junior tech challenge

The practical side of science and tech

READY, SET, ROLL!

2024-2025 EDITION

TEACHER'S GUIDE

Intended for:

Intensive ESL Project, Elementary Cycle 3

Science and Technology Program, Elementary Cycle 2 & 3

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A program of

RÉSEAU TECHNOSCIENCE

Together for a new scientific generation

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INTRODUCTION

THE JUNIOR TECH CHALLENGE: A UNIQUE LEARNING SITUATION!

Every year in Quebec, the Junior Tech Challenge allows all elementary school students to learn about science and technology in a creative and fun way. The Junior Tech Challenge is an original, hands-on classroom project that is also a learning and evaluation situation (LES), aligned with the Progression of Learning and the Framework for the Evaluation of Learning for Elementary Science and Technology.

Six challenges are presented cyclically, one per year. Educational tools are offered to meet the challenge of the current year. The pedagogical content can be adapted according to the intended pedagogical objectives. With each new edition, the rules and educational tools are improved upon to ensure that they best meet teachers' needs.

This document is intended to support professionals who teach the Intensive ESL Project or the Science and Technology Program (Elementary), or anyone who wishes to experience the Junior Tech Challenge with their students in English.

THE RETURN OF, READY, SET, ROLL!

The ***Ready, Set, Roll!*** challenge has returned to Quebec classrooms after a five-year hiatus, now in a more streamlined and improved format.

All teaching tools are available free on our technoscience.ca website. To discover optimal strategies for using these tools effectively, we invite you to view the **video capsule** available on the web page *(in French only)*.

FOR INTENSIVE ESL TEACHERS

The students will have the opportunity to:

1. **Develop Competency 1 (*Interact orally in English*) through challenging hands-on activities.**
   The teacher will have various opportunities to observe the students' oral interactions during these activities*.
2. **Review and consolidate science knowledge in an English-language context.**
   The Science, Technology concepts covered in this LES have already been taught in previous cycles. This LES gives students the opportunity to put these concepts into practical application and reach their end-of-cycle objectives (*see Progression of Learning for Science and Technology on pages 6-8.*)
3. **Participate in an authentic learning situation.**
   The Junior Tech Challenge can be organized as a class competition, extended to a school-wide level, or elevated to a regional event. The latter provides students from selected schools the opportunity to connect with their peers from other schools participating in these Regional Finals.

** Optional resources such as evaluation tools, activity suggestions, and graphic organizers tailored for Intensive ESL learners can be found in Appendix 2, ESL Extras*

TEACHING TOOLS AVAILABLE

All documents, including those that have been translated into English, can be accessed on the **technoscience.ca** website.

Required reading to complete the challenge:

- Rules

Suggested materials:

- Teacher's Guide
- Student Handbook
- Junior Tech Certificate of Participation
- Slideshow *(Google Slides, PPT and PDF formats)*
- Capsules vidéo d'accompagnement *(French Only)*

Optional materials *(available in French only)*:

- Tableau de pointage Excel
- Carton de notation pour saisie du pointage
- Fiche de vérification des prototypes

PREPARATORY ACTIVITIES

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

While the activities can be conducted independently, their significance may diminish if not integrated into a meaningful context where students can apply their knowledge within an authentic production. The activities suggested in this LES allow students to become familiar with the design process and to enable the teacher to collect evidence of the following competencies in Science and Technology:

- Competency 1: To propose explanations for or solutions to scientific or technological problems.
- Competency 2: To make the most of scientific and technological tools, objects, and procedures.
- Competency 3: To communicate in the languages used in science and technology.

All activities allow students to establish concrete links with scientific concepts anchored in the **Progression of Learning Science and Technology** and the Québec Education Program.

FROM A CLASSROOM LES TO THE REGIONAL FINALS

The **Junior Tech Challenge** is an authentic learning opportunity in which students experience a Science and Technology design in the classroom. They are invited to compete in one of the many levels of competition - with the ultimate experience of participating at the Regional Finals!

Here are the different levels of finals:

Class Finals	These finals are organized in class and will determine the most efficient prototypes that will move on to the next level: • The school final; • The school service center or school board final *(if there is no school final)*; • The Regional Final *(if there is no school, school service center or school board final)*.
School Finals	School finals are organized per cycle to determine the representatives who will go to the school service center or school board finals. If there are no finals in the school service center or school board, they will go directly to the regional finals.
School Service Center Finals or School Board Finals	These finals are organized per cycle by the school service center or school board, or in collaboration with a member of Réseau Technoscience. If the school service center or school board is planning on holding finals, students will have to register to these finals **first**.
Regional Finals	Regional finals are organized by cycle and bring students from their region together. The members of Réseau Technoscience organize 11 regional finals which will take place in May. Consult the **calendar** for the date of your regional finals. To register teams, contact the Regional Coordinator of the Junior Tech Challenge. The contact information is available on the **website**.

Note: During the regional finals, the challenge may be presented in a different format to that presented in the school service center, or school board finals. The students will be required to change their strategy to adapt to this new format. No advanced preparation is needed, but extra time will be given to students to make the necessary changes.

PROGRESSION OF LEARNING

The intention of this Learning and Evaluation Situation (LES) is to foster the development of students' skills, particularly those associated with the technological design process. Many of these skills are detailed in the activities outlined in the Teacher's Guide. The details of the concepts targeted in each of the activities, and the links with the Progression of Learning are presented below.

KNOWLEDGE APPLIED IN THE LES

This LES incorporates the following knowledge from the **Progression of Learning Science and Technology**:

SCIENCE AND TECHNOLOGY

MATERIAL WORLD

		Elementary					
→	Student constructs knowledge with teacher guidance.						
*	Student applies knowledge by the end of the school year.						
	Student reinvests knowledge.	Cycle 1		Cycle 2		Cycle 3	
A. MATTER		**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**
1. Properties and characteristics of matter							
a. Classifies objects according to their properties *(e.g. colour, shape, size, texture, smell)*		→	*				
e. Describes the shape, colour and texture of an object or a substance				→	*		
f. Distinguishes between the mass *(quantity of matter)* of an object and its weight *(gravitational force acting on the mass)*				→	*		
j. Describes various other physical properties of an object, a substance or a material *(e.g. elasticity, hardness, solubility)*						→	*
k. Recognizes the materials of which an object is made						→	*
C. FORCES AND MOTION		**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**
5. Characteristics of motion							
a. Describes the characteristics of motion *(e.g. direction, speed)*				→	*		
6. Effects of a force on the direction of an object							
a. Identifies situations involving the force of friction *(pushing on an object, sliding an object, rolling an object)*		→	*				
c. Describes the effects of a force on an object *(e.g. Sets it in motion, changes its motion, stops it)*				→	*		
d. Describes the effects of a force on a material or structure				→	*		

→	Student constructs knowledge with teacher guidance.	Elementary					
*	Student applies knowledge by the end of the school year.						
	Student reinvests knowledge.	Cycle 1		Cycle 2		Cycle 3	
D. SYSTEMS AND INTERACTION		**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**
1. Everyday technical objects							
a. Describes the parts and mechanisms that make up an object		→	*				
b. Identifies the needs that an object was originally designed to meet		→	*				
2. Simple machines							
a. Recognizes simple machines *(lever, inclined plane, screw, pulley, winch, wheel)* used in an object *(e.g. lever in seesaw, inclined plane for an access ramp)*				→	*		
b. Identifies the needs that an object was originally designed to meet				→	*		
6. Transportation technology *(e.g. car, airplane, boat)*							
a. Recognizes the influence and impact of transportation technology on people's way of life and surroundings				→	→	→	*
E. TECHNIQUES AND INSTRUMENTATION		**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**
1. Use of simple measuring instruments							
a. Appropriately uses simple measuring instruments *(rulers, dropper, graduated cylinder, balance, thermometer, chronometer)*				→	→	→	*
2. Use of simple machines							
a. Appropriately uses simple machines *(lever, inclined plane, screw, pulley, winch, wheel)*				→	→	→	*
3. Design and manufacture of instruments, tools, machines, structures *(e.g. bridges, towers)*, devices *(e.g. water filtration device)*, models *(e.g. glider)* and simple circuits							
b. Interprets a diagram or a plan containing symbols				→	→	→	*
d. Draws and cuts parts out of various materials using appropriate tools				→	→	→	*
e. Uses appropriate assembling methods *(e.g. screws, glue, nails, tacks, nuts)*				→	→	→	*
F. APPROPRIATE LANGUAGE		**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**
1. Terminology related to an understanding of the material world							
a. Appropriately uses terminology related to the material world		→	→	→	→	→	*
b. Distinguishes between the meaning of a term used in a scientific or technological context and its meaning in everyday language *(e.g. source, matter, body, energy, machine)*		→	→	→	→	→	*

→	Student constructs knowledge with teacher guidance.	Elementary				
*	Student applies knowledge by the end of the school year.					
	Student reinvests knowledge.	Cycle 1		Cycle 2		Cycle 3
2. Conventions and types of representations specific to the concepts studied						
a. Communicates using appropriate types of representations that reflect the rules and conventions of science and technology *(e.g. symbols, graphs, tables, drawings, sketches, norms and standardization)*				→	→	→ *

STRATEGIES

EXPLORATION STRATEGIES

- Distinguishing between the different types of information useful for solving the problem.
- Recalling similar problems that have already been solved.
- Becoming aware of his or her previous representations.
- Drawing a diagram for the problem or illustrating it.
- Formulating questions.
- Putting forward hypotheses *(e.g. individually, as a team, as a class)*.
- 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.
- Taking into account the constraints involved in solving a problem or making an object *(e.g. specifications, available resources, time allotted)*.
- Examining his or her mistakes in order to identify their source.
- 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 technical design to illustrate a solution *(e.g. diagrams, sketches, technical drawings)*.
- Using different tools for recording information *(e.g. diagrams, graphs, procedures, notebooks, logbook)*.

COMMUNICATION STRATEGIES

- Using different means of communication to propose explanations or solutions *(e.g. oral presentation, written presentation, procedure.)*
- Using tools to display information in tables and graphs or to draw a diagram.
- Organizing information for a presentation *(e.g. tables, diagrams, graphs)*.
- Exchanging information.
- Comparing different possible explanations for, or solutions to, a problem in order to assess them *(e.g. full-group discussion)*.

OVERVIEW

DESCRIPTION	TIME	PEDAGOGICAL RESOURCES
PREPARATION		
Setting the Stage The teacher presents the challenge to the students but does not give them all the details. The rules will be presented at a later time.	30 minutes	• Slideshow *(Setting the Stage)* • Rules • Student Handbook p. 2-3 • **Capsule 1 - Mise en situation** • Intensive ESL Extras - Appendix 2A
Activity 1: The Wheel Hunt Students will gain an understanding of the vocabulary associated with various vehicle components. Additionally, they will analyze the differences between various rolling objects and develop the ability to compare and interpret their observations.	45 minutes	• Slideshow *(Activity 1)* • Student Handbook p. 4-5 • Scientific Notions (p. 10) • Intensive ESL Extras - Appendix 2B
Activity 2: Let's Get Rolling! The activity involves constructing a functional wheel-and-axle system. It will help students identify the factors that enable wheels to roll effectively.	75 minutes	• Slideshow *(Activity 2)* • Student Handbook p. 6 • Intensive ESL Extras - Appendix 2C + C1 Evaluation Tool
Activity 3: It's Rolling! Down We Go! This activity guides students through each step of the General Learning Process in Science and Technology. By controlling experimental parameters and focusing on one factor at a time *(such as height or mass)*, students will understand the importance of conducting multiple tests to ensure replicability and reliability of their results.	120 minutes	• Student Handbook p. 7-12 • Intensive ESL Extras – Appendix 2D + C1 Evaluation Tool
Activity 4: Let's Create Friction! The student will control the friction on a vehicle's wheels to slow its descent from an inclined plane and aim to hit targets from a specified reference distance.	120 minutes	• Student Handbook p. 13-14 • Scientific Notions (p. 10) • Intensive ESL Extras – Appendix 2A
IMPLEMENTATION		
Preparing to Meet the Challenge The teacher will present the rules of the competition to the students. Working in teams of one, two, or three, they will design and build their prototype for the competition.	120 minutes	• Rules • **Capsule 2 - En route vers le défi** • Slideshow *(Setting the Stage)* • Student Handbook p. 15-18 • Intensive ESL Extras – Appendix 2A + C1 Evaluation Tool
The Trials Students will test the effectiveness of their prototype and make adjustments based on the challenges they encounter.	120 minutes	• Student Handbook p. 18-20 • Competition area *(Appendix 1)* • Inclined Plane *(Appendix 1)* • Intensive ESL Extras – C1 Evaluation Tool
3, 2, 1, Let's Go! Students will carry out the challenge.	60 minutes	• Rules • Student Handbook p. 21
REVIEW AND REFLECT		
Reflection The teacher and the students will review the design and the construction of their prototypes, as well as the strategies that will be used to carry out the task.	30 minutes	• Student Handbook p. 22 • **Capsule 3 - Retour sur le défi** • Intensive ESL Extras – Appendix 2E

SCIENTIFIC NOTIONS

Chassis : The supporting frame of a vehicle.

