CLIL LESSON PLAN: PHYSICS

by Lykogiannaki Styliani

Content Subject: Physics

English Level: at least B1 and above: from B1 to C1.

Grade: 2nd grade of junior high school / 8th year

MATERIALS /RESOURCES: All the suggested activities are adapted from the book Think Teen, 3rd grade: Student's book p. 27, 28, 35 and Workbook p. 26, 31. Relevant Book Content: Book of Physics 2nd grade of High School, pages: 54-59. Other resources: http://science.howstuffworks.com/roller-coaster2.htm

Estimated time: 90 minutes, 2 class sessions.

Suggested lesson title: "Newton's Laws of Motion".

Learning objectives:

Students will revise and use Newton's Laws of Motion.

Students will understand the application of Newton's Laws of Motion through examples.

Students will understand the mechanism and process of motion of objects.

Students will expand their knowledge about kinetic and potential energy through the example of the roller coaster ride.

Students will revise and become familiar with key physics concepts associated with motion, such as the different types of energy and their interaction, action and reaction, speed and acceleration, balance, inertia, friction.

Students will do all of the above using the language of physics.

Lesson procedure / Learning Activities

1. Students read the following text regarding the Laws of Physics that explain the process of motion. [20 minutes]

Read Newton's ‘Laws of Motion'.

Law 1. Newton's law of motion states that for every force there is an equal and opposite force. These forces are called action forces and reaction forces.
Law 2. Newton's law of motion states that objects at rest tend to stay at rest, and objects that are moving tend to continue moving. This tendency of objects to resist changes in motion is called inertia.
Law 3. Newton's law of motion states that when an unbalanced force is applied to an object the object accelerates. The amount of acceleration depends on the mass of the object and the amount of force applied to it. More force to an object results in greater acceleration. Increases in mass result in less acceleration.

2. Students match the above 3 Newton's Laws of Motion to the simpler way of saying them.

a. An object moving in a straight line will keep moving in that direction unless acted on by an outside force.
b. If an object is moved by a force, it will move in the direction of the force. Also the greater the force, the faster the object moves.
c. For every action there is an equal and opposite reaction.

Adapted from Student's book Think Teen, 3rd grade, p. 27

3. Students work in pairs and share their experience from going on a roller coaster ride. They think and explain how Newton's Laws are used in the design and movement of roller coasters: “They don't have engines, they don't have brakes so, what makes a roller coaster speed up, slow down, and loop upside down?” They try to summarize two principles that make roller coasters move along the tracks. They are given the following drawing and collaborate in order to decide at which points a-f the cars have the most kinetic energy and the most potential energy waiting to be used. [15 minutes]

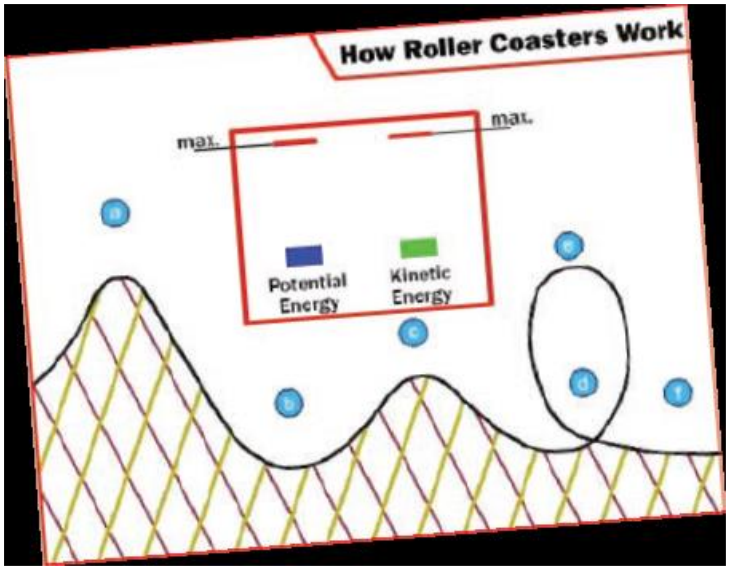

Photo adapted from http://science.howstuffworks.com/roller-coaster2.htm

Then, they read the text below to confirm their answers.

At first glance, a roller coaster is something like a passenger train. It consists of a series of connected cars that move on tracks. But unlike a passenger train, a roller coaster has no engine or power source of its own. For most of the ride, the train is moved by gravity and momentum. To build up this momentum, you need to get the train to the top of the first hill (the lift hill) or give it a powerful launch.
A roller coaster's energy changes from potential to kinetic energy. At the top of the first hill, there is a maximum potential energy because the train is as high as it gets. As the train starts down the hill, this potential energy becomes kinetic energy and the train speeds up. This happens again and again as the train moves along the track.

Adapted from http://science.howstuffworks.com/roller-coaster2.htm

4. Students read the text on roller coaster rides and use the following words: **ascent, kinetic, energy, friction, potential, track** to complete it. [5 minutes]

The basic elements of a roller coaster are kinetic energy and friction. Kinetic energy is the power that an object gets because it is moving. Friction is the force that stops something moving when it rubs on another surface. Both are used in roller coaster rides. The coaster cars ride along on a long winding _____. The track begins with a steep _____, which builds up a reservoir of _____ energy in the coaster car. The rest of the track's hills and valleys, twists and turns change the built-up _____ back and forth between potential energy to _____ energy. As the train moves, it gradually loses energy because of _____ until it reaches the end of the ride.

Adapted from http://science.howstuffworks.com/roller-coaster2.htm

5. Students use their knowledge about Physics Laws of Motion to complete a multiple choice activity. [10 minutes]

1. Newton's first Law …… that for every force, there is an equal and opposite force.
a) tells b) makes c) states d) informs
2. The amount of …… depends on the mass of the object.
a) acceleration b) quickness c) speed d) fastness
3. More …… to an object results in greater acceleration.
a) power b) force c) strength d) speed
4. Objects at rest tend to stay at ……
a) place b) once c) home d) rest
5. On a roller coaster, the energy changes between potential and ……
a) energetic b) active c) kinetic d) friction
6. At the top of each roller coaster hill there is …… potential energy.
a) little b) some c) no d) maximum

Adapted from Student's book Think Teen, 3rd grade, p. 35

6. Students use relevant information about the Laws of Motion and choose the term of physics from those given that is most suitable to complete every sentence. [15 minutes]

Have you ever experienced **1…**…, which means going against changes in your state of **2…**…, for example, in a car while it is braking to a stop? The **3…**… of the road on the locked wheels provides the unbalanced force to change the car's **4…**… of motion, however, there is no **5…**… force to change your own state of motion. Therefore, you continue in motion, sliding along the seat in a forward motion. A person in motion tends to stay in motion with the same **6…**… and in the same direction unless there is a(n) **7…**… force. In a car this can be a seat belt. Yes, seat belts are used to provide safety for passengers whose motion is governed by Newton's laws. The seat belt provides the unbalanced force which brings you from a state of motion to a state of **8…**…. So, what do you think might happen when you do not put on your seat belt and your car hits another one?
1. a. forces **b.** inertia **c.** potential **d.** action
2. a. motion **b.** moving **c.** change **d.** mind
3. a. object **b.** action **c.** force **d.** amount
4. a. state **b.** tendency **c.** force **d.** mass
5. a. acceleration **b.** motion **c.** unbalanced **d.** object
6. a. speed **b.** acceleration **c.** inertia **d.** reaction
7. a. opposite **b.** tendency **c.** motion **d.** effort
8. a. reaction **b.** rest **c.** acceleration **d.** change

Adapted from Workbook Think Teen, 3rd grade, p. 31