SCIENCE/ADST GR 6-7: HOW AGRICULTURE TOOLS HAVE CHANGED OVER TIME

DESCRIPTION OF LEARNING EXPERIENCE
Through this learning experience, students will explore machinery and technology used in the past in homes and in agriculture through an emphasis on technology and design. They will be able to identify how new design was a result of necessity and how this impacted farming and life. They will also explore the role of science in the invention and improvement of machinery. This program will tie into social studies as well as through it, students will learn the history of agriculture in this area and its significance to settlers as well as to our lives today.

BC CURRICULUM TIE INS	
Big Ideas	**Science 6:** Newton's three laws of motion describe the relationship between force and motion. **ADST 6/7:** Design can be responsive to identified needs.
Competencies	**Science 6/7:** Communicate ideas, explanations, and processes in a variety of ways Transfer and apply learning to new situations Generate and introduce new or refined ideas when problem solving **Science 7:** Co-operatively design projects Make a plan for production that includes key stages, and carry it out, making changes as needed **ADST 6/7:** Identify how the land, natural resources, and culture influence the development and use of tools and technologies
Content	**Science 6:** Newton's three laws of motion **Science 7:** survival needs: we need water, space, and access to resources to survive. **ADST 6/7:** Devices that transform energy

PRE-VISIT ACTIVITY
LEARNING INTENTION
Students will be able to explain how machinery works while thinking about the three laws of motion.
GUIDING QUESTIONS
How do machines rely on the three laws of motions to perform a task? What are the three laws of motion? Where can we find the three laws of motion in our everyday lives?
ACTIVITY
Discussion: - What are Newton's three laws of motion? How can you see these in everyday life? - *Answers: pushing a load, riding a bike, kicking or throwing a ball.* - Can you think of ways that machines use these laws to make a task easier? - *Answers: a machine that can push larger loads, rotates, moves faster, redirects an object's course, external force.* - What were the results of improved technology, specifically in people's lives and in farm work? - *Answers: make tasks easier, accomplished faster, eventually led to making a profit on food when more could be accomplished in a shorter amount of time.*

Sample Activities:

- In pairs, design a project or demonstration illustrating one or more of Newton's three laws. Alternatively have students describe the three laws on chart paper and illustrate and describe examples.
- Have students find and record or demonstrate examples of Newton's three laws of motion in and around the school.
- Have students work together to explain the connection between a machine (such as a car, airplane) and the three laws of motion.
- Students explore and research how First Nations' traditional food gathering tools relied on the three laws of motion in their ways of life.

SUGGESTED QUESTIONS FOR FURTHER THINKING

How do simple machines build more complex machines?
Do you think that understanding the three laws of motion helps us to build better machines?

YOUR VISIT TO THE BC FARM MUSEUM

FOCUSES OF YOUR VISIT

You will focus on exploring how these machines and other artifacts were designed to effectively complete a task that was previously done entirely by manual labour. How do you think the advancements in technology and design impacted agriculture and society overall?

LEARNING INTENTION

I can recognize Newton's three laws of motion in farming machinery.
I can recognize how people's needs lead to an improved design for machinery.

GUIDING QUESTIONS

How can the three laws of motion be recognized in farming in the past through to today?
What were the benefits of improvements in farming machinery?
Why do we always work to improve machines?

WHAT TO EXPECT

The primary focus of this program is to introduce students to the devices and machines used in agriculture, and how these machines have been improved on throughout the years. Separated into three different stations, the tour will introduce students to the different designs of each piece of machinery as well as the role of motion and force in the effectiveness of the machine. Students will compare the different motions and devices. They will be encouraged to consider how the design of the machine impacts its effectiveness. They will reflect on the progression of technology from past to present and consider how machines have been improved on.

