**Pequea Valley School District**

**STEM Department**

**Unit: Simple Machines Course: STEM 9 Grade: 9**

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| **Planning the Focus Based on the Desired Result**  **What do you want all students to know, understand and do by the end of the unit?** |
| **Unit Essential Question(s)**  How are simple machines used to create a mechanical advantage? |
| **Keystone Eligible Content/PA Core Standard**  **3.2.10.B** Apply process knowledge and organize scientific and technological phenomena in varied ways  **3.2.10.D** Identify and Apply the technological design process to solve problems.  **3.6.10.C** Apply Physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, research and design to real world problems.  **3.7.10.A** Identify and safely use a variety of tools, basic machines, materials, and techniques to solve problems and answer questions |
| **Pacing: Approximate number of class sessions per unit**  22 |
| **Tier 3 Vocabulary (Content specific vocabulary)**  Fixed pulley, movable pulley, compound pulley, input force, output force, mechanical advantage, direct variation, box and whisker plot, quartile, mean, Drive gear, follower gear, idle gear, spur gear, worm gear, RPM, gearing up, gearing down, gear train, torque, speed, input, output |
| **Know -** What do students need to **know** in order to be able to do and understand? ***List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”.***   * Mechanical advantage * How to calculate mechanical advantage using proportions * How to read a spring scale * Types of gears and gearing systems * Types of pulleys |
| **Understand -** What do students need to **understand**? What is the **big idea**? ***List broad concepts or “big ideas” in a statement of enduring understanding.***   * How to use gears to create speed or torque * How pulleys can be used to create a mechanical advantage |
| **Learning Outcome -** What do students need to be able to **accomplish** by the unit’s end? ***List skills and competencies.***   * Learners will setup and test the mechanical advantage of pulley systems. They will complete a pulley lab that requires learners to measure input and output forces, calculate mechanical advantage, design their own pulley system. * Learners will Complete a slow car collision lab. Students will collect data to determine the speed of their car. This info is placed on a graph and then solved using a systems of equations to determine the collision time and location. * Learners will use gears and legos to construct a car that moves the slowest. They will calculate the gear ratio, motor rpm, and distance of their car and test them to check for accuracy |
| **Assessments:**   * Gear calculations Quiz |
| **Software/Resources:**   * Legos * Pulleys * Spring scale |