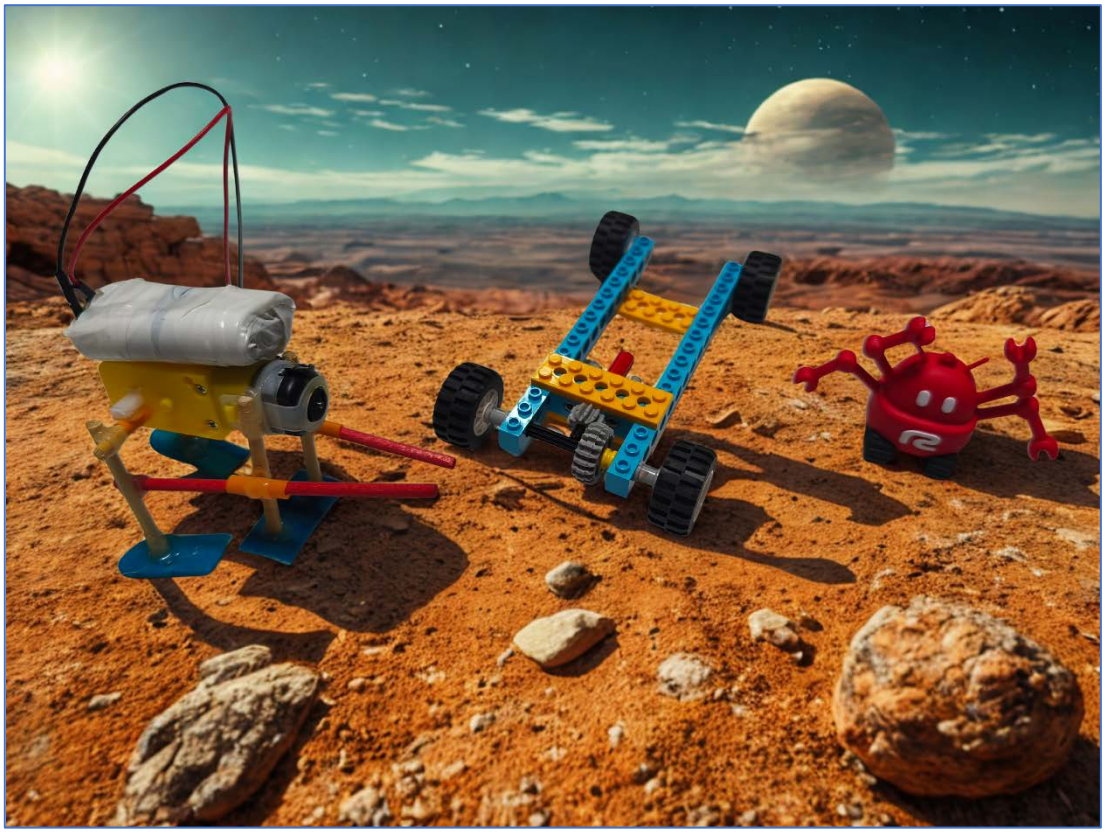
Activity 1 – The Walking Robot Explorer



Theme: Engineering & Motion

Duration: 60–90 minutes
Difficulty: Medium Fun
Materials Cost: Very low – all from home or supermarket!

Mission: Build Your Own Robot Explorer!

Hey young inventor!

Imagine you're part of a space crew landing on Mars. Your job is to design a tiny walking robot that can explore the rocky surface. But here's the twist — you'll do it using simple materials found at home! Let's get ready to build, test, and laugh while learning how real engineers bring robots to life!

Your goal is to make your robot walk at least 30 cm without falling!

Let's Build Step by Step!

Step 1 – Prepare Your Lab: Lay out all your materials neatly on the table — just like a real space engineer preparing for a mission. You're now a scientist getting ready for a top-secret Mars mission!

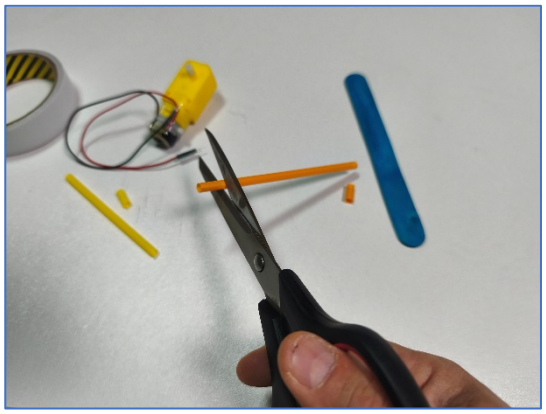
Funded by the European Union

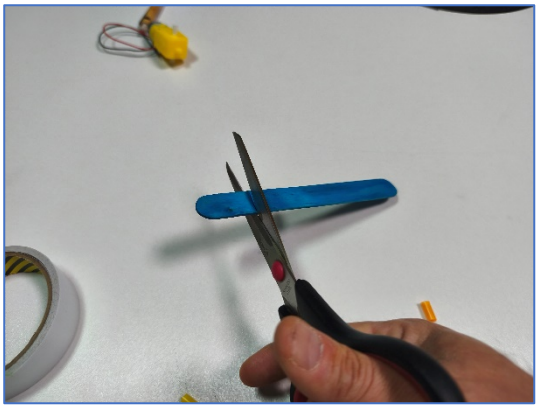
Activity 1 – The Walking Robot Explorer

What You'll Need

-1 small DC motor (3V–6V)
-2 AA batteries
-1 paper clip
-Wooden skewers
-Colorful straws (thin & thick)
-1 craft stick (ice-cream stick)
-Tape hot glue gun
-Scissors
-**A big dose of creativity!**

Step 2 – Cut the Straws: Cut a few pieces of straw — these will become the robot's joints and connectors. Try different lengths to experiment later with movement!



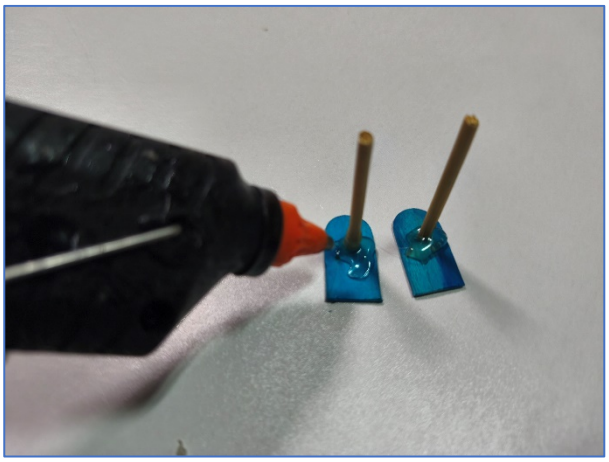


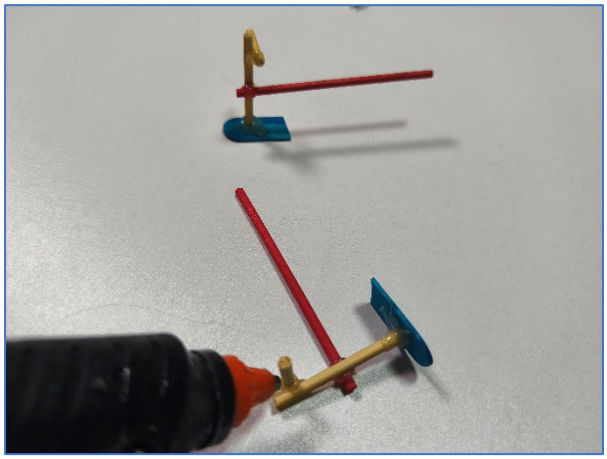
Step 3 – Make the Feet: Cut your blue craft stick in half. These will be your robot's big flat feet for balance!