ACTIVITY

INTRODUCTION – 8 mins

- What is agriculture? Share one word that you think of when you hear the word "agriculture".
    - Key words: farming, land, tractors, plants, barn, animals, etc.
- Agriculture is the harvesting and raising of plants and animals for resources such as food and fuel (specifically biofuel) for a living.
    - What are some types of food we grow?
    - What are some forms of fuel produced on a farm?
        - Key words: wood, animal power, plant-based fuel, biofuel/biodiesel, etc.
- BC has a lot of valuable resources which provided early European settlers with means of

survival. How do you think agriculture benefitted early European settlers?
  - Answers: Food such as animals and produce, selling food for money for other needs, etc.
- How do you think First Nations traditionally used the land for food?
- Have students share with a partner, then choose volunteers: Why do you think early settlers went into agriculture?
  - Survival: people needed to find something sustainable while building a new family on foreign land.
  - Business and trade: the more the land developed, the more people joined the community. What one farmer has, another doesn't.
- How did farms function in the past? How was farm work accomplished?
  - Manual labour, animal powered, family owned
- How do farms work today? (answers may vary)
  - Use machines, all mechanical i.e. tractors, hay balers, etc.
  - Food farming (dairy, eggs, produce, etc.) are done in factories and mega farms
- Raise hand if you think agriculture is surviving in the modern world.
- Question: How so?
  - Examples of modern agriculture: community gardens, school gardens, local farm markets, organic farm markets, home gardens, etc.
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GROUPS AND INSTRUCTIONS – 3 mins

To give the students an idea of how farming equipment and farming life worked, they will be observing **3** different hands on demonstrations: Rope Making, Tomato Grader, and Egg Grader. They will observe at 2 other stations: Windmill and Steam Powered Pump. They get 10 minutes at each station which are located around the museum. At this time, divide the class into 5 groups (each with their own teacher/parent supervisor) and send them to their stations.

Group 1 – Rope Making
Group 2 – Tomato grader
Group 3 – Egg grader
Group 4 – Windmill
Group 5 – Steam Powered Pump

STATION 1: Rope Making

10 Minutes
3 minutes of history
5 minutes for demonstration
2 minutes to wrap up

History – 3 mins

1. Raise your hand if you know what rope is made of. (Call on students to respond.)
   - List the different rope materials: plant based, animal based, synthetic, etc. Show samples of each type and pass them around for students to feel.
   - Note that farmers used what was available to them which is why some rope was made out of plants and animal fibres. Eventually, man-made/manufactured materials became the common fibre.

2. Now that they know the different types of materials, do they know how these ropes were made in the past?
    - Back then, they had to hand braid the rope, which used to take a long time.
    - Eventually, they came up with a rope making device that efficiently made rope with little effort.

3. Who used rope? For what? When?
    - More than farm material/tool.
    - Used on boats.
    - Manufactured for companies.

4. Why did they invent a tool/machine to make rope? (Answers will vary)
    - Possible answers: reduce labour, efficiently use time in order to complete other tasks, make longer lengths for their tasks
    - Note that farmers used to make lengths of rope for all types of jobs, even for boats and fishing.
    - This machine is actually a smaller scale model for common chores. There are actually large warehouses dedicated to creating thicker and longer lengths of rope for industrial and commercial jobs. Show pictures and clippings from the binder.

Demonstration – 5 mins

Now that they know a little bit of background information about rope materials and methods to make them, move on to the rope machine.

1. Ask for 3 volunteers to help with the demonstration: hook, paddle, and crank.
2. Have student at the **crank** to slowly turn the handle. Note how the hooks turn around. That motion will mimic braiding and twist the rope.
3. Have the student with the **paddles** to hold up the different types. Explain that these paddles will help form the shape of the rope. Depending on what the farmers needed the rope for, there 3, 4 and 5 strand paddles.
4. Have student with the **hook** carefully hold it up for the others to see. This part is extremely important if farmers wanted to make a tight and sturdy rope. It is also good for measuring the length of rope needed.
5. Set up the ropes and proceed with the demonstration. *There should be enough time to do 2 demonstrations depending on the grade.
6. Give the rope to the teacher to keep in the class.

