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| **Title: Straw Tower Lesson** | **Grade Level: 3-5th Grade** |
| **Big Idea:Team Building,**  **Collaboration and Aerodynamics,**  Lesson focuses on the students creating rockets out of paper and tap which will be launched using drinking straws. | **Enduring Understanding:** Students will be given an opportunity to explore the design a straw rocket that can travel in a straight line for a significant distance. During the exploration students will learn about force, basic aerodynamics, drag, trajectory and velocity. |

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| **SCIENCE STANDARDS** | **TECHNOLOGY STANDARDS** | **ENGINEERING**  **STANDARDS** | **MATH STANDARDS** |
| **Habits of the Mind**  **S5-1CS1. Students will be aware of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.**  a. Keep records of investigations and observations and do not alter the records later.  b. Carefully distinguish observations from ideas and speculation about those observations.  c. Offer reasons for findings and consider reasons suggested by others.  d. Take responsibility for understanding the importance of being safety conscious**.**  **S5-1CS2. Students will have the computation and estimation skills necessary for analyzing data and following scientific explanations.**  a. Add, subtract, multiply, and divide whole numbers mentally, on paper, and with a calculator.  b. Use fractions and decimals, and translate between decimals and commonly encountered fractions – halves, thirds, fourths, fifths, tenths, and hundredths (but not sixths, sevenths, and so on) – in scientific calculations.  c. Judge whether measurements and computations of quantities, such as length, area, volume, weight, or time, are reasonable answers to scientific problems by comparing them to typical values.  **S5-1CS3. Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities.**  a. Choose appropriate common materials for making simple mechanical constructions and repairing things.  b. Measure and mix dry and liquid materials in prescribed amounts, exercising reasonable safety.  c. Use computers, cameras and recording devices for capturing information.  d. Identify and practice accepted safety procedures in manipulating science materials and equipment.  **S5-1CS4. Students will use ideas of system, model, change, and scale in exploring scientific and technological matters.**  a. Observe and describe how parts influence one another in things with many parts.  b. Use geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, and stories to represent corresponding features of objects, events, and processes in the real world. Identify ways in which the representations do not match their original counterparts.  c. Identify patterns of change in things—such as steady, repetitive, or irregular change—using records, tables, or graphs of measurements where appropriate.  d. Identify the biggest and the smallest possible values of something.  **Focus Standards:**  **Specific to 4th...**  S4P3. Students will demonstrate the relationship between the application of a force and the resulting change in position and motion on an object. | * Demonstrate the ability use technology for critical thinking, decision making, communication, collaboration and creativity and innovation. * Use a variety of age-appropriate technologies (drawings, presentation software to communicate and exchange ideas. | **Next Generation Engineering Standards**   * Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials and time. * Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. * Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. | **8 Mathematical Practices of Math**   1. Makes sense of the problem and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics 5. Use appropriate tools strategically 6. Attend to precision. 7. Look for and make use of the structure 8. Look for and express regularity in repeated reasoning.   **National Math Standards**   * Analyze data and obtained from testing different materials to determine which materials have the properties that are best suited for the intended purpose. * Using computational strategies to solve real-world problems cooperatively.   **1st Grade Common -Core Math Standards**   * **I can use the same size non-standards objects as repeating units.** * **I can write a numeral to represent a number of objects.** * **I can represent data in 3 categories.** * **I can practice counting using tally marks.** |

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| **INSTRUCTIONAL STRATEGIES** | **LEARNING TARGETS** | **ESSENTIAL QUESTIONS:** |
| indirect instruction  experiential learning  demonstration  discussion  work-based learning  journals  cooperative learning | -I can work cooperatively as a group  -I can use critical thinking to solve a confronted problem.  -I can learn about aeronautical engineering.  -I can learn how engineering can help solve society’s challenges. | How can we create a rocket to be fired using a drinking straw which will travel in a straight line for a significant distance.? |

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| **KEY VOCABULARY:** Velocity, Trajectory, Force, Drag, Aerodynamics, Motion |

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| **MATERIALS:** 1 drinking straw per 1-2 students - rocket template - roll of tape - scissors - pencil - measured out string and observation & data log sheet |
| **OPENING- (Ask and Imagine Step) 7 minutes** | **EVIDENCE** |
| **Day 1**:   1. The lesson will start with reviewing the Engineering Design Process Steps. 2. Students when then are introduced to the problem or the challenge. 3. In the opening, background information will be provided with visuals of rockets + an introduction to the new vocabulary.   **Day 2:**   1. The lesson will start with reviewing the Engineering Design Process Steps. 2. Class reviews the problem or the challenge. 3. Review background information and revisit vocabulary. | * Student Group Discussions * Blueprint Worksheet Filled out |
| **WORK PERIOD- (Plan and Create) 30 minutes** | **EVIDENCE** |
| **Day 1**:   1. Students will then work together in their groups to complete the planning step using the stages on the blueprint. 2. Once the teacher initials that the plan is complete, students will begin creating their straw rockets with.   **Day 2:**   1. Students will continue to work by honing their modifications to improve flight stability and distance. 2. Students will test fire, record qualitative and quantitative observations to use to improve future modifications and execute modification construction. | * Blueprint Worksheet * Rockets * Photos * Graphs * Data Log Sheets |
| **CLOSING- ( Improve) 8 minutes** | **EVIDENCE** |
| 1. Students will visit from table to table to view their classmates prototypes and test out their flight stability and distance. 2. Students will use a string marked out with tape to determine distance traveled. 3. Students will then reflect using the 3, 2, 1 model in discussion. 4. Students will use the data in their Math extension activity with their homeroom teacher. | **S**tudent Reflection Sheet with Rubric  Teacher Reflection Survey  Math Extension Activity |