Axle : Rods to which the wheels are attached.

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.

Friction occurs between two objects in contact as they move relative to each other. The surfaces of these objects are covered with microscopic irregularities that catch and collide, causing a reduction in speed, changes in direction, heat generation, and noise. These irregularities vibrate, transferring the vibration to the air and ultimately to our eardrums, producing sound.

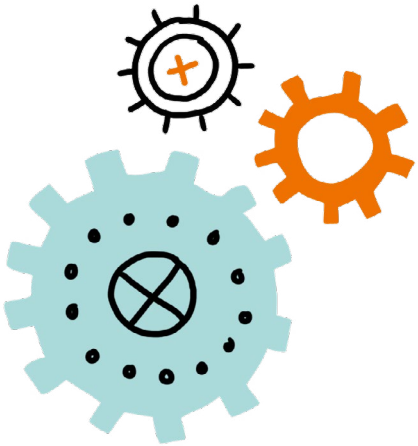
SOME COMMON SITUATIONS INVOLVING FRICTION:

- The treads that grip and prevent tractors from slipping while climbing a hill.
- Car tires that grip the asphalt, preventing them from sliding.
- The soles of our shoes that create friction with the sidewalk, helping prevent us from slipping. In fact, it's much harder to move on ice than on pavement because there is far less friction!

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

Roue : 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.

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.



SETTING THE STAGE

Pedagogical Intentions

- Present the LES *(Learning and Evaluation Situation)* and the challenge
- Generate student interest.

Materials

- Slideshow *(Setting the Stage)*
- Rules
- Student Handbook p. 2-3
- Capsule 1 - Mise en situation *(en français seulement)*
- Intensive ESL Extras - Appendix 2A

Procedure

1. Watch the video capsule with the class.
2. Use the slideshow and the rules, to review the main points of the challenge.
3. To help generate interest, distribute the Student Handbook and go over pages 2-3.

Intensive ESL Extras: Distribute Appendix 2A. Inform students that these are the important scientific notions that they will be exploring throughout the challenge. Invite them to fill out only what they know, and during later activities, they will be asked to complete the rest of the table, if needed.

ACTIVITY 1 - THE WHEEL HUNT

Pedagogical Goals

- To gain an understanding of the vocabulary of the components of various vehicles.
- To conduct a technological analysis of existing objects that roll.
- To compare the characteristics of different models.
- To record observations using a designated tool.

Materials

- Slideshow *(Activity 1)*
- Student Handbook p. 4-5
- Scientific Notions *(Teacher's Guide p. 10)*
- Objects that roll
- Intensive ESL Extras – Appendix 2B

Procedure

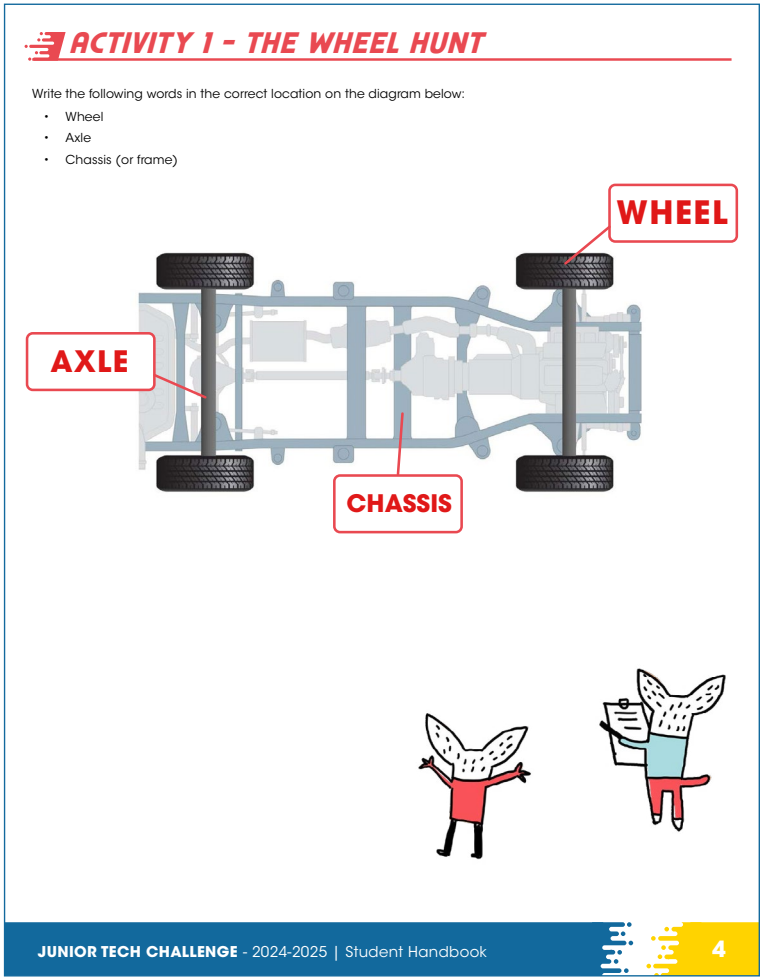
Preparation

1. Watch the slideshow for Activity 1 slideshow with the students. It presents the wheel as a technological object and introduces vocabulary related to the mechanisms of a wheel.
2. Invite students to identify objects that roll in their environment *(toys, objects in the home, outside, in school, etc.)*.
3. Invite students to choose some rolling objects from home to bring toys with wheels to class. For the activity to run smoothly, there should be at least 1 object for every 3 students.

Implementation

4. Review the vocabulary of the wheel using the diagram on page 4 of the Student Handbook *(wheel, axle, chassis)*.
5. Explain to the students that they will be making scientific observations of the rolling systems brought to class. They will need to identify and name their observations and note them at the top of the table on page 5 of the Student Handbook *(Criteria 1, 2, 3).**

   ** Intensive ESL students can use the handout (Appendix 2B) before filling out page 5 of their Student Handbook. This extra step offers them vocabulary and functional language support to help sustain a dialogue and complete the page.*



6. Encourage students to find their own examples of observation criteria that could be used to analyze the rolling objects and to help them understand how they work.

Simple guiding questions:

- "What similarities do you notice when observing the wheels?"
- "What differences do you notice when observing wheels?"

Example of a student response:

- "Some wheels are small, and others are large. So, the size of the wheels could be considered an observation criterion."

7. Use these questions to encourage students to create a list of observation criteria that can be used to analyze the wheels.

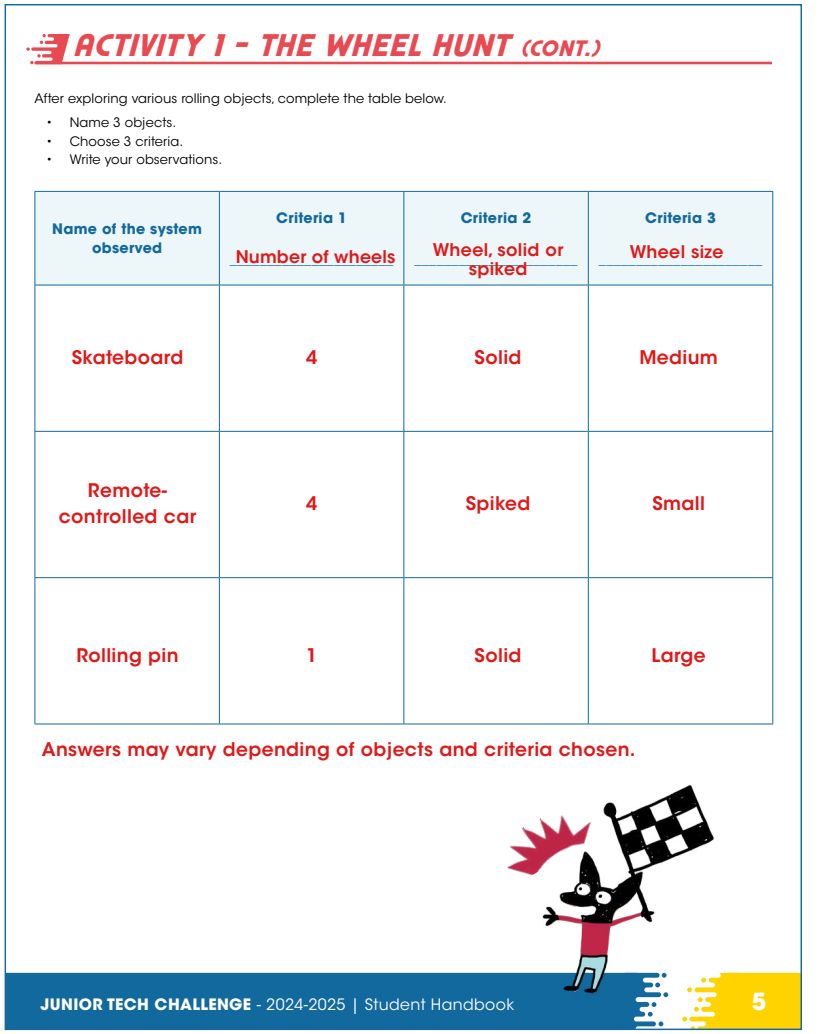
8. The following list of observation criteria can be used to supplement the list compiled by the students:

- Wheel with or without axle
- Spoked or solid wheel
- Wheel fixed on axle or freewheel
- With or without tire
- Material used for wheel and axle
- Wheel width, stability or size
- Axle width or length
- Number of wheels on object
- Connection system between wheel and axle

9. Divide class into teams of 2-3 students.

10. Invite the teams to choose observation criteria from among those proposed.

Adaptation: The number of observation criteria for each team can be adjusted ranging from 1 to 3, based on the students' needs and abilities.



ACTIVITY 1 - THE WHEEL HUNT (CONT.)

After exploring various rolling objects, complete the table below.

- Name 3 objects.
- Choose 3 criteria.
- Write your observations.

Name of the system observed	Criteria 1 Number of wheels	Criteria 2 Wheel, solid or spiked	Criteria 3 Wheel size
Skateboard	4	Solid	Medium
Remote-controlled car	4	Spiked	Small
Rolling pin	1	Solid	Large

Answers may vary depending of objects and criteria chosen.

11. Set up the classroom to facilitate the movement of rolling objects between teams or allow teams to rotate from one object to another to conduct their observations effectively.

12. Ask students to record their observations in the table on page 5 of the Student Handbook.

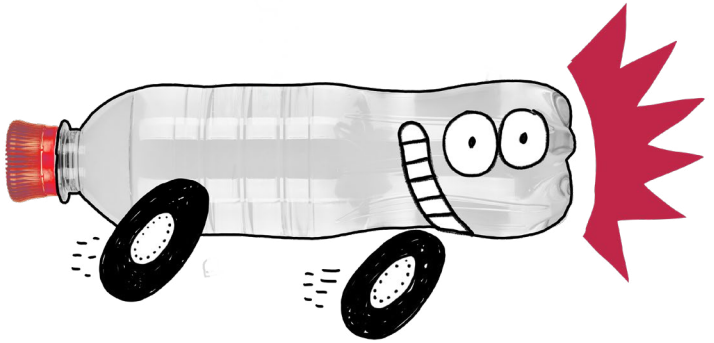
Integration Phase

13. Invite the teams to present their observations to the class.

14. Record the students' responses on the board to create a summary presenting the variety within different wheel systems, noting the similarities and the differences.

Here are some examples the teacher can note on the board:

- Every wheel is different.
- There are large and small wheels.
- Some wheels have spokes, others don't, because they're solid.
- Some wheels are made of plastic, others of wood.



ACTIVITY 2 – LET'S GET ROLLING!

