Chain Reaction Machines
Chain Reaction Machines Pre K-2 Workshop

This classic STEM workshop combines engineering and design skills with opportunities for inquiry. A great launching or culminating activity for a unit on forces.

Activity includes:

1. **Engineering Design Cycle**: Students practice the engineering design cycle through planning the solution to a problem, developing a solution, testing, and rebuilding as needed.
2. **Practice with Forces**: Students learn about forces through the chain reaction machine by developing a plan to get a marble from one point to another.
3. **Additional Challenges**: Students are given chances to test their solutions, and are given additional challenges as needed.

Supporting NGSS & Common Core Standards:

**K-2-ETS1-1 Engineering Design**
Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

**K-2-ETS1-2 Engineering Design**
Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

**K-2-ETS1-3 Engineering Design**
Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

**CCSS.ELA-LITERACY.SL.K.6**
Speak audibly and express thoughts, feelings, and ideas clearly.

**CCSS.MATH.CONTENT.K.CC.A.1**
Count to 100 by ones and by tens.
Chain Reaction Machines 3-5 Workshop

This classic STEM workshop combines engineering and design skills with opportunities for inquiry. A great launching or culminating activity for a unit on forces.

Activity includes:

1. **Engineering Design Cycle**: Students practice the engineering design cycle through planning the solution to a problem, developing a solution, testing, and rebuilding as needed.
2. **Practice with Forces**: Students learn about forces through the chain reaction machine by developing a plan to get a marble from one point to another with added challenges.
3. **Additional Challenges**: Students are given chances to test their solutions, and are given additional challenges as needed.

Supporting NGSS Standards:

3-5-ETS1-1 Engineering Design
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 Engineering Design
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 Engineering Design
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.
Chain Reaction Machines 6-8 Workshop

This classic STEM workshop combines engineering and design skills with opportunities for inquiry. A great launching or culminating activity for a unit on forces.

Activity includes:

1. **Engineering Design Cycle**: Students practice the engineering design cycle through planning the solution to a problem, developing a solution, testing, and rebuilding as needed.

2. **Practice with Forces**: Students learn about forces through the chain reaction machine by developing a plan to get a marble from one point to another with added challenges.

3. **Additional Challenges**: Students are given chances to test their solutions, and are given additional challenges as needed.

Supporting NGSS & Common Core Standards:

**MS-ETS1-1 Engineering Design**
Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

**MS-ETS1-2 Engineering Design**
Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

**MS-ETS1-3 Engineering Design**
Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

**MS-ETS1-4 Engineering Design**
Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
Chain Reaction Machines 9-12 Workshop

This classic STEM workshop combines engineering and design skills with opportunities for inquiry. A great launching or culminating activity for a unit on forces.

Activity includes:

1. **Engineering Design Cycle**: Students practice the engineering design cycle through planning the solution to a problem, developing a solution, testing, and rebuilding as needed.

2. **Practice with Forces**: Students learn about forces through the chain reaction machine by developing a plan to get a marble from one point to another with added challenges.

3. **Additional Challenges**: Students are given chances to test their solutions, and are given additional challenges as needed.

Supporting NGSS & Common Core Standards:

**HS-PS2-1 Motion and Stability: Forces and Interactions**

Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

**HS-PS2-3 Motion and Stability: Forces and Interactions**

Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*