

A Note to Teachers

Supporting Grade 4 Students in Combined Grade 4/5 STEMterprise Classrooms

Most of the STEMterprise lessons that address science expectations and build STEM skills found in Strand A of the Ontario Science Curriculum can be used as-is in a combined Grade 4/5 classroom. However, in Stage 2, the expectations vary quite a bit between Grade 4 Science and Grade 5 Life Systems: Human Health and Body Systems.

To help make planning easier, we've developed a few optional learning opportunities designed especially for Grade 4 students. These activities connect to the Pizza Shop Project and link directly to the Grade 4 Science expectations from Strand D Structures and Mechanisms.

Teachers know their students best—feel free to adapt these ideas or use your own approaches to meet your learners' needs. You'll also find alternate science lesson suggestions at the end if you prefer a different direction.

When teaching combined grades, many educators start with a shared topic and then give each grade a different task or challenge. This is one of the strategies recommended in this [Ontario curriculum resource](#) and works very well in this stage.



A Note to Teachers

The following activities are optional learning opportunities for your Grade 4 students to explore during Stage 2 of the STEMterprise Pizza Shop Project. These activities can be completed independently, with a partner, or in small groups.

This stage includes:

- Minds-On – Students make early connections between the topics of simple machines and farm equipment through [active viewing](#) of 2 videos. Consider using a KWL chart for this stage. Note that the [active viewing doc](#) includes activities for videos on slides 8, 9, 10 and 12 that relate to Challenges 1, 2, and 3.
- The Future of Pizza Article: Read and answer questions about modern food innovation



A Note to Teachers

The following activities are optional learning opportunities for your Grade 4 students to explore during Stage 2 of the STEMterprise Pizza Shop Project. These activities can be completed independently, with a partner, or in small groups.

This stage includes:

- Machine Challenge 1: Student need to design a well water system for grain and pizza ingredient plants
- Machine Challenge 2: Students design a simple machine gear system to grind wheat into flour
- Machine Challenge 3: Students explore food chains and a pizza delivery path using Ozobots
- Machine Challenge 4: TVO Learn Green Iglu/Food for Thought lesson that explores food, climates and growing foods in the Arctic.
- Additional Resource Suggestions – Other learning opportunities and extensions

The four Machine STEM Challenges are on [Grade 4 Machine Challenges doc](#) and can be accessed online or printed. These activities were developed and adapted from ideas from Let's Talk Science, SciTech Ontario, Science North, TVO Learn and original content.



Expectations



D. Structures and Mechanism - Machines and Their Mechanisms

D1. Relating Science and Technology to Our Changing World - evaluate the impacts of various machines and their mechanisms on society and the environment

D2. Exploring and Understanding Concepts - demonstrate an understanding of the basic principles and functions of machines and their mechanisms

C. Matter and Energy - Light and Sound (optional coding lesson - see slide 17)

C2. Exploring and Understanding Concepts - demonstrate and understanding of light and sound as forms of energy that have specific characteristics and properties



Grade 4 - Stage 2: Machines and Pizza



Learning Goals



We can:

- Understand the impact of machines on society and the environment
- Explain the parts of a food chain and create a pizza food chain that includes producers
- Apply the engineering design process to design, build, test, and modify a water well, grain grinder, and a food chain
- Communicate our choices, results, and conclusion for our STEM challenge
- Work independently while being productive, responsible, and respectful of our classmates



Minds On!

There are six types of simple machines:

- **Lever**
- **Screw**
- **Pulley**
- **Inclined plane (ramp)**
- **Wheel and axle**
- **Wedge**

Discuss what you already know about simple machines.

Watch both videos and note the examples of simple machines.



Video 1 - watch from 14:25 - 19:12



Video 2 - augers

Intro - The Future of Pizza?

What does innovation mean?

Read this [article](#) and answer these [questions](#).