Pedagogical Goals

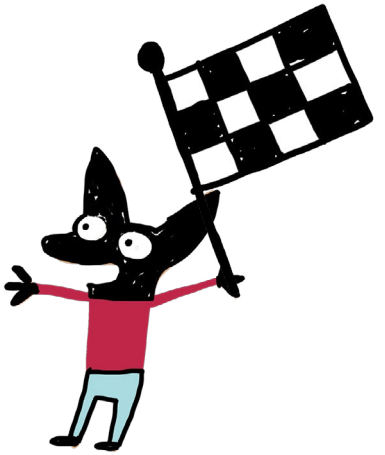
- To introduce students to the principles underlying the design and construction of axles and wheels.
- To identify the functions of the main parts of a rolling system.
- To identify the characteristics of the best rolling systems.

Materials

- Slideshow *(Activity 2)*
- Student Handbook p. 6
- Intensive ESL Extras - Appendix 2C + C1 Evaluation Tool

Suggested materials to help build the prototype

CHASSIS	WHEELS	AXLES	CONNECTION FOR SECURING WHEELS TO AXLES
Sturdy cardboard	Bottle caps of any kind	Straws	Nuts and bolts
Long, thin box	Lids of any kind	Wooden skewers	Brass paper fasteners
Milk or juice carton	Empty spools or thread	Wooden dowels	Pipe-cleaners, nails and necklace beads *(glued with hot glue or modeling clay)*
Corrugated plastic board	CDs	Pencils	Adhesive or masking tape
Thin pieces of wood	Corks	Empty pens tubes	Plasticine
2L plastic bottle	Buttons	Plastic tubes	Hot glue
1 gallon plastic bottle	Coasters		White glue



Procedure

Preparation

1. View the slide show *(images of wheel models)* with students. At the end of the activity, you'll find photos of wheel models that can be built by students. You can choose to show these photos before or after the activity. To spark students' creativity and motivate them to enhance their prototypes, consider presenting the slideshow midway through the activity instead of at the start.

2. Inform students that after examining the wheels, they will now move on to assembling them.

a. Ask students about the strategies they could use to build rolling systems.

b. Use the slideshow to present concret examples of materials that could be used to assemble wheels.

c. Ask the following guiding questions.

- What materials could you use to make the chassis? The wheels? The axles?
- How would you connect the wheels together?
- How would you attach the axle to the wheels?

Implementation

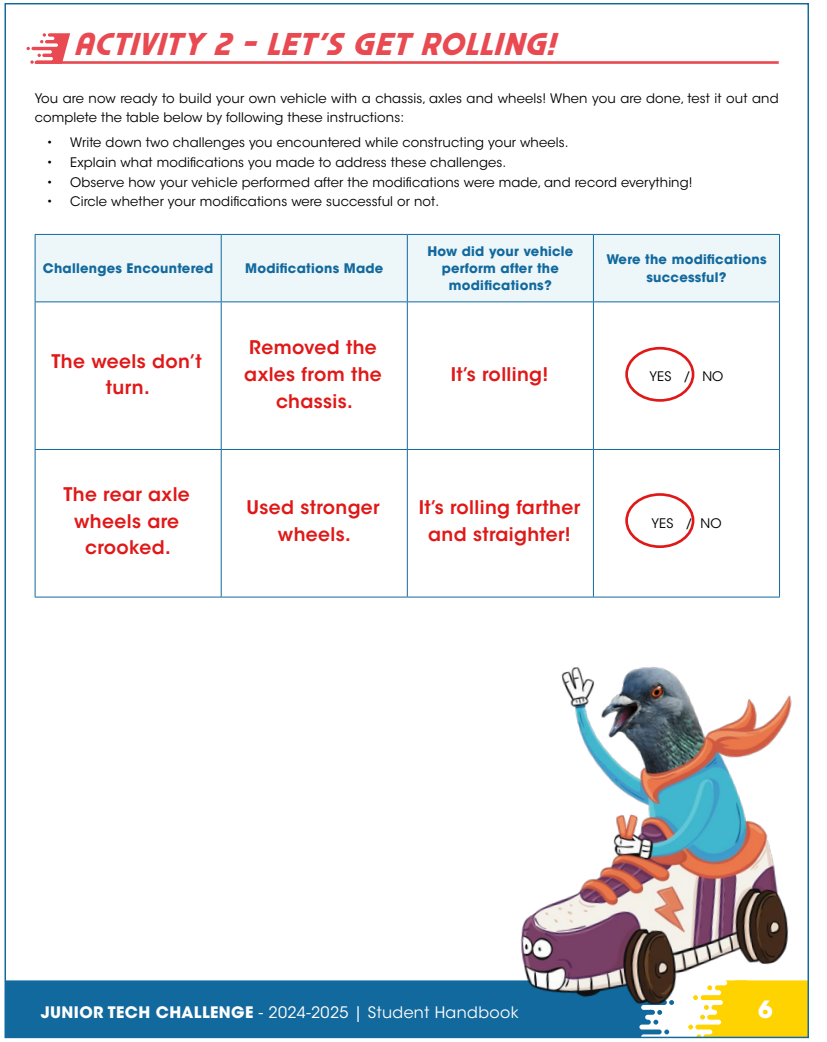
3. Encourage students to gather materials for building wheels by bringing items from home, such as CDs, corks, toilet paper rolls, and hockey pucks.

Intensive ESL Extras: Appendix 2C contains the vocabulary necessary for finding objects at home, and the functional language required for testing the objects. Students can use the table to help them remember the vocabulary by drawing images beside the words.

4. In teams, students build a temporary chassis to which they will attach the wheels and axles made from the materials available to them.

5. Students test wheels of different shapes, sizes, and axle designs. As they encounter challenges, provide guidance and support to help them troubleshoot make modifications to their wheels, while ensuring they remain actively engaged in the assembly process. Encourage reflection by asking which aspects of their design worked well and which needed improvement. Revisit the questions from Step 2 to help them analyze and solve any issues.

Intensive ESL Extras: The teacher can use the C1 Evaluation tool to circulate around the room and evaluate discussions. Please note that this tool can be used several times throughout the design process.



ACTIVITY 2 – LET'S GET ROLLING!

You are now ready to build your own vehicle with a chassis, axles and wheels! When you are done, test it out and complete the table below by following these instructions:

- Write down two challenges you encountered while constructing your wheels.
- Explain what modifications you made to address these challenges.
- Observe how your vehicle performed after the modifications were made, and record everything!
- Circle whether your modifications were successful or not.

Challenges Encountered	Modifications Made	How did your vehicle perform after the modifications?	Were the modifications successful?
The weels don't turn.	Removed the axles from the chassis.	It's rolling!	YES / NO
The rear axle wheels are crooked.	Used stronger wheels.	It's rolling farther and straighter!	YES / NO

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Integration

6. Invite students to document their problem-solving process in the table provided on page 6 of the Student Handbook. Encourage them to use keywords to organize their thoughts, which will help them actively contribute to the group discussion.

7. Lead the students in a class discussion to share their wheel-building experiences.

Sample question to highlight the problems encountered and the solutions found by one team:

- *"I noticed that for one team, the axle was rubbing on the frame, and it wasn't rolling well. The team told me that they modified the system by enlarging the hole in the chassis to leave space for the axle to turn better. What problems did you encounter during the manufacturing process? What modifications did you make to solve these problems?"*

Additional sample questions:

- *"How did you enlarge the hole? What tools did you use?"*

8. During the discussion, encourage students to use precise vocabulary to describe the quality of the systems they have designed.

EXAMPLE OF STUDENT RESPONSE	REFORMULATED RESPONSEN
The wheel was rubbing in the hole, so we made it bigger to make it roll better.	There was **friction** around the **axle**, which caused the wheel to roll poorly. We enlarged the axle hole to improve the wheel **rotation**.
It slipped rather than rolled, so we removed the tape and rolled the wheel into a cardboard space.	The wheels were fixed and couldn't roll, as the axles were taped to the chassis. A cardboard gap was created to allow the axle to move.
The wheel kept turning and rolling crookedly. We made a new wheel.	We observed an irregular rotation…etc.

9. In teams, students create a summary identifying the key factors that contributed to their vehicle's performance. They can present their findings through small-group discussions, drawings, sketches, or classroom displays.

ACTIVITY 3 – IT'S ROLLING! DOWN WE GO!

Pedagogical Goals

- To experience the steps of The General Learning Process in Science and Technology.
- To control experimental parameters by studying only one factor at a time *(height and mass)*.
- To recognize the importance of conducting multiple trials to verify the repeatability of the results.
- To predict and monitor the distance traveled by a vehicle by different factors *(such as position on the inclined plane, mass, etc.)*.

Materials

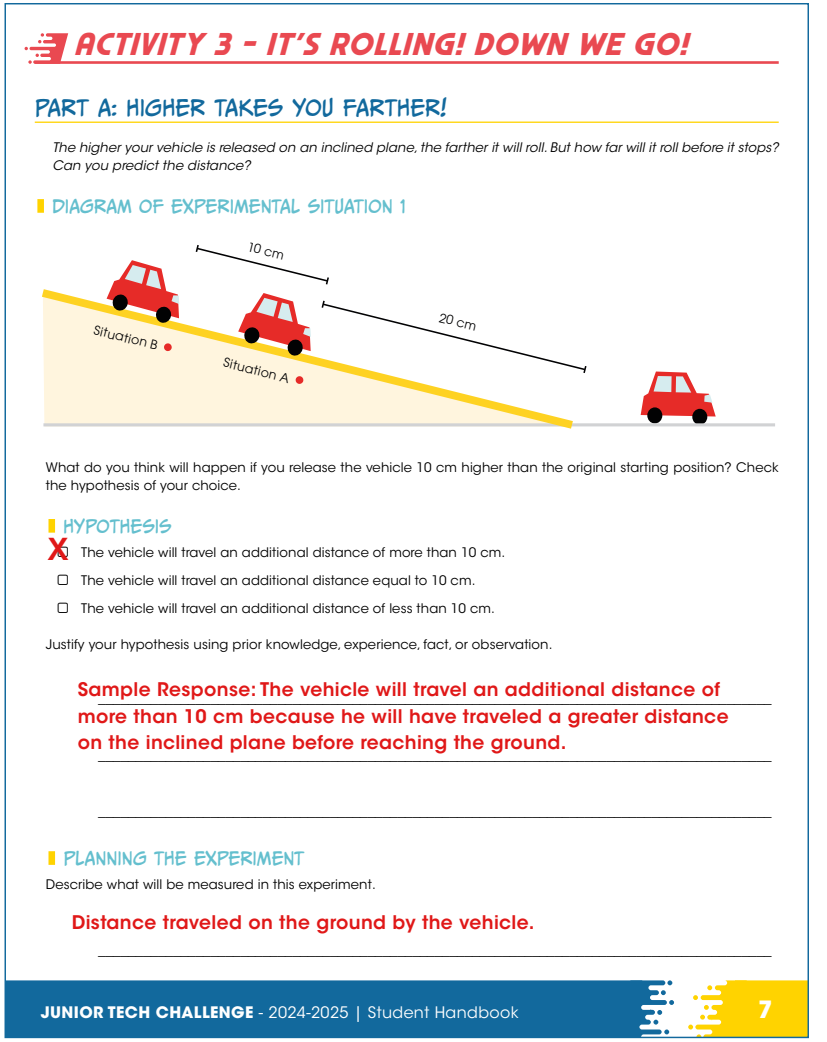
- Student Handbook p.7-12
- Intensive ESL Extras – Appendix 2D + C1 Evaluation Tool
- An inclined plane *(you can use the same inclined plane as in the challenge or create a smaller one)* - ideally, several ones
- An object to elevate the inclined planes
- A scale
- For each team of two students:
  - A tape measure
  - A small vehicle *(a toy car or truck)* to which you can add a small weight

Procedure

Part A: Higher Takes You Farther!

Preparation

1. Prior to this activity, the teacher must build the inclined planes and test the vehicles on it. Depending on the models, materials, and the angle of the inclined plane, the vehicles could travel different distances. For the purposes of this activity, the first hypothesis *"The vehicle will travel an additional distance of more than 10 cm"* would have to be fulfilled during the experiment.
2. The inclined planes can be marked with the starting position *(Situation A)* and the position 10 cm higher *(Situation B)*.



ACTIVITY 3 – IT'S ROLLING! DOWN WE GO!

PART A: HIGHER TAKES YOU FARTHER!

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?

DIAGRAM OF EXPERIMENTAL SITUATION 1

10 cm
20 cm
Situation B
Situation A

What do you think will happen if you release the vehicle 10 cm higher than the original starting position? Check the hypothesis of your choice.

