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| **3rd Grade Motion and Matter** | | |
| **Content Area:** Science | | |
| **Unit Title:** **Motion and Matter** | | |
| **Target Course/Grade Level: 3** | | |
| **Unit Summary:**  Motion and Matter provides grade 3 students with experiences around physical sciences core ideas dealing with forces and interactions, matter and its interactions, and with engineering design.  **Primary interdisciplinary connections:**  ELA/Literacy –  RF 4c: Use context to confirm understandings of words.  RI 1: Ask and answer questions.  RI 2: Determine the main idea of a text.  RI 2: Determine the main idea of a text; recount the key details.  RI 3: Describe the relationship of scientific ideas or concepts.  RI 3: Describe the relationship between scientific ideas using cause and effect.  RI 4: Determine the meaning of domain-specific words and phrases in text.  RI 5: Use text features to locate information.  RI 6: Distinguish their own point of view from that of the author of a text.  RI 7: Use information gained from illustrations to demonstrate understanding of the text.  RI 10: Read and comprehend science text.  RF 4c: Use context to confirm understandings of words.  W 3: Write narratives.  SL 1: Engage in collaborative discussions.  SL 3: Ask and answer questions about information from a speaker.  SL 4: Report on a topic or text.  SL 5: Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace.  L 4: Determine or clarify the meaning of new or unknown words.  L 5: Demonstrate understanding of word relationships.  L 6: Acquire and use domain-specific words.  Mathematics  MP.2 Reason abstractly and quantitatively. (3-PS2-1)  MP. 5 Use appropriate tools strategically. (3-PS2-1)  3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve  one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent  the problem. (3-PS2-1) | | |
| **21st Century Themes:**  Digital media will be used incorporated in project presentations. This module will develop students’ abilities to do and understand scientific inquiry. Students will identify questions, design and conduct scientific investigations to answer those questions, employ tools to gather, analyze, and interpret data. They will use data to construct reasonable explanations, develop and communicate investigations and evidence and understand that scientists use different kinds of investigations and tools to develop explanations using evidence and knowledge. This module will develop and extend students’ understandings about science and technology. Students will work collaboratively in teams and use tools and scientific techniques to make better observations. | | |
| **Unit Rationale**  Magnetism and gravity are the forces students explore as they look for patterns of motion to predict future motion. Students work with magnets and paper clips, wheel-and-axle systems, paper air twirlers, and rotating tops. Students use their knowledge of science to enter the engineering design process and through the process refine their science understanding.  Students build on the science concepts of matter and its interactions developed in grade 2 using new tools to quantify observations. Students use metric tools to refine observations by measuring mass and volume, they make mixtures and solutions to develop a foundational understanding of conservation of mass, and they observe a simple chemical reaction to extend their understanding of conservation. These new experiences with matter will prepare students for the disciplinary core ideas introduced in grade 5. | | |
| **Learning Targets** | | |
| Disciplinary Core Ideas  PS1.A: Structures and properties of matter: The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. Measurements of a variety of properties can be used to identify materials.  PS2.A: Forces and motion:The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.  PS2.B: Types of interactions:Objects in contact exert forces on each other. Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.  PS1.B: Chemical reactions:When two or more different substances are mixed, a new substance with different properties may be formed. No matter what reaction or change in properties occurs, the total weight of the substances does not change.  ETS1.A: Defining and delimiting engineering problems: Possible solutions are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.\  ETS1.B: Developing possible solutions: At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.  ETS1.C: Optimizing the design solution:Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. | | |
| **PE #** | **Performance Expectations** | |
| 3-PS2-1 | Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. | |
| 3-PS2-2. | Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion. | |
| 3-PS2-3. | Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. | |
| 3-PS2-4. | Define a simple design problem that can be solved by applying scientific ideas about magnets. | |
| 3-5-ETS1-1. | Define a simple design problem reflecting a need or a want that includes specified criteria for success and  constraints on materials, time, or cost. | |
| 3-5-ETS1-2. | 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. | |
| 3-5-ETS1-3. | 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. | |
| **Unit Essential Questions**   * What happens when magnets interact with other magnets and with paper clips? * How is the magnetic field affected when more magnets are added? * What causes change of motion? * How can we change the motion of wheels rolling down ramps? * What rules help predict where a rolling cup will end up? * Student-created question, e.g., What happens to the motion of a twirly bird when the wing length changes? * What is the best design for a top? * What are some important features of a cart that will roll from here to there? * How can you improve the design of your cart? * Student-created questions, e.g., How does start position affect how far a cart rolls? * How can you use magnets to do cart tricks? * What happens when you mix two materials? * What happens when you mix two materials? * What is the importance of accurate measurements for a metric field day? | | **Unit Enduring Understandings**  Energy and Change   * Magnetic forces between a pair of objects do not require that the objects be in contact. * The strength of the force depends on the properties of the objects and their distance apart. * The interaction between magnets depends on their orientation (sometimes they attract and sometimes they repel). * Unbalanced forces (pushes or pulls) result in change of motion. * Gravity is the force that pulls masses toward the center of Earth. * The pattern of an object's motion in various situations can be observed and measured. * When past motion exhibits a regular pattern, future motion can be predicted from it. * A wheel-and-axle system with two sizes of wheels describes a curved path. * A twirly bird is a simple winged system that spins when it interacts with air; variables affect twirler performance. * Tops exhibit rotational motion (spinning) when torque is applied to the axial shaft; variables affect top performance. * Possible solutions to a problem are limited by available materials and resources (constraints). * The success of a designed solution is determined by considering the desired features of a solution (criteria). * Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. * The pattern of an object’s or system’s motion in various situations can be observed and measured. * When past motion exhibits a pattern it can be used to predict future motion. * A mixture is two or more materials distributed evenly throughout one another. * A special class of mixture, a solution, results when a solid material dissolves (disappears) in a liquid. * Starting materials change into new materials during chemical reactions. * Mass is neither created nor destroyed during physical and chemical interactions. Matter is conserved. |
| Unit Learning Targets -  Throughout the Motion and Matter Module, students engage in science and engineering practices to collect data to answer questions, and to define problems in order to develop solutions. Students reflect on their own use of these practices and find out about how others use these practices in science and engineering careers. | | |
| **Evidence of Learning** | | |
| **Embedded Assessments:**   * Response Sheets * Performance Assessments * Science Notebook Entries   **Benchmark Assessments:**   * Investigation I-Checks * Surveys * Post-Test | | |
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