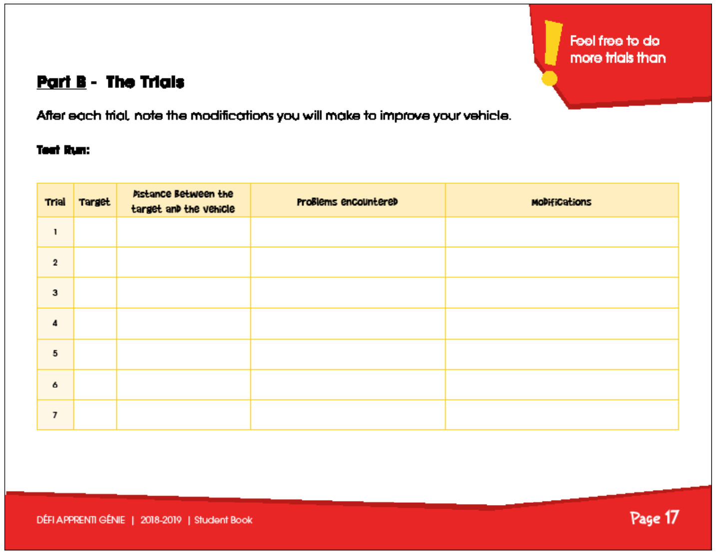
1. During the Trials

Students will test the performance of their vehicle and complete the Table on p. 17 of their Student Booklet. They will:

- Note the distance between the target and the vehicle.
- Note a problem encountered (ie. the wheels don't hold, they turn crookedly, the vehicle is not stable, it rolls crookedly).Note the modification made to the vehicle to solve the problem (add sticks, make sure the axle is properly connected to the center of the wheel).

2. After the trials

- Students will compare their results and determine which trial was the best. They will identify the criteria for success.


Feel free to do more trials than

Part B - The Trials

After each trial, note the modifications you will make to improve your vehicle.

Test Run:

Trial	Target	Distance between the target and the vehicle	Problems encountered	Modifications
1				
2				
3				
4				
5				
6				
7				

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Analysing My Performance

Objectives

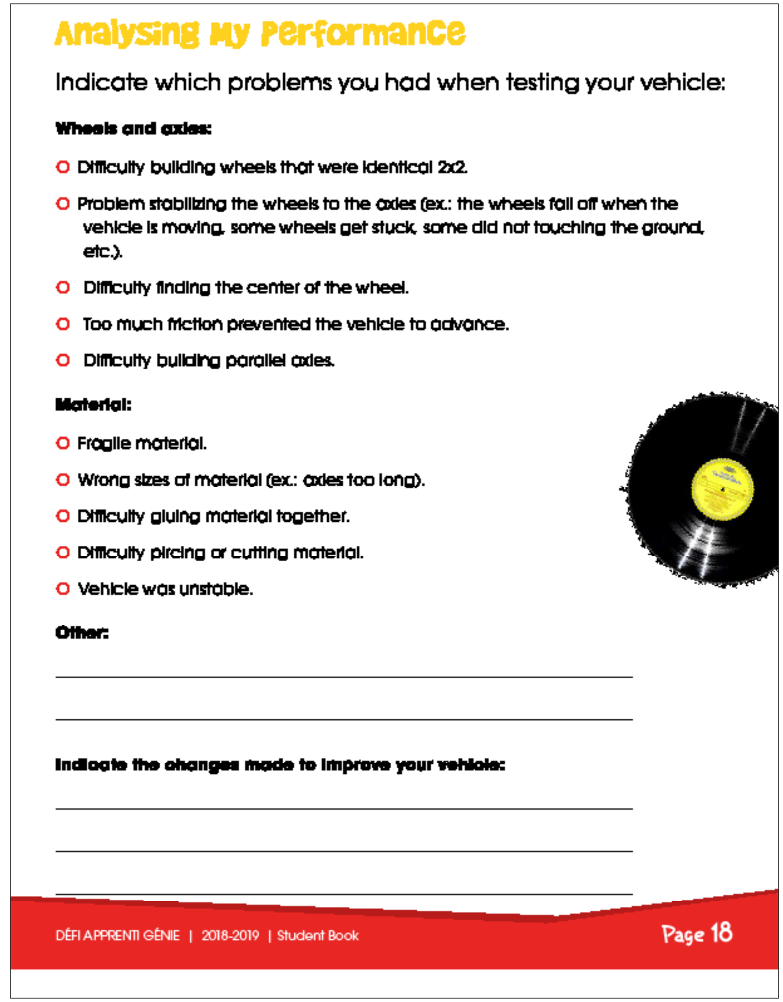
- Students will consolidate their learning.
- Review of the design and creation of the vehicle, and the strategies used to meet the challenge.