HYPOTHESIS

- [X] The vehicle will travel an additional distance of more than 10 cm.
- [ ] The vehicle will travel an additional distance equal to 10 cm.
- [ ] The vehicle will travel an additional distance of less than 10 cm.

Justify your hypothesis using prior knowledge, experience, fact, or observation.

Sample Response: The vehicle will travel an additional distance of more than 10 cm because he will have traveled a greater distance on the inclined plane before reaching the ground.

PLANNING THE EXPERIMENT

Describe what will be measured in this experiment.

Distance traveled on the ground by the vehicle.

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3. Organize the room so that there is enough space for the practice sessions to be carried out.

Intensive ESL Extras: The teacher can use the C1 Evaluation tool to circulate around the room and evaluate discussions.

4. Ask students to choose one of the three hypotheses. This can be an opportunity to use the mathematical symbols <, > and =.

5. When students justify their hypothesis, they can draw on their own prior knowledge, everyday experience, reasoning, fact or observation. The student does not have to correct their hypothesis after the experiment.

6. The student must anticipate that they will be measuring the distance travelled by the vehicle on the ground. It is important to specify that the measurement will be taken on the ground.

7. When completing the table on page 8 of the Student Handbook, students must recognize that they are only modifying one element, i.e. "the distance travelled by the vehicle on the inclined plane".

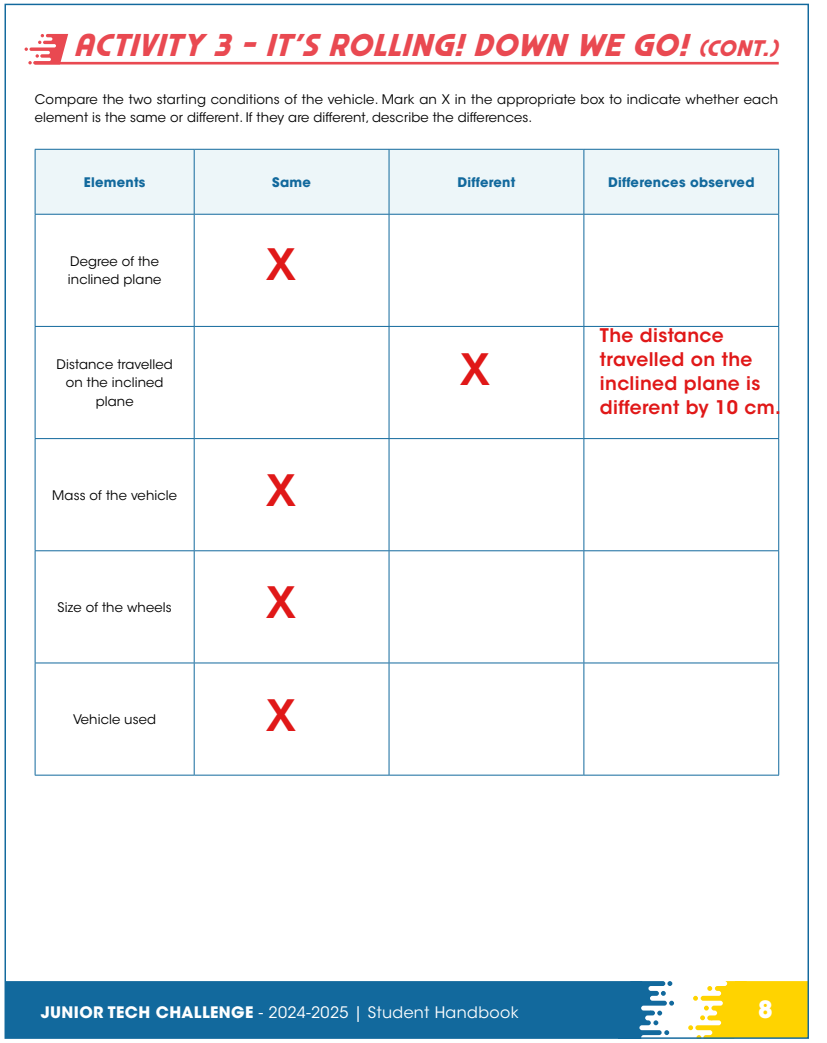
Implementation

8. Discuss the data collected in the table with students by asking guiding questions.

Intensive ESL Extras: Appendix 2D suggests a way students can find the answers collaboratively.

Example of guiding questions and answers:

a. What is data? Data is the information or measurements obtained during an experiment.
b. Why is it necessary to organize data in a table? A data table organizes information in a way that makes it easier to understand.
c. Why do we need to conduct several trials? We do several trials because the results may not always be the same.
d. How do you calculate the average? *(Notion learned in 3rd cycle mathematics, although some younger students may develop a strategy for calculating it.)* Since there is three résultats, we add them together and divide the result by three.
e. What is the difference between Situation A and Situation B? Situation A is the original starting position, while Situation B starts at a position that is 10 cm higher.



ACTIVITY 3 – IT'S ROLLING! DOWN WE GO! (CONT.)

Compare the two starting conditions of the vehicle. Mark an X in the appropriate box to indicate whether each element is the same or different. If they are different, describe the differences.

Elements	Same	Different	Differences observed
Degree of the inclined plane	X		
Distance travelled on the inclined plane		X	The distance travelled on the inclined plane is different by 10 cm.
Mass of the vehicle	X		
Size of the wheels	X		
Vehicle used	X		

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9. Divide class in to teams of two.

10. Organize the order in which teams take turns on the inclined plane, so that all vehicles are tested three times in the initial position, and three times at the position that is 10 cm higher.

11. Invite the teams to record the measurements in the table on page 9 of the Student Handbook.

12. After the teams have completed their tests, invite them to calculate the average of their data and confirm or refute their initial hypothesis.

Integration

13. The teacher explains that the experiment allowed us to reach a conclusion because:

- Only one factor was modified each time, while the other factors remained the same *(constant)*.
- Several measurements were taken under the same conditions.

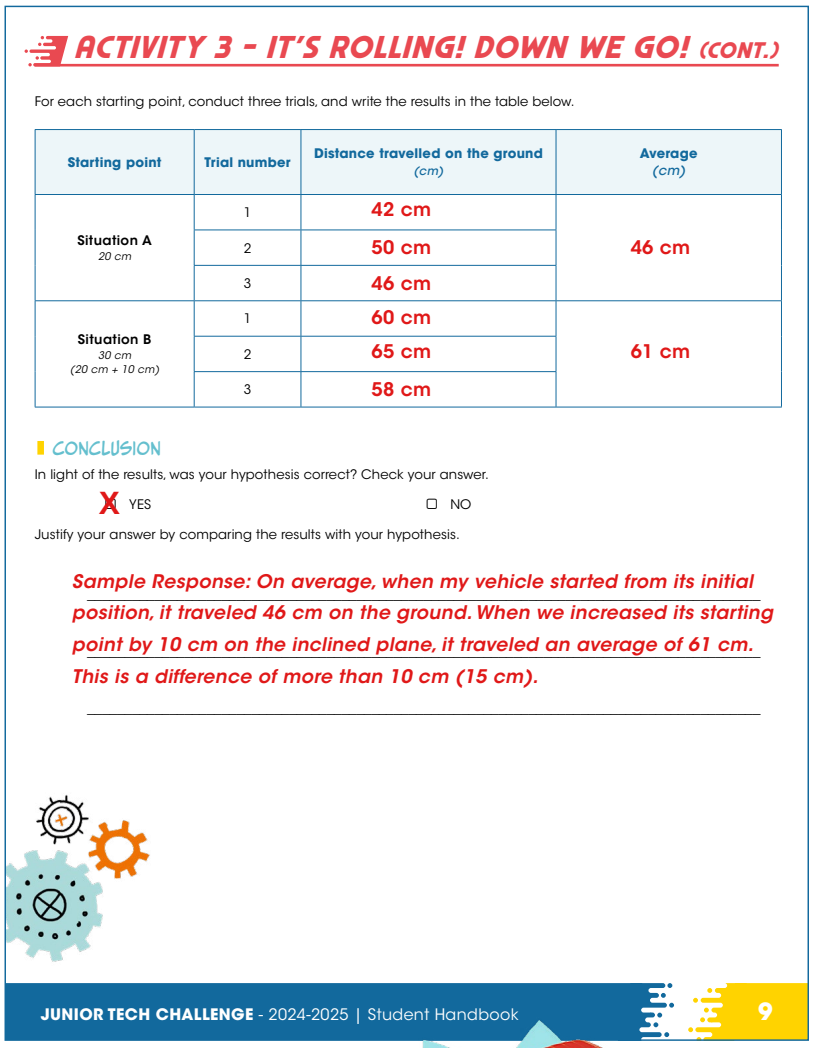
14. The teacher leads a class discussion to determine whether all the vehicles performed in the same way. The results will vary according to the mass, the design of the axles, the size of the wheels, etc.

Part B: Does Heavier Mean Farther?

15. Invite students to repeat steps 4 to 7 and 10 to 12 varying the mass rather than the starting position. The results associated with Situation A in Part A can be repeated in Situation A in Part B.

Note : Mass can vary the distance covered in different ways. Sometimes, adding mass can improve a prototype's adhesion, enabling it to go further. On the contrary, for another prototype, mass can slow the prototype down when it reaches the bottom of the inclined plane. The main aim of this exercise is to introduce students to the scientific approach, so that they can use it when designing their prototype. It's up to them to discover it for themselves through their experimentation!

16. If there is enough time, more experiments can be conducted varying other factors such as wheel size, etc.



ACTIVITY 3 – IT'S ROLLING! DOWN WE GO! (CONT.)

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

Starting point	Trial number	Distance travelled on the ground *(cm)*	Average *(cm)*
Situation A *20 cm*	1	42 cm	46 cm
	2	50 cm	
	3	46 cm	
Situation B *30 cm (20 cm + 10 cm)*	1	60 cm	61 cm
	2	65 cm	
	3	58 cm	

CONCLUSION

In light of the results, was your hypothesis correct? Check your answer.

X YES ☐ NO

Justify your answer by comparing the results with your hypothesis.

Sample Response: On average, when my vehicle started from its initial position, it traveled 46 cm on the ground. When we increased its starting point by 10 cm on the inclined plane, it traveled an average of 61 cm. This is a difference of more than 10 cm (15 cm).

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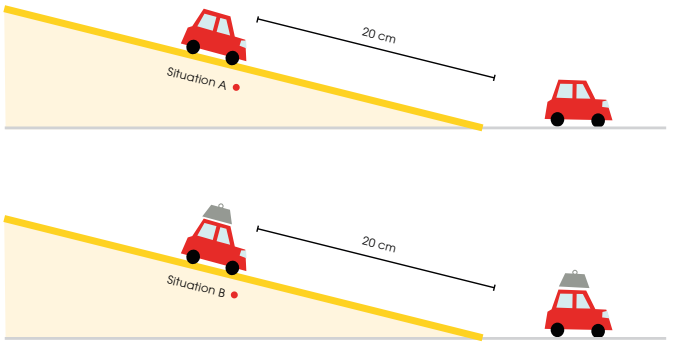
ACTIVITY 3 - IT'S ROLLING! DOWN WE GO! (CONT.)

PART B: DOES HEAVIER MEAN FARTHER?

In the following experiment, you will observe what happens when you increase the mass of your vehicle.

DIAGRAM OF EXPERIMENTAL SITUATION 2



What do you think will happen if you increase the mass of the vehicle? Check the hypothesis of your choice.

HYPOTHESIS

- ☐ The vehicle will travel farther.
- ☒ The vehicle will not travel as far.
- ☐ The vehicle will travel the same distance.

Justify your hypothesis using prior knowledge, experience, fact, or observation.

Sample Response: The vehicle will travel a shorter distance when its mass increases because heavier trucks on the road tend to move more slowly.

PLANNING THE EXPERIMENT

What will I measure in my experiment?

Distance traveled on the ground by the vehicle.

ACTIVITY 3 - IT'S ROLLING! DOWN WE GO! (CONT.)

Compare the two starting conditions of the vehicle. Mark an X in the appropriate box to indicate whether each element is the same or different. If they are different, describe the differences.

Elements	Same	Different	Differences measured or observed
Degree of the inclined plane	X		
Distance travelled on the inclined plane	X		
Mass of vehicle		X	The vehicle's mass will be heavier.
Size of the wheels	X		
Vehicle used	X		

ACTIVITY 3 – IT'S ROLLING! DOWN WE GO! (CONT.)