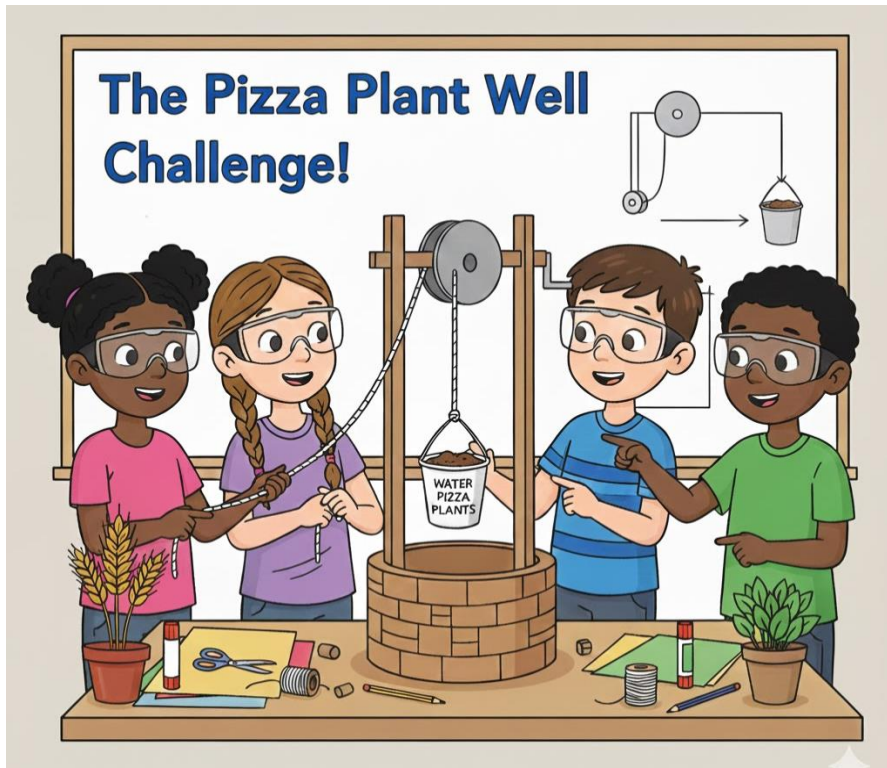
What is the impact of the article's innovative machines on the daily lives of people?

Is there an environmental impact?



Machine Challenge 1: Pizza Pulley Power

Scenario: Grade 4 Farmers! You have time travelled 200 years to 1826 and your family has moved to Ontario from Europe. You want to grow food on your family farm and need a working well to water your plants.



Your Challenge: Design, build, and test a pulley system to lift a bucket of water from a well so you can water your pizza plants.



ABOUT PULLEYS: begin at 12:50 end at 15:00

Machine Challenge 2: About Gears and Grains

Before you begin this challenge, learn more about gears.



Go to gearsket.ch to **create** and **experiment** with gears.

This video is a short tutorial, or use the tutorial on the gearsket.ch site.

About Gears Video - Think about...

- what gear makes it easier to bike uphill and why?
- what is used as an example of a complex gear?



Machine Challenge 2: About Gears and Grains



The Story of Flour video

Think about...

- what are the steps in making flour?
- what do farmers worry will damage their wheat?