Materials

- Vehicles used in trials
- Student Booklet p. 18

Procedure

- Students will present their vehicle, the techniques they used, the modifications they made, and their final result to the class.
- They will compare the differences in the vehicles created by the different teams of students.
- Students will discuss which strategies they used to create their vehicle.
- Each team analyses their experience by completing Student Booklet p. 18.



Analysing My Performance

Indicate which problems you had when testing your vehicle:

Wheels and axles:

- Difficulty building wheels that were identical 2x2.
- Problem stabilizing the wheels to the axles (ex.: the wheels fall off when the vehicle is moving, some wheels get stuck, some did not touching the ground, etc.).
- Difficulty finding the center of the wheel.
- Too much friction prevented the vehicle to advance.
- Difficulty building parallel axles.

Material:

- Fragile material.
- Wrong sizes of material (ex.: axles too long).
- Difficulty gluing material together.
- Difficulty pircing or cutting material.
- Vehicle was unstable.

Other:

____

____

Indicate the changes made to improve your vehicle:

____

____

____

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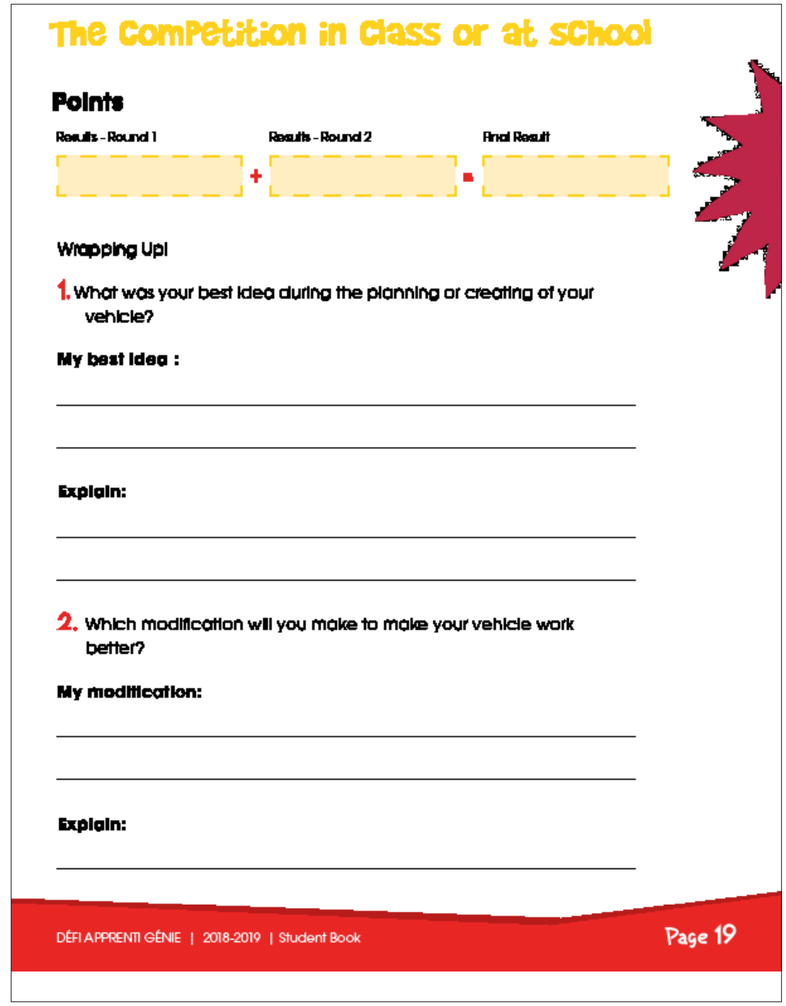
The Competition In Class or at School

Information about the competition can be found on pages 6-8 of the Rules booklet. Here are additional hints to help you set up the competition of your final:

- The height and the width of the inclined plane can vary depending on the material used. The important thing is that participants conduct trials at the same competition area.

