Junior tech challenge

The practical side of science and tech

2016-2017 edition

SUGAR POWER!

Teacher's Guide

Intensive English

A program of

RÉSEAU TECHNOSCIENCE

Together for a new scientific generation

Production Team

Supervision
Isabelle Jutras

Conception, production and revision
Stéphane Coupal, conseiller pédagogique Commission scolaire de Laval
Catherine Farrugia, conseillère pédagogique Commission scolaire Pierre-Neveu
Donald Gaudreau, conseiller pédagogique Commission scolaire de la Pointe-de-l'Île
Audrey Girard, conseillère pédagogique Commission scolaire des Affluents
Myriam Larue, conseillère pédagogique Commission scolaire de la Seigneurie-des-Mille-Îles
Phylippe Laurendeau, conseiller pédagogique Commission scolaire des Samares
Chantal Pepin, conseillère pédagogique Commission scolaire de la Rivière-du-Nord
Vanessa Tessier, conseillère pédagogique Commission scolaire Pierre-Neveu
Robert Vivier, conseiller pédagogique Commission scolaire des Laurentides

Layout and illustrations
Maxime Lacasse Germain

Adaptation and Translation
Joelle Drouin-Poudrier, Intensive ESL Teacher, CSSMI
Voula Plagakis, Pedagogical consultant, ESL, CSSMI

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INTRODUCTION

This document is intended to support Intensive English teachers who wish to experience the junior tech challenge with their students in English. The original version of the tech challenge and other teaching tools are available in French at the following site http://www.technoscience.ca/.

INTRODUCTION FOR INTENSIVE ENGLISH TEACHERS

Every year students in cycles 2 and 3 across Québec participate in Junior Tech science challenges at their schools and at regional events. These challenges help initiate students into the wonders of science and technology and allow 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.

Six challenges are presented and used alternately, once a year. For each challenge, pedagogical tools support students in meeting the challenge. The tools and documents provided may be adapted according to your pedagogical goals. With each new 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 your classroom only or you can also select teams to participate in the school board's annual science competition. Other teachers from your school may also be participating, so you can select the best teams out of the participating classes.

INTENTIONS

The students will have the opportunity to:

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

TEACHING TOOLS AVAILABLE

- Rules
- Teacher's Guide, Intensive English
- Student handbook
- Activity 1: The Lever – Student handbook
- Activity 1: The Lever – Teacher's notes
- Activity 2: Effect of a Force on a Material or Structure – Student handbook
- Activity 2: Effect of a Force on a Material or Structure – Teacher's notes
- Activity 3: Planning the Adjustments for My Future Catapult - Student handbook
- Activity 3: Planning the Adjustments for My Future Catapult - Teacher's notes
- Assembly techniques – Short video clips
- PowerPoint: Presenting the challenge to students
- Targets – PDF http://technoscience.ca/uploads/2017_DAG_cibles_a_imprimer.pdf
- Junior Tech Challenge Diploma
- Preparatory Activities

The preparatory activities were developed to help the students get ready to design and build a catapult for the "Sugar Power!" Junior Tech Challenge. They are presented in separate handbooks and accompany the Teacher's Guide and Student Handbook. Print them according to your needs.

The first two activities review concepts related to levers and elastic energy and support the students in building their catapult. The third activity helps students develop a strategic and scientific approach, while building and adjusting their catapult.

Competency 1 (To interact orally in English) is developed, while the students participate in the three activities, as specified in the Teacher's notes for each activity.

A LES FOR THE CLASSROOM…AND MUCH MORE

As mentioned earlier, this challenge is open to schools across Québec. Therefore, you can decide to simply organize a class final, participate in the competition with other classes in your school, or follow your students' success all the way to the regional final. Consult your school's principal or science resource person to find out who is in charge of promoting and supporting teachers who wish to participate in the Junior Tech Challenge with their students, and to find out how your school has organized the competition (delays, dates, etc.). You can also sign up to send one of your teams to the regional final.