Funded by the European Union

Activity 1 – The Walking Robot Explorer

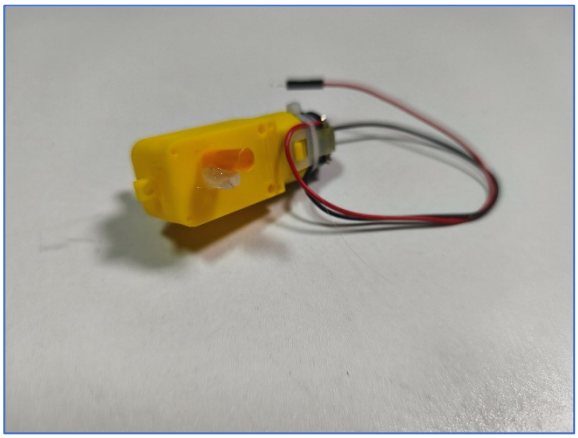
Step 4 – Add the Legs: Glue two skewers upright on each foot. Make sure they stand tall and straight.



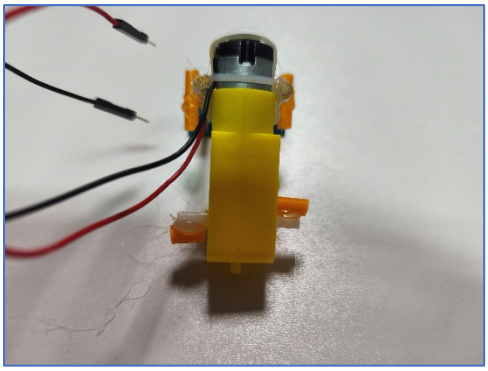


Step 5 – Connect the Legs: Glue a small stick connecting the leg junction to the motor shaft.

Step 6 – Prepare the Motor: Glue a small piece of straw onto the motor's rotating shaft.

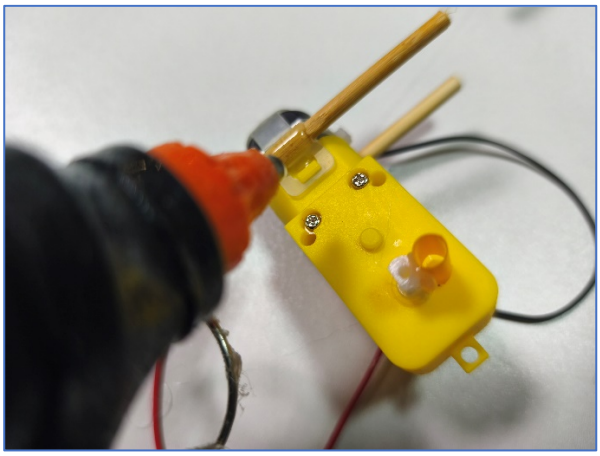


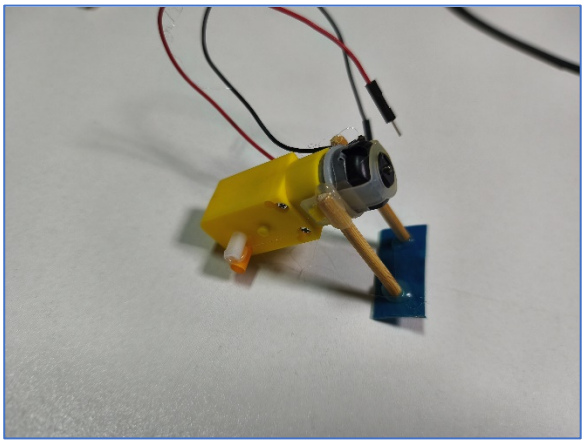
Activity 1 – The Walking Robot Explorer



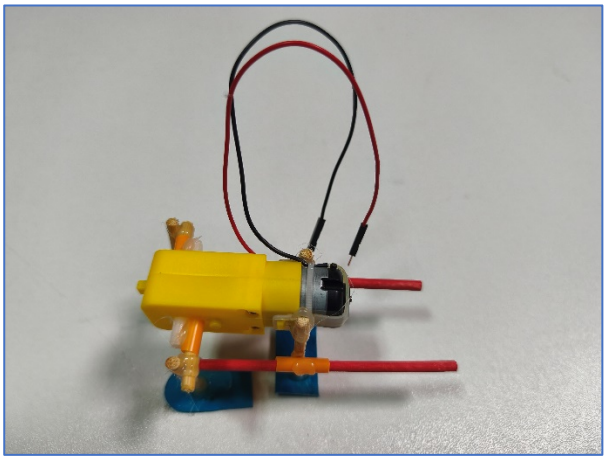
Tip: Glue the straws slightly off-center — one a bit higher and one lower on the motor shaft. This creates a fun, uneven motion when it spins!

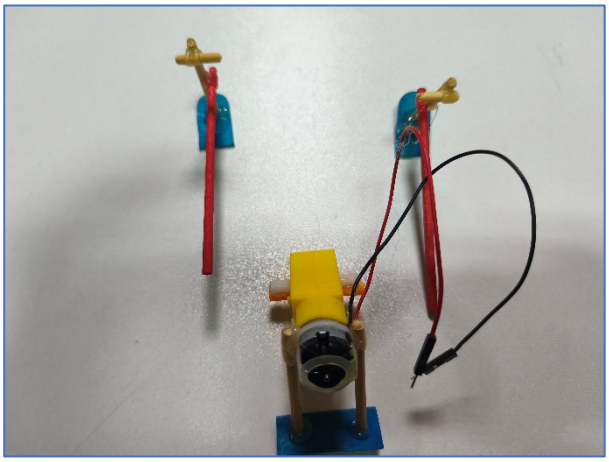
Step 7 – Give Your Robot a Body: Attach the motor *between the legs* as the body core.



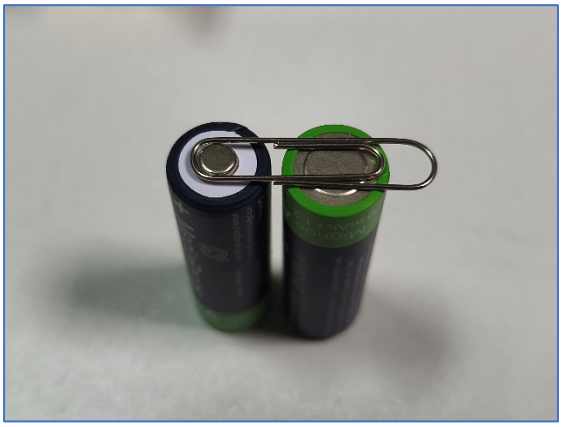


Step 8 – Add the Red Walking Arms: Connect the legs to the robot body by inserting the small wood sticks to the straw joints of the motor body.



