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Arts in Stem
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In my 4th grade, we just completed our unit on energy. Throughout this unit, we learned about energy transfer and how it creates a change reaction. We explored simple machines and even constructed one. A highlight of the unit was watching several Rube Goldberg-inspired videos, which the students loved. Their enthusiasm inspired me to expand into a full-blown project creating Rube Goldberg-inspired machines.

This project is perfect for bringing art and science together. Students will discover how to connect simple machines to accomplish a task, but they will also engage in visual arts as they brainstorm and collaborate with teammates to design their machines. Also, they will be tasked with building their designs and creating an engaging poster to showcase their work. This project is a perfect blend of art and science, and I am excited to see the outcomes!

Rube Goldberg Machine Challenge: Transferring Engineering to Art

Grade Level: 4th Grade
Subject: Science & Arts
Duration: 8 Days

Learning Targets:

- With my team, I can successfully plan and build a Rube Goldberg machine that has at least 3 different simple machines and 5 energy transfers.
- Draw a detailed design of the machine, highlighting the simple machines and the energy transfers that occur.
- I can successfully work with my team and have the initiative to consistently help by: planning, problem solving, building, being positive, filming, etc.
- I can use calming strategies when building and problem solving is challenging, and I am feeling frustrated.
- With my team, I can create a WeVideo that shows our Rube Goldberg machine in action and describes each of our energy transfers and the simple machines we use.
- Create a poster to market the machine.

Engage

- **Activity:** Introduce students to Rube Goldberg machines through a short video showcasing different Rube Goldberg inventions.
- **Discussion:** Ask students what they noticed about the machines and how they think these machines work. Prompt them to share their ideas about simple machines and energy transfers.
- **Objective:** Capture students' interest and activate prior knowledge about machines and energy.

Explore

- **Group Work:** Divide students into small teams. Each team will brainstorm ideas for their Rube Goldberg machine by listening to each other's ideas and sharing their own.
- **Planning:** Using the Engineering Design Process, teams will choose one idea and start planning their machine.
    - **Requirements:** Include at least 3 different simple machines and outline at least 5 energy transfers.
    - **Materials:** Create a list of supplies needed for the build.
- **Sketching:** Encourage teams to create a detailed plan and sketch of their machine, showing how each part will work together.
- **Engineering Design Process:**

    - **Ideas:** Teams brainstorm and share ideas for their Rube Goldberg machine. Encourage listening and collaboration.
    - **Choose Ideas:** Teams select the best idea for their machine.
    - **Plan:** Teams create a detailed plan including:
        - At least 3 simple machines (e.g., lever, pulley, inclined plane)
        - 5 energy transfers (e.g., kinetic, potential, mechanical)
        - Supply list for building the machine.

Explain

- **Mini-Lesson:** Teach students about simple machines (lever, pulley, inclined plane, wheel and axle, screw) and energy transfer (mechanical, potential, kinetic, etc.).
- **Discussion:** Discuss how they can incorporate calming strategies when they face challenges during building. Share examples of how to communicate positively in a team setting.
- **Poster Creation:** Each team will create a poster to showcase their plan. The poster should include:
    - Drawings of their design
    - Labels for simple machines and energy transfers
    - Materials needed for building

Elaborate

- **Building Days (Days 2-4):**
    - **Day 2:** Begin building the Rube Goldberg machine. Use the cardboard attachments slide to assist in construction. Ensure each team member has a role.
    - **Day 3:** Continue building. Record each day's progress with one designated team member filming.
    - **Day 4:** Finalize the machine. Test each part, improve as needed, and ensure all simple machines are filmed.
    - **Reflection:** Ask teams to describe their simple machines and energy transfers. Encourage them to share the challenges faced and how they overcame them.

Evaluate

- **Deconstruction (Day 5):** Teams will take apart their machines, ensuring all materials are returned to their original state.
- **Video Editing (Day 6-7):** Using WeVideo, teams will edit their recordings to create a cohesive video showcasing their Rube Goldberg machine, including descriptions of the simple machines used and the energy transfers.
- **Poster completion:** Draw a plan on 11x17 paper using an accurate depiction of the machine. Make the poster stand out to engage the audience.
- **Presentation(Day 8):** Each team will present their video to the class, highlighting their design process and the challenges they faced.

Aligned Standards:

- **National Core Arts Standards:**
  - **Creating:** Anchor Standard 1: Generate and conceptualize artistic ideas and work.
  - **Performing:** Anchor Standard 6: Convey meaning through the presentation of artistic work.
- **Next Generation Science Standards:**
  - Engineering Design (4-PS3-4)

This lesson plan encourages creativity, teamwork, problem-solving, and application of engineering concepts through hands-on learning.