Procedure – Conception Phase

Note: All pedagogical resources can be found at technoscience.ca

Description	Time	Pedagogical Resources
Preparation		
The teacher presents the challenge to the students.	15 min	• PowerPoint presentation
Preparatory activities		
Activity 1 The Lever To help the student acquire knowledge on levers in order to use them while designing the catapult.	60 to 120 minutes	• Activity 1 - Teacher's notes • Activity 1 - Student handbook • Video: The Lever https://www.youtube.com/watch?v=Sl7wfc_GUTg
Activity 2 Effect of a Force on A Material or Structure To explore the effects of a force (tension) that can be used when designing a catapult.	120 to 180 minutes	• Activity 2 - Teacher's notes • Activity 2 - Student handbook
Activity 3 Planning My Future Catapult's Adjustments To help the student understand the control of variables, so as to be more efficient when designing the catapult.	About 60 minutes	• Activity 3 - Teacher's notes • Activity 3 - Student handbook

Procedure – Conception Phase

(continued)

Description	Time	Pedagogical Resources
Construction phase		
REVIEW THE INTENTION AND PLAN THE DESIGN. • Student handbook (pages 2 and 3): Read the mission. Present the general learning process in science and technology. • Present the materials (page 4). • Present the rules. • Present the assembly techniques (video). • Review functional language and vocabulary.	About 60 minutes	• PowerPoint Presentation • Assembly techniques, videos https://vimeo.com/album/3791305
Initial ideas and hypotheses • Choosing materials and making a drawing: (page 5) *Note: This is to help the student find relevant solutions before starting to build.* **Planning and carrying out** • The students make their prototype in class. • They test their catapult, identify the problems, and suggest modifications (page 7). • There is no time limit for this part. However, there will be a 45-minute limit to assemble, test and adjust the catapult at the finals.	2 to 3 periods	• Student handbook

Procedure – Conception

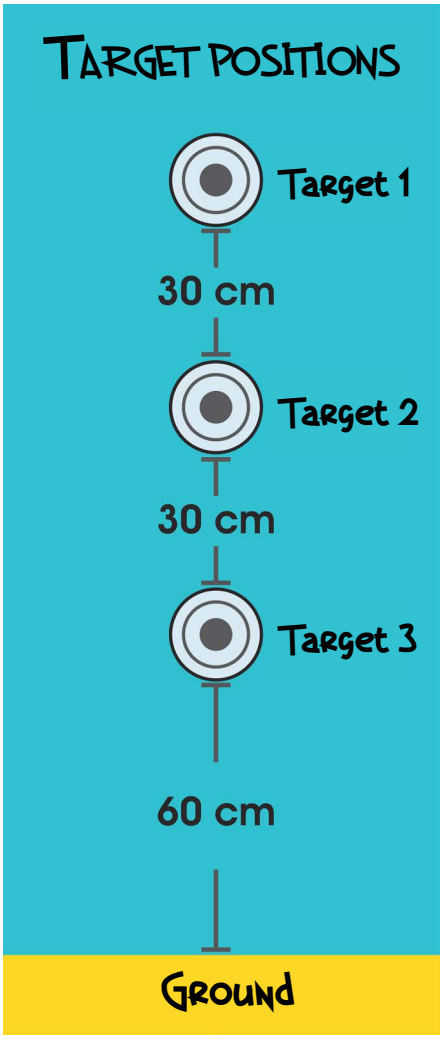
(continued)

Description	Time	Pedagogical Resources
Integration		
OUTCOME • The students note the modifications. • The students note the problems they encountered and the modifications necessary to improve their prototype (page 8).	30 min	• Student handbook
School Finals		
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 observe the same rules for the assembly and testing as for the regional finals; or you can adapt the time according to the students' needs.	According to the number of teams	• Rules

Procedure – Class Competition

Cycle 3

The catapult must have a lever that accumulates tension in its propulsion system, and must be activated by a mechanical trigger. The trigger must be operated manually by the system, ex.: a button, a switch, cutting a string, etc.



You will find detailed information for the class competition on page seven of the Rules document. Here are a few details to guide you in organizing the in-class final:

- For a class final, you do not have to impose a time limit for assembling and testing the catapult.
- The sugar packets can be used as-is or folded and held in place with tape. Ask the students who wish to use sugar packets to prepare them in advance.
- The targets must be reached in the right order. To aim for target 2, target 1 must have been reached successfully. Hitting the previous target makes it possible to move on to the next one. If the students succeed and still have packets, they can go another round.
- The students can adjust their catapults between shots, move the catapult on the desk or even move the desk inside the starting area. However, both team members must also stay inside the starting area.