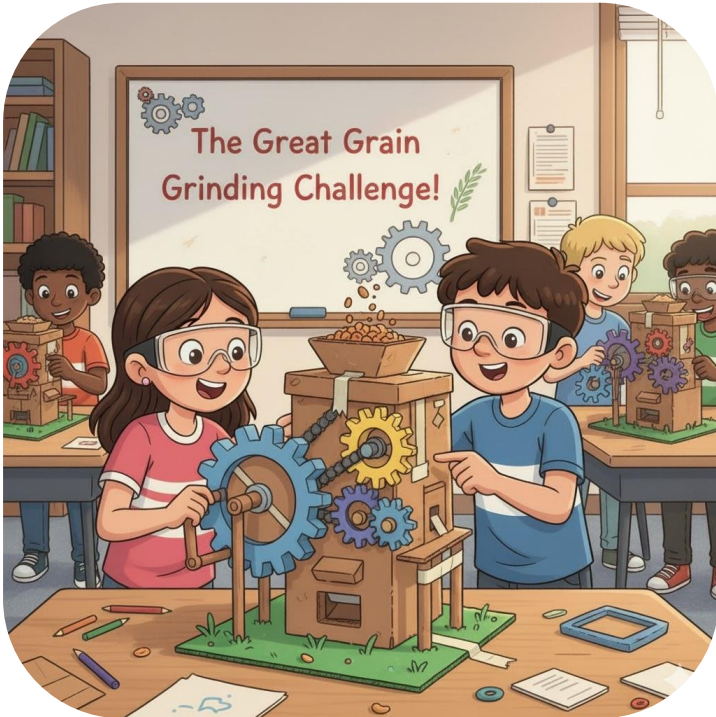
Gears in an old flour mill video

Think about...

- compare how flour was made differently in the early 1800's with today?
- how are gears used in the mill?

Machine Challenge 2: About Gears and Grains

Scenario: Grade 4 Engineers! The Miller family needs your help. They have a small farm and grow beautiful wheat, but grinding it into **flour** is hard work! They are currently using a small hand-crank that is too slow and requires too much effort. They've learned that **gears** can help make work easier by changing the **speed** or the **force** (mechanical advantage).



Can you help them by creating a prototype to make the grinding process faster and more efficient?

Your Challenge:

Design, build, and test a simple **Flour Mill** that uses a gear system to significantly increase the rotational speed of a small grinding mechanism when a user turns a single, large input handle. Think about what you've learned about mills and gears as you plan your design.

Machine Challenge 3: Ozobot Food Chain Challenge



A **food chain** has producers, consumers, and decomposers. It is a flow that goes from start to finish

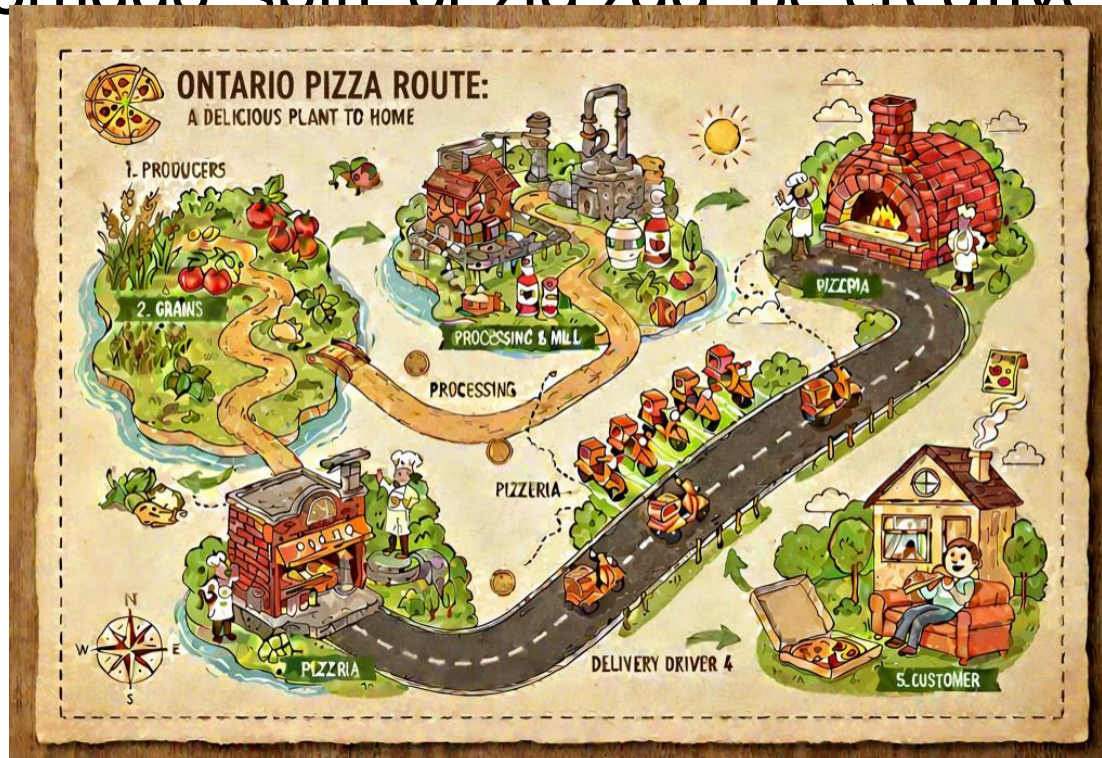
What do you **notice** and **wonder** about this Pizza Food Chain?



