

Quebec - Achievements and Competencies

Learning Outcomes

Cycle 1 (Gr. 1-2)	Cycle 2 (Gr. 3-4)	Cycle 3 (Gr. 5-6)
Properties of matter	Properties of matter	Properties of matter
Mixtures	Mixtures	Mixtures
Solids, liquids, and gases		

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

CYCLE 1 (Gr. 1-2)

MATERIAL WORLD

A. Matter

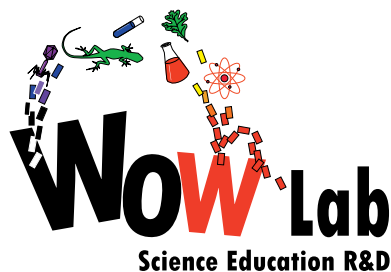
1. Properties and characteristics of matter
 - a. Classifies objects according to their properties (e.g. colour, shape, size, texture, smell)

In *Rainbow in a Bottle*, students can classify the sugar-water solutions into different categories, such as more sweet or less sweet. By keeping track of the quantity of sugar added to the water, students can judge how sweet the solution will be without tasting it. Teachers can also get students to classify the sugar-water solutions by the food colouring used to give it its colour.

2. Mixtures
 - a. Distinguishes between substances that are soluble in water (e.g. salt, sugar) and those that are not (e.g. pepper, sand)

Students will understand that sugar dissolves in water. Teachers can ask students to list substances that also dissolve in water, like salt, and to list substances that will not dissolve in water, like oil.

3. Solid, liquid, gaseous state, phase changes
 - a. Distinguishes among the three states of matter (solid, liquid, gas)
 - d. Determines the state of various objects and substances in his/her environment (e.g. glass, air, milk, plastic)



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Students should be able to describe solids, liquids, and gases. They can identify sugar as a solid and water as a liquid. They should recognize that when the two substances (sugar and water) are mixed together, the resulting state is a liquid. Teachers can explain how the sugar dissolves into the water.

E. Techniques

1. Use of simple measuring instruments

- a. Appropriately uses simple measuring instruments (rulers, dropper, graduated cylinder, balance, thermometer, chronometer)

Students are required to demonstrate appropriate use of simple measuring instruments, such as measuring spoons.

F. Appropriate Language

1. Appropriately uses terminology related to the material world

Students are required to use the appropriate terminology throughout the activity (e.g. sugar, water, solution, dissolve, soluble, solid, liquid, gas).

CYCLE 2 (Gr. 3-4)

MATERIAL WORLD

A. Matter

1. Properties and characteristics of matter

- e. Describes the shape, colour and texture of an object or a substance

In this activity, students can use descriptive words to describe the sugar-water solutions. Students can compare the solutions discussing the sugar amounts, explaining what they think the solutions look like at the molecular level.

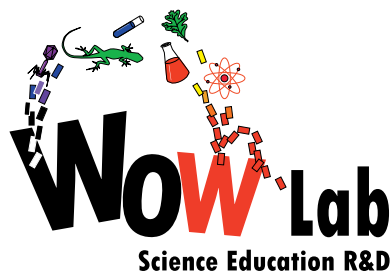
- h. Associates the buoyancy of a volume of liquid in an identical volume of a different liquid with the densities of these liquids (relative density)

Students will have the opportunity to see that the different amounts of sugar cause the sugar-water solutions to have different densities. The different coloured solutions will be layered in the glass container for students to see that solutions with lower densities sit on top of solutions with higher densities. Students should engage in discussions to explain why this happens.

2. Mixtures

- b. Distinguishes between mixtures of miscible and immiscible liquids (e.g. water and milk, water and oil)

Students will learn that the miscible sugar-water solutions will eventually mix together and achieve equilibrium, forming a single uniform solution. This doesn't happen with immiscible solutions, such as water and oil.



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- c. Distinguishes between substances that are soluble in water (e.g. salt, sugar) and those that are not (e.g. pepper, sand)

Students will identify sugar as a substance that is soluble in water. Teachers can engage students in a discussion about situations where it may seem as though the sugar isn't dissolving such as when there is too much solute (sugar) and not enough solvent (water) for the solute to dissolve in. This may lead into a discussion about saturated and super-saturated solutions.

E. Techniques

1. Use of simple measuring instruments
 - a. Appropriately uses simple measuring instruments (rulers, dropper, graduated cylinder, balance, thermometer, chronometer)

Students are required to demonstrate appropriate use of simple measuring instruments, such as measuring spoons.

F. Appropriate Language

1. Appropriately uses terminology related to the material world

Students are required to use the appropriate terminology throughout the activity (e.g. sugar, water, solution, dissolve, soluble, solid, liquid, gas, density, buoyancy, miscible, immiscible, solubility).

CYCLE 3 (Gr. 5-6)

MATERIAL WORLD

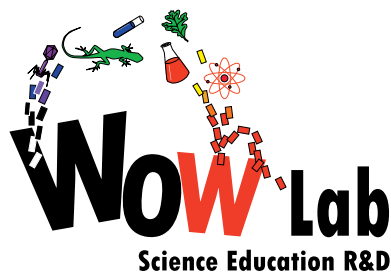
A. Matter

1. Properties and characteristics of matter
 - j. Describes various other physical properties of an object, a substance or a material (e.g. elasticity, hardness, solubility)

In this activity, students can use descriptive words to describe the sugar-water solutions. Students can compare the solutions discussing the sugar amounts, explaining what they think the solutions look like at the molecular level. Students can make comparisons between the sugar-water solutions, discussing which amount of sugar would dissolve faster and explain why.

- h. Associates the buoyancy of a volume of liquid in an identical volume of a different liquid with the densities of these liquids (relative density)

Students will have the opportunity to see that the different amounts of sugar cause the sugar-water solutions to have different densities. The different coloured solutions will be layered in the glass container for students to see that solutions with lower densities sit on top of solutions with higher densities. Students should engage in discussions to explain why this happens.



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2. Mixtures

- b. Distinguishes between mixtures of miscible and immiscible liquids (e.g. water and milk, water and oil)

Students will learn that the miscible sugar-water solutions will eventually mix together and achieve equilibrium, forming a single, uniform solution. This doesn't happen with immiscible solutions, such as water and oil.

- c. Distinguishes between substances that are soluble in water (e.g. salt, sugar) and those that are not (e.g. pepper, sand)

Students will identify sugar as a substance that is soluble in water. Teachers can engage students in a discussion about situations where it may seem as though the sugar isn't dissolving such as when there is too much solute (sugar) and not enough solvent (water) for the solute to dissolve in. This may lead into a discussion about saturated and super-saturated solutions.

E. Techniques

1. Use of simple measuring instruments
 - a. Appropriately uses simple measuring instruments (rulers, dropper, graduated cylinder, balance, thermometer, chronometer)

Students are required to demonstrate appropriate use of simple measuring instruments, such as measuring spoons.

F. Appropriate Language

1. Appropriately uses terminology related to the material world

Students are required to use the appropriate terminology throughout the activity (e.g. sugar, water, solution, dissolve, soluble, solid, liquid, gas, density, buoyancy, miscible, immiscible, solubility, solute, solvent, saturated solutions, super-saturated solutions).

Strategies

EXPLORATION STRATEGIES

- 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)



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STRATEGIES FOR RECORDING, USING AND INTERPRETING INFORMATION

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

COMMUNICATION STRATEGIES

- Using tools to display information in tables and graphs or to draw a diagram
- Exchanging information
- Comparing different possible explanations for or solutions to a problem in order to assess them (e.g. full-group discussion)