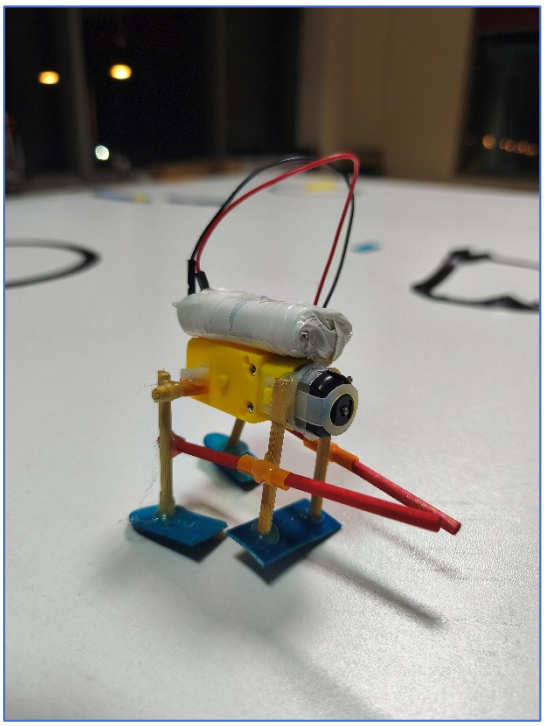


Activity 1 – The Walking Robot Explorer



Step 9 – Build the Power Source: Place your two batteries side by side in opposite directions, and use a paper clip to connect their ends. This way we will connect the positive edge of one battery to the negative edge of the other, creating a simple 3V power source.

Step 10 – Bring It to Life: Tape your battery pack on top of the robot and connect the wires to the motor terminals.



You've just built your first robot! Now you're ready to explore new planets with your imagination and engineering skills!

Extension Challenge

- *Can you make your robot walk slower or faster?*
- *Can you make it turn?*
- *What if you add a second motor?*
- *Try adding a small light or buzzer for extra fun!*

Activity 2 – The Toy Airplane Engineer

Theme: Aerodynamics & Electricity

Duration: 60–90 minutes
Difficulty: Medium Fun
Materials Cost: Very low – all from home or supermarket!

Mission: Build Your Own Toy Airplane!

Hey young pilot!
Today you're joining the *STEM Flight Crew*! Your mission: design and build a tiny electric airplane using only craft materials and your imagination.
Your LEGO pilot is ready for takeoff – but he needs your help to finish his plane and start the engine!

Can you make his airplane move smoothly and spin its propeller like a real one? Let's test your creativity, balance, and wiring skills to make it happen!

Goal: Build a motorized airplane that rolls on its wheels and spins its propeller!

Let's Build Step by Step!

Step 1 – Prepare Your Workbench

Lay out all your tools and materials on a clean surface. You're now the *chief engineer* of the hangar — safety goggles on, hot glue gun ready, and your pilot waiting for instructions!

What You'll Need

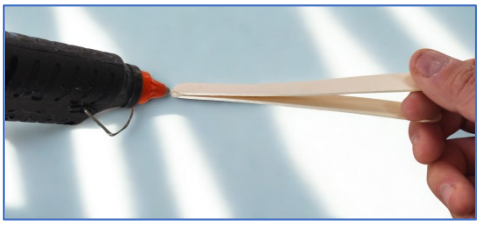
- 1 small DC motor (3–6 V)

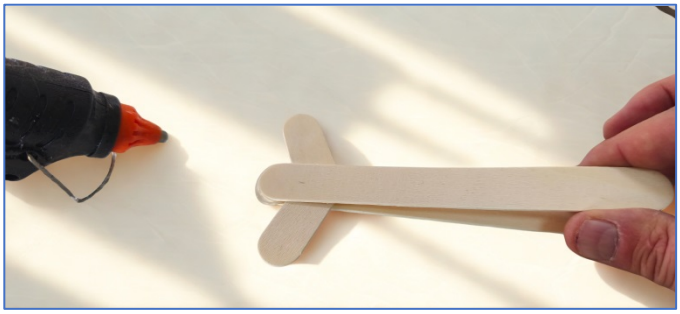
Activity 2 – The Toy Airplane Engineer

- 1 AA battery (3 V total with holder or tape)
- 1 switch
- 4–5 craft sticks
- 1 wooden skewer
- 3 small toy wheels or bearings
- Hot glue gun & sticks
- Tape
- Scissors
- LEGO pilot (optional but awesome!)

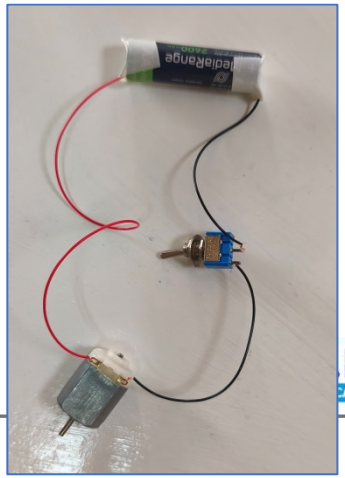
Step 2 – Build the Fuselage

Cut two long craft sticks and glue them together to make the airplane body.
Add one short stick across the front – this will later support the motor and propeller.





Step 3 – Wire the Circuit



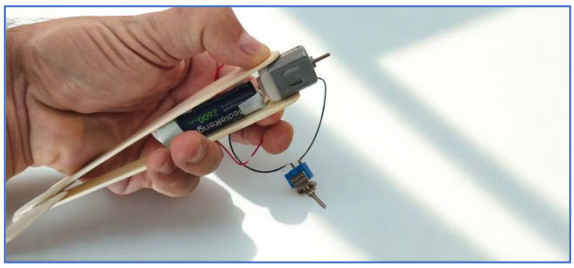
Funded by the European Union

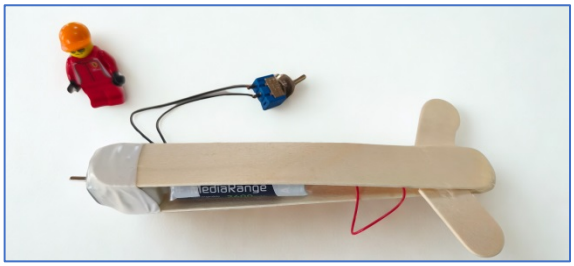
Activity 2 – The Toy Airplane Engineer

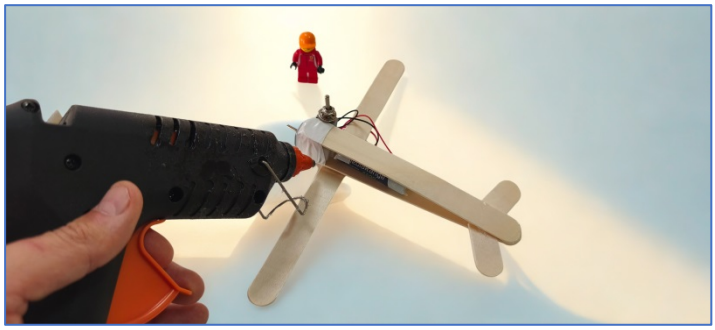
Connect the **motor**, **switch**, and **battery** in series using wires.
When you flip the switch, the motor should spin — that's your future propeller!