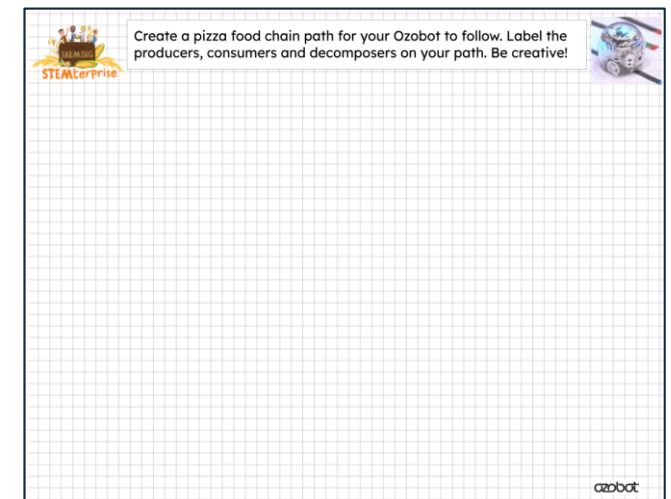
Machine Challenge 3: Ozobot Food Chain Challenge

Your Challenge:

Create a pizza food chain for your Ozobot to follow. Include some special moves like a tornado, spin, or zig zag. Be creative



Food Chain Video Review



Machine Challenge 4: TVO Learn - Green Iglu/Food for Thought

Learn where our food comes from, how our climate and landscape limits our growing seasons, how innovation is allowing fresh food to be grown in the arctic with this TVO [Food for Thought](#) lesson



Reflection and Assessment

Grade 4 Rubric and Self Assessment



Name: _____

Single Point Rubric		
Grows How you can strengthen your work.	Learning Goals	Glows Strong aspects to your work.
	I can be independent , productive , responsible , and respectful during the challenge.	
	I effectively used the engineering design process (design, build, test, redesign) to create and improve my water well, grain grinder, and/or Ozobot food chain path.	
	I can clearly communicate my choices and results.	
	I can evaluate the impact of machines on society and the environment.	

STEM Reflection
1. What was the greatest success in your Stage 2 work? Why did it work well?
2. If you had more time and materials, what is the one change you would make to one of your designs?

Additional Resources

The following links provide extensions and additional learning resources.

- Coding - Use a Microbit to code a [Sunlight Sensor](#). See the [Coding Connections](#) light lesson and slides 18 and 19
- [STAO](#) - Science Teachers' Association of Ontario
- TVO Learn - Coding [Food Chain Frenzy](#), and [Food Chains](#) lesson, [Mighty Machines](#) lesson
- [Science North](#)
- Ontario Curriculum - [Science Long-Range Plans](#)
- [Let's Talk Science](#) - STEM Resources and Lessons





