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| Woodland S.T.E.A.M. Integrated Plan | |
| Grade Level: Second | Time Frame: March 2016 |
| Ask: What is the big idea of your unit?  How can we, as engineers, design a rollercoaster using energy of motion that safely brings passengers to a stop? | |
| Focus Standards  Math:  MCC2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.  MCC2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.  MCC2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.  MCC2.MD.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems10 using information presented in a bar graph.  MCC2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.  Science:  S2P2. Students will identify sources of energy and how the energy is used.  a. Identify sources of light energy, heat energy, and energy of motion.  b. Describe how light, heat, and motion energy are used.  S2P3. Students will demonstrate changes in speed and direction using pushes and pulls.  a. Demonstrate how pushing and pulling an object affects the motion of the object.  b. Demonstrate the effects of changes of speed on an object.  ELA:  ELACC2W2: Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.  ELACC2W7: Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).  ELACC2RI5: Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexesm electronic menus, icons) to locate key facts or information in a text efficiently.  ELACC2RI6: Identify the main purpose of a text, including what the author wants to answer, explain, or describe. | |
| Essential Question(s)  What is potential energy?  What is kinetic energy?  How does friction affect the speed of an object?  How do rollercoasters work?  What careers are involved in the design and production of a rollercoaster?  How can we collect data on the effects of friction on an object?  How can we research the design and mechanics of rollercoasters?  How do height and incline effect the speed of an object travelling downhill?  **From CCGPS:**  • What makes things move?  • How can you move something farther?  • Why are forces needed?  • How is push like a pull? Different?  • What surfaces make moving things easier?  • How is speed affected by push and pull?  • Why does speed change?  • Why is gravity important in our daily life?  • How can motion be described?  • How can you use forces? | Key Vocabulary Terms  Friction, kinetic, potential, engineer, physics, mechanics, surface, friction, push, pull, position, motion |
| Technology Needed  Computers, iPads, videos, timers | Supplies Needed  Timers, tubes, marbles, alternate surfaces (sandpaper, felt, plastic paint drop cloth), tape, dominoes, color tiles, foam cubes, notecards, |
| Teaching the Target  **Integrated Humanities Centers:**  **Computers- Roller coaster Portaportal in Reading**  **Writing Center- Ask a physicist**  **Integrated STEAM Centers:**  **Computer-** **online** **simulator**  **March 15:**  **STEM**🡪 Pre-Assessment (Write on a sticky note: What do you think makes a roller-coaster move?) Do you remember our rubber band and clothespin experiment with Mason? You twisting the rubber band and using your own energy created potential energy in the rubber band. When you released the clothespin, the potential energy changed to kinetic energy. What other examples of this have you seen? Discuss kinetic and potential energy with roller coasters. Show video <https://www.youtube.com/watch?v=JFNKyi_lzyg> and pause throughout to ask questions about energy conservation. Have students touch their nose if they are viewing potential energy and flash their hands if they are viewing kinetic energy.  **Humanities🡪** TW introduce unit vocabulary and SW define and think of an example. Watch BrainPop Jr. Pushes and Pulls video. Then go over vocabulary for pushes and pulls using BrainPop Jr. word wall.   * Content Specific Vocab: gravity, force, potential, kinetic, motion, mass, friction, speed, push, pull, position. Write the definition and draw an example.   **March 16:**  **STEM**🡪Energy of motion can be observed constantly. Can energy be transferred from one object to another? Each table group will receive ten dominoes to set up in a line or pattern. Can you transfer energy to all ten dominoes? Give students a variety of objects such as color tiles, foam blocks, etc and test the ability to transfer kinetic energy from your body**🡪 potential energy** 🡪 kinetic energy in a chain through the objects. Extension: Write on a notecard how energy is being transferred.  **Humanities🡪** Students will receive a poster with a picture of a rollercoaster. Answer: Describe what you see. What do you notice first? What is the physical setting? What people and objects are shown and how are they arranged? What tools were used to create the object in the image? What do you wonder about the object?  **March 17:**  **STEM**🡪 After brainstorming, students will identify push and pull in toys, machines, sports, daily life experiences-put up the flag, open the door, put on my socks, etc.  