  See appendix 3
- If there are many teams, it is possible to create more than one competition area. In this situation, more judges will be needed.
- Once the competition is done, students are invited to write their points on p. 19 of their student booklet.



The Competition in Class or at School

Points

Results - Round 1		Results - Round 2		Final Result
	+		=	

Wrapping Up!

1. What was your best idea during the planning or creating of your vehicle?

My best idea :

Explain:

2. Which modification will you make to make your vehicle work better?

My modification:

Explain:

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Wrapping-up

Review the process and ask students to complete Student Booklet p. 19.

There is a "Frequently asked questions" in French, which is updated every week on the Reseau Technoscience website. Consult it regularly and don't hesitate to send your question if the information you are seeking isn't there.

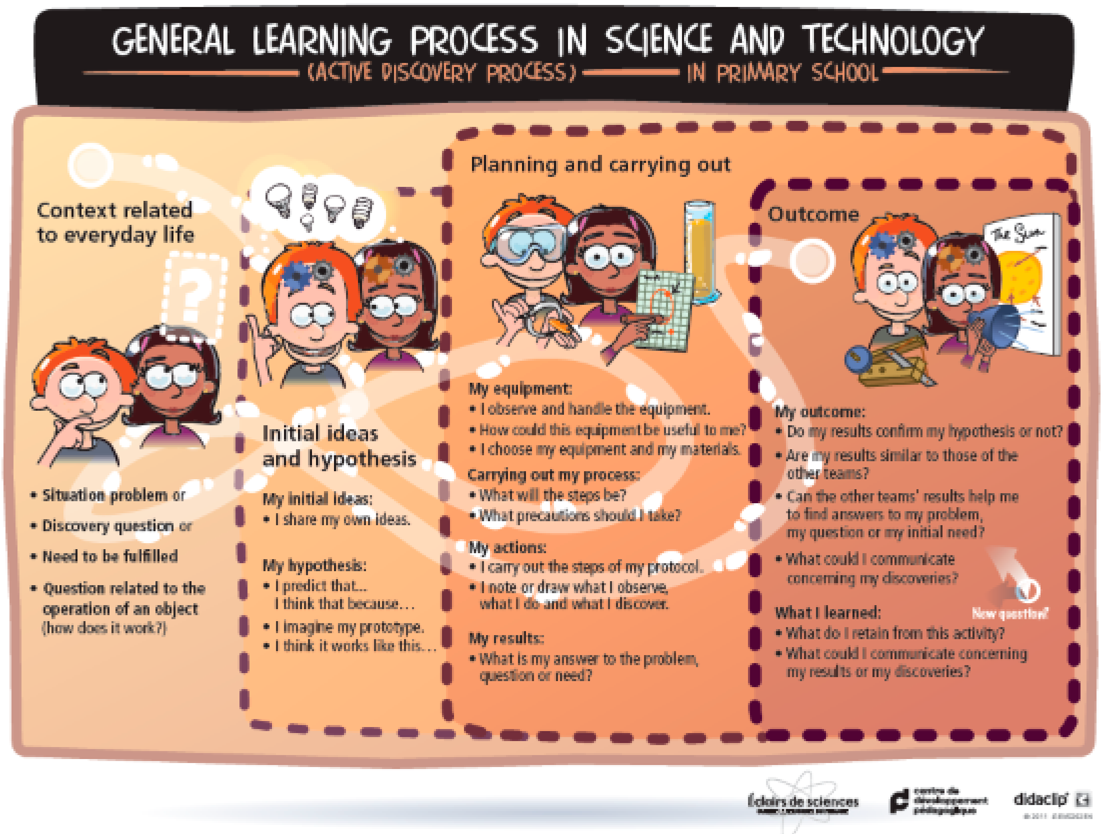
Appendix

Appendix 1 :

