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STE(A)M Truck 6 Day Project

Name of Project: Rube Goldberg Contraption

Theme	Repurpose and Reuse, Physical Science, Force and Motion
Essential Question(s)/Brief Description	How do we connect prior knowledge about simple machines to create a Rube Goldberg machine? How do simple machines work together to complete one task? What household items can we repurpose to model simple machines and create a Rube Goldberg machine?
STEAM Focus: Science, Technology Engineering, Arts and/or Math	Science, Technology, Engineering, and Math
Badge(s) Earned	*Modifying and Remixing* The learner experiments by repurposing materials, modifying existing products, or combining components in novel and surprising ways. 1A: REPURPOSE: The learner demonstrates openness to the use of various materials by, within the planning process, considering uses for various materials that are out of the realm of their normal use. 1B: MODIFY: The learner creatively modifies an existing material or object to better suit it to a particular use. 1C: COMBINE: The learner combines various unlikely materials to achieve an intended result that is different from each material’s intended purpose.
Program Fit: Directed, guided or independent stages. Alternatively is this a beginning/middle/end phase challenge?	This project will have a variety of stages in which the students will work independently, in pairs or groups, or under adult direction.

Standard(s)	**S.5.CS.4. 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. c) Identify ways in which the representations do not match their original counterparts. **S.4.P.3. Students will demonstrate the relationship between the application of a force and the resulting change in position and motion on an object.** a) Identify simple machines and explain their uses (lever, pulley, wedge, inclined plane, screw, wheel and axle). b) Using different size objects, observe how force affects speed and motion. c) Explain what happens to the speed or direction of an object when a greater force than the initial one is applied. d) Demonstrate the effect of gravitational force on the motion of an object.
Connections to (a) prior learning, (b) everyday life, (c) other content areas**.**	a) This project will reference what the students have learned through previous science units, particularly the lessons on physics and simple machines. b) This project could connect to students' prior experiences with the annual Atlanta Fair and/or Six Flags over Georgia. Students may be familiar with rides at these amusement parks to inform their understanding of the path the marble travels in the Rube Goldberg machine.
Assessment How will students demonstrate that they have mastered the objective(s) and can answer the Essential Question(s) for this lesson?	Throughout the build process students will take responsibility for following written and verbal instructions. There will multiple opportunities for students to give and receive feedback to each other as well as receive feedback from teacher(s). By creating a video describing the Rube Goldberg machine and verbally presenting it to an audience, students will be able to demonstrate their understanding of the design process and scientific concepts of this build.

Resources / Connections

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Will you need the STEAM Truck?	No	No	No	No	No	No
Will you need the STEAM Trailer?	Yes	Yes	Yes	Yes	Yes	Yes
List all tools and equipment needed. Please note if you are removing anything from the container, trailer or truck.	Scissors, tape, etc.					
Safety plan and mitigation. Please note any safety concerns and how they will be addressed.	Maker mentor and students will review safety mantra for tool use.					
Materials/Resources/ Technology List all materials needed by teacher and students. Attach all handouts, schematics, Power Points etc.	aluminum foil; plastic containers; cardboard; water bottles, toilet paper or paper towel tubes for chutes; cereal boxes to use like dominoes; pop cans, soup cans, or batteries to roll dominoes; funnels; marbles; golf balls; toy cars; string; buckets; cups or bowls					

Learning Sequence

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Opening Session (Activating Strategy) This is your attention getter to engage students and provide an overview of the concept.	Students will view a video to learn about Rube Goldberg machines.	Students will re-watch the video and conduct additional research to gather ideas to improve their contraptions.	Students will view a quick tutorial about creating videos in iMovie.	Each group will demo their Rube Goldberg component and receive feedback from class about what works or what could be fixed.	As a class, discuss the class sketch created yesterday so everyone understands what the final machine should look like and how it should function.	Students will share their infomercial ideas with the class. The class will make a list of pros and cons for each of the infomercial ideas they heard.
Work Session (Guided Teaching of New Content) Explore Tinker Design Build	**Explore** Ask students what they know about Rube Goldberg machines. Brainstorm ideas for how you might use everyday items to build a Rube Goldberg Machine. **Review six simple machines:** *Lever* *Wheel & Axle* *Pulley* *Inclined Plane* *Wedge* *Screw*	**Explore** Revisit the Design Thinking techniques learned in the wallet exercise. Then, students will define the problem they want to solve and how they want to solve it. Students will share the simple and compound machine sketches they created during the closing session of the previous day.	**Explore** Students will break into yesterday's groups and compare the sketches they made in their journals during the closing. As a group they will decide which additional component to add to their Rube Goldberg machine.	**Tinker** Students will collectively figure out how to combine all four groups' components to create one class machine. **Design** Students will create a large diagram for the class illustrating each component and what should happen at each stage of the chain reaction.	**Build** Students will permanently assemble all of the Rube Goldberg machine components, adjusting each part as necessary.	**Tinker** Students will test their machine twice to ensure each component works. **Design** From the list of pros and cons generated earlier, students will decide how to create a video that demonstrates how the machine works. Students will decide if they want narration, signs, subtitles, music, etc.

Work Session (cont.)	**Tinker** Assign students the task to model two working simple machines with the available household items. Students should explain which machine is represented and how it simplifies work and conserves energy. **Design** On individual dry erase boards, students will work in pairs to sketch out, at most, four components of a Rube Goldberg machine.	**Build** Students will reconstruct the simple machines they constructed individually yesterday and figure out a way to connect their machine with a partner's. Student pairs will find another student pair to join to make a four-component chain reaction. **Tinker** After observing successes/failures of combining the simple machines, groups will brainstorm how to make the reaction smoother. Each student will sketch the group diagram in their journal and add one additional component.	**Build** Students will reconstruct the four steps of the Rube Goldberg machine, adding on the next component. **Tinker** Students will make any additional changes or modifications. Students will view other groups' machines to decide who they would want to join with to create one class model.		**Design** Students will revisit the class diagram illustrating each component and what should happen at each stage of the chain reaction. Students will adjust the drawing to reflect any changes that occurred during today's build.	**Build** Students will film a 3-5 minute video to detail the construction and success of their Rube Goldberg Machine.

Closing Session Teacher seeks evidence of student understanding of this lesson's content.	*(5 min)* In their journals, students will draw and label each simple machine. Then, students will draw 2-3 compound machines that could be incorporated into their Rube Goldberg machine. These sketches will be shared with the group the following day.	*(5 min)* Students will reflect about today's build in their journals. Have them consider what went well, what didn't, and what still needs to be done.	*(5 min)* Students will reflect about today's build in their journals. Have them consider what went well, what didn't, and what still needs to be done.	*(5 min)* Students will reflect about today's build in their journals. Have them consider what went well, what didn't, and what still needs to be done.	*(5 min)* Students will brainstorm creative ways to advertise their Rube Goldberg machine. In their journals, students will be write a short infomercial about their "wild and wacky Rube Goldberg machine."	Students will showcase their video to a set of classmates, a different class or other people in the building. They will introduce video, explain the main concept of the build, as well as any "fabulous failures" and "significant successes" they experienced. After showing the video, students will answer questions from the audience.

Differentiation

Learning Styles Describe how each learning style is incorporated into the lesson.	**Visual:** Students will be given a general written outline this project's steps. There are also written tasks for various parts of the lesson. Teacher demonstrations will also support visual learners.
	Auditory: Teacher demonstrations, videos, and peer discussions will support auditory learners.
	Kinesthetic: By nature, the project caters to kinesthetic learners. Students will engage in hands-on activities throughout the lesson's tinker, design, and build processes.