Wrap Up – 2 mins

1. Ask students what simple machines they saw in this demonstration? Ask them to identify where they think they saw Newton's three laws of motion.
    - Wheel and axle; external force applied (Second Law)
2. Before they move on to the next station, ask them what they think about rope making? Can they imagine making rope by hand without this machine? How long do they think it would take to hand braid the same length of rope they made today?

3. Gather the students and lead them to the next station: Tomato Grader.

STATION 2: Tomato Grader

10 Minutes
3 minutes of history
5 minutes for demonstration
2 minutes to wrap up

History – 3 mins

1. Raise your hand if you can guess what this machine does.
   - Keyword: it sorts tomatoes into different sizes.
2. How do you think this machine works to sort tomatoes? (Answers will vary.)

3. Explain what the machine is.
   - Sorts tomatoes by size.
   - Upgrade from hand picking and sort tomatoes.
4. What simple machines do you see in the tomato sorter? What do you think they do? Allow students to examine and share with partner. Then call on volunteers.
   - Answer 1: Inclined plane, screw, incline plane, lever, pulley, wheel and axle
   - Answer 2: answers will vary.
   - Why do you think farmers developed this machine?
     i. Reduce manual labour
     ii. As time progressed and farmers started selling to the markets, they needed to sort quickly and efficiently to get their product out fresh and early.

Demonstration – 5 mins

1. Turn on the machine without releasing the tomatoes.
   - Describe where the tomatoes will go, how they will travel through the machine to the sorter, and where they end up.
   - Ask them how they think the machine works through observation of the moving parts.
     i. Key words: gravity, slope, etc.

2. Turn off the machine to set up the demonstration.
   - Get students to participate by asking them to work together to set up and start up the machine. Supervise carefully. Guide them with questions like: Where do the tomatoes go first? What do you do to start up the machine? What do you do to get the tomatoes to move down?

Wrap Up – 2 mins

1. Following the demonstration, ask:
   i. What did they think of the process?
   ii. How do you think the farmers felt when this machine came into use?
2. Would you change the design in any way? How so? Why? Have students share with a partner then select volunteers to share.
3. Similar to the tomato grader, the next machine is something special in that it is a multi-functioning machine. Gather and move to the next location.

STATION 3: Egg Grader

10 Minutes
3 minutes of history
5 minutes for demonstration

2 minutes to wrap up

History – 3 mins

1. Can anyone then guess what this machine does?
    - Key phrase: sorts eggs.
2. This machine uses some simple machines to wash, polish, and sort eggs by size. What are some simple machines that you see? Do you think eggs were always sorted this way?
    - Answer 1: Incline plane, screw, etc.
    - Answer 2: No. In books and movies, farmers are shown to manually collect their eggs from the chicken coop.
3. The egg grader consists of different components/parts that farmers used by hand, such as the scale, polisher, and candler. Can you think of any modern day appliances that function similarly to these tools?
    - Sample answers: Scale – weight scale; polisher – buffer for nails, sanders; candler – x-ray

Demonstration – 5 mins

1. Explain what the candler, scale, and polisher are. Have students share with their partner their ideas on the following question:
    - Why do you think farmers had to grade their eggs? Why did they have to examine each egg through these processes and steps?
2. Match and identify the candler, scale, and polisher to parts on the egg grading machine.
    - Turn the machine on and ask where they think all the parts are. Get them to help identify and match the parts in order to promote critical thinking.
3. Give full demonstration of machine. Put eggs through. Carefully monitor their journey through the machine as they may get stuck in specific areas. Allow students to see at least 4-5 different sizes.
4. Ask students to imagine not having the egg grading machine and only using the candler and scale and polisher. What would be the hardest part? Why?
5. Turn and share with your partner: what laws of motion did you see in this machine?
    - Answers: External force propelling eggs forward, etc.

