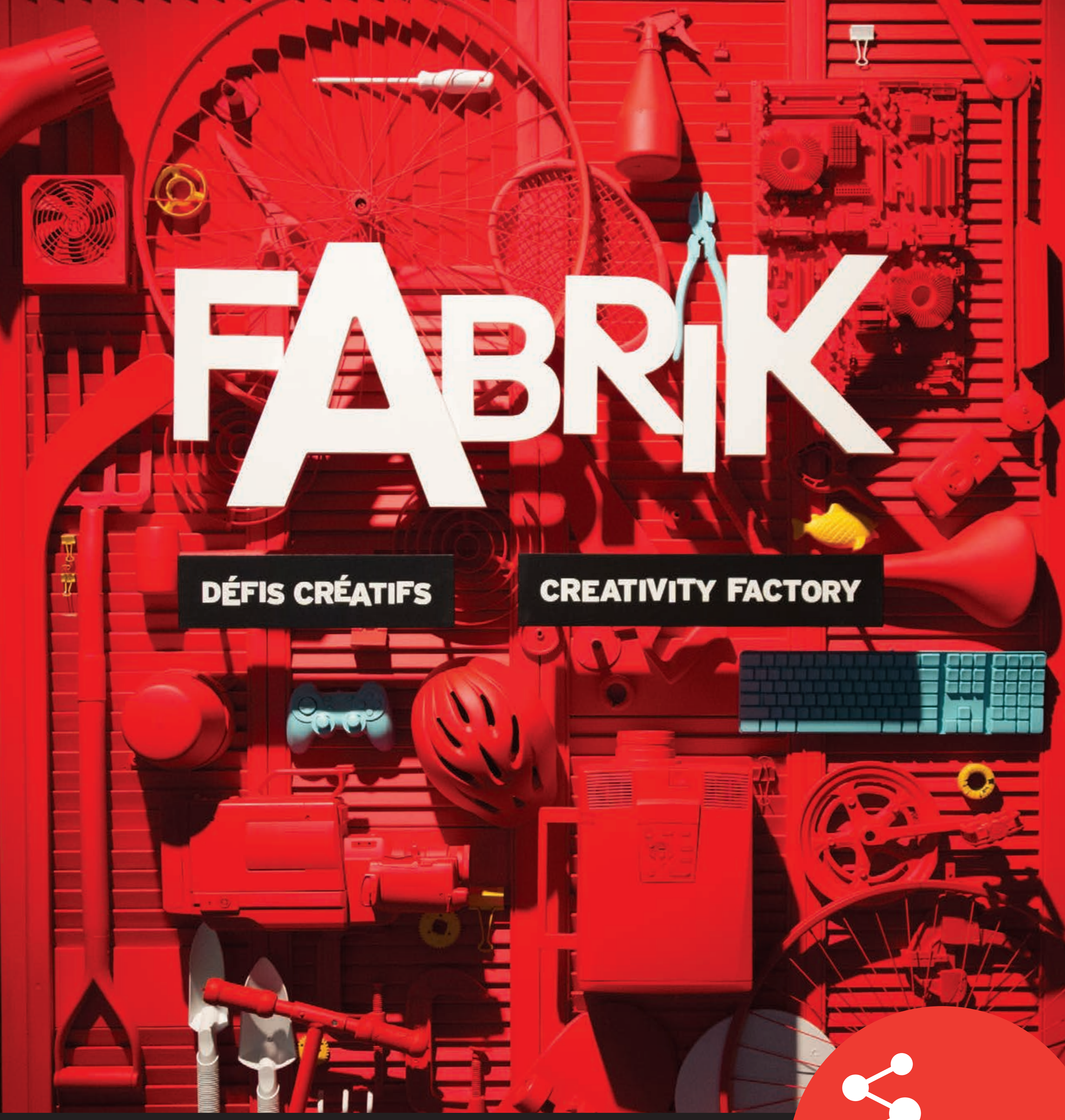

TEACHER'S GUIDE

MONTRÉAL SCIENCE CENTRE

Société immobilière du Canada limitée
Canada Lands Company Limited

Welcome to Fabrik!

In this guide, the Montréal Science Centre Educators propose some creative challenges based on working with and assembling a variety of objects. Based on the tinkering movement, these <u>60-minute</u> challenges relate to the *Québec Education Program* and offer students an experience in which the joy of learning leads to the acquisition of new competencies.

