### Understanding Structures and Mechanisms

**Simple Machine: Levers**

<table>
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<th><strong>Specific Expectations</strong></th>
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<td><strong>Grade 2 – Movement:</strong> 1.1 assess the impact on society and the environment of simple machines that allow movement; 2.2 investigate and describe different kinds of movement; 2.3 investigate the structure and function of simple machines; 2.4 use technological problem-solving skills (see page 16), and knowledge and skills acquired from previous investigations, to design, build, and test a mechanism that includes one or more simple machines; 3.1 describe different ways in which objects move (e.g., turning, spinning, swinging, bouncing, vibrating, rolling); 3.2 identify ways in which the position of an object can be changed (e.g., by pushing, by pulling, by dropping); 3.3 identify the six basic types of simple machines – lever; inclined plane; pulley; wheel and axle, including gear; screw; and wedge – and give examples of ways in which each is used in daily life to make tasks easier; 3.4 describe how each type of simple machine allows humans to move objects with less force than otherwise would be needed; 3.5 identify simple machines used in devices that move people</td>
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<td><strong>Grade 3 – Strong and Stable Structures:</strong> 2.3 investigate, through experimentation, the effects of pushing, pulling, and other forces on the shape and stability of simple structures; 3.1 define a structure as a supporting framework, with a definite size, shape, and purpose, that holds a load</td>
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<td><strong>Potential Specific Expectations with minor extensions to the lesson:</strong></td>
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<td><strong>Grade 5 – Forces Acting on Structures and Mechanisms:</strong> 2.2 measure and compare, quantitatively and/or qualitatively, the force required to move a load (e.g., to lift a book, to open a drawer) using different mechanical systems (e.g., different pulley systems, a lever, a gear system), and describe the relationship between the force required and the distance over which the force moves; 2.5 use appropriate science and technology vocabulary, including tension, compression, torque, system, and load, in oral and written communication; 3.3 explain the advantages and disadvantages of different types of mechanical systems</td>
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<td><strong>Grade 8 – Systems in Action:</strong> 2.2 investigate the work done in a variety of everyday activities and record the findings quantitatively; 2.3 use scientific inquiry/experimentation skills (see page 12) to investigate mechanical advantage in a variety of mechanisms and simple machines; 2.6 use appropriate science and technology vocabulary, including mechanical advantage, input, output, friction, gravity, forces, and efficiency, in oral and written communication; 3.2 Identify the purpose, inputs, and outputs of various systems; 3.3 Identify the various processes and components of a system that allow it to perform its function efficiently and safely; 3.5 understand and use the formula work = force × distance ( W = F \times d ) to establish the relationship between work, force, and distance moved parallel to the force in simple systems; 3.6 calculate the mechanical advantage (MA = force needed without a simple machine divided by force needed with a simple machine) of various mechanical systems</td>
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**Big Ideas (for lesson):**

- Students will understand why people create and use simple machines to make tasks easier to perform (mechanical advantage)
- Students will learn how levers function and how they are used to move heavy objects
- Students will see how levers are used effectively in everyday life

#### Accommodations:

- ☒ Increase time
- ☒ Visual Aids
- ☒ Manipulatives
- ☒ Chunking
- ☒ Step-by-Step
- ☒ Scaffolding
- ☒ Copy of Notes
- ☒ Student Grouping

#### Differentiated Instruction:

- ☒ Content: Use demonstrations throughout verbal instruction to help visual learners.
- ☒ Process: Students will work in pairs or groups to support each other if limitations or impediments exist.
- ☒ Product: Students may demonstrate their learning verbally, visually, or by written means.
- ☐ Other: _____________________________

#### Multiple Intelligence:
Bloom’s Taxonomy:
☒ Knowledge
☒ Comprehension
☒ Application
☒ Analysis
☒ Synthesis
☒ Evaluation

☒ Verbal/Linguistic
☒ Logical/Mathematical
☒ Visual/Spatial
☒ Bodily/Kinesthetic
☐ Naturalist
☐ Musical/Rhythmic
☒ Interpersonal
☒ Intrapersonal

Teachers Notes:
- This lesson is accompanied by a supplementary PowerPoint, “Levers (powerpoint)”, and a worksheet, “Levers (worksheet)”
- The use of simple machine kits can be found throughout the lesson – it is recommended that these manipulatives be used to increase the experience and understanding of the students
  - your school might have access to a set of levers you can use for this lesson
  - if this is not available, you can purchase simple machines sets here:
    - [http://www.pitsco.com/Grades_3-5/Kits/Simple_Machines_Set](http://www.pitsco.com/Grades_3-5/Kits/Simple_Machines_Set)
  - if this is still not an option, you can build your own simple machines
    - see below for examples:
- Extensions to the lesson should be done if it is to be used at the grade 5 or 8 levels
  - The material covered by these lessons is strongly emphasized at the Grade 2 level – the more complex concepts that arise at later grade levels can be situated within the lesson
    - i.e. calculating force and mechanical advantage can be added into the lesson
- Resources for teaching and learning about simple machines can be found here:
  - Bill Nye The Science Guy: Simple Machines [https://www.youtube.com/watch?v=rRjCQGa_HCE](https://www.youtube.com/watch?v=rRjCQGa_HCE)
- The font used for the handout is called Dyslexie. It is designed to help dyslexics read, but it is a very easy to comprehend font which will aid all readers.
## Delivering the Lesson

<table>
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<tr>
<th>Portion &amp; Timing</th>
<th>Grouping:</th>
<th>Introduction:</th>
<th>Materials</th>
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| Minds On: 5 minutes | W ☒ S ☐ I ☐ | Teacher introduces **levers** to students  
- (ppt slides 1-3)  
- Perform demonstration for class by lifting various weights; **Gizmos** simulation can be used as well  
- Discuss the **Mocomi** video | - Lever set to provide example to students  
- projector technology |
| Action: 30 minutes | W ☒ S ☒ I ☒ | Proceed through “**Levers (powerpoint)**”  
- “**Levers (worksheet)**” can be followed along and filled in by students  
- Answer questions about the simple machine as the lesson proceeds  
- Students should highlight/underline important vocabulary words  
Activity:  
- Separate students into groups or pairs  
- Allow students to build and operate different lever systems (different classes and lengths of beam)  
- Have them record their observations by drawing and labelling diagrams of all the different levers they can create  
- See which group can create the most efficient and effective levers (can lift the most weight easily) | - Lever sets to allow students to explore the use and function of levers |
| Consolidate: 5 minutes | W ☒ S ☒ I ☐ | Conclude lesson by taking up worksheet – ensure each student has filled in all the appropriate information  
- Answer any remaining questions on levers | |

**References:**
- Mocomi; [http://mocomi.com/](http://mocomi.com/)
- Teach Engineering;  
- ExploreLearning Gizmos;  

All images from Google image search, Educational websites, and stock photos  
All videos found on YouTube for educational purposes