STEM IN THE WILD

Nature-Powered Projects for Hands-On Learning

Hands-on projects that turn nature into a STEM classroom!

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TREE GROWTH & MEASUREMENT

Objective: Learn how trees grow, measure tree height, circumference, and track growth over time.

Materials: Measuring tape, ruler, string, clipboard, journal, pencil, camera (optional).

ACTIVITY STEPS

Observation
Have students pick a tree to study. Discuss the parts of a tree and how it grows.

Data Collection
Measure the tree's circumference using string and a measuring tape. Record the measurements in a nature journal.

Tree Height
Introduce the concept of angles and geometry. Use a ruler and a fixed height object (or clinometer) to calculate tree height.

Growth Monitoring
Revisit the tree at regular intervals to track growth. Compare it to other species.

Extension
Discuss carbon storage in trees, the role of photosynthesis, and how math helps scientists understand forest health.

SIMPLE MACHINES IN NATURE

Objective: Identify and create simple machines using natural materials (levers, pulleys, wedges, etc.).

Materials: Sticks, stones, rope, logs, basic tools (optional), natural materials.

ACTIVITY STEPS

Scavenger Hunt
Explore nature to find objects that serve as simple machines, like rocks as wedges and sticks as levers.

Build a Lever
Use a long stick and a fulcrum (like a log or rock) to build a lever. Discuss the mechanics of how a lever works.

Pulley System
If near a tree, use rope and natural materials to construct a basic pulley system.

Real-World Connection
Discuss how animals use their bodies as simple machines (e.g., beavers building dams).

Math Connection
Calculate the mechanical advantage provided by your simple machine.

ECOSYSTEMS & BIODIVERSITY

Objective: Explore and map a local ecosystem, identifying relationships between plants, animals, and non-living elements.

Materials: Field guides, nature journal, clipboard, measuring tape, magnifying glass.

ACTIVITY STEPS

Ecosystem Survey
Visit a local park, forest, or wetland. Identify and list different species of plants, insects, and animals. Note how they interact with each other and their environment.

Map Creation
Using measuring tools, create a scale map of a section of the ecosystem. Include plant locations, water sources, and elevation changes.

Biodiversity Index
Learn how to calculate the biodiversity index (number of species divided by total organisms counted).

Technology Connection
If available, introduce students to apps like iNaturalist for species identification.

Data Analysis
Chart the biodiversity findings using graphs and discuss which areas have the most diversity and why.

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WEATHER & CLIMATE

Objective: Investigate weather patterns and how they affect local ecosystems.

Materials: Thermometer, barometer, anemometer, rain gauge, weather journal, graph paper.

ACTIVITY STEPS

Weather Station
Set up a simple weather station using available tools (thermometer, barometer, rain gauge, etc.).

Data Collection
Record weather data over a week or month. Include temperature, rainfall, and wind speed.

Weather Predictions
Use the collected data to make predictions about future weather patterns.

Graphing
Chart the daily data using bar and line graphs, teaching how to interpret the data visually.

Ecosystem Impact
Discuss how weather patterns influence local plants and animals.

WATER ENGINEERING

Objective: Explore water flow, erosion, and simple engineering structures.

Materials: Rocks, sticks, sand, water source (river, stream, or water hose), containers for water.

ACTIVITY STEPS

Build a Stream Model
Create a small stream model using a container filled with sand, rocks, and water. Observe how water flows and interacts with the materials.

Erosion Experiment
Pour water over different slopes of sand to observe erosion. Record how quickly different slopes erode and the shapes that form.

Construct a Dam
Use rocks and sticks to build a small dam in your stream model. Observe how the dam alters water flow and creates a reservoir.

Measure Water Flow
Set up a simple water wheel using natural materials and measure how quickly it spins in flowing water. Discuss how water flow can generate energy.

Real-World Applications
Research real-life applications of water engineering, such as dams and canals. Discuss their importance for flood control, irrigation, and energy production.

NATURE-INSPIRED ARCHITECTURE

Objective: Use nature's designs (biomimicry) to inspire architectural structures.

Materials: Photos or models of natural structures (honeycombs, tree branches), clay, sticks, paper, rulers.

ACTIVITY STEPS

Research Nature's Designs
Explore natural structures like honeycombs, bird nests, and tree canopies, and discuss their functions in nature.

Design Inspiration
Choose a natural structure that resonates with you and sketch a design for a building or bridge that mimics its shape and function.

Model Building
Construct a model of your design using clay, sticks, and other materials, emphasizing the elements that inspired it.

Evaluate Stability
Test the stability of your model by adding weights or applying pressure. Discuss which shapes and materials provide the most support and why.

Present Your Design
Share your model and the inspiration behind it with the group. Explain how your design reflects principles found in nature and how it could benefit humans.

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SOLAR ENERGY & PHOTOSYNTHESIS

Objective: Explore the process of photosynthesis and use solar energy for simple experiments.

Materials: Solar-powered tools (optional), leaves, paper, and chlorophyll extraction tools (rubbing alcohol, glass containers).

ACTIVITY STEPS

Photosynthesis Exploration
Collect leaves from various plants and discuss how they use sunlight to create energy through photosynthesis.

Leaf Observation
Place the leaves in different light conditions (full sun, partial shade, and darkness) and observe the changes over time.

Chlorophyll Extraction
Perform a simple chlorophyll extraction by soaking leaves in rubbing alcohol and observing how the green pigment is released.

Solar Energy Experiment
Use a small solar-powered device to demonstrate how sunlight can be converted into energy for human use.

Energy Calculation
Measure the solar panel's energy output throughout the day and graph it, comparing it to plant energy from photosynthesis.

ROCK FORMATIONS & EROSION

Objective: Understand rock types, formation processes, and how natural forces shape landscapes through erosion.

Materials: Rock samples (igneous, sedimentary, metamorphic), sand, water, vinegar, magnifying glass, journals.

ACTIVITY STEPS

Rock Hunt & Classification
Go on a nature walk to collect rocks. Identify and classify them as igneous, sedimentary, or metamorphic using a field guide or magnifying glass.

Rock Cycle Discussion
Discuss how each type of rock is formed and how they transform over time through the rock cycle (e.g., heat, pressure, erosion).

Erosion Simulation
Create a sand mound and use water to simulate erosion. Observe how water shapes the sand and record the effects in your journal.

Chemical Weathering
Use vinegar to demonstrate how certain rocks, like limestone, break down due to chemical weathering. Record observations on rock reactions.

Erosion Rate Measurement
Conduct timed water erosion experiments on different materials (sand, soil, rocks) and measure how much material erodes over time.

POLLINATION & PLANT REPRODUCTION

Objective: Study the role of pollinators (bees, butterflies, birds) in plant reproduction and the factors that impact pollination.

Materials: Flowering plants, magnifying glass, pollinator field guide, measuring tape, journal.

ACTIVITY STEPS

Pollinator Observation
Visit a local garden or park to observe pollinators in action. Identify different types of pollinators and track which flowers they visit.

Plant Structure
Examine the anatomy of flowers, identifying the parts involved in pollination (stamen, pistil, etc.).

Pollination Data Collection
Create a chart to record pollinator visits, time of day, and plant species. Analyze the data to see patterns.

Pollination Simulation
Use household items (cotton swabs and powdered sugar) to simulate how pollen is transferred between flowers.

Math Connection
Discuss probability and ratios by comparing the number of pollinator visits to successful flower fertilization. Graph the data.