Wrap Up – 2 mins

1. What did they enjoy the most out of the egg grader? What was the most interesting part?
2. Why do you think farmers built and used the egg grading machine? What reasons would they decide to mechanize the process?
    - Key words: fulfill demands/rise in demands, minimize labour, maximize efficiency and output.

STATION 4- WINDMILL

This station allows students to see a windmill used for irrigation, and water pumping on a farm. This windmill is currently powered by electricity, as it is inside, but was not in its original state.

Questions to consider

- What do you know about windmills? What are they for?
- How would this windmill have been powered when being used on a farm?
- What other things did windmills do on the farm? Where were they commonly used?

- Why was it important for farmers to be able to pump water to different places on their farm? What did they do before they had the ability to do that?

STATION 5- STEAM POWERED PUMP

At this station students will view a giant working steam powered pump that could have been used for a variety of jobs in the early 20th century. It is no longer powered by steam, but still could do the jobs it was created for. You can also show students the other steam powered equipment around this area during this station.

Questions to consider

- What does it mean when we say that this pump was "steam-powered"?
- Why did people use steam back in the pioneer days?
- Why don't we use steam anymore?
- What kind of jobs could this machine have done? Would it have been used only on a farm, or could it have been used in other important BC industries?
- What about this machine stands out to you? How have we improve on it?

If this is the end:
Meet under the plane for conclusion.

If this is first to fourth stop:
Move to Rope making activity.

CONCLUSION – 5 mins

Close off by explaining how our history still lives on today. You can still find people working on farms and doing these things for a living in the local community.
Then choose 2 or 3 of these questions for students to share their answers to.

1. Why do they think we showed them these machines?
2. What did they learn about history that they didn't know before?
3. What are some things they noticed about the machines or things they hear that reminded them of something in the present?

*You can ask other questions in relation to what you have said or what you think is important for them to know.

SCAVENGER HUNT – 30 mins

Each student will get a handout of 10 items. Must work in pairs.

There are two scavenger hunt handout options (see handouts attached):

- 10 images of artifacts from both buildings. They have to locate it and answer the questions on the sheet.
- Handout with series of questions. Students find the artifacts based on the descriptions on the sheet.

When students are finished, if they still have time left they can explore the buildings and

examine the artifacts until the teacher calls them back.

*Note, if students are finished their scavenger hunt and they ask to make a piece of rope, check their sheet for all the answers. If all are correct, then they can make a rope. Limit students if necessary.

POST-VISIT ACTIVITY

LEARNING INTENTION

Students will be able to compare the differences and similarities between machinery and technology today and in the past

GUIDING QUESTIONS

- How has a deeper understanding of science been significant in improving technology and the completion of tasks?
- Where does science fit into change over time?
- Do you think the machines at the BC Farm Museum could be improved on? If so, how?

ACTIVITY

Discussion:

- Would you design any of these machines differently? How? (Think, pair, share)
- Where did we see Newton's three laws of motion in any of the machines we saw at the museum?
- What factors lead to improved technology?
- *Answers: necessity, better understanding of science and design, new ideas*
- What tools did coastal First Nations design and use to bring food to the table?

Suggested activities:

- Choose an artifact as seen in the museum, and show the progression of this artifact through time. Explain what has changed in the design of this item and the consequences of that change. (Washing clothes, tractors, clothing irons, tomato sorting machines, sewing machine, etc.)
- Create a Venn diagram comparing a machine from the past and the present.
- With a partner, brainstorm ways that you would improve the design of a selected machine at the BC Farm Museum and create a draft explaining your design.
- Research First Nations artifacts to find the tools they developed for their traditional ways of life.

SUGGESTED QUESTIONS FOR FURTHER THINKING

- How have other machines changed and improved overtime?
- What machines do you know are being constantly redesigned and improved on?
- Why is it important to understand science in building and engineering?