LEARNING EXPERIENCE FOUR

Guiding Question: How does mechanization affect the food system?

This **Learning Source** and accompanying **Build Competencies** activities explore the concept of farm mechanization, focusing on examples of mechanization over time and comparing technologies – tools and implements – of the past with emerging technologies used today in seeding and harvesting. Students are encouraged to think about design and function as it relates to agricultural machinery. This **Learning Source** and **Build Competencies** activity can also be used with **LEARNING EXPERIENCE FIVE** on **pages 52 to 55** to explore connections between mechanization and sustainability.

This **Learning Source** provides starting points and information to investigate: • The impact of innovation • Mechanization over time • Changing approaches to sustainability • Effects of mechanization on the food system Ask students how machines help agriculture – what do they know about the types of machines that are used on farms? Encourage them to consider what types of machines might have been used in the past and those that they are aware of today. Students may have varying degrees of familiarity with machinery used on farms, depending on their family and community backgrounds. Explore the extent to which students can connect the concept of mechanization to agriculture.	**Build Competencies: Farm Machines - Design and Function** Students analyze agricultural machines to identify the simple machines that are used in their design and explore their function and energy sources. This handout includes activities that support competencies, literacy and numeracy, and weblinks to online resources that can support student learning.	**Assess** Look for evidence of understanding of the following concepts: • Innovation • Food system • Farm mechanization • Simple machines • Compound machines • Energy • Efficiency For a formative assessment, have students revisit the concept of the food system. Use the food system cycle infographic provided in the carousel slide. Have students use a **cycle diagram** to identify examples of agricultural machines that are important for each stage of the food system, including short descriptions of their design (type of machine), function and source of energy. Provide students with the option of focusing on historical or current machines and technologies.

Additional Research or Background Sources

Consult teacher or student background sources such as the examples that follow to further explore, enrich or expand activities for this guiding question. Student research sources are also provided in **Build Competencies** handouts.

Farms.com provides a timeline of events connected to the history of agriculture, including examples of mechanization, technology and crop innovation at www.farms.com/reflections-on-farm-and-food-history/history-of-canadian-agriculture.

The Let's Talk Science website provides information and activities centred on simple machines and their mechanical advantages at https://letstalkscience.ca/. Search for "mechanization" to find images, information, related career profiles and activities.

Additional information and discussion questions are provided in the carousel slide for this guiding question in the **sustainable** PRACTICES section of the **LEARN** webpage.

Click on the carousel slide to open and explore the following content.

- A growing population and Canadian farm mechanization
- Canadian combines
- Mechanization in the food system

Find **Science 8** learning outcomes supported by this learning experience on the following page.

Use this activity to focus on the use of machines in agriculture, comparing machines used in the past to those used today. Analyze the way that energy is transferred to perform functions such as tilling, seeding and harvesting. Encourage students to assess how changes in technology have resulted in increased efficiencies and protection for environments.

Small Farm Canada provides the article 150 years of Canadian agriculture: What's changed, what hasn't and what trends will shape farming in the future, at www.smallfarmcanada.ca/features/150-years-of-canadian-agriculture-what's-changed-what-hasn't/. Examples of mechanization and crop technology can be shared with students. An overview of "the game-changers" can be found at the bottom of this article's webpage. This concept could be used with students to have them think critically about those innovations that they think have had the most impact at different periods of time throughout history.

Find a fact sheet on Grain Farm Technology today on the Agriculture in the Classroom Canada website at https://aitc-canada.ca/en-ca/learn-about-agriculture/category/growing-crops/grain-farm-technology. Students can be asked to make comparisons between technology in the past and the technology that grain farmers use today.

The Good in Every Grain website from Grain Farmers of Ontario provides a Photo Story: Harvest Equipment at https://goodineverygrain.ca/2020/08/13/photo-story-harvest-equipment/, which can be used to provide students with an overview of farm machinery currently used for harvesting.

A comprehensive, global overview of the history of farming machinery and technology is provided by the Farm Machinery article and image collection, provided by Britannica Kids at https://kids.britannica.com/students/article/farm-machinery/274269.

Companies such as John Deere Canada provide links and photos of a wide range of different types of farm equipment and technology that students can use to identify examples of machines used in agriculture. Find the John Deer Canada website at www.deere.ca/en/agriculture/.

> ACCOMMODATE AND/OR EXTEND LEARNING

Farm mechanization has probably had the most significant impact on how farmers raise crops and care for livestock. Tractors, planters, and combines are much larger and more efficient. Technologies are used to monitor crops and control application of water, pesticides and fertilizers. These technologies and others have enabled farmers to produce more with less labor.

Have students predict the technologies they think will have the most impact on crop farming fifty years into the future. What changes in mechanization do they think they will see? How might these changes affect the food system?

Evidence	My ideas	Prediction

Use a **Triple T-Chart** graphic organizer organized like the example to find evidence from their learning and brainstorm ideas to create their predictions.

Learning Experience Four: LEARNING OUTCOMES AND COMPETENCY MAP

project AGRICULTURE Activity	GRADE 8 SCIENCE	
	CONCEPTUAL KNOWLEDGE	**PROCEDURAL KNOWLEDGE**
LEARNING SOURCES How does mechanization affect the food system? **BUILD COMPETENCIES** Farm Machines - Design and Function 	**Grade 8 Science Unit D: Mechanical Systems** 1. Illustrate the development of science and technology by describing, comparing and interpreting mechanical devices that have been improved over time • investigate and provide examples of mechanical devices used in the past to meet particular needs (e.g., describe and interpret devices developed to move water or be moved by water, such as the Persian wheel, Archimedes' screw, mill wheel) • illustrate how a common need has been met in different ways over time (e.g., development of different kinds of lifting devices) 2. Analyze machines by describing the structures and functions of the overall system, the subsystems and the component parts • analyze a mechanical device, by: – describing the overall function of the device – describing the contribution of individual components or subsystems to the overall function of the device – identifying components that operate as simple machines • identify the source of energy for some familiar mechanical devices • identify linkages and power transmissions in a mechanical device, and describe their general function (e.g., identify the purpose and general function of belt drives and gear systems within a mechanical device) 4. Analyze the social and environmental contexts of science and technology, as they apply to the development of mechanical devices • illustrate how technological development is influenced by advances in science, and by changes in society and the environment	**Grade 8 Science Unit D: Mechanical Systems** Ask questions about the relationships between and among observable variables, and plan investigations to address those questions • identify practical problems (e.g., identify problems related to the effectiveness or efficiency of a mechanical device) • identify questions to investigate arising from practical problems (e.g., "What is the efficiency of this device?") Analyze qualitative and quantitative data, and develop and assess possible explanations • evaluate designs and prototypes in terms of function, reliability, safety, efficiency, use of materials and impact on the environment (e.g., test and evaluate the efficiency and reliability of a prototype device to lift a given mass from the floor to a tabletop) • identify and evaluate potential applications of findings (e.g., identify possible applications of a simple machine or mechanical system they have studied)