Step 4 – Mount the Motor and Battery

Place the **motor** at the front of the fuselage and tape the **battery** snugly in the middle.
Glue the **switch** behind the motor where your pilot can reach it easily. Use two craft sticks as wings and carefully glue them to the sides of the airplane's body.



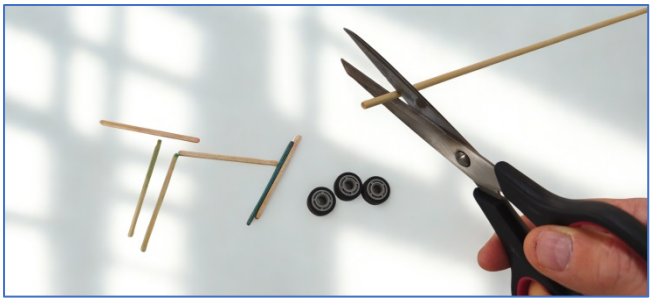




Step 5 – Make the Wheels

Activity 2 – The Toy Airplane Engineer

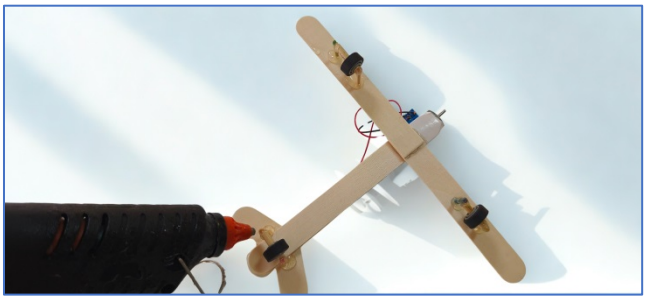
Cut short pieces of **wooden skewer** and insert them into three small **wheels** or bearings.



Glue each axle carefully so the wheels can roll.

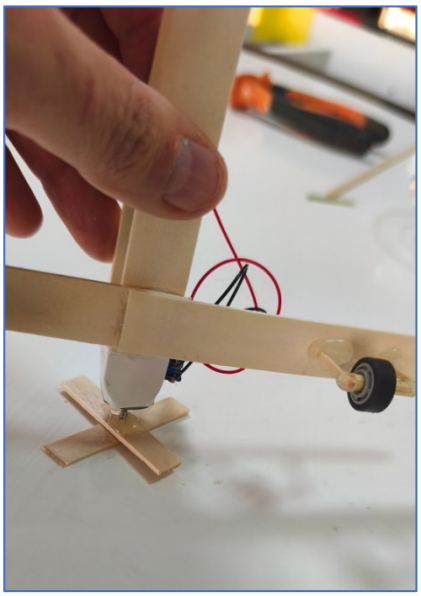
Step 6 – Attach the Landing Gear

Glue the wheels underneath the wings – two at the front and one smaller at the back.
Now your airplane can move smoothly across the ground for takeoff!



Step 7 – Create the Tail and Propeller

Cut a short craft stick in half and glue it as a cross — that's your **propeller.**
Turn the airplane in vertical position to make it easier to glue the propeller.



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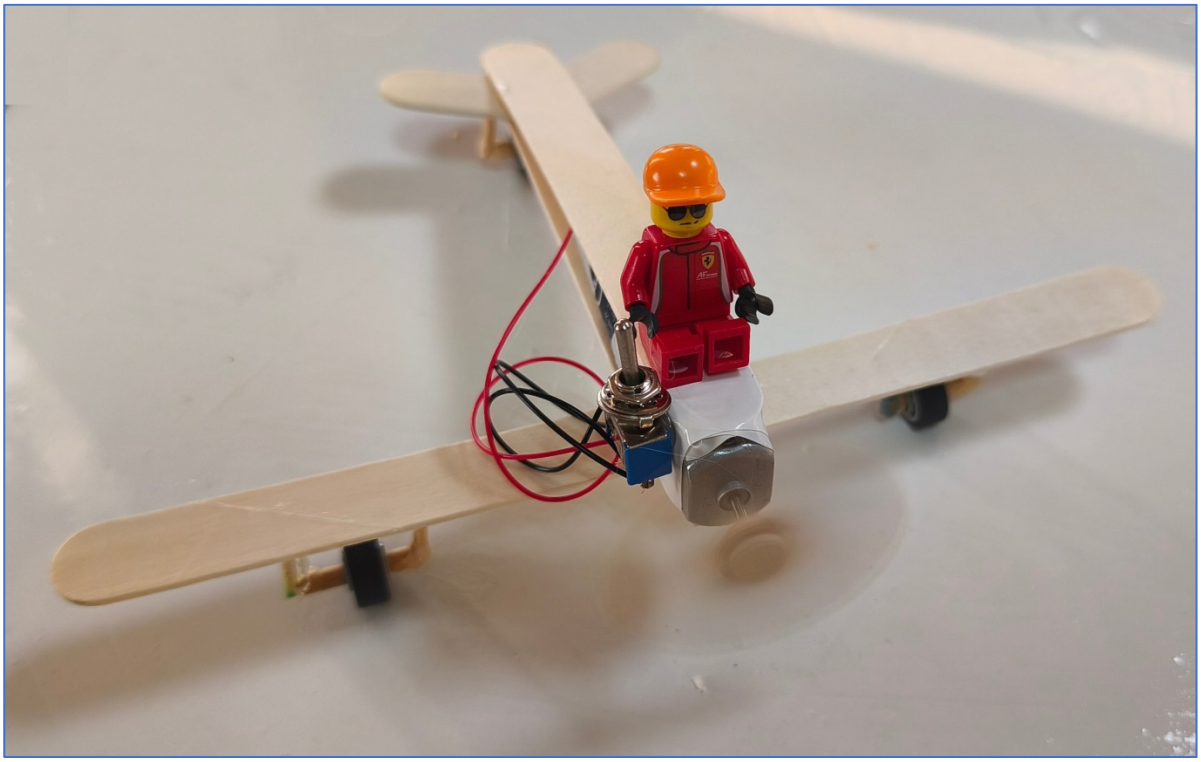
Activity 2 – The Toy Airplane Engineer

Step 8 – Pilot Onboard & Test Flight!

Seat your LEGO pilot on top, flip the switch, and watch the propeller spin!
Your **Toy Airplane** is alive — rolling, buzzing, and ready for its first test mission!



Extension Challenge

- *Add **LED lights** for navigation or a buzzer for sound.*
- *Try **two batteries** for more power – but make sure the motor can handle it!*
- *Design a runway and race against your friends' planes.*
- *Can you balance it enough to glide for a few seconds after a push?*

Activity 3 – Mini Bug Robot

Theme: Engineering & Motion

Duration: 60–90 minutes
Difficulty: Medium Fun
Materials Cost: Very low – all from home or supermarket!