Resources for Students

- Friction for students: https://www.ducksters.com/science/friction.php
- Wheel and axle video: https://www.youtube.com/watch?v=ndT35aqDfAQ
- Intermediate Simple Machines: Wheels and Axles: https://www.youtube.com/watch?v=P7xu9O0miEc

Appendix 2 :



Appendix 3 :

Setting Up the Competition Area and the Inclined Plane

FOR THE READY, SET, ROLL! CHALLENGE

2018-2019 EDITION

MATERIALS

Competition Area

- Universal Competition Area (see p. 29 for details) OR masking tape or duct tape to delineate the competition area on the ground.
- Stickers of approximately 2.5 cm in diameter.

Inclined Plane

- Coroplast 50 cm X 150 cm.
- Planks of wood to stabilize the inclined plane if necessary.
- 2 cardboard boxes to support the inclined plane at approximately 50 cm (boxes used to store 10 packs of 500 8 ½ x 11 sheet paper packs).
- Measuring Tape.
- Stopwatch for the time it takes to install the inclined plane.
- Computer and Excel sheet to record results (Excel sheet provided at technoscience.ca) .

IMPLEMENTATION

Competition Area

The distance of the target is measured from the tip of the coroplast that touches the ground to the target. Target A is placed at 1.5 m from the bottom of the inclined plane, and Target C at 3.5 m.

Inclined Plane

The coroplast can be any thickness desired, but note that the thinner it is, the more it will bow. To avoid this bowing of the inclined plane, the coroplast can be doubled or wood slats can be added to it using hot glue. The important thing is that the conditions are the same for all students participating in the competition.

*Le Réseau Technoscience created a universal competition area that can be purchased for use for all the versions of the Junior Tech Challenge. This *Aire de Jeu Universelle* can be accessed at technoscience.ca.

The Challenge

In teams of 2, design a vehicle that can go down an inclined plane and stop as close as possible to Target A and Target C.

Rules

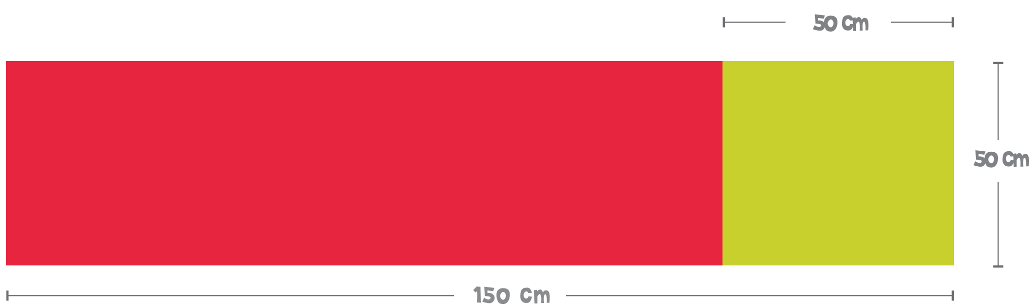
DESIGNING YOUR VEHICLE

1. You must use a plastic bottle (max. 2 L)
2. The maximum length of the vehicle must be 50 cm.
3. Teams must make their wheels and axles out of everyday objects.
4. If a chassis is used, it twill have to be made.
5. You cannot use :
    - Components that can cause injury or alter the competition area;
    - Liquids;
    - Hazardous products;
    - Any chassis from a commercial toy;
    - Wheels and axles coming from toys.

