



## Stage 6 - Designing an Innovative Farming Machine

### Stage Overview:

Students will learn about the engineering design process, a requirement of the Science and Technology curriculum. Students will have the chance to seek solutions to a problem that affects others and help farmers continue to protect the environment while farming with sustainable equipment. They will design their own innovative farming machine to help farmers plant their crops while protecting the environment and fighting climate change.

### Learning Objective:

- Practise the engineering design process.
- Follow the process by which crops are planted, grown, harvested, and processed to become ingredients we use to prepare food.
- Learn about current farming equipment.
- Discuss/review previous learning of the impact of environment on agriculture (and vice versa).

### Materials Needed:

- *Grain Matching* cards (one set per group)
- *Farm Machines Note Making Template* (one set per group)
- Recycled materials
- Tape, glue, stapler
- Craft wire, pipe cleaners, popsicle sticks, straws, etc.
- Reference material about farm machinery
- Optional: Consider contacting your local farm equipment dealer and requesting materials about combine/harvester, seeders and cultivator/tillage equipment.

Time Frame: 3 hours

**Curriculum Connections:** These lesson plans are mapped to curriculum objectives. Find all the details on page 3.

### Presentation Notes

Slide 3 - 4:  
Grain Game

- Explain: Many food products are made from grain plants like the ones we are growing but they have to go through different processes to become food.
- Give the children the grain matching cards. Have them work in pairs to determine which food products are made from each grain.
- Allow time for students to give their answers and share the video(s) to demonstrate the process involved in growing oats and wheat.
- See how oats get from farm to fork, ready for your warm, tasty bowl of oatmeal:
  - **The lives and work of Ontario grain farmers**  
<https://goodineverygrain.ca/2022/01/10/virtual-360-degrees-grain-farm-tour/>
  - **Good in Every Grain, a video about growing oats in Ontario**  
<https://www.youtube.com/watch?v=IVdVmGS5zfs>
  - **From Saskatchewan, four videos about planting, harvesting, processing oats**  
<https://www.farmfood360.ca/en/oats/>
  - **How Bread is Made, animated video, wheat from seed to loaf**  
<https://www.youtube.com/watch?v=gIWpjy2qpPk>



<p><b>Slide 5:</b> The Engineering Design Process</p>	<ul style="list-style-type: none"> <li>• Use the PowerPoint presentation to share the stages of the engineering design process and then work through the stages.</li> </ul>
<p><b>Slide 6:</b> Ask</p>	<ul style="list-style-type: none"> <li>• Explain: we will use the engineering design process to design our own planting machine. Our goal is to overcome challenges faced by farmers.</li> <li>• Ask students to remember some of the challenges farmers face that we learned about in previous stages (e.g., soil compaction, keeping nutrients in the soil, erosion).</li> </ul>
<p><b>Slide 7 - 10:</b> Research</p>	<ul style="list-style-type: none"> <li>• Watch the video to explain how a seed drill works: How Do You Plant Ontario Grains? <a href="https://www.youtube.com/watch?v=OMLOx7Cehn8">https://www.youtube.com/watch?v=OMLOx7Cehn8</a> - YouTube</li> <li>• Allocate one piece of farming machinery to each business group and ask them to research what it does, how it works, and some of its advantages and disadvantages. For example, you could use a cultivator, a seed drill, a crop sprayer, and a combine harvester.</li> <li>• Ask students to make their notes on the <i>Farm Machines Note Making Template</i> and then present their findings to the class.</li> </ul>
<p><b>Slide 11:</b> Imagine</p>	<ul style="list-style-type: none"> <li>• Explore the role of technology on farms.</li> <li>• This video, <b>The Future of Farming Robots</b>, shows how farming technology can use AI mapping, GPS, and robots within the natural environment. Robots can help make farming more efficient, environmentally friendly, and productive. <a href="https://www.youtube.com/watch?v=uD4mJCgsmdM">https://www.youtube.com/watch?v=uD4mJCgsmdM</a></li> </ul>
<p><b>Slide 12:</b> Plan</p>	<ul style="list-style-type: none"> <li>• Ask students to start planning their planting machine designs using a labelled sketch.</li> <li>• To simplify this activity, you could use this example as a starting point: <a href="https://www.curiositymachine.org/challenges/121/">https://www.curiositymachine.org/challenges/121/</a></li> <li>• If you opt to use the tutorial in the video, which shows a plan for a seed planter that drops one seed at a time, the activity could be to think about how to adapt and improve the tutorial's planter using what they have learned. For example, real seed drills plant hundreds of seeds at a time. How could students modify the seed planter to plant a larger area of the field at a time, so the farmer could plant a field of grains faster.</li> </ul>
<p><b>Slide 13:</b> Create</p>	<ul style="list-style-type: none"> <li>• Working in groups, ask students to build their farming machine using recycled materials. This could be a homework task if you are short of time.</li> </ul>
<p><b>Slide 14:</b> Test and Improve</p>	<ul style="list-style-type: none"> <li>• Give the students an opportunity to test their new machine and make adjustments to it.</li> <li>• Using the evaluation template, ask students to evaluate what has gone well with their machine design and what they would like to improve.</li> </ul>
<p><b>Slide 15:</b> Present</p>	<ul style="list-style-type: none"> <li>• Ask groups to present their designs to the class and explain the farming challenge they are solving.</li> </ul>



