STEM Field Trip Activity Catalog

This catalog provides an example of many of the hands-on STEM activities students can participate in at a field trip. To help guide planning, difficulty level is included. Based on materials and resources available, certain activities may not be possible at a specific time. Per student participation cost may also affect choice of activities. Though activities are grouped by grade levels, all activities can be tailored to support learning at the elementary, middle, or high school level.

Note: Activities will be conducted in parallel stations so students rotate through challenges during a field trip.

Legend

- □ Puzzle/Math
- □ Coding
- □ Cybersecurity
- □ Drones
- □ Web Design
- □ 3D Modeling
- □ Building (Legos/Planks)
- □ Circuits/Motors
- □ Robotics
- □ Science

Difficulty Levels:
⋆ Easy | ⋆⋆ Moderate | ⋆⋆⋆ Advanced

Elementary School (Grades K–5)

Puzzles & Math

- **Tangram Challenge** ⋆ – Tangram sets; arrange shapes into animals/objects.

- **Geometric Scavenger Hunt** ⭐ – Worksheet + pencils; find shapes in surroundings.
- **Probability Games** ⭐⭐ – Dice, coins; record outcomes and predict patterns.
- **Domino Chain Reaction** ⭐ – Dominoes/planks; explore cause and effect.

Coding

- **Scratch Storytelling** ⭐ – Computers/tablets; create interactive digital stories.
- **Code-a-Dance** ⭐ – Cards with coding moves; act out step-by-step commands.
- **Micro:bit Games** ⭐⭐ – Micro:bit kits; program animations and sounds.
- **Coding Simon Says** ⭐ – Scratch or unplugged; recreate memory game.

Engineering & Building

- **Lego Marble Run** ⭐ – Legos; build tracks for marbles.
- **Plank Tower Contest** ⭐ – Wooden planks; tallest stable tower challenge.
- **Paper Roller Coasters** ⭐⭐ – Cardstock + tape; roll marbles through designs.
- **Catapult Design** ⭐⭐ – Craft sticks, rubber bands, marshmallows.

Circuits & Motors

- **Paper Circuits** ⭐ – LEDs, coin batteries, copper tape; light up cards.
- **Squishy Circuits** ⭐ – Conductive dough + LEDs; safe play circuits.
- **Build a Flashlight** ⭐⭐ – Battery holders, bulbs, wires.
- **Balloon Rockets** ⭐ – Balloons, string, straws; balloon-powered racers.

Science

- **Bottle Rockets** ⭐⭐ – Plastic bottles, pumps; launch water rockets.
- **Parachute Drop** ⭐ – Tissue/plastic + toys; explore air resistance.
- **Magnet Maze** ⭐ – Magnets, paper; guide objects through maze.
- **Pendulum Painting** ⭐ – Paint + cups + string; art through physics.

Middle School (Grades 6–8)

Puzzles & Math

- **Tower of Hanoi** ⭐⭐ – Disks + pegs; solve by logic.
- **Magic Squares** ⭐⭐ – Puzzle sheets; equal-sum grids.
- **Bridge-Building Contest** ⭐⭐ – Straws/sticks + tape; load-bearing designs.
- **Cryptarithms** ⭐⭐ – Worksheets; letter-digit substitution puzzles.
- **Maze Solvers** ⭐⭐ – Scratch/robots; program to solve mazes.
- **Debugging Relay** ⭐⭐ – Broken code snippets; fix in teams.
- **Python Turtle Art** ⭐⭐⭐ – Laptops; create patterns with Turtle library.
- **Blockly Race** ⭐⭐ – Online coding puzzles; fastest solution wins.

Cybersecurity

- **Password Strength Tester** ⭐ – Worksheet/online tool; test strong vs. weak.
- **Encryption Relay** ⭐⭐ – Paper/pens; encode and decode messages.
- **Binary Code Bracelets** ⭐ – Beads/strings; translate initials into binary.
- **Safe-Cracking Math** ⭐⭐ – Lock boxes; open using math problems.
- **Scavenger Hunt** * * -- real-world applications of cybersecurity knowledge.

Engineering & Design

- **Lego Bridge Test** ⭐⭐ – Legos; strongest span wins.
- **Lego Gears Challenge** ⭐⭐ – Gears + axles; build moving machines.
- **Simple Machines** ⭐ – Lego pulleys/levers; experiment with force.
- **Earthquake Simulation** ⭐⭐ – Lego/plank towers tested on shake tables.

