SUBJECT: Science

GRADE: 5

DATE: June 2019

DURATION: 60 minutes

UNIT: Forces and Work
TOPIC: Investigating the effects of friction

ATTAINMENT TARGET:

- Recognise the importance of energy to life processes, everyday life, and the relationship between energy and matter.
- Gain an understanding of and apply aspects of the scientific method.
- Begin to appreciate the influence and limitations of science.
- Demonstrate a positive attitude towards the use of scientific language

BENCHMARKS:

- Understand the effects of forces and the concept of work.
- Make predictions of what will happen based on scientific knowledge and understanding. Suggest and communicate how to test these predictions. Interpret data and decide whether results support predictions, and are sufficient to draw conclusions.
- Display curiosity, objectivity and perseverance in their approach to activities.

SPECIFIC OBJECTIVES:

- Operationally define friction
- Assess the effect of friction on daily life
- Investigate the effects of friction and how these may be reduced
- Make and repeat measurements to ensure accuracy of results
- Consider patterns in results in order to draw conclusions
- Show objectivity by using data and information to validate observations and explanations about forces
- Show curiosity in investigating forces

KEY SKILLS: Measure, record, report, draw conclusions, interpret, infer, communicate, collaborate, define operationally

KEY VOCABULARY: force, friction, rough, smooth, lubrication, resistance

MATERIALS/RESOURCES: Measuring tape or ruler, stones, sticks, marbles, balls, toy cars, paper, Surfaces of different materials (plastic, wood, rubber, sand paper etc.), ramp, computer, internet

CONTENT OUTLINE:

- Forces can either affect the size, shape or motion of an object.
- Friction is the force that opposes the motion of one object against another. Friction reduces motion by slowing down the object or causing it to stop.
- Friction can be useful in daily life, seen in everyday tasks such as walking, driving and writing. Friction can also cause machines to be less efficient as more energy is needed to operate while energy can also be lost as heat.
- The effects of friction can be reduced by using lubricants (oils) and grease on machine parts (e.g. brake fluids in cars).

PRIOR LEARNING: Check that students:

- Know that a force is a push or pull
- Know some effects of forces

LEARNING OUTCOME: Students who demonstrate understanding can:

- Show some effects of friction
- Employ methods to reduce friction
- Show appreciation for how forces are used in different situations

ASSESSMENT CRITERIA:

- Acceptable explanations given for observations
- Acceptable inferences made
- Correct force linked with observed change
- Correct measurement of distances made
- Correct explanations given for categorizing everyday activity as useful or not useful friction

PROCEDURES/ACTIVITIES

Engage - *How can I get students interested in this?* Use of an interesting picture. (5 min)

- Option 1: Students will watch a video on how to make fire with sticks, https://www.youtube.com/watch?v=BKnMB-T5VFI or https://www.youtube.com/watch?v=l8C8qPoMZdo

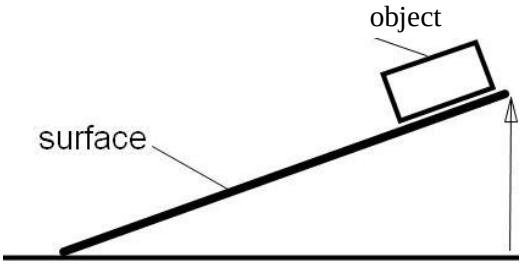
  Option 2 Students will carry out the following actions:

a) rubbing of hands together,
b) rubbing of stones together,
c) rubbing of sticks together.

Students will discuss what happened when they carried out the actions and how the fire was generated in the video. Students will be led to see that a force was involved which caused heat to be formed. *Teacher will introduce the term friction in the discussion.*

Explore - *What tasks/questions can I offer to help students puzzle through this?* Use of a simple investigation. (10 min)

- In groups, students will explore the effects of friction by carrying out the following activities:



Roll marbles, balls or toy cars down a ramp using different surfaces (paper, carpet, wood, sandpaper or plastic. Students will measure the distance the object moved off the ramp.

Students will discuss what needs to be done to ensure a fair test with guidance from the teacher. The results will be collected, interpreted and conclusions made about the effects of friction and the surfaces that had the most or least friction.

Explain - *How can I help students make sense of their observations?* Class presentation and discussions. (10 min)

- Students will present findings of the surface with the most or least friction using evidence from results collected. Students will operationally define friction and outline the effects of friction. *Teacher will check that students' responses are scientifically correct and clarify misconceptions as necessary.*

Elaborate - *How can my students apply their new knowledge to other situations?* Application of what they learned. (10 min)

- Students will identify everyday activities that make use of friction. Students will discuss whether friction is useful or not in these instances. A Worksheet will be administered that requires students to identify whether pictures of activities demonstrate useful or not useful friction and give explanations for their choices.
- Students will suggest strategies that are used to reduce friction, for instance in engine brakes and moving objects across a floor.
- Advanced Students will be asked to explain how wheels aid in overcoming or reducing frictional force
- Students with learning challenges – Students will name objects that use wheels to move.

Evaluate - *How can I help my students self-evaluate and reflect on the teaching and learning, and how can I evaluate the students learning of concepts and skills.* Assessment (10 min)

- Worksheet identifying friction that is useful or not useful will be assessed.
- Students will complete an Exit Slip to check for understanding or complete a partially-filled Concept map on Friction

EXTENDED LEARNING: Students will research on the use of ball bearings in treating with friction OR research shapes (and names) of objects that reduces air or water resistance.

LINKS TO OTHER SUBJECTS:

- Mathematics, Resource & Technology

POST-LESSON REFLECTION:

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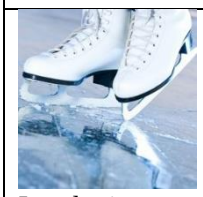
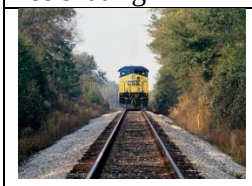
Activity 1: Determining whether friction is helpful or not helpful

Aim: To identify when friction is useful and when it is a problem
Skills: Analyzing, constructing explanations

Instructions: Complete the table below.

Activity	Is friction helpful or Is it a problem?	Explanation
 Ice skating		
 Train slowing on a track		
 Walking on slippery surface		
 Using a water slide		
 Turning a door knob		
 Striking a match		

Concept map: Investigating Friction