SCIENCE MUSEUM OF MINNESOTA ENGINEERING ASSEMBLY, GRADES 3-5

Concepts, Learning Goals, & Logistics

GENERAL OUTLINE:

Engineering Habits of Mind and an Engineering Design Process

How do engineers think as they approach problems affecting people in today's world? Students see that engineers first must identify and understand a problem before developing solutions such as using various types of gloves to complete some tricky tasks. The challenge of moving a large fragile object under design constraints allows the audience to propose different solutions with the provided materials. Teams of volunteer engineers test their solutions, hoping for success but also experiencing failure. Students see that repeated designing does bring engineers to optimal solutions, as in the real-world case of designing high-speed trains. They realize that in each of the presented challenges, engineers were using an engineering design process.

Living in a Designed World

Student volunteers help reveal how engineers are involved in creating many of the things we use every day, even having a party! One by one we discover how engineers design everything from board games, to tables, to the pizza we eat. By examining the breadth of the engineering field and meeting a few people who work in it, students understand how engineering affects our daily life, the world, and society.

Science Learning Goals

- Engineers design solutions (products, processes, and systems) to meet human needs and wants.
- Engineering design is a systematic and iterative approach that includes the following:
  - Understanding and defining problems (criteria and constraints)
  - Developing and Testing possible solutions
  - Determining the optimum solution given the criteria and constraints)
- People live a designed world in which technology and society affect each other and the natural world.

Vocabulary Introduced:

- Engineering
- Technology,
- Design Process

Program Length: 50 minutes
Audience Size: Up to 250 students
Preparation: Science Museum instructor brings all needed equipment and materials. School provides two tables for demonstrations and access to electricity. Allow 45 minutes before and after program for set-up and take-down.

MN Academic Standard Strand: The Nature of Science and Engineering (0.1.1.2.1, 1.1.1.1.1, 1.1.1.1.2)
NGSS Science and Engineering Practices: Analyzing and Interpreting Data (1-ESS1-1), Constructing Explanations and Designing Solutions (1-LS3-1)
NGSS Crosscutting Concepts: Structure and Function (2-LS2-2)

If you have further questions on bringing programming to your school, please contact our Outreach Registration Coordinator at (651) 221-4748 or schooloutreach@smm.org.

SCIENCE MUSEUM OF MINNESOTA ENGINEERING RESIDENCY, GRADES 3-5

AIR DANCERS SESSION

Design teams create models of devices that would hold a person for a new amusement park ride. The rider is attached to the team's designed construction which they test in a column of rising air. Teams will use the Engineering Design Process (Ask, Imagine, Plan, Create, Improve) again and again as they strive for a design that balances the forces of gravity and air, and that meets the design criteria.

Program Length: Please allow 90 minutes for initial setup and 1 hour for final teardown. Allow for at least 10 minutes to reset between classes

Audience Size: Up to 30 students

Preparation: Science Museum Instructor brings all needed equipment and materials. This program requires at least 4-6 tables for instruction materials and it must remain in a designated space as it cannot be moved from room to room.

Science Learning Goals

- Engineers are people who solve problems creatively using their knowledge and understanding of math and science.
- Engineers use a design process to develop and refine multiple solution options to a problem. SMM uses the process of Ask, Imagine, Plan, Create, and Improve.
- Moving air can provide a force than can lift and support an object. Changing the object' shape, size weight and/or materials affects its motion.

Vocabulary Introduced:

- Engineering, Technology

Standards

MN Academic Standard Strand

Program supports Minnesota Academic Standards and Next Generation Science Standards, including disciplinary core ideas, science and engineering practices and crosscutting concepts. More details available upon request.

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SCIENCE MUSEUM OF MINNESOTA ENGINEERING RESIDENCY, GRADES 3-5

SUPER STRUCTURES SESSION

Different shapes have different strengths. Students can build shapes with strength by connecting dowels with rubber bands and use these shapes to construct either a tower or a bridge that supports weight. However, this is not possible with simple building techniques; the structures must be reinforced to be a "super structure."

Program Length: Please allow 45 minutes for initial setup and 30 minutes for final teardown. Allow for at least 10 minutes to reset between classes and 20 minutes if moving between rooms

Audience Size: Up to 30 students

Preparation: Science Museum Instructor brings all needed equipment and materials. This program requires at least 2 tables for instruction materials and it can be moved from room to room or taught in a designated space. An open space with minimal furniture is ideal.

Science Learning Goals

- Students experience the relative strengths of different geometric shapes and how well they respond to a load.
- Students work cooperatively to problem solve and apply their knowledge to engineer a solution to a problem.
- Geometric principles can be applied to help solve real-world challenges.

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CELEBRATE ENGINEERING!

Explore, experiment, celebrate

Science Museum of Minnesota

OVERVIEW

Let the Science Museum make your event a science celebration with some of our favorite hands-on activity stations. These experiments allow **kids and adults to work together** to explore, experiment, and have fun!

Our base science celebration event includes hands-on stations for up to **150 children and adults, for 90 minutes**. (We can also double the event size for up to 300 people, for more exploration fun!)

PRICING

Group size: 10-150
Event time: 90 min
Price: $600

The length or the capacity of the event can be increased for an additional cost.

FREE PRE-K ADD-ON!

While most of our stations are appropriate for K-5 audiences, you can also add on a special general science area for your youngest learners at no additional cost, thanks to our partners at PNC!

RECOMMENDED STATIONS

These stations are what we'd recommend for an average Celebrate Engineering event. We're happy to discuss other available stations to best meet the needs of your theme, space, or attendees!

Bridge Building

Build a bridge over the river with only water to stick the blocks together!
Serves 25-50 participants, grades K-5
Engineering, forces and motion, math

Frog Flingers

Can you catapult your frog to all three lily pads?
Serves 25-50 participants, grades K-5
Engineering, forces and motion, math

Stomp Rockets

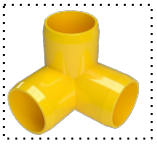
Build a rocket from paper and launch it using the power of air in a stomp launcher!
Serves 25-50 participants, grades K-5
Engineering, forces and motion, math

Cantilever Challenge

Avoid obstacles by building out over them, exploring center of gravity!
Serves 10-15 participants, grades 3-5
Engineering, forces and motion, math

Pipe Shape Building

Free build with PVC pipes to find patterns and shapes!
Serves 10-15 participants, ages K-5
Engineering, computational thinking, math, creativity



Cup Stacking

Build as many different towers as you can with only five cups!
Serves 10-15 participants, grades 3-5
Engineering, computational thinking, math, creativity