## Curricular Connections:



### Science and Technology: Engineering Design Process, Health and Physical Education and Language

- **A1.3** use an engineering design process and associated skills to design, build, and test devices, models, structures, and/or systems.
- **D1.1** demonstrate an understanding of how the origins of food (e.g., where the food is grown, harvested, trapped, fished, or hunted; whether and how it is processed or prepared) affect its nutritional value and how those factors and others (e.g., the way we consume and dispose of food) can affect the environment.



### Language

- **A1.1** Apply transferable skills when reading, listening to, viewing, and creating texts of various forms.
- **A3.1** Apply the knowledge and skills developed in this grade to support learning in various subject areas and identify some ways this learning can be used in everyday life
- **B1.1** Use effective listening skills, including asking questions to clarify information and ideas, in formal and informal contexts and for various purposes, including in small- and large-group conversations and various classroom activities
- **B1.3** Identify the purpose and audience for speaking in formal and informal contexts, and use appropriate speaking strategies, including establishing a rapport with the audience, to communicate clearly and coherently
- **B1.5** Use appropriate word choice, including new vocabulary, grammar, and cohesive sentences when speaking and communicating ideas in various contexts, to support audience comprehension.

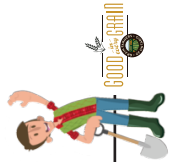
## Grain Farming Connections

- Show how grains get from the farm to the table.
- Consider innovative sustainable/environmental use of farm machines.
- Innovation is making today's farming equipment part of the solution to climate change. Today's machinery is more efficient and less harmful to soil and the environment. More efficient vehicles mean farmers spend less time driving on fields, which mean less soil compaction and therefore healthier soil. Less fuel burned means fewer emissions and therefore cleaner air.

# Farm Machines Note Making Template



<p><b>Cultivator/Tillage</b></p> <p>Function:</p> <p>How Does it Work?</p>	<p><b>Sprayer</b></p> <p>Function:</p> <p>How Does it Work?</p>
<p><b>Seed Drill</b></p> <p>Function:</p> <p>How Does it Work?</p>	<p><b>Combine Harvester</b></p> <p>Function:</p> <p>How Does it Work?</p>





# Grain Matching Cards

Printing Instructions: We suggest printing onto a thicker paper stock (card or matte photo paper) and select "Fit to printable area" (or similar) to ensure the page fits with your printer type and local paper size. One set per group.





<p><b>Barley</b></p> 	<p><b>Pet Food</b></p> 	<p><b>Fish Food</b></p> 	<p><b>Baby Food</b></p> 
<p><b>Corn</b></p> 	<p><b>Candy</b></p> 	<p><b>Chalk</b></p> 	<p><b>Toothpaste</b></p> 
<p><b>Oats</b></p> 	<p><b>Lotion</b></p> 	<p><b>Granola</b></p> 	<p><b>Soap</b></p> 



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<b>Soybeans</b> 	<b>Steering Wheel</b> 	<b>Candle</b> 	<b>Crayon</b> 
<b>Wheat</b> 	<b>Bread</b> 	<b>Glue</b> 	<b>Paper</b> 

