SCIENCE LESSON PLAN
Wheel and Axle

UNIT	Exploring Force and Simple Machines	**TEACHER**	Miss Candace
Lesson	Science Challenge: Wheel and Axle	**Date:**	March 12, 2019
Grade Level:	5	**Number of Students:**	24
Lesson from Unit:	5 of 18	**Time Per Lesson**	60 minutes

Big Ideas

1. Machines are devices that transfer force and energy.

Curricular Competencies (CC)	Content (C)
1. Demonstrate a sustained curiosity about a scientific topic or problem of personal interest.	1. Properties of simple machines and their force effects.
2. Identify questions to answer or problems to solve through scientific inquiry.	2. Machines: constructed and found in nature.
3. With support, plan appropriate investigations to answer their questions or solve problems they have identified.	3. Power – the rate at which energy is transferred.

Core Competencies

Connect and engage with others (to share and develop ideas).

- Students engage in informal and structured conversations where they listen, contribute, develop understanding and relationships, learn to consider diverse perspectives, and build consensus.

Lesson Objective(s)

- demonstrate the mechanics of the wheel and axle
- Identify and classify parts of the wheel and axle in project and the process from start to finish
- make connections to how wheels and axles are used in everyday life

Safety Procedures

Keep all supplies on desks, floors should be clear of materials for safe and efficient movement of foot traffic. Projects can be tested in a designated area to prevent unforeseen injuries.

Materials for Class

Students bring their own materials for the simple machines they have researched for this class.

Masking Tape
Tape Measure
Whiteboard Markers
Sample Projects from last day
Paper
Pencils (school has these)
Post-it Notes

Backup Materials:

RUBBER BAND RACERS MATERIALS:

2 small lids
2 large lids
2 straws
3 rubber bands
3 toothpicks
low temp glue gun
ruler

Availability of Materials

Dollar Store
School Recycling
Supplies from Home
Staples
Walmart

Pre-Class Preparation

Print out Project Log and Exit Slip

Rubber Band Racers Kits:

1. Cut straw into two 3 ½ " pieces.
2. Cut straw into one 1 ½ " piece.
3. Cut straw into two ½ " pieces.
4. Using a toothpick, cut three ½ " pieces.
5. Poke holes into the centre of each of the caps with a nail.

Cross Curricular Connection

Math Education
Big Idea: Data represented in graphs can be used to show many-to-one correspondence.
Art Education
Big Idea: Artists experiment in a variety of ways to discover new possibilities and perspectives.

Resource Materials

Videos from YouTube

Pictures to match vocabulary for visual learners

Simplification

Create samples of wheel and axle machines for students to replicate.

Create various wheel and axle kits using lego, K'nex or other building manipulatives. Include visual images as part of the instructions. These also require minimal assembly.

Extension

In the testing component of the assignment, have students create a chart to include the circumference of the wheel. Using the data they have collected, students can determine the number of wheel rotations and the distance travelled by using the calculations:
R (revolutions) =D(distance) / C (circumference)
Radius = r (center point to edge of circle)
Diameter = 2r
Circumference (perimeter of a circle) = 3.14 x 2r

Video Links

https://www.youtube.com/watch?v=2vRiL_ygaG0
https://www.youtube.com/watch?v=lAgy8I7P9BY
https://www.youtube.com/watch?v=XlZYPFDjTJM

Time	Student's Role	Teacher's Role
10 min	**Discussion:** Review of activities and vocabulary from last day. **Vocabulary:** Students volunteer to write definitions on the whiteboard for: ***Wheel*** *- a circular disk* ***Axle****- the rod that connects the wheels* ***Force*** *– the push or pull of an object in a certain direction* ***Friction*** *– holds back the movement of an object* **Projects from last day:** Tell me what part is the wheel and which part is the axle. Students come up to the whiteboard and write down their new discoveries.	ACTIVATE AND ENGAGE: ***Discussion***: *From the activities we did last week, can you explain what the wheel and axle does?* **Teacher Tip:** Use the projects from last day as a visual for students when discussing vocabulary.      What did you discover about wheel and axle from the research you did? Did you discover anything new?
5 min	**Science Challenge** ***Hand out the Project Log Sheet*** If you have not done so already, sketch a design of your simple machine in the first box of the Project Log Sheet. Students complete the other two boxes by writing down the materials they need and their predictions about how their project will work. Once you have shown it to me, you can begin to create your project.	EXPLORE AND DISCOVER: **Intro Discussion** *Use the worksheet to draw a detailed version of the wheel and axle machine you plan to build today.* *Include all of the following details in the graphic organizer:* *The sketch, the materials you are going to use to create your wheel and axle machine and predictions about how it will work.* *Once complete, check in with me and you may begin your project.*

40 min	Independent Practice Students work in their partner groups to create their wheel and axle project. Students test out their wheel and axle machines and record their observations on a piece of paper. Students create a chart to record the following: Attempt 1 – 3 Distance of Travelled Circumference of Wheel	ORGANIZE AND INTEGRATE: Facilitate learning by observing students as they work together in groups. Ask questions for understanding and listen for vocabulary words being used in discussion. Are the student's able to identify the parts of a the wheel and axle? While students are working: Prepare testing area for groups to experiment and collect data . Model how to create a chart for their project testing on the whiteboard. *Ask students questions for understanding:* *Tell me about your simple machine?* *What did you observe?* *Were your predictions correct?* *What changes would you make for the future?*
5 min	Gallery Walk Students display their projects and their project log on their desks. Students take a post it note and write down one thing that stuck out to them during the gallery walk and put it in the "parking lot" on the whiteboard. EXIT SLIP Students debrief about the building process, what worked and what did not. Students begin to explore the changes that they could make. Which simple machine worked the best and why?	CLOSURE: *Gallery Walk* *Students, we are going to walk around the classroom looking at one another's design.* Create "parking lot" on Whiteboard for post it notes. *Discussion:* *What worked best in your design?* *What did not work with your design?* *What changes could you make to improve it?* *Next day, we are going to spend the class troubleshooting and improving our catapults.* *Reflect on what you observed today and the changes that you would make.*

Reflection
What worked well for the students? What did not work well? What changes will I make for next time?

Assessment Tools
Formative – Students will be able to answer questions that explain their scientific process. (problem, hypothesis, test/observations, conclusions.) Summative – Wheel and Axle Project Log Sheet

Resources and References
https://curriculum.gov.bc.ca/curriculum/science/5 K-7 IRP Science Curriculum https://study.com/academy/lesson/how-to-make-a-catapult-lesson-for-kids.html http://www.cpalms.org/Public/PreviewResourceLesson/Preview/127966 https://www.merriam-webster.com/dictionary/

Science Challenge:
Wheel and Axle Project Log Sheet

Sketch your Project Design:

Materials required to build simple machine:

Predictions about how it will work:

Name: _____

Wheel and Axle Exit Slip

1. **Reflection from today:**

   What worked best in your design?

   What did not work with your design?

   What changes could you make to improve it?

2. **Choose one vocabulary term to define: Wheel, axle, force or friction.**

3. **What are three examples of a wheel and axle simple machine?**