AT THE COMPETITION

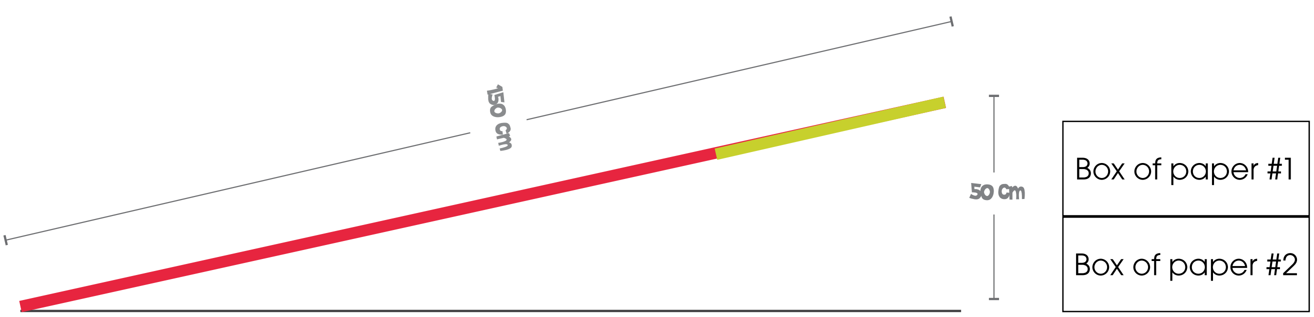
- The team must set up their vehicle at the Start Zone. The wheels of the vehicle must be touching this zone.
- At the start signal, the team must release the vehicle. The vehicle must roll down the inclined plane. Pushing is not permitted.
- Teams can make changes to their vehicle between rounds. (Time will be alloted for this.)

The inclined plane



The team sets up their vehicle at the start zone.

The wheels of their vehicle must be touching this zone.



2 stacked boxes of printing paper (150 cm long by 50 cm wide)

Appendix 4 :
Extras

• FUNCTIONAL LANGUAGE

What do you think? Why? Do you agree? I agree / I disagree think that ...because... I don't think...because...	• Where should we place the axle? • Let's try… placing it this way / that way. • Place it near the… • Place it in the center of the… • Don't push it. Just release it. • Let's change the angle of the inclined plane. • Ready, set, roll!

• SUGGESTED WRITING ACTIVITIES

1. Students can make a poster of the rules for their team.

2. Students can write about the steps they took to create their vehicle.

Example: First, we …

Then, we …

At the end, we decided to…

• CONSOLIDATION AND REFLECTION

Consider these questions during a group reflection, or have the students complete a reflection sheet or a journal entry.

√ Describe how knowledge of science concepts can be useful in every day life.

√ What was your favourite part of the challenge? Explain.

√ What did you find the most difficult part of the challenge? Explain.

√ Name something you learned about teamwork while completing this challenge.

• EVALUATION

Use the C1 rubric to evaluate your students' oral interaction during the different activities.

ELEMENTARY CYCLE THREE ESL GENERIC EVALUATION TOOL

Competency 1, *To interact orally in English*

Class : ____________________

Evaluation criteria	Criterion	Score	Description	Student names		
Evaluation criteria : Participation in exchanges and Use of functional language	Participation in exchanges	**20**	Speaks throughout, contributing substantial content, AND uses techniques to create true interaction (e.g. asks partner questions, reacts to and builds on partner's ideas)			
		16	Speaks throughout, contributing substantial content.			
		12	Speaks throughout, contributing limited content.			
		8	Speaks sporadically.			
		4	Speaks rarely.			
	Use of vocabulary and useful expressions	**15**	Quickly accesses a variety of vocabulary and expressions.			
		12	Uses a variety of vocabulary and expressions.			
		9	Uses basic vocabulary and expressions.			
		5	Lacks vocabulary.			
	Comprehension of messages by an anglophone	**15**	Messages are easily understood despite errors, if any.			
		12	Messages are understood with **some** interpretation.			
		9	Messages are understood with **considerable** interpretation.			
		6	Some messages are not understood despite interpretation.			
		3	Messages are understood; however, they are brief, very simple and/or very few.			
			Total : /50			
			Challenges (see list below)			

Ministère de l'Éducation et de l'Enseignement supérieur – Anglais langue seconde, troisième cycle du primaire – version 2017

Special cases :

- ❖ If a student does not participate or does not speak in English, allot 0/50.
- ❖ If most or all messages cannot be understood, allot 0/50.

Challenges

1. Using English words
2. Pronouncing keywords clearly
3. Using a variety of words
4. Expressing more ideas
5. Elaborating on ideas (giving examples, details, etc.)
6. Expressing a personalized messages
7. Asking questions to maintain interaction, ask for details, ask for clarification, etc.
8. Building on what partner says
9. Reacting to what partner says
10. Initiating an exchange
11. Using vocabulary from available resources
12. Using a specific language convention : ____________________
13. Using the strategy : ____________________
14. ____________________