TW create a Venn diagram🡪 How are pushes and pulls alike and different? SW experiment moving different objects in different ways. Are you applying a push or a pull? What force is always at work on all objects (gravity)? SW create T-chart of push and pull and will sort things that they test. Extension if time: Read motion little reader or read a Forces and Motion book. **Skype with roller coaster company- Sabers/Castleberry/Robertson - Thursday 8am- Ss need to develop thick questions.**  **Humanities🡪** Teacher will discuss career connections and will discuss the history of roller coasters. In 1885, the first patent was obtained for rollercoasters by LaMarcus Adna Thompson. Physics gives engineers the background knowledge to design roller coasters. **🡪 Initial Inventor** 🡪 **Physicist 🡪 Engineer 🡪 Mechanic**  **March 18:**  **STEM**🡪 In math journal, glue data table for upcoming STEM experiments. SW record: Object, Surface, Prediction, actual measurement. Teacher will discuss how math is integrated into science. A moving object will travel in a straight line if it is not touched. The distance it travels depends on the amount of force and the surface it is traveling on. Using the blocks covered in different materials, go to slides and test with timers.  Each trial will first be predicted, repeated, measured, and recorded.  **Skype with roller coaster company- Fritchie/Nichols/Islam - Friday 8am**  **Horn/Harlan - Friday 10am - Ss need to develop thick questions**  **Humanities🡪** Close read “Roller Coaster Science,” passage adapted from Super Teacher Worksheets’ passage “Roller Coaster Thrills” by Lydia Lukidis, an informational text about roller coasters using 3x close read prompting sheet.   * Close Reading questions:   + 1st read **🡪** What is the main idea of the text?   + 2nd read **🡪** What details support the main idea of the text? What details are interesting but not important to the main idea?   + 3rd read 🡪 What is the author’s purpose in sharing these ideas?     **March 21:**  **STEM**🡪 Discuss EDP and complete the Imagine and Plan sections. Discuss behavior expectations and data collection. Watch Bill Nye friction video <https://www.youtube.com/watch?v=MAqrWvkBoHk> and discuss. SW complete a Frayer model for friction.  **Humanities🡪** How can we use the vocabulary we have learned in discussions? TW give prompting question: How have we integrated subjects through STEM? Write your answer on a piece of paper and crumble it up to have a snowball fight. Practice using the vocabulary you have learned. Respond to the paper that you find and read. Do you agree or disagree? Do you have anything to add? Write your response and snowball fight again.  **March 22:**  **STEM and Humanities🡪** Create your rollercoaster. Guidelines: Ss will receive 3 tubes, but they must use 2. Ss must create one loop, one hill (which can be the initial incline). Extension: If successful, you may add more loops or hills.  **Before Questions🡪**  How are inclines on your hills affecting the speed of your marble?  How can your improve your design to keep your marble on the course?  How can you safely stop the marble?  **Build: 25 min**  **During Questions**🡪  How does incline affect the speed of your marble?  What changes occur when you alter the height of your hills?  Why do these changes occur?  How are your trials allowing you to improve your design?  How can you change the speed of your marble?  Can you explain your process?  Why did that happen?  What force or energy do you need to keep your marble moving?  Is the shape of your loop affecting how your marble is moving?  How can you improve your design so that your marble can successfully finish the course?  **Come together as a group and discuss how to improve your plan. TW create chart of ideas and SW have opportunity to improve.**  **Build 2: 25 min**  **After Questions**🡪 Review previously asked questions and have students complete rubric and reflection questions. | |
| Assessment: Collection of EDP**🡪 develop rubric with class to determine success of rollercoaster design** | |
| **Career Connections:**  LaMarcus Adna Thompson (American inventor and businessman) obtained a patent for rollercoasters in 1885.  **Physicist:** Physics is the natural science that involves the study of matter and its motion through space and time, along with related concepts such as energy and force. One of the most fundamental scientific disciplines, the main goal of physics is to understand how the universe behaves. A physicist has the background knowledge of forces and motion to understand how a rollercoaster will behave.  **Engineer:** An engineer is a practitioner of engineering, concerned with applying scientific knowledge, mathematics, and ingenuity to develop solutions for technical, societal and commercial problems. Engineers design materials, structures, and systems while considering the limitations imposed by practicality, regulation, safety, and cost.  **Mechanic:** A mechanic is a technician who uses tools to build or repair machinery. Modern rollercoasters require machinery to function. | |