Mission: Bring Your Mini Bug to Life!

Your mission is to bring a tiny robotic bug to life!

Imagine you're a scientist working in a secret mini-lab where small robots help clean up tiny dust particles and explore hidden corners of the world. Today, you'll design and build one of these little helpers — the Mini Bug Robot!

With just a clothespin, a small motor, and some paper clips, you'll create a glowing, buzzing creature that crawls on its own. Get ready to see your invention wiggle, vibrate, and explore its new world!

Funded by the European Union

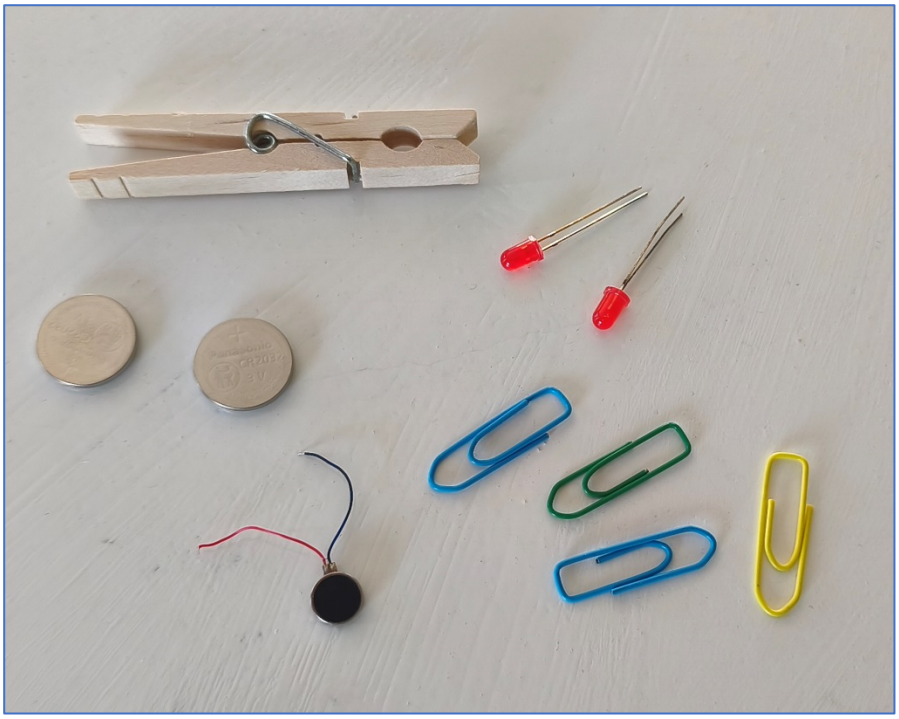
Activity 3 – Mini Bug Robot

Let's Build Step by Step!

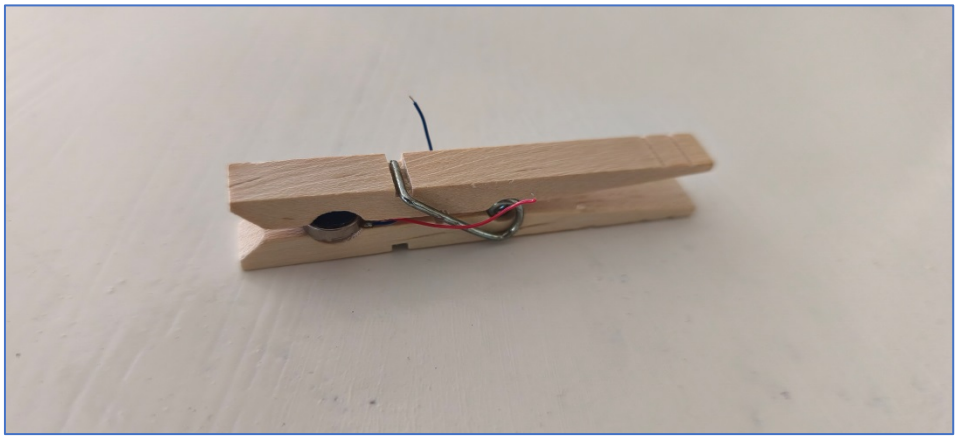
Step 1 – Prepare Your Lab: Lay out all your materials neatly on the table — just like a real scientist!

What You'll Need

- -1 small vibrating motor (3V)
- -2 button cell batteries (CR2032, 3V each)
- -3–4 colorful paper clips
- -2 red LEDs
- -1 wooden clothespin
- -Wires (red and black)
- -Soldering iron (optional)
- -Hot glue gun
- -Small pliers or wire cutter
- -A lot of curiosity!



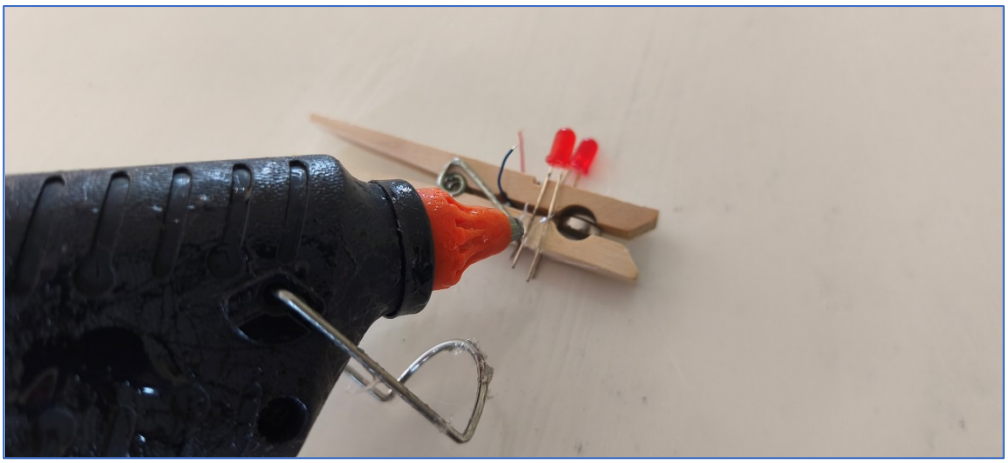
Step 2 – Place the small vibrating motor inside the side of the clothespin and fix it with a bit of hot glue. Make sure the **red and black wires** come out from the front.