IMPLEMENTATION

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

Starting point	Trial number	Distance travelled on the ground *(cm)*	Average *(cm)*
Situation A *Vehicule*	1	42 cm	46 cm
	2	50 cm	
	3	46 cm	
Situation B *Vehicule + additional mass*	1	65 cm	57 cm
	2	52 cm	
	3	55 cm	

CONCLUSION

In light of the results, was your hypothesis correct? Check off your answer.

☐ YES ☒ NO

Justify your answer by comparing the results with your hypothesis.

Sample Response: On average, when my vehicle had its initial mass, it traveled 46 cm on the ground. When its mass was increased, it traveled an average of 57 cm. Therefore, it went farther when it was heavier.

ENRICHMENT

Repeat the experiment using different masses. Can you predict how far the vehicle will travel using a different mass? Write your hypothesis before every trial.

Answers will vary.

ACTIVITY 4 – LET'S CREATE FRICTION!

Pedagogical Intentions

- To use wheel friction to slow down a vehicle descending from an inclined plane.
- To control a vehicle so it reaches its target on the ground, after being released from a fixed starting position.
- To record the vehicle's various stops on a diagram.

Matériel

- Student Handbook p.13-14
- Scientific Notions *(Teacher's Guide p.10)*
- Intensive ESL Extras – Appendix 2A
- An inclined plane *(same as in Activity 3)* – ideally, several ones
- For each team of two students:
  - A small vehicle *(a toy car or truck)*
  - Blue mounting putty
  - Wooden coffee stirrers cut into approximately 2 cm pieces
  - 3-meter measuring tape
  - Masking tape

Procedure

Preparation

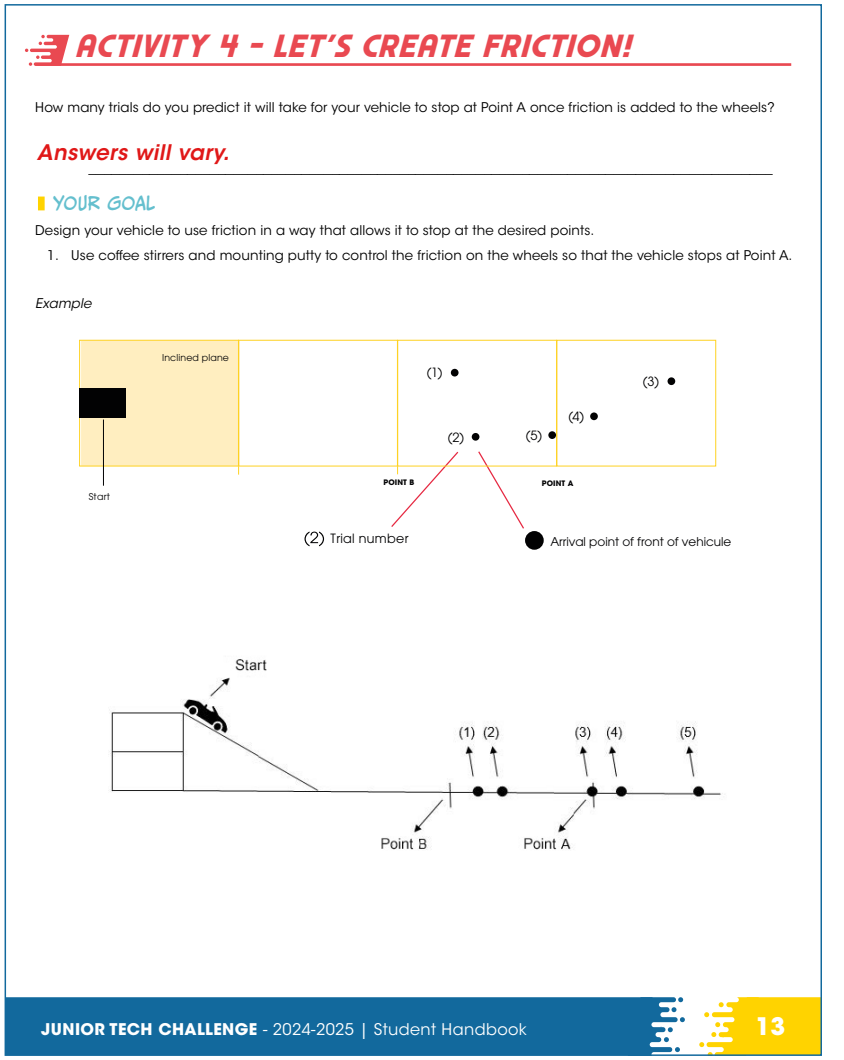
1. Install the inclined plane *(see example on page 13 of the Student Handbook)*.

2. Work with the students to identify the vehicles that can travel at least 1.5 meters on the ground when starting from the highest point on the inclined plane. The highest is defined by the position of the rear wheels at the edge of the inclined plane.

3. Establish points A and B.

- Point A represents approximately 2/3 of the distance all the vehicles have traveled.
- Point B represents approximately 1/3 of the distance all the vehicles have traveled.
- 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 most vehicles reach 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.

4. Mark the points with some masking tape.



ACTIVITY 4 – LET'S CREATE FRICTION! (CONT.)

Implementation

5. Present the following questions to the students to set the stage for the activity. Encourage them to share their perspectives on the topic.

- 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?

Intensive ESL Extras: Refer students to Appendix 2A where they can add examples of friction to the table.

6. Using friction, design the vehicle so that it will stop at the desired points.

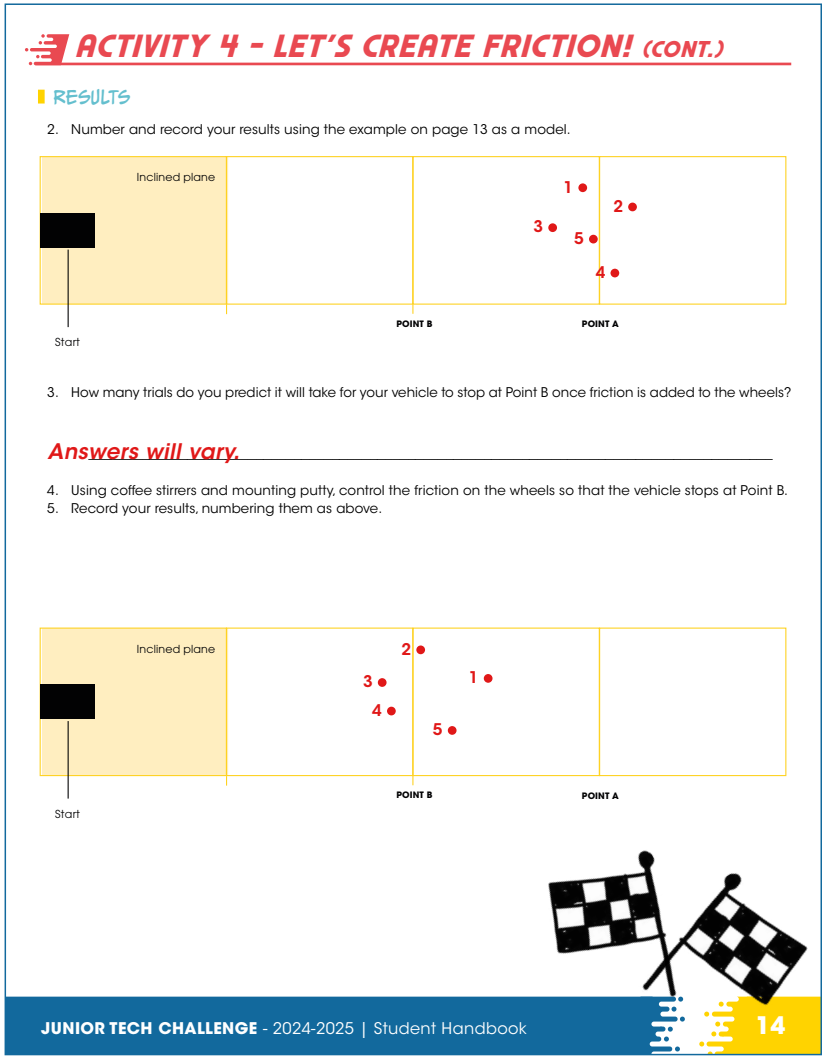
a. Place a ball of blue mounting putty near the wheels on the chassis of the toy.
b. Place a 2 cm coffee stirrer on the blue mounting putty so that the stick rubs gently on the wheel.

7. Use the diagram 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 *(see example in Student Handbook p.13)*.
c. Change the position of the coffee stirrer until the vehicle reaches Point A.
d. Repeat the same process for Point B.
e. It is possible to control the friction on more than one wheel by adding more coffee stirrers and blue mounting putty.

Integration

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



PREPARING TO MEET THE CHALLENGE!

Pedagogical Goals

- To consolidate the learning acquired during the process of designing a prototype.

Materials

- Rules
- Capsule 2 – En route vers le défi *(en français seulement)*
- Slideshow *(Setting the Stage)*
- Student Handbook p. 15-18
- Intensive ESL Extras – C1 Evaluation Tool

Procedure

1. Watch the video capsule with the class.
2. Take time to address the questions included in the video during a plenary session. Pause the video whenever a question is presented to facilitate discussion.
3. Use the slideshow to review the rules of the challenge.
4. Arrange students into teams of 1-3.

   Intensive ESL Extras: The teacher can use the C1 Evaluation Tool to circulate around the room and evaluation discussions while they are preparing to build their prototype.

5. Before building their prototype, teams must:
   - Select the material they want to use and record it in the Student Handbook on page 15.
   - Draw at least one sketch of their prototype.
6. Review the rules on page 18 of the Student Handbook to ensure the prototype meets all the criteria.

THE TRIALS

Pedagogical Goals

- To make the necessary adjustments to create a functional and competitive prototype for the competition.
- To build the prototypes.

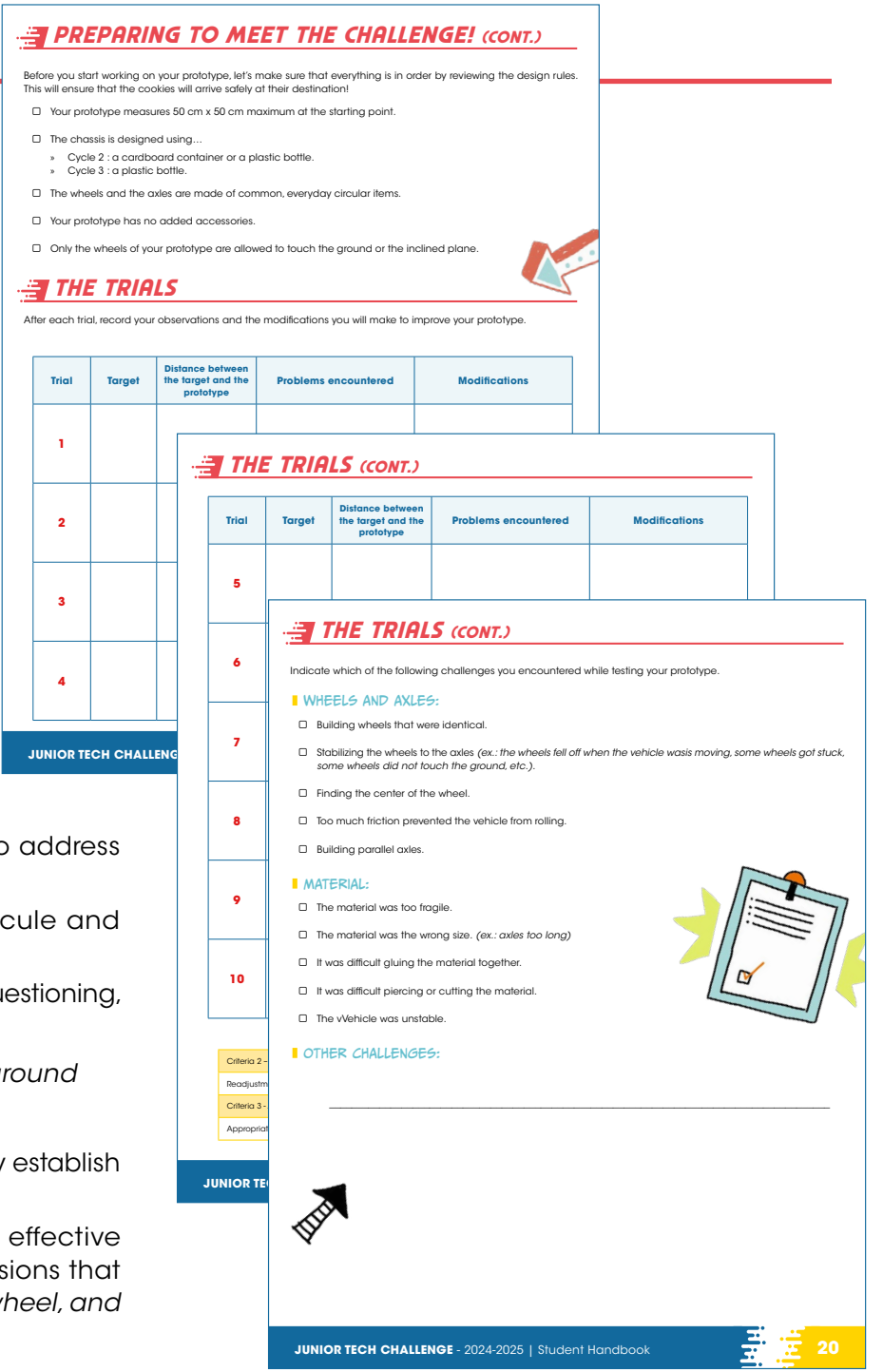
Materials

- Student Handbook p.18-20
- Competition Area *(see Appendix 1)*
- Inclined Plane *(see Appendix 1)*
- Materials required to build the prototype
- Intensive ESL Extras - C1 Evaluation Tool