Working alone or in teams, visitors of all ages must come up with technological solutions and build them from the hodgepodge of materials at their disposal. It might be a racing car, a parachute, a catapult or a floating structure… anything is possible. Participants think, experiment, and above all, have fun, because in Fabrik, no idea is a bad idea.

WHAT IS TINKERING?

Tinkering, one of the key trends in the maker movement, involves learning with your hands. When you tinker, you are using principles that patent makers have applied in Quebec for generations.

Test Quickly and Often

Does it work? There's only one way to find out: test it! So you construct, you test… and you begin again! At Fabrik, we experiment with materials. And we love iterations.

Collaborating and Pollinating Ideas

We often compete with our peers, but not at *Fabrik where* collaboration is the rule. And the emphasis is on the creative process rather than on performance. There are no "corporate secrets" here: knowledge sharing is encouraged and imitation is permitted. "Good artists copy; great artists steal," said Steve Jobs, who "borrowed" that quotation from Picasso.

Mistakes Allowed

A mistake is a learning opportunity. There are no "right answers", but an infinite number of solutions. A mistake is viewed as an opportunity to learn and to improve the prototype. It has positive value.

Autonomy

Students are given an initial goal that they can modify as they go along without continually referring to the educator or the teacher for advice. It is up to the students to experiment. Did they finish early? No problem! A series of supplemental challenges will test the mettle of even the most adept.

Authenticity

To make objects, you need real tools and real skills. You also need to be careful and it can be noisy Fortunately, our experienced educators are there to oversee the entire process.

Enjoyment

… is key. Your students will be involved as never before and will persevere despite the occasional frustration. Your challenge will be to get them to stop.

A FOUR-STEP PEDAGOGICAL APPROACH

1 Challenge

Each class is divided into two groups of up to 15 students in order to meet the following 6 challenges:

- build a light structure in the Shack;
- keep a weight from "drowning" in the Pond;
- protect a ball from shock in free fall from the Balcony;
- construct a wind-powered engine capable of moving a mass down the Alley;
- assemble a racing car that can speed down the Clothesline;
- construct a giant chain reaction in the Garden Shed.

With each challenge, you need to be creative, persist, and have fun.

2 Construction

Working in teams of 2 or 3, students practice the principles of tinkering. "Creativity means inventing, experimenting, taking risks, breaking rules, making mistakes and having fun," said Mary Lou Cook, artist, minister and more. That sums it up.

The first challenge provides instant success for everyone, after which the students' ingenuity — including that of little geniuses — will be put to the test through a series of increasingly difficult challenges. The progression is adapted to the rhythm of each pupil (differentiation).

3 Presentation

After about half an hour of intense work, each team presents their prototype. On what principles did they base it? What are they most proud about? What difficulties did they face and how did they overcome them? You will be amazed at what your students can accomplish. In the end, whether the prototype passes the test or not, it attests to the tenacity and creativity of each student.

4 Disassembly

Everything that was assembled must be disassembled. This encourages students to put things away at home and at school, to the delight of parents and teachers. Now it is up to you to follow up with additional tinkering challengers that are easy to do. Who said science has to be complicated?

DO KIDS LEARN AT FABRIK?

Tinkering is an excellent way to put the disciplinary competencies of the *Quebec Education Program* in science and technology into practice, while at the same time making connections to elements of the *Progression of Learning*.

Tinkering triggers the retention of concepts while creating an emotional link with the student. Your students will remember their innovations and will be better able to contextualize their learning.

The links to many aspects of the *Progression of Learning* will depend on the design of the prototypes (gravity, friction, mechanics, guidance, assembly techniques, etc.)

LINKS TO SCIENCE AND TECHNOLOGY DISCIPLINARY SKILLS IN PRIMARY AND SECONDARY SCHOOL

In connection with the practical component (competency 1):

- seeks answers or solutions to scientific or technological problems;
- communicates in the languages used in science and technology.

POTENTIAL LINKS TO THE PROGRESSION OF LEARNING

Links to the Progression will vary, depending on the nature of the challenge and the prototypes invented by your students. Here are some examples of potential links:

- forces and motion;
- simple machines;
- components of a system;
- electrical circuits;
- mechanisms that transmit motion ;
- engineering;
- effects of a force on the direction of an object;
- friction;
- gravitational force exerted on an object;
- techniques for the safe use of machines and tools;
- assembly and disassembly techniques;
- etc.