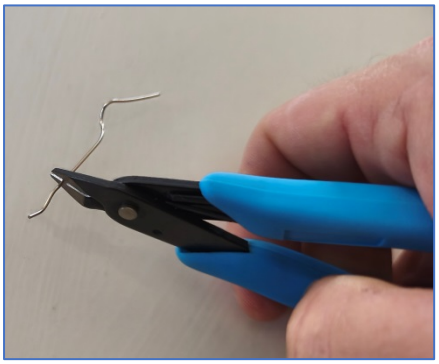
Funded by the European Union

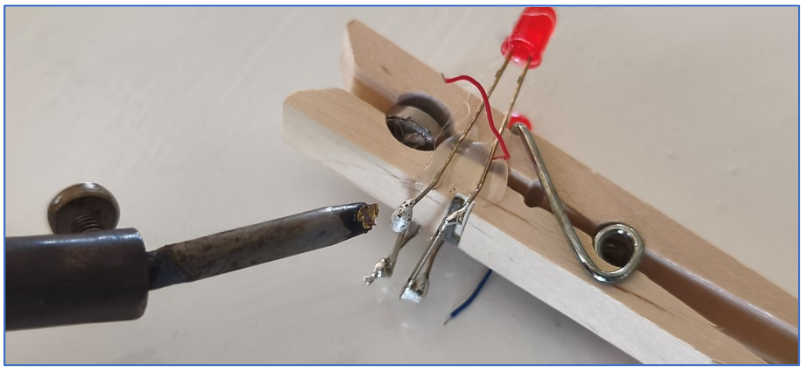
Activity 3 – Mini Bug Robot

Step 3 – Add the LEDs:
Glue the two red LEDs on the front side of the clothespin — these are your bug's glowing eyes! Keep their metal legs straight and pointing backward for easy wiring.

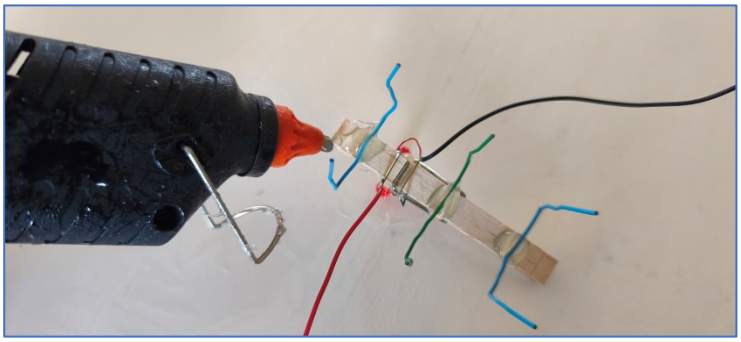


Step 4 – Cut two small metal pieces from a paper clip.
Use them to **join the two long legs of the LEDs together** (positive side) and then join the **two short legs together** (negative side).
Now both LEDs are connected in parallel.





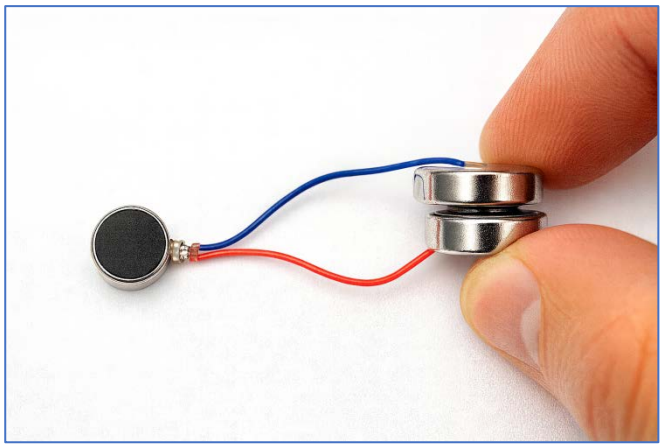
Step 5 – **Solder the motor wires to the LEDs**
Connect the red wire from the motor to the joined long LED legs (positive) and the black wire to the joined short LED legs (negative)**.**
You can twist the wires tightly or solder them for a stronger connection.



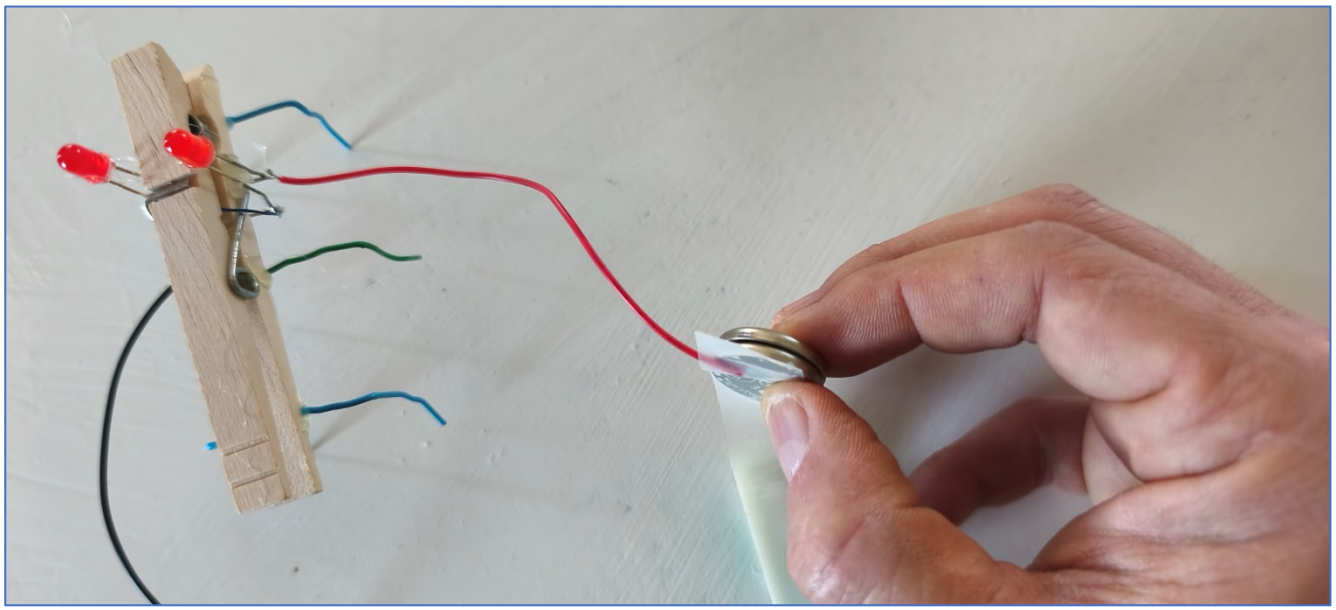
Funded by the European Union

Activity 3 – Mini Bug Robot

Step 6– Attach the two coin batteries together (+ side facing up).
Touch the red wire to the + side and the black wire to the – side.
When the circuit is complete, the **LEDs will light up** and the **motor will start vibrating** — test it before fixing the battery with tape.



Step 7 – Bend three paper clips into “U” shapes and glue them under the clothespin: two in the front and one at the back. Adjust them so your bug stands upright.



