

**CODE/MOE/UOIT Makerspaces Project**

**Lesson Plan: Grade 1 Science & Mathematics:**

**Rube Goldberg Machines (Using Keva Blocks)**

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| **Big Ideas**  Science and Technology:   * Objects have observable characteristics and are made from materials. (Overall expectation 3) * Materials have specific properties. (Overall expectations 2 and 3) * An object is held together by its structure. (Overall expectation 2) * The materials and structure of an object determine its purpose. (Overall expectations 1 and 3) * Humans make choices related to their use of objects and materials that have a direct effect on the environment. (Overall expectation 1)   **This lesson also incorporates the Mathematical concept of Estimation and can be found in the Measurement Strand.**  **Note: Specific Science and Technology Curriculum connections have been made for grade 1 but may be adapted for grade 2 and 3.**  **Science and Technology - GRADE 1: UNDERSTANDING STRUCTURES AND MECHANISMS**  **Mathematics - GRADE 1: MEASUREMENT (ESTIMATION)**  **Science and Technology Overall Curriculum Expectations**  **1. assess the impact on people and the environment of objects and structures and the materials used in them;**  **2. investigate structures that are built for a specific purpose to see how their design and materials suit the purpose;**  **3. demonstrate an understanding that objects and structures have observable characteristics and are made from materials with specific properties that determine how they are used.**  **Science and Technology Specific Curriculum Expectations**  **2.1 follow established safety procedures during science and technology investigations (e.g., wear safety goggles when using saws and hammers);**  **2.3 investigate, through experimentation, the properties of various materials;**  **2.4 use technological problem-solving skills (see page 16), and knowledge acquired from previous investigations, to design, build, and test a structure for a specific purpose.**  **Mathematics Specific Curriculum Expectations**   * **estimate, measure, and describe length, area, mass, capacity, time, and temperature, using non-standard units of the same size;**   **Mathematics Specific Curriculum Expectations**   * **estimate, measure, and describe the passage of time, through investigation using nonstandard units (e.g., number of trials of the Rube Goldberg Machine, successes and failures).** | |
| **Learning Goals:**  “We are learning to create and understand how a Rube Goldberg Machine can be built and used.”  “Using specific building materials students will test successes and failures of their Rube Goldberg Machines.”  “Understand and estimate how many trials they will need to perform to complete the machine.” | **Success Criteria:**  “We will be successful when we can create our Rube Goldberg Machine to operate from start to finish and be able to understand how the structure is able to guide the ball through the test course.”  “Students will have a tally chart of successes and failures and try to estimate how many trials they will need to be successful.” |
| **Lesson Overview:**  Students will create a simple Rube Goldberg machine (3-5 stages) using the material provided. They will begin by designing and testing each stage and then predict how many failures it will take before they reach a success is reached.  **With this the culminating task of creating a Rube Goldberg Machine could hit many areas of the science curriculum for Understanding Structures and Mechanisms in grade 1, Understanding Structures and Mechanisms Movement in grade 2 and Understanding Structures and Mechanisms Strong and Stable Structures grade 3.** | |
| **Materials and Technology:**   * Book: [Anything is Possible by Giullia Belloni](https://www.amazon.ca/Anything-Possible-Giulia-Belloni/dp/1926973917) * Youtube: [Video of Audri’s Monster Machine](https://www.youtube.com/watch?v=IMboI4cOAuQ) * Youtube: [Video of This Too Shall Pass (Giant Rube Goldberg Machine)](https://www.youtube.com/watch?v=qybUFnY7Y8w) * [Keva Blocks](https://www.amazon.ca/Mindware-KEVA-Maple-200-Plank/dp/B00BM9BFLQ) * Tablets * Dominos * Plastic and Rubber Tubing * Marbles/Plastic Ball (various sizes) * Tape * Rulers * LEGO/Mega Block * String * Other Assorted Materials for Students to Choose From | |