Coding Connections

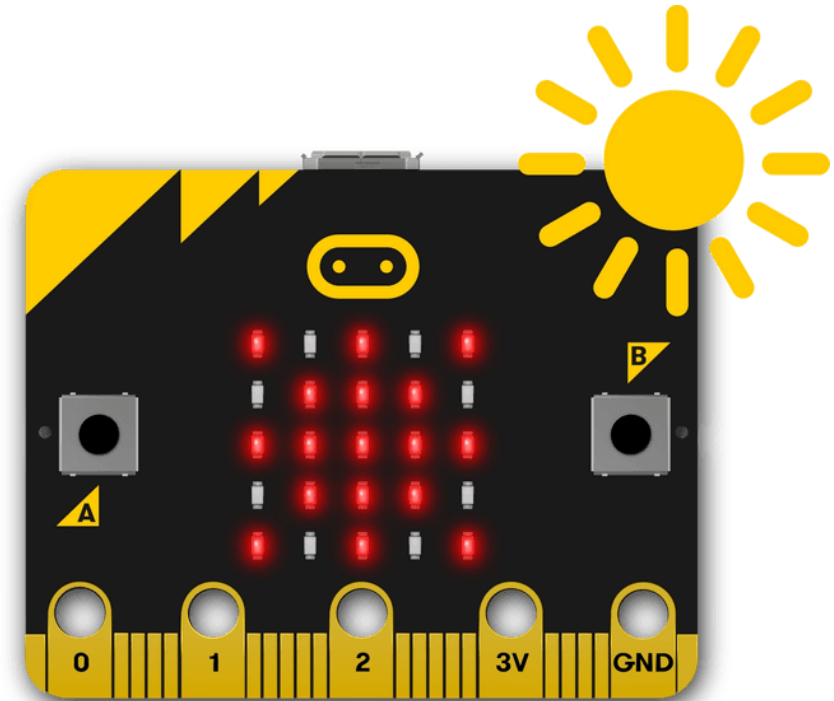


Sunlight Sensor

Why is sunlight important for plants and crops?

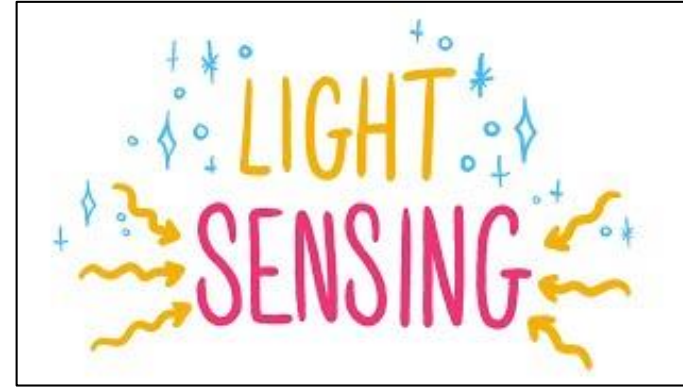
You will create a conditional/“if... else” statement to show the sun image only if the light level is greater than ($>$) a certain level.

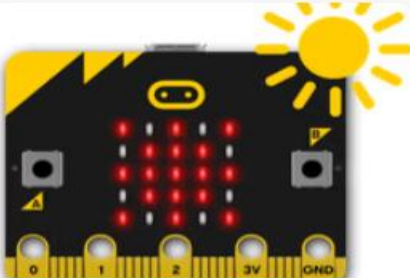
1. Go to MakeCode at makecode.microbit.org
2. Press the blue button to create a New Project
3. Follow the steps to code light levels
4. modify your code



Coding Connection - Light

For more Micro:Bit light lessons, go to this link for [light projects](#).

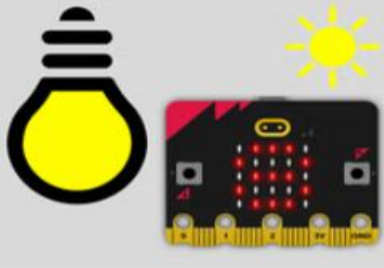




Sunlight sensor

Make your micro:bit light up when the sun comes up

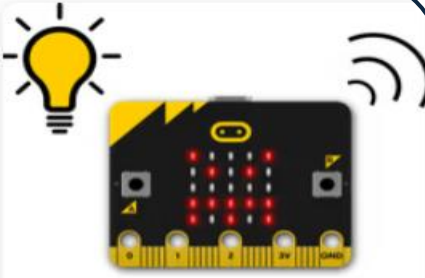
■ Beginner



Energy light meter

Measure the strength of light in different places

■ Advanced



Light alarm

Make an alarm that goes off when lights go on

■ Advanced

Check In – What's Next?