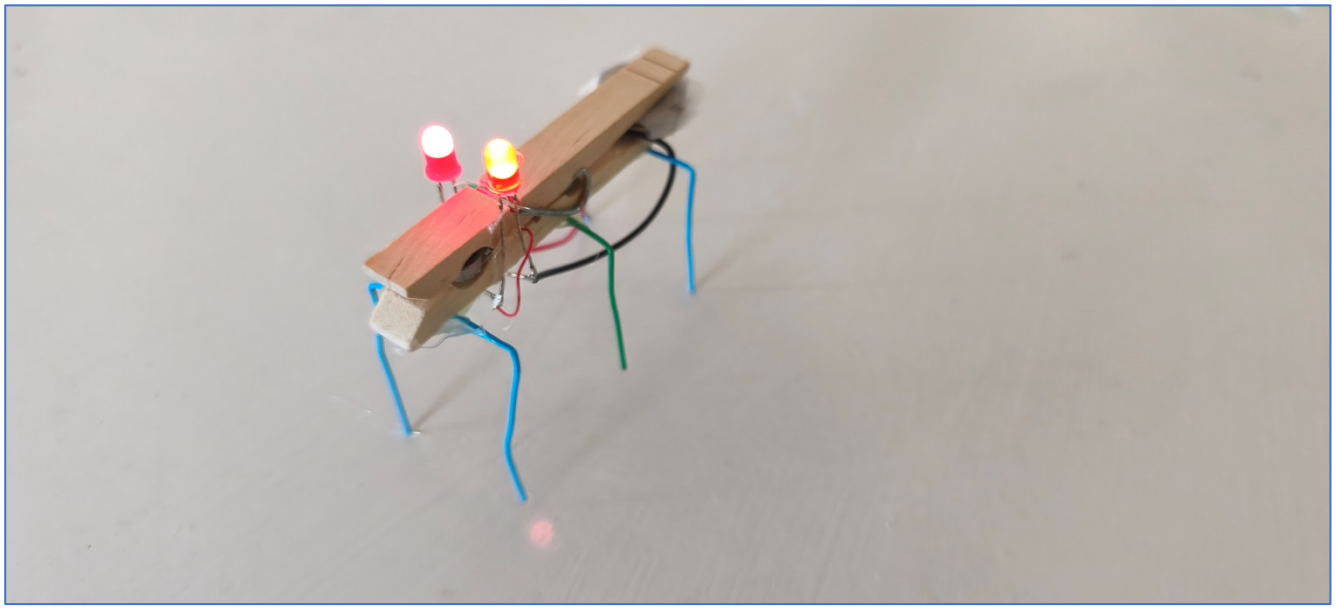
Activity 3 – Mini Bug Robot

Step 8 – Add a small amount of glue to hold the battery in place and decorate your robot as you like — colorful eyes, wings, or dots!

Step 9 – Test your robot

Place it on a flat surface and watch it crawl, wiggle, and shine.

You've just created your *Mini Bug Robot*!

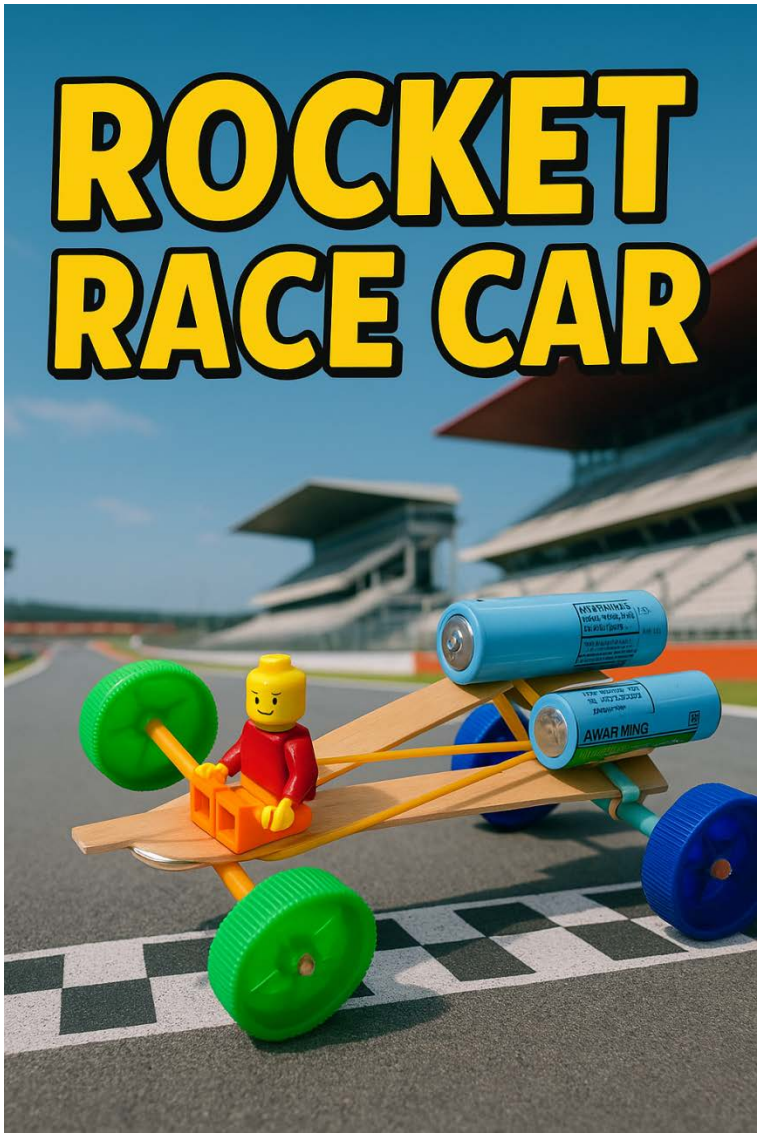


Extension Challenge

- *Can you make your Mini Bug Robot walk straighter or faster?*
- *Try changing the leg angles or the motor position.*
- *Bonus challenge: Add color or patterns to give your bug a unique personality!*

Funded by the European Union

Activity 4 – The Rocket Racer Car



Theme: The Rocket Racer Car

Duration: 60–90 minutes
Difficulty: Medium Fun
Materials Cost: Very low – all from home or supermarket!

Mission: Build Your Own Rocket Racer!

Ready to race?
Today, you'll become an engineer and design your very own rocket-powered racer!
This fun challenge uses only simple materials like bottle caps, sticks, and rubber bands — but the result will *zoom* across the floor like a real mini car!
Your goal: make your racer move at least **1 meter** powered only by rubber band tension!

Funded by the European Union

Activity 4 – The Rocket Racer Car

Let's Build Step by Step!

Step 1 – Lay out all your tools and materials neatly on your workspace.
Check that your straws fit around the skewers — these will be your car's axles!

What You'll Need

- 2 wooden craft sticks
- 2 wooden skewers
- 4 bottle caps (2 green, 2 blue)
- 2 straws (1 orange, 1 green)
- 2–4 rubber bands
- 2 AAA batteries (as weights)
- 1 screw and a screwdriver
- Hot glue gun
- Small cutting pliers
- Scissors
- A little LEGO driver (optional but fun!)

Step 2 – **Build the Chassis Frame**
Glue two wooden craft sticks together in a triangle shape using hot glue.
This will be the main body of your car.