Frequently Asked Questions (FAQ) *(available in French)*

The FAQ page is updated every Wednesday, check it out regularly!

English as a Second Language

EVALUATION

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

USEFUL VOCABULARY

Hypothesis	(noun) an educated guess or prediction
Experiment	(noun) a way to test your hypothesis
Fulcrum	(noun) a pivot point
Lever	(noun) a bar used for raising or moving weights, centered on a pivot point, or turning point.
Load	(noun) a mass or weight supported by something
Pivot point	(noun) the center point of any rotational system, e.g. a lever system
Lift	(verb) to rise from the ground
Propel	(verb) to throw forward

FUNCTIONAL LANGUAGE

What do you think? Why? Do you agree? I agree / I disagree I think that ...because... I don't think...because...	Where should we place …? Let's try… Move the load… Place it near the pivot point… Place it further from the pivot point. Ready, set, go!

ADDITIONAL SCIENCE RESOURCES

This episode of Bill Nye, the Science Guy, is all about simple machines. The catapult is explained and demonstrated during the first part of the episode. At the end of the episode, the catapult activated by a mechanical trigger is also described and demonstrated. https://www.youtube.com/watch?v=faRz6HHnVXA

SUGGESTED WRITING ACTIVITY

Have your students write down what they have to do on competition day to make sure they can succeed in the challenge (a step-by-step preparation).

Example: First, we must…

Then, we must not forget to…

Assemble the… on the… is very important…

CONSOLIDATION AND REFLECTION

Consider these questions as a way to reflect as a group, or have the students complete a reflection sheet or a journal entry.

- Describe how knowledge of science concepts can be useful in everyday life.
- What was your favourite part of the tech challenge? Explain.
- What did you find the most difficult part of the tech challenge? Explain.
- Name something you learned about teamwork while completing this challenge.

RUBRIC: SUGAR POWER
INTENSIVE ENGLISH

Appendix 1

Competency 1: To interact orally in English						
C1 **Evaluation Criteria***		Fantastic A Exceeds expectations	Very Good B Meets expectations	So-So C Meets expectations minimally	Not Yet D Does not quite meet expectations	Oops E Does not meet expectations
PARTICIPATION IN EXCHANGES	• Participates in discussion during the experiments (Activity 1-2-3) • Perseveres in using English at all times: e.g. asks for help • Initiates and maintains exchanges: e.g. asks questions, gives examples, reacts to others • Supports peers during interaction • Expresses personalized messages	Participates very often	Participates regularly	Participates sometimes	Participates rarely	Participates only when someone helps OR Uses classroom language and new vocabulary correctly only when someone help
USE OF FUNCTIONAL LANGUAGE	• Uses expressions and vocabulary targeted for the task (e.g. Move the pivot point. Where should we place the load?) • Pronunciation of frequently used expressions and targeted vocabulary	Uses a wide range of classroom language and new vocabulary correctly	Uses classroom language and new vocabulary correctly or mostly correctly	Sometimes uses classroom language and new vocabulary correctly	Rarely uses classroom language and new vocabulary correctly	

* Use of strategies: Provide students with feedback on their use of learning and compensatory strategies

GENERAL LEARNING PROCESS IN SCIENCE AND TECHNOLOGY

(ACTIVE DISCOVERY PROCESS) IN PRIMARY SCHOOL

Context related to everyday life

- Situation problem or
- Discovery question or
- Need to be fulfilled
- Question related to the operation of an object (how does it work?)

Initial ideas and hypothesis

My initial ideas:
- I share my own ideas.

My hypothesis:
- I predict that... I think that because…
- I imagine my prototype.
- I think it works like this…

Planning and carrying out

My equipment:
- I observe and handle the equipment.
- How could this equipment be useful to me?
- I choose my equipment and my materials.

Carrying out my process:
- What will the steps be?
- What precautions should I take?

My actions:
- I carry out the steps of my protocol.
- I note or draw what I observe, what I do and what I discover.

My results:
- What is my answer to the problem, question or need?

Outcome

My outcome:
- Do my results confirm my hypothesis or not?
- Are my results similar to those of the other teams?
- Can the other teams' results help me to find answers to my problem, my question or my initial need?
- What could I communicate concerning my discoveries?

New question?

What I learned:
- What do I retain from this activity?
- What could I communicate concerning my results or my discoveries?