

Separating Mixtures – Recycling Challenge Grade 7 Matter and Energy

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| <h2 style="margin: 0;">Lesson Plan</h2>   | Assessment   | Assessment for/of learning |
|   | Cross-curricular   | Social Studies             |
| <p><b>Big Ideas</b></p> <ul style="list-style-type: none"> <li>Pure substances and mixtures have an impact on society and the environment</li> <li>Understanding the characteristics of matter allows us to make informed choices about how we use it</li> </ul> <p><b>Overall Expectations</b></p> <ol style="list-style-type: none"> <li>1. Evaluate the social and environmental impacts of the use and disposal of pure substances and mixtures</li> <li>3. Demonstrate an understanding of the properties of pure substances and mixtures; and describe these characteristics using particle theory</li> </ol> | <p><b>Specific Expectations</b></p> <ul style="list-style-type: none"> <li><b>1.2</b> Assess the impact on society and the environment of different industrial methods of separating mixtures and solutions</li> <li><b>3.5</b> Describe the processes used to separate mixtures or solutions into their components, and identify some industrial applications of these processes</li> </ul> <p><b>Learning Goal</b></p> <p>To apply separation techniques in a real world application</p> |                            |
| <p><b>Description</b></p> <p>Recycling plants are an industrial example for which separation of mechanical mixtures occur every day. They must find ways to separate tonnes of incoming material ranging from paper to steel, so that it can be re-used in an effective and cost effective way. In this lesson, students create a device or tool to sort recycling at their school, reducing the strain on their municipal recycling facility.</p>  |  |                            |
| <p><b>Materials</b></p> <ul style="list-style-type: none"> <li>Cardboard</li> <li>Newspaper</li> <li>Steel cans</li> <li>Aluminum cans</li> <li>Glass bottles</li> <li>Plastic bottles</li> <li>Various classroom supplies (Elastics, skewers, popsicle sticks, magnets, tape, pipe cleaner, paper plates, plastic cups, string, paper clips, etc.)</li> </ul>  | <p><b>Safety Notes</b></p> <p>Ensure that all recycled material is clean before using it for this project. Wear gloves when handling recycled material.</p>  |                            |

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## Introduction

Outline the importance of recycling and effective separation techniques:

There are numerous benefits to recycling including reducing our climate impact, conserving resources, creating jobs and helping our community by distributing unwanted goods. The benefits of recycling are well known with the average Canadian recycles 112 kg of material per year. In Ontario, this amounts to over 1.5 million tonnes of recycling a year.

Recycling facilities are increasingly sophisticated in order to sort through the large quantities of recycling that make it to the facility. Unfortunately, material that cannot be recycled often ends up at these facilities as well. This has a negative impact on recycling facilities as it is wasteful and dangerous to transport materials that cannot be processed. Furthermore, non-recyclable material can spoil the recyclability of materials, cause machines to break down and prevent other material from being properly recycled.

The **PowerPoint** included in this lesson can be used to detail the importance of recycling and provide a visual representation of how recycling plants sort recycling.

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## Action

### Objective

To reduce the impact of non-recyclable material on sorting facilities, the local recycling plant is challenging students to develop a better recycling sorting system at their school. They will be developing and implementing the best design across the city.

Your goal is build a tool, machine, or system that can efficiently sort through recycled material. You never know what kind of material you'll get so your invention must **sort the material without using your hands and incorporate three separation methods**. Your invention will have to sort recycling into the following piles: **cardboard, paper, steel, aluminum, glass, and plastic**.

### Procedure

To complete the project, you must do the following:

1. Develop a plan that outlines a process for sorting the recycling. Consider what needs to be sorted first, the materials you'll use and what you will need to build. Include a drawing of your invention. This must be approved before continuing to the next step.
2. Buy the materials necessary for sorting your recycling. The primary goal is to invent an efficient recycling system but the recycling facility is looking for a design that is both efficient and cost effective. The material list can be found in **Table 1** of the **student handout**.
3. Build your recycling system; this step includes any trial runs and modifications.
4. Use your recycling system to sort the components (cardboard, paper, steel, aluminum, glass, plastic, waste)

### Consolidation

Students present a 2 minute sales pitch as to why their recycling system should be used by the recycling facility. The **rubric** for this project, including the presentation, is provided as part of the lesson files.

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### Resources

#### Tips for a great sales pitch:

( <https://blog.hubspot.com/sales/essential-elements-of-a-successful-sales-pitch> )

- Summarize why they should buy from you
  - Focus on client problems and present solutions
  - Communicate results
  - Make it easy and quick to understand
  - Give examples that demonstrate your product's value
  - Provide evidence
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