Procedure

1. Each team prepares their prototype for testing.
2. The prototype is then tested in the competition area.
3. The students note their prototype's performance in their Student Handbook.
4. The student may make one or more modifications to the initial prototype.
5. Students document the problems they encounter in their Student Handbook, referencing the trial number *(e.g., the wheels don't stay in place, they don't turn properly, the vehicule is unstable, it veers off course, etc.)*.
6. Beside each problem, the student records the improvements implemented to address them *(e.g., adding sticks, better aligning the axle with the wheels, etc.)*.
7. Once the team is satisfied with the adjustments, they can retest their vehicule and document its performance.
8. During the testing of the prototypes, the teacher accompanies the students by questioning, encouraging and guiding them in their adjustments.

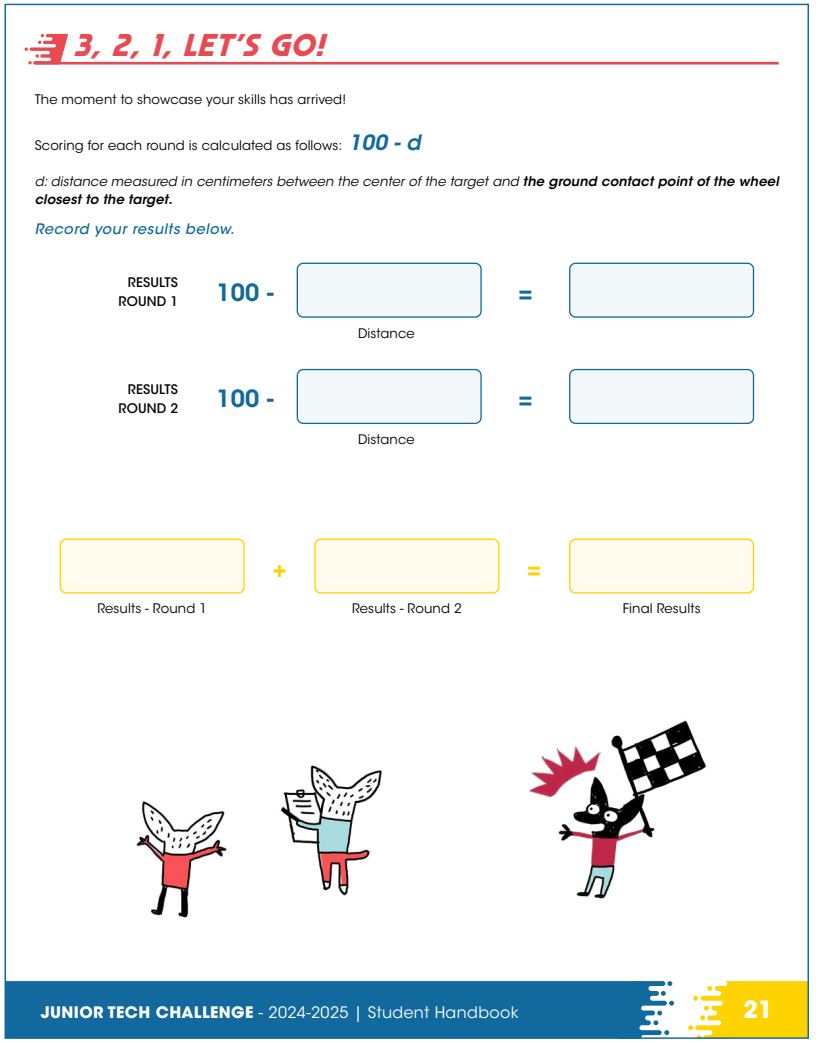
   Intensive ESL Extras: The teacher can use the C1 Evaluation Tool to circulate around the room and evaluate discussions.
9. The students then compare their results and identify their best performance. They establish success criteria by completing page 20 of the Student Handbook.
10. Facilitate a group discussion about the properties of the most and least effective prototypes, as well as potential improvements if needed. Aim to draw conclusions that could help in tackling the challenge *(e.g., the axle must be centered on the wheel, and wheels on the same axle should be the same size)*.



3, 2, 1, LET'S GO!

You will find all the information regarding the competition in the Rules pages 5 to 8. Briefly, here are a few details to guide you in the organization of your final:

- For a class final, you do not have to impose a time limit.
- If there are many teams participating, it is possible to prepare more than one competition area. In this case, make sure to have enough judges.
- When the competition is over, the students write down their points in their Student Handbook.
- Make sure that students of the same cycle complete all the challenges under identical conditions.
- The height and length of the inclined plane can vary depending on the materials available. What's most important is that all participants conduct their trials on the same testing surface.



3, 2, 1, LET'S GO!

The moment to showcase your skills has arrived!

Scoring for each round is calculated as follows: **100 - d**

d: distance measured in centimeters between the center of the target and ***the ground contact point of the wheel closest to the target.***

Record your results below.

RESULTS ROUND 1 | 100 - | Distance | = |

RESULTS ROUND 2 | 100 - | Distance | = |

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

REFLECTION

Pedagogical Goals

- To consolidate learning.
- To review the design and construction of the prototype, as well as the strategies used to complete the challenge.

Materials

- Student Handbook p. 22
- Capsule 3 - Retour sur le défi *(en français seulement)*
- Intensive ESL Extras – Appendix 2E

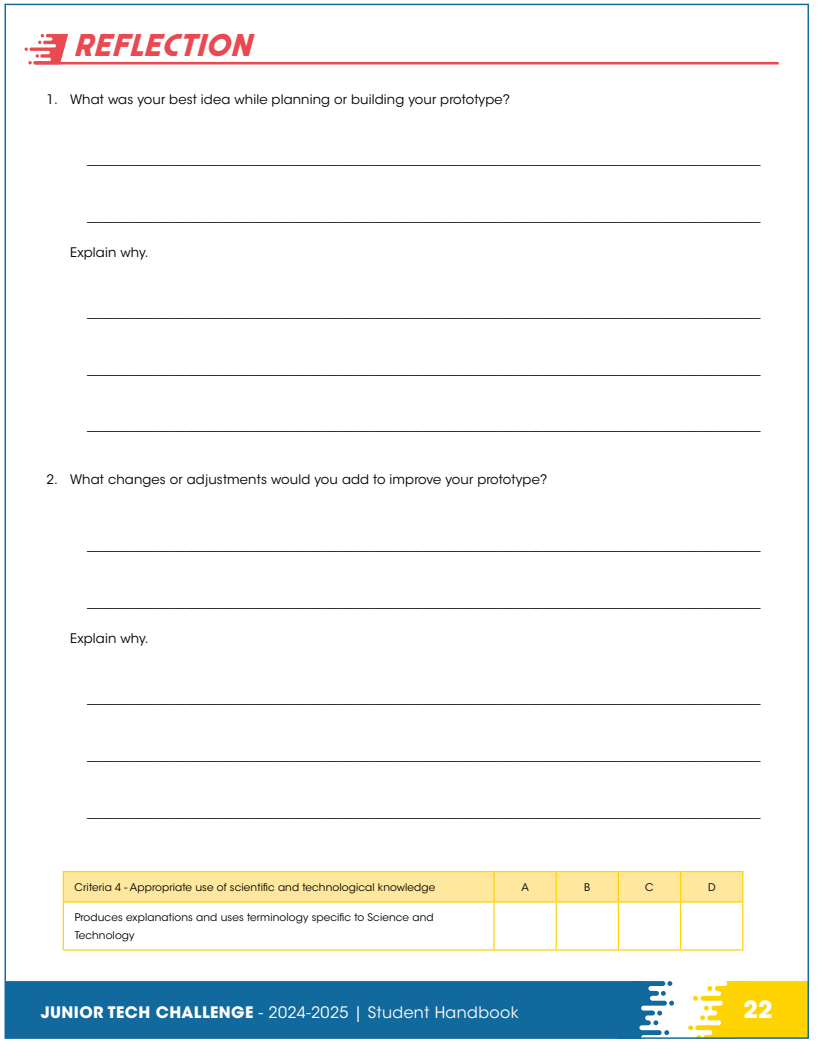
Procedure

Review and discuss the following questions as a group, then invite students to complete the last page of their Student Handbook on their own.

1. Ask students to present their prototypes, detailing their technical choices, any modifications made during the tests, and their final result.
2. Compare the different characteristics of the different prototypes in the class.
3. Ask students about the strategies used by the teams. Were some more effective than others?
4. Watch the video capsule with the class.
5. Discuss the following questions with the class:
   - What did you learn from the challenge?
   - Did you discover a strenght you didn't know you had?
   - Which professions do you think are connected to the challenges you faced?

Intensive ESL Extras: Following the class discussion, Appendix 2E offers students a selection of writing topics along with various presentation formats to enhance their expression and engagement. There is also a selection of writing tools that the teacher can choose to assist students.

The frequently asked questions are updated every week sur le site du Réseau Technoscience. Consult it regularly, and do not hesitate to send us your questions.



REFLECTION

1. What was your best idea while planning or building your prototype?

Explain why.

2. What changes or adjustments would you add to improve your prototype?

Explain why.

Criteria 4 - Appropriate use of scientific and technological knowledge	A	B	C	D
Produces explanations and uses terminology specific to Science and Technology				

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EVALUATION GRID

EVALUATION CRITERIA	A	B - C - D
Appropriate description of the problem	**Formulation of complete and relevant solutions** *(Student Handbook and observations made in class)* The student proposes, orally or in writing, relevant solutions that keep in mind at least three of the following constraints: • the presence of all essential prototype components *(wheels, axles, chassis and connections)*. • compliance with the permitted dimensions. • the logical selection of materials used. *Note: We are not assessing whether or not the proposed solutions are viable. We want to check whether the student can identify the essential elements and give relevant provisional solutions before designing.*	B : The student proposes a relevant solution, either orally or in writing, that addresses two of the three constraints mentioned in A. C : The student proposes a relevant solution, either orally or in writing, that addresses only one of the constraints listed in A. D : The student does not propose any relevant solutions either orally or in the Student Handbook.
Application of an appropriate procedure	**Readjustment of the design made during the testing phase** *(Student Handbook and observations made in class)* During the testing phase, the student identifies three problems encountered, and offers a number of relevant solutions for each, either orally or written. *Note: We are not assessing whether the proposed solutions are viable or not. We want to evaluate the descriptions of the trials where the modification to the problem has been made.*	B : During the testing phase, the student identifies two problems encountered, and offers a solution for each, either orally or in writing. C : During the testing phase, the student identifies one problem encountered, and offers a relevant solution, either orally or in writing. D : During the testing phase, the student does not identify any problems.
Appropriate use of instruments, tools or techniques	**Appropriate handling of tools and instruments** *(Observations made in class)* The student appropriately uses the techniques taught in class.	B : The student appropriately uses the techniques taught in class. Some difficulties are observed. C : The student appropriately uses the techniques taught in class. A lot of difficulties are observed. D : The student does not appropriately use the techniques taught in class.
Appropriate use of scientific and technological knowledge	**Produces explanations and uses terminology specific to Science and Technology** *(Student Handbook)* The student summarizes: • by describing their best idea AND a modification; • by using the terminology specific to Science and Technology.	B : The student summarizes by describing their best idea AND a modification. The student does not consistently use terminology specific to Science and Technology C : The student summarizes by describing their best idea OR its modification, and by using the terminology specific to Science and Technology D : The student simply presents their ideas without any explanation, or the explanation provided is not based on Science and Technology.