| **Student Accommodations/Modifications:**   * Partner students * Partner students with various ability levels * Have EA available to assist student(s) * Have more difficult part pre-assembled for students * provide specific blocks to use with a template * provide alternative items to use. A Rube Goldberg Machine can be built out of anything | **Lesson will be differentiated by:**   * **Content, specifically:** Provide students with the option of following video instructions step by step on a tablet * **Process, specifically:** Partners can direct and explain the instructions and/or construct the Rube Goldberg Machine * **Product, specifically:** have partners work on different part of the machine and then combine them * **Environment, specifically:** Allow students to work on tables, on the floor or the carpet area |
| **MINDS ON: Getting Started** | |
| * Introduce: Read the book Anything is Possible: By Giullia Belloni and discuss. Explain and give examples of resiliency and how we can encourage ourselves and others to keep trying even after several failures. * Watch Video: This Too Shall Pass Rube Goldberg Machine * Watch video: Audri’s Monster Trap * Key Questions: “What would have happened if the sheep listened to the Wolf in the beginning?” “What changed the wolf's mind?” “What did they do each time their flying machine failed to try to improve it?” * “How many failures did Audrey think it would take before a success?” “How did he react when he had a success?” “How many failures do you think the giant Rube Goldberg machine had?” “How can you tell?” * “Discuss modern inventions and if they would have worked on the first try?” “What does the word Resiliency mean?” “What are some ways you encourage others to keep trying even after they have several failures?” “How can you encourage yourself to keep trying even after many failures? * Assess Understanding: Explore the answers to the key questions in a class discussion. Provide real life examples of people who failed many times before they succeeded (Dr. Seuss, Michael Jordan, Walt Disney, Thomas Edison, J.K. Rowling etc…) * Groups: Student will watched various Youtube videos selected by the teacher of various Rube Goldberg machines by kids to give them some ideas for their machines.  Materials: Computer, Chromebook or Table, Headphones, Youtube playlist created by teacher. | |
| **ACTION: Working on it** | |
| Task(s): Create a Rube Goldberg Machine with 2-5 stages and transitions of energy. Upon completion make a prediction before testing the completed machine and estimate the number of failures before a successful run is achieved.  Difficulties:.  -students might have difficulties working as partners  -understanding the concept that to keep the ball moving their needs to be a downward slope  -fine motor skills for setting up the blocks could be challenging  -tracking their successes and failures  Demonstrate Understanding: Students will modify their machines through trial and error testing and be able to explain how they overcame the obstacles. Students will demonstrate their ability to predict and observe.  Assessment: *Checklist/Anecdotal Records*   * Is the student participating? * Does student understand the concept of using slope and gravity? * Does the student understand the cause and effect of the stages and transitions? * Does the student pose questions about problems they experienced building their Rube Goldberg machine? * Does the student make predictions and observations while designing their machine?   Potential Extensions:  - Prompt the students by asking, “Can you make your Rube Goldberg machine to perform a useful task (i.e. catching a monster, turning on a light etc…) - Increase the number of stages and transitions or specify the type of simple machines that are required. | |
| **CONSOLIDATION: Reflecting and Connecting** | |
| Sharing Work: Videotape students’ successful runs and share with class and on See-Saw/Twitter/Google Classroom with parents.  Key Questions:  - Ask students what tips and tricks they could share with another class that is beginning to create their own Rube Goldberg machines? - What problems did you have with your machine? How did you solve the problems? - How did you share the work between partners? How did you encourage each other to keep trying? - What other ideas do you have for a Rube Goldberg machine? What would you like to try next?  Strategies/Key Concepts:   * Connect learning to key concepts of slope, gravity, structure and transition of energy.   - Finish by reviewing their successes and failures. How many times did you think you would need? what was your estimation? How do the Rube Goldberg machines compare to the others in the class? Have one or two demonstrate to the whole class how their machine works. | |