Circuits & Motors

- **Motorized Fans** ⭐⭐ – Motors + propellers; build working fans.

- **Buzzer Quiz Game** ⭐⭐ – Wires, buzzers; build quiz circuit.
- **Electromagnet Experiment** ⭐⭐ – Nails, wire, batteries; lift objects.
- **Solar Circuit Challenge** ⭐⭐⭐ – Mini solar panels + LEDs.

Science

- **Water Filtration Build** ⭐⭐ – Sand, gravel, charcoal; filter water.
- **Hovercraft Experiment** ⭐⭐ – CD + balloon; hovercraft design.
- **Density Tower** ⭐ – Cups + liquids; layer by density.
- **Sound Wave Experiments** ⭐ – Speakers + salt; visualize vibration.

High School (Grades 9–12)

Puzzles & Math

- **Math Escape Room** ⭐⭐⭐ – Locks + puzzles; solve to escape.
- **KenKen Puzzles** ⭐⭐ – Worksheets; logic + operations.
- **Probability Experiments** ⭐⭐ – Dice/cards; collect, graph data.
- **Cryptography Challenge** ⭐⭐⭐ – Ciphers, keys; decode hidden messages.

Coding & Web Design

- **App Prototype** ⭐⭐ – MIT App Inventor or Scratch; design mobile apps.
- **Website Redesign** ⭐⭐ – Simple HTML/CSS; improve usability.
- **Interactive Quiz Site** ⭐⭐⭐ – HTML/JS; create web-based games.
- **Mobile-First Design** ⭐⭐⭐ – Responsive sites for phones.

Cybersecurity

- **Phishing Simulation** ⭐⭐ – Identify real vs. fake emails.
- **Digital Forensics** ⭐⭐⭐ – Analyze “evidence” from mock devices.
- **Capture the Flag (CTF)** ⭐⭐⭐ – Competitive cybersecurity challenge.

- **Firewall Sorting Game** ⭐ – Sort safe vs. unsafe “data packets.”
- **Scavenger Hunt** * * -- real-world applications of cybersecurity knowledge

Drones

- **Drone Obstacle Course** ⭐⭐ – Navigate drones through hoops.
- **Mapping Mission** ⭐⭐⭐ – Program drones for grid flight.
- **Drone Delivery Race** ⭐⭐ – Carry payloads to targets.
- **Search & Rescue Simulation** ⭐⭐⭐ – Locate hidden objects.

3D Modeling

- **Tinkercad Chess Pieces** ⭐⭐ – Design game tokens.
- **Prototype Inventions** ⭐⭐⭐ – Model original gadgets.
- **3D City Planning** ⭐⭐⭐ – Design full towns virtually.
- **Custom Phone Stand** ⭐⭐ – Functional 3D design.

Robotics

- **Line-Following Robots** ⭐⭐ – Sensors guide robots.
- **Robot Sumo** ⭐⭐⭐ – Program robots to push rivals.
- **Robotic Arm Task** ⭐⭐⭐ – Move and sort objects.
- **Mars Rover Simulation** ⭐⭐⭐ – Navigate rough terrain.

*We are currently using Dash Robots

Science & Engineering

- **Egg Drop Challenge** ⭐⭐ – Protect eggs from falls.
- **Solar Oven** ⭐⭐ – Cook with sunlight.
- **DIY Seismograph** ⭐⭐⭐ – Build earthquake recorders.
- **Windmill Generator** ⭐⭐⭐ – Test blade efficiency.

Cross-Grade (Scalable)

- **Lego Robotics Basics** – From simple motions ⭐ (elementary) to advanced sensors ⭐⭐⭐ (high school).
- **Bridge-Building** – Straw bridges ⭐ (elementary) to truss analysis ⭐⭐⭐ (high school).
- **Drone Coding** – Block coding ⭐ (elementary) to advanced scripts ⭐⭐⭐ (high school).
- **3D Modeling** – Keychains ⭐ (elementary) to inventions ⭐⭐⭐ (high school).
- **Paper Circuits** – Cards ⭐ (elementary) to interactive posters ⭐⭐ (middle/high).

Virtual Reality (VR) Experiences: The novelty and interactive nature of VR are highly motivational for students. It captures their attention and fosters a sense of wonder and curiosity. This excitement can translate into a genuine interest in STEM subjects, as students see them not just as academic requirements but as thrilling fields of exploration. Participating in VR gaming can inspire students to pursue careers in STEM, turning a simple field trip into a potential turning point for their future.