APPENDICES

APPENDIX 1

SETTING UP THE COMPETITION AREA AND THE INCLINED PLANE

Materials

COMPETITION AREA

- Competition area *(available for order on the* **Réseau Technoscience website***)* OR colored masking tape or colored duct tape
- Stickers of approximately 5 cm in diameter

INCLINED PLANE

- Board *(coroplast, foam board, plywood/etc.)* measuring 50 cm x 150 cm
- Planks of wood to stabilize the inclined plane *(if necessary)*
- 2 empty cardboard boxes *(boxes used to store 10 packs of 500 8 ½ x 11 inch sheet paper packs)* OR any other support measuring about 50 cm in height
- Measuring Tape
- Stopwatch used to measure to time it takes to to install the inclined plane
- Computer and Excel sheet to record results *(Excel sheet provided at* **technoscience.ca***)*

Implementation

COMPETITION AREA

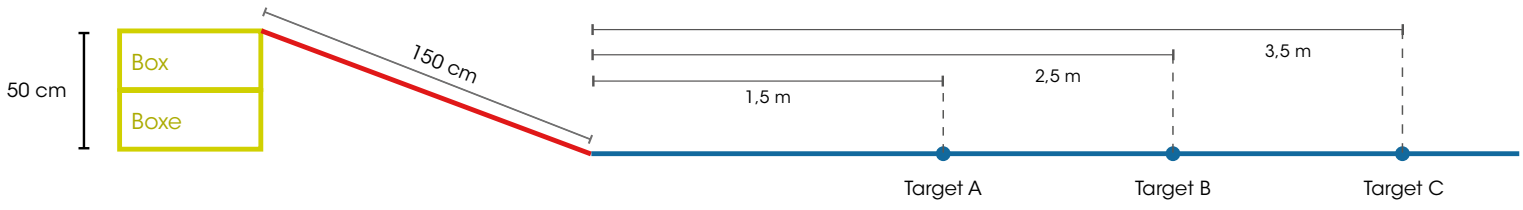
Targets are measured on the ground, starting at the bottom of the inclined plane. Each target is positioned as follows: Target A is placed at 1.5 m from the inclined plane, Target B is 2.5 m from the inclined plane and Target C is 3.5 m from the inclined plane. The targets A, B and C are positioned in a straight line with respect to the center of the inclined plane. The targets can be circular stickers glued directly to the floor.

INCLINED PLANE

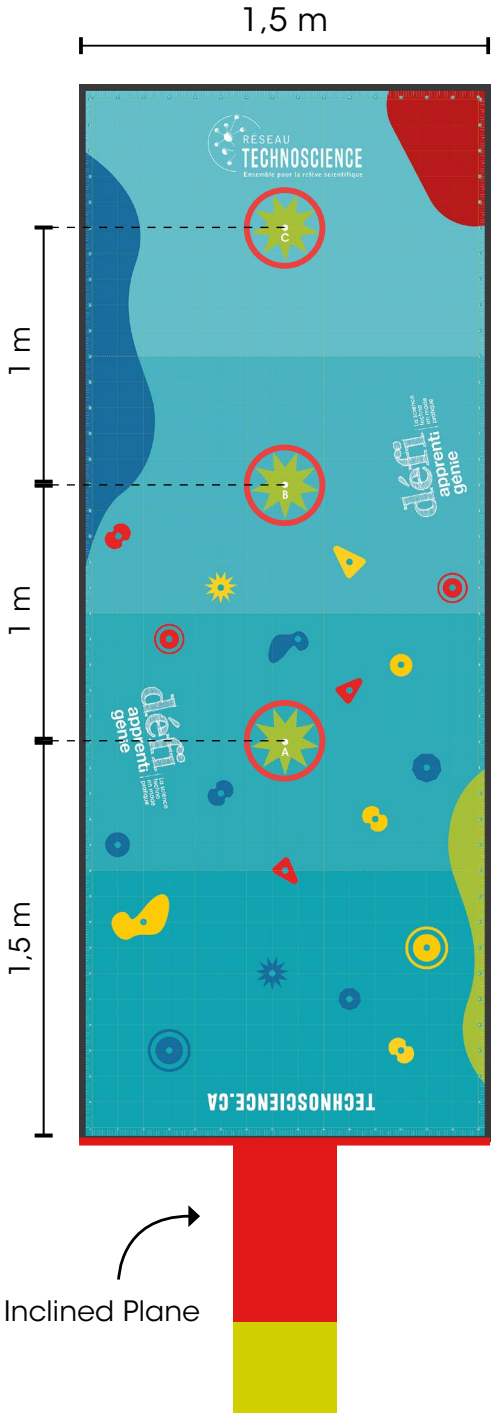
You can use any thickness of corrugated plastic board *(coroplast/foam board/plywood/etc.)*, but note that the thinner the board, the more it will curve. To avoid curving, you can use two boards, or glue wooden planks underneath it with hot glue. The important thing is that the conditions are the same for all students taking part in the competition.

One side of the board must touch the edge of the competition area *(closest to Target A)*, while the other side must rest against the supporting box. To prevent movement, we recommend securing the board to both the ground and the box.

SIDE VIEW



TOP VIEW OF THE INCLINED PLANE



APPENDIX 2 - ESL EXTRAS

APPENDIX 2A - SCIENTIFIC NOTIONS

Complete the table with what you already know *(prior knowledge)*. As you work on the challenge, you can continue to fill out the table with information you learned.

This will help you understand and remember the scientific notions.

Vocabulary	Definition	Example or drawing
CHASSIS	The supporting frame of a vehicle.	
AXLE	Rods to which the wheels are attached.	
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.	
ROTATION	A rotation is the movement of an object that turns on its axis.	
WHEEL	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.	

Let's Untangle this
Describe some real-life situations where these concepts are important.

APPENDIX 2B - EXPLORING VARIOUS ROLLING OBJECTS – NOTE TAKING SHEET

Procedure

In the table below…

1. Add suggestions to the list of Systems.
2. Read the Observation Criteria. Feel free to add more to the list.
3. Use the Observation Criteria to describe what you and your partner observed about a system.
4. Write your observation in the column, Your Observations.
5. Choose 3 systems and complete page 5 of your Student Handbook.

Use the Functional Language suggested below to help you discuss the Observation Criteria with your partner(s).

Functional Language

Sample Questions
• What **similarities** do you notice when observing the wheels? • What **differences** do you notice when observing wheels?
Sample Responses
• Some wheels are **small**, and some are **large**. So, the **size of the wheels** could be considered an **observation criterion**. • Every wheel is **different**. • Some wheels have **spokes**. Other wheels don't because they are **solid**. • Some wheels are made of **plastic**, some are made of **wood**.

Add your own Systems, Observation Criteria and Observations.

Example of SYSTEMS	Your OBSERVATIONS	Some observation CRITERIA
A roller skate	• 4 solid, plastic wheels • No spokes • With an axle	Wheels: • Spoked or solid • With or without a tire • With or without an axle • Material (rubber, plastic, etc.) • Size, width, stability • Number of wheels
Toy car	• 4 solid wheels • With an axle	

APPENDIX 2B - EXPLORING VARIOUS ROLLING OBJECTS - NOTE TAKING SHEET (CONT.)

Example of SYSTEMS	Your OBSERVATIONS	Some observation CRITERIA
A bicycle		Axle: • Material used • Width, lenght
A car		Connection system between wheels and axle: • • •
A rolling pin		
A wheelbarrow		
A dishwasher drawer		

APPENDIX 2B - EXPLORING VARIOUS ROLLING OBJECTS - NOTE TAKING SHEET (CONT.)

Example of SYSTEMS	Your OBSERVATIONS	Some observation CRITERIA
Suitcase wheels		
A desk chair		

LET'S UNTANGLE THIS!

What is the difference between a wheel and a tire?

APPENDIX 2C - VOCABULARY

Circle the materials that you bring to school to build your prototype.

Chassis	Wheels	Axles	Connection for securing wheels to axles
Sturdy cardboard	Bottle caps of any kind	Straws	Nuts and bolts
Long, thin box	Lids of any kind	Wooden skewers	Brass paper fasteners
Milk or juice carton	Empty spools or thread	Wooden dowels	Pipe-cleaners, nails and necklace beads *(glued with hot glue or modeling clay)*
Corrugated plastic board	CDs	Pencils	Adhesive or masking tape
Thin pieces of wood	Corks	Empty pens tubes	Plasticine
2L plastic bottle	Buttons	Plastic tubes	Hot glue
1 gallon plastic bottle	Coasters		White glue

Functional Language

What can we use to build the…?	Let's try a…
This works great!	This doesn't really work. Let's try something else.
We had trouble with …	We changed it by…
	• The vehicle performed better after the modifications. • The vehicle did not perform better after the modifications.

LET'S UNTANGLE THIS!

What other vocabulary and functional language will you need to work on this project? Brainstorm with your team and write them below.

Vocabulary	Functional language

APPENDIX 2D - COOP STRUCTURE – NUMBERED HEADS TOGETHER

Procedure

PREPARATION

1. Divide students into teams of four.
2. Assign each student in the team a number (1, 2, 3, 4).
3. Give each team a small erasable white board and a marker, or paper with a marker.
4. Tell students there will be two rotating roles:
   - Speaker
   - Writer

IMPLEMENTATION

5. Ask a question but give one minute of quiet time where students can individually look for or think about the answer.
6. Say "Heads Together". This is the time where students share their answers
7. Assign one student to write the answer, and another to share it with the rest of the class. (*Example: Number 1 will write the answer, number 2 will share it with the class*)
8. The student assigned to share stands up and in turn, shares the answer with the class.
   - The teacher can assign points for the answers to add a bit of competition to the activity.
   - The goal is for students to work together to find the answer, support each other, and speak English.

APPENDIX 2E - REFLECTION - C3 WRITING TASK

Circle the question(s) you will answer and the way you will present your writing.

Choose any, or as many, of these topics as you want to write about.		
1. What did you learn from the challenge? • About working with your teammates. • About building a prototype. • Your likes and dislikes. • Did you discover a strength you didn't know you had?	**2. Which professions do you think are connected to the challenges you faced?** • Are any of these professions interesting to you? Why? • Do you know anyone who works in any of these professions? If yes, describe what they do.	**3. After seeing the various prototypes presented by your classmates, describe the ones you found the most interesting.** • Describe the prototype(s). • Explain what was interesting about it (them).
Present your writing in any of the following ways:		
Write a text • Include complete sentences that fully describe the question(s).	**Produce a slide presentation** • Include 1-2 phrases on each slide. • Include relevant images.	**Create an infographic** • Include small images. • Include important information that explains your message.

Brainstorm and take notes here:

CHECKLIST

To write texts

I Write Texts

1. I prepare to write.

- I think of the instructions.
- I take out the resources I need (my books, my dictionary, my bank of expressions . . .)
- I look at the model.
- I write down ideas in English.
- I put them in order.

2. I write a draft.

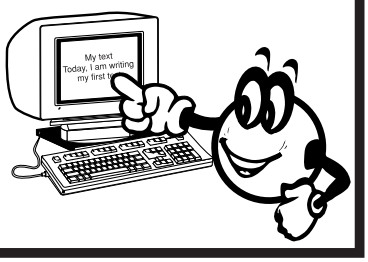
- I look at the model again.
- I follow the instructions.
- I use my ideas.
- I write short sentences in English. (Subject / Verb / Object)
- I use the vocabulary and expressions I know.
- If I have a problem:
  - ➤ I ask for help, I use my bank of words . . .

3. I revise my text.

- Did I follow the instructions?
- Did I follow the model?
- Are my ideas original?
- I check the spelling, the word order and punctuation with the resources I have.
- I ask a friend to revise my text.
- I correct my text.

4. I write my final text.

- Is it OK?
- Is it neat?
- Is it easy to read?



STUDENT TOOL - WRITING PROCESS

Prepare

- Refer to the instructions.
- Become familiar with the C3 evaluation tool.
- Activate prior knowledge.
- Brainstorm ideas with others.

