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| **Title: Christmas Tree Challenge Lesson** | **Grade Level: Pre-K through 2nd** |
| **Big Idea:Team Building,**  **Collaboration and Aerodynamics,**  Lesson focuses on students learning about capillary action and evaporation. | **Enduring Understanding:** Students will be given an opportunity to create a christmas tree from cardboard that will be used as a medium to learn about capillary action and evaporation. At the end of the lab students will understand how capillary action and evaporation worked together to form the structure they will observe at the completion of the lab. |

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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. | What will happen to the cardboard sitting in the solution of ammonia, water, blueing, slat and food coloring? |

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| **KEY VOCABULARY:** Capillary Action, Gravity, Evaporation |

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| **MATERIALS:**  Cardboard (the back of a paper pad works great)  Small dish  3 TBS Water  1 ½ TBS Ammonia  3 TBS [Bluing](http://www.amazon.com/gp/product/B001NEMV3Q/ref=as_li_tf_tl?ie=UTF8&camp=1789&creative=9325&creativeASIN=B001NEMV3Q&linkCode=as2&tag=midrunmom-20)  3 TBS Salt  Green Food Color  Masking tape to label with |
| **OPENING- (Ask and Imagine Step) 15 minutes** | **EVIDENCE** |
| **Day 1**:   1. Handout scientific method worksheet covering lab 2. Fill in table of contents new entry 3. Briefly go over scientific method 4. Briefly go over worksheet 5. Write down essential question. Which also doubles as the **Purpose** in the scientific method 6. **Research**: Conduct paper towel demonstration by placing paper towel in a glass of water and having students observe the capillary action taking place in the paper towel. 7. **Research:** Students write down observation on worksheet 8. **Research:** Conduct evaporation demonstration by taking wet paper towel and smearing it across the dry lab table then watching it evaporate away. 9. **Research:** Students write down observation on worksheet 10. **Research:** Go over vocabulary 11. Discuss and create **Hypothesis**   **Day 2:**   1. Review previous lab worksheet and observations | * Student Group Discussions * Scientific Method Worksheet |
| **WORK PERIOD- (Plan and Create) 30 minutes** | **EVIDENCE** |
| **Day 1**: **Experiment**   1. Handout materials to each 4 person group. 2. Number students off 3. Label each experiment with tape with students names on it. 4. **Experiment:** Begin calling out the numbers to have the corresponding number pour the materials they are responsible for into the bowl. 5. **Analysis**: Once complete make first observation. Guide students towards watching the cardboard to see if any liquid is being sucked up.   **Day 2:**   1. **Analysis:** Hand each group its experiment and have groups make their last observation 2. Discuss. 3. **Conclusion:**Write down conclusions by comparing them to hypothesis. | * Blueprint Worksheet * Rockets * Photos * Graphs * Data Log Sheets |
| **CLOSING- ( Improve) 8 minutes** | **EVIDENCE** |
| **Day 1**:   1. Clean up materials 2. Place experiments in safe place 3. Students will use the data in their Math extension activity with their homeroom teacher.   **Day 2:**   1. **Conclusion:** Share experiment in front of class and conclusions. 2. Clean up materials 3. 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 |