

## Quebec - Achievements and Competencies

### Learning Outcomes

<b>Cycle 2 (Gr. 9-10)</b>	<b>Physics - Sec. 5</b>
Transformation of energy	Dynamics

The Quebec Achievements and Competencies are based on the Progression of Learning Outcomes derived from the Quebec Education Plan set by the Ministère de l'Éducation, du Loisir et du Sport.

### Specific Expectations

#### **GENERAL EDUCATION PATH**

#### **CYCLE 2 (Gr. 9-10) — Secondary 4**

#### MATERIAL WORLD

#### B. Changes

5. Transformation of energy
  - b. Law of conservation of energy
    - i) Explains qualitatively the law of conservation of energy
    - ii) Applies the law of conservation of energy in different contexts

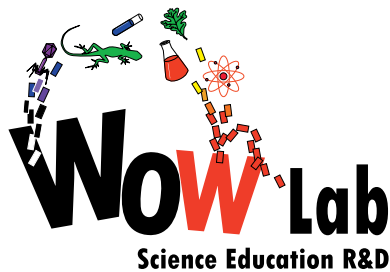
In *Tumbling Dominoes*, students will determine how the law of conservation of energy is applied to the two demonstrations that use the dominoes. Students will engage in discussions to explain how the dominoes are able to “climb up” the stairs or how a smaller domino can cause a much larger domino to fall over.

#### **EST Secondary 4**

#### MATERIAL WORLD

#### B. Changes

5. Transformation of energy
  - i. Relationship between potential energy, mass, acceleration and distance travelled
    - i) Describes qualitatively the relationship between the potential energy of a body, its mass, its gravitational acceleration and the distance it travels
    - ii) Applies the mathematical relationship between potential energy, mass, gravitational acceleration and the distance travelled ( $E_p = mgh$ )



a WOW Lab

# BLUEPRINT

## Tumbling Dominoes - Quebec - Achievements and Competencies

In *Tumbling Dominoes*, students will describe the relationship between mass, height, and potential energy by examining the two demonstrations in this activity. They will use the mathematical relationship ( $E_p = mgh$ ) to determine the gravitational potential energy of the ninth (the largest) domino and of the cereal box.

### **APPLIED GENERAL EDUCATION PATH**

#### **CYCLE 2 (Gr. 9-10) — Secondary 4**

##### MATERIAL WORLD

##### B. Changes

5. Transformation of energy
  - b. Law of conservation of energy
    - i) Explains qualitatively the law of conservation of energy
    - ii) Applies the law of conservation of energy in different contexts

In *Tumbling Dominoes*, students will determine how the law of conservation of energy is applied to the two demonstrations that use the dominoes. Students will engage in discussions to explain how the dominoes are able to “climb up” the stairs or how a smaller domino can cause a much larger domino to fall over.

#### **SE Secondary 4**

##### MATERIAL WORLD

##### B. Changes

5. Transformation of energy
  - f. Relationship between potential energy, mass, acceleration and distance travelled
    - i) Describes qualitatively the relationship between the potential energy of a body, its mass, its gravitational acceleration and the distance it travels
    - ii) Applies the mathematical relationship between potential energy, mass, gravitational acceleration and the distance travelled ( $E_p = mgh$ )

In *Tumbling Dominoes*, students will describe the relationship between mass, height, and potential energy by examining the two demonstrations in this activity. They will use the mathematical relationship ( $E_p = mgh$ ) to determine the gravitational potential energy of the ninth (the largest) domino and of the cereal box.

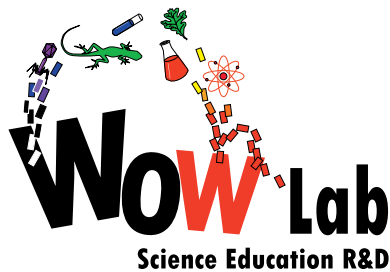
### **PHYSICS - Optional Program**

#### **Secondary 5**

##### DYNAMICS

##### 1. Gravitational acceleration

- a. Compares the average values of gravitational acceleration on Earth and on the Moon (9,8 m/s<sup>2</sup> on Earth, 1,6 m/s<sup>2</sup> on the Moon)



a WOW Lab

# BLUEPRINT

## Tumbling Dominoes - Quebec - Achievements and Competencies

As an extension for this activity, teachers can have students calculate the gravitational potential energy of the ninth domino (the largest domino) and of the cereal box, using the value of the gravitational acceleration on the Moon. Students can discuss the differences in value and why they occur.

### 2. Gravitational force

- a. Associates the free fall of a body with the effect of gravitational force
- b. Associates the gravitational force of a body with its weight

Students should describe the gravitational force acting on the dominoes. They can compare the gravitational force acting on the small and large dominoes. Students can discuss the concept of gravitational force and its relationship to the centre of gravity (or the centre of mass).

## Strategies

### A. EXPLORATION STRATEGIES

3. Referring to similar problems that have already been solved
4. Becoming aware of his or her previous representations
6. Formulating questions
7. Putting forward hypotheses (e.g. individually, in teams, as a class)
10. Imagining solutions to a problem in light of his or her explanations
13. Using different types of reasoning (e.g. induction, deduction, inference, comparison, classification)

### B. INSTRUMENTATION STRATEGIES

4. Using different tools for recording information (e.g. diagrams, notes, graphs, procedures, logbook)
5. Using a variety of observational techniques and tools

### C. ANALYTICAL STRATEGIES

1. Identifying the constraints and important elements related to the problem-solving situation
3. Using different types of reasoning (e.g. inductive and deductive reasoning, comparison, classification, prioritization) in order to process information
4. Reasoning by analogy in order to process information and adapt scientific and technological knowledge

### D. COMMUNICATION STRATEGIES

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