- Note and organize your ideas in a planning tool.
- Research the topic, if necessary.
- Use resources, as needed.

Draft

- Refer to your planning tool.
- Set down ideas in complete sentences.
- Refer to written models and reference tools.
- Consult research, as needed.
- Ask for help, as needed.

Revise

- Reread the instructions.
- Determine if your ideas are clear, complete and well-structured.
- Refer to written models and reference tools.
- Request feedback from peers/teacher, as needed.
- Add, substitute, delete and rearrange words and ideas.

Edit

- Verify the grammar, punctuation and spelling targeted for the task.
- Refer to written models and reference tools.
- Request feedback from peers/teacher, as needed.
- Correct your errors.

Final copy

- Rewrite your revised draft to deliver a well-presented text.
- Share your final copy with the intended audience (optional).

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The Writing Process

Elementary Cycle Three, Intensive ESL

SOAP

Proofreading Marks

Use the letters S-O-A-P to write feedback on your partner's text.

Spelling of words

Reread your text to check your spelling:

- ❑ Use a computer.
- ❑ Use a dictionary.
- ❑ Refer to flashcards and word banks.

Order of words

Reread your text to verify that:

- ❑ Words are in the correct order (Subject-Verb-Object, adjectives before nouns)
- ❑ No words have been omitted. (I happy. = I **am** happy.)
- ❑ No words have been added. (It's ~~is~~ good = **It's** good.)
- ❑ No words have been mixed up. (It is a ~~cat black.~~ = It is a **black cat**.)

Agreement

Reread each sentence to make sure all parts are in agreement:

- ❑ Verb Tense (Yesterday, I **went** to the park.)
- ❑ Subject-Verb (Max like**s** Kim.)
- ❑ Pronoun (**Max** likes **Kim**. = **He** likes **her**.)

Punctuation

Reread your text to verify that you have used correct punctuation marks including:

- ❑ Period (.)
- ❑ Comma (,)
- ❑ Apostrophe (')
- ❑ Question mark (?)
- ❑ Exclamation point (!)

Reread your text to verify capital letters including:

- ❑ Pronoun "I"
- ❑ People's names (Sara)
- ❑ Nationalities (Canadian)
- ❑ Holidays (Mother's Day)
- ❑ Places (Quebec)
- ❑ Days and months (Monday, January)
- ❑ Languages (English)
- ❑ Important words in titles (Alice in Wonderland)

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ELEMENTARY CYCLE THREE ESL GENERIC EVALUATION TOOL

Competency 1, *To interact orally in English*

Class: _____

Evaluation criteria: Participation in exchanges and Use of functional language				Student Names		
	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 very brief, very simple and/or very few.			
			Total /50			
			Challenges (see list below)			

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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 15/50.

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 message
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. _____

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Using the Evaluation Tool

This generic evaluation tool is suitable for most oral interaction tasks. It may be used with Elementary 5 or 6 students. Teachers may adjust the level of difficulty through task choice, design, requirements and expectations.

This tool was designed for two purposes:

1) to allow teachers to collect marks on students' oral interaction skills for the report card
2) to help teachers support student learning by providing specific feedback in the form of challenges

For each section of the tool, first determine which descriptor best represents each student's performance, and write the corresponding mark in the appropriate box. Add up the marks to obtain the final result for the task.

Next, determine which challenge(s) from the provided list, if any, each student should focus on to improve his or her oral interaction skills. Write the corresponding number(s) in the correct boxes.

Notes on the Descriptors

› *Participation in exchanges*

Throughout – The student is participating from beginning to end.

Sporadically – The student speaks at irregular intervals, creating long pauses or leaving most of the talking to his or her partner.

Rarely – The student is barely active in the discussion. Since the student has managed to express a minimal number of messages, the performance must be evaluated. Less participation than *Speaks rarely* means that the student is not speaking (see the *Special Cases* section).

Substantial content – The student expresses a fair or significant number of ideas and/or expresses in-depth ideas (e.g. elaborates, gives examples, explains).

Limited content – Ideas are few and/or of little depth. Limited content may be exhibited as one or more of the following:

- The student tends to repeat his or her own ideas or those of his or her partner.
- The student mostly expresses generic ideas that could apply to any task (e.g. *It is correct*; *It's a good idea*; *I agree*).
- Most of the student's statements are short, not detailed.

Techniques to create true interaction – The student uses techniques to initiate a conversation, to keep it going or to involve a partner. True interaction is demonstrated when a student asks a partner questions, reacts to something the partner has said, or expands on an idea expressed by the partner by, for example, adding to it, disagreeing with it, or taking it in a new direction. Basic turn-taking, without considering what the partner has previously said, is not true interaction.

› *Use of vocabulary and useful expressions*

Quickly – "Quickly accesses" denotes the speed and considerable ease with which the student retrieves most or all words and expressions from his or her personal language repertoire to express messages. Pauses that occur when reflecting, that are used to create an effect or to allow the partner to speak are considered to be natural pauses and are not penalized.

Variety of vocabulary and expressions – "Variety" refers to the range and precision of words and expressions used by the student to express messages.

Basic vocabulary and expressions – The student uses a minimum range of words and expressions, which are rarely precise. The student is able, nonetheless, to convey a message using the language he or she has acquired.

Lacks vocabulary – The student is often unable to retrieve the language he or she needs, failing to use synonyms or circumlocutions. The student's speech is characterized by missing words, French words or expressions, and/or long pauses during which the partner may jump in to help. The student who demonstrates a lack of vocabulary has difficulty expressing a message.

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› *Comprehension of message by an anglophone*

You must listen to students as if you were an anglophone with little or no knowledge of French.

Easily understood – You do not have to infer to understand the student's messages.

Despite errors, if any – Errors, if any, do not affect comprehension of the student's messages.

Some interpretation – You must infer to understand a few messages but most messages do not require interpretation.

Considerable interpretation – You must make a substantial effort to understand many of the student's messages.

Some messages are not understood despite interpretation – Even though you try to infer meaning, you do not always understand the student's messages, either in whole or in part.

Messages are very brief, very simple or very few – When messages are very brief (one or two words), very simple (e.g. *It is good*) or very few, they can be understood but consist of too little language or content.

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Elementary Cycle Three Generic[1] Evaluation Tool for Competency 3, *To write texts*

Name of student: _____ **Class:** _____

Evaluation criteria: Characteristics of the written text and Application of targeted language conventions

For marks and feedback purposes	For feedback purposes + = good job | – = to work on	
	Content	**Form**
› *Comprehension of the text by an anglophone* 10 The text is easily understood despite errors, if any. 8 The text is understood with **some** interpretation. 6 The text is understood with **considerable** interpretation. One or two sentences may not be understood. 4 Parts of the text are not understood despite interpretation.	+ – clarity + – detail + – flow + – paragraphing + – pertinence + – other: _____	+ – articles + – capitalization and/or punctuation + – prepositions + – pronouns / possessive adjectives / possessive forms + – sentence structure (e.g. word order) + – singular/plural + – spelling + – verbs (e.g. tense, agreement) + – vocabulary + – other: _____
› *Introduction or introductory sentence* 1 Effective 0 Ineffective 0 Missing	+ appropriate + catchy + original + useful + other: _____	– does not make sense – inappropriate or not pertinent to the task or context – incomplete – unclear – other: _____
› *Body of the text* 3 Effective 2 Mostly effective 1 Mostly ineffective 0 Ineffective	+ accurate + complete (all necessary information) + easy to follow + pertinent + well developed + well organized + other: _____	– essential information missing – inaccuracies – insufficient detail or development – lack of logic – lack of organization – poor paragraphing – repetition – some content that does not make sense, is confusing or is not understood – some content that is inappropriate or not pertinent to the task – task requirements missing – other: _____
› *Conclusion or closing* 1 Effective 0 Ineffective 0 Missing	+ appropriate + original + useful + other: _____	– does not make sense – inappropriate or not pertinent to the task or context – incomplete – repetitive – unclear – other: _____
› *Adaptation of the text to purpose and audience (task)* 5 Entirely 3 Mostly 1 Somewhat 0 Not at all	+ well-selected content + well-adapted content + well-selected language + other: _____	– some inappropriate content – some poorly adapted content – some inappropriate language – other: _____
Total mark for Competency 3	**/20**	

Main challenges

Special cases

If you are unable to fairly evaluate the text using the tool, select one of the following descriptors and allot 6/20.

- Most or all of the text cannot be understood, despite interpretation.
- The text is incomplete or too short.
- The text is off task.

[1] If this evaluation tool is used along with a Competency 2 tool, do not evaluate "Body of the text" or "Adaptation of the text to purpose and audience," in order to avoid an overlap in evaluation, as these two elements will be addressed in the Competency 2 tool.

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Using the Evaluation Tool

This generic evaluation tool is suitable for most writing tasks. It may be used with Elementary 5 or 6 students. You may adjust the level of difficulty through task choice, design, requirements and expectations.

This tool was designed for two purposes:

1) to allow teachers to collect marks on students' writing skills for the report card
2) to help teachers support student learning by providing specific feedback

The left-hand column is used to assess the texts and provide marks. In the right-hand column, you may provide specific feedback that will allow students to have a better idea of what they are doing well (+ sign) and what they still need to work on (– sign), and enable you to base your assessment on observable elements.

For each section of the evaluation tool, first determine which descriptor best represents the student's text, and circle the corresponding mark. Next, in the right-hand column, circle the elements that were particularly strong and those that were the most problematic. The goal is to identify which elements stood out and which should be tended to, not to catch each mistake or weakness. Finally, add up the marks in the left-hand column to obtain the final result for the task.

Notes on the Descriptors

› *Comprehension of the text by an anglophone*

You must read the text in its entirety as if you were an anglophone with little or no knowledge of French or the task.

Easily understood – You do not have to infer to understand the text.

Despite errors, if any – Errors, if any, do not affect the comprehension of the text.

Some interpretation – You must infer to understand parts of the text but most of the text requires no interpretation.

Considerable interpretation – You must make a substantial effort to understand several parts, or a significant portion of, the text.

Parts of the text are not understood despite interpretation – Even though you try to infer meaning, part of the text remains unclear.

› *Introduction or introductory sentence*

Depending on the form of text that students are required to write, the introduction may simply consist of an introductory sentence (e.g. *I'm writing to propose a new activity for the school* or *Once upon a time there lived a little girl*).

Do not use this section (and adjust the total marks) if:

- the text does not call for any introduction or introductory sentence (e.g. poster)
- students merely reproduce an introduction from a model provided to them

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› *Body of the text*

No matter what form of text students are required to write, the body of the text must meet certain requirements: the content must be relevant to the task and sufficiently developed; ideas must be clear and grouped in a logical manner so the reader can easily follow them; information must be accurate, etc. To determine the degree of effectiveness, refer to the task and the set requirements. Refer to the sidebar if the task involves Competency 2.

Note about integrated tasks

If the task that students carry out involves Competency 2, *To reinvest understanding of written and oral texts*, two sections of the tool will not be used in order to avoid an overlap in evaluation: "Body of the text" and "Purpose and audience." These sections will be addressed in the Competency 2 tool.

› *Conclusion or closing*

Depending on the form of text that students are required to write, the conclusion may simply consist of a brief sentence that appropriately brings the text to a close (e.g. *I hope this information will be useful* or *They lived happily ever after*).

Do not use this section (and adjust the total marks) if:

- the text does not call for any conclusion or closing (e.g. poster)
- students merely reproduce a conclusion or a closing from a model provided to them

› *Adaptation of the text to purpose and audience*

All texts are written for a purpose and a target audience. The purpose can be basic (e.g. to remind someone of an upcoming event) or more complex (e.g. to convince someone to do something). The target audience can be a single person, a group or the public at large.

You can determine whether or not a text was written in light of the purpose and audience by asking yourself a few questions. For example:

- Does the text accomplish what it was supposed to accomplish? For example, if the student was meant to explain a concept, was the concept explained well so that the reader will easily understand?
- Is the language used appropriate to the purpose and audience? For example, are words too technical for the target audience? Is slang used in a formal text?
- Is necessary background provided (if applicable)? For example, does the audience need to know certain facts about the topic to understand the text?
- Is there too much irrelevant or extraneous information, thus confusing the reader?
- Is information detailed enough for the audience to understand? For example, if a decision is presented in the text, is it explained? Are opinions supported?
- Is the information too specialized or technical for the reader, hindering his or her comprehension?
- Is the information organized in a way that the reader can easily follow and understand?

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