Funded by the European Union

Activity 4 – The Rocket Racer Car

Step 3 – **Cut the Straws**

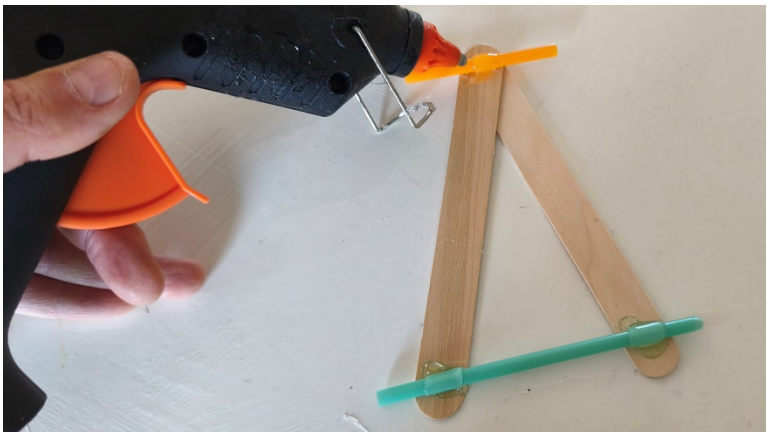
Cut two short straw pieces (green and orange).

These will hold the axles so your wheels can spin smoothly.

Step 4 – **Glue the Straws to the Frame**

Attach one straw to the front edge and one to the back of your triangle frame using hot glue.

Make sure they're perfectly horizontal — your car needs balance!

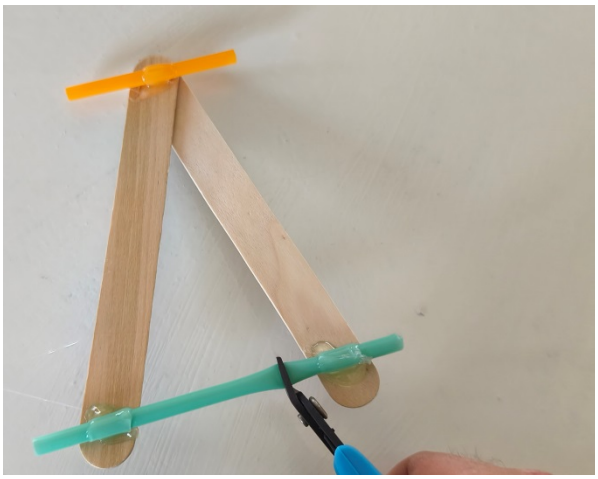


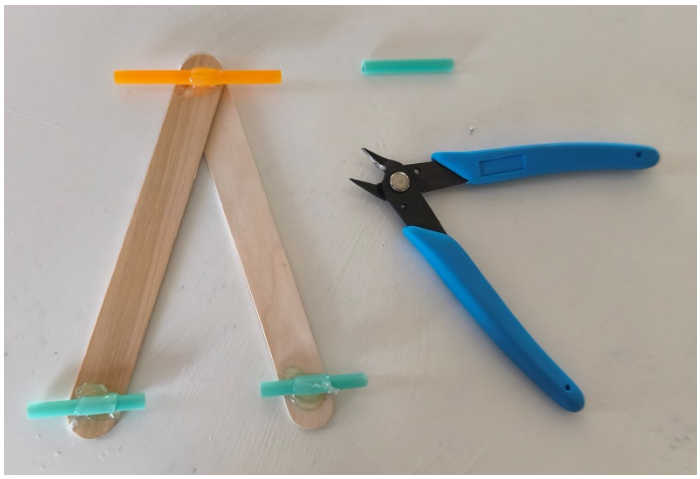
Funded by the European Union

Activity 4 – The Rocket Racer Car

Step 5 – **Trim the Extra Straw**

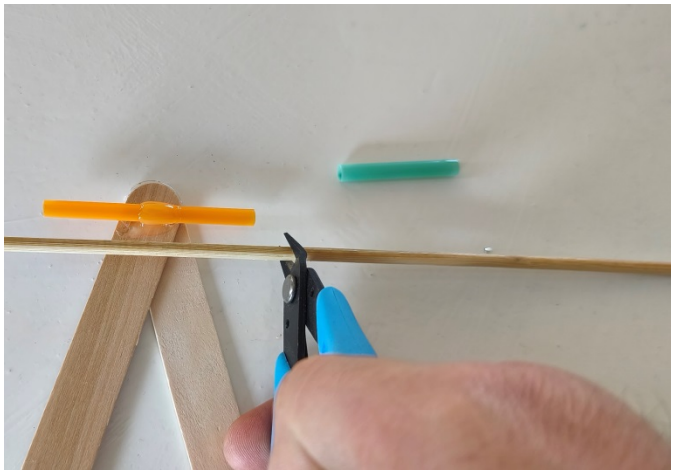
Once the glue dries, cut off any extra length from both straws.





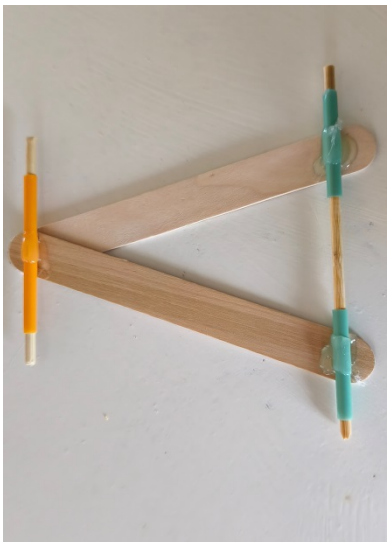
Step 6 – Create the Axles

Cut two pieces of skewer slightly longer than the straws.



Slide one skewer through each straw.

Now you have two spinning axles!



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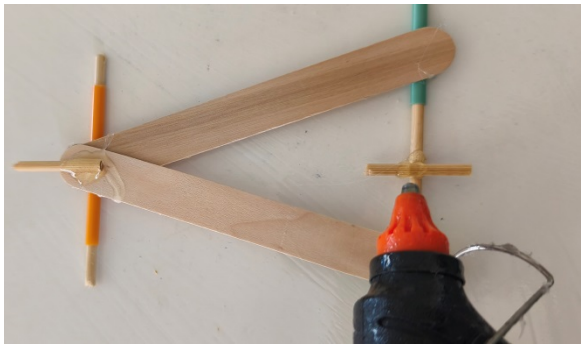
Activity 4 – The Rocket Racer Car

Step 7 – **Prepare the Wheels**

Use the screwdriver to carefully make a small hole in the center of each bottle cap.

These will become your car wheels!



Step 8 – **Attach the Wheels**

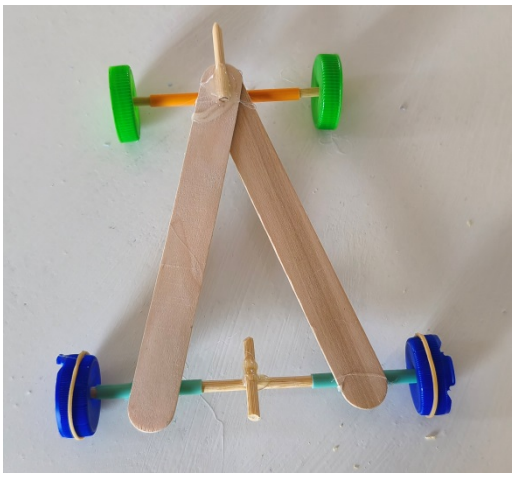
Push each skewer end through a cap hole and glue lightly with hot glue to secure them.

Step 9 – **Assemble the Car**

Place the two axles through the straws again — now your racer stands on four wheels!

Check that the wheels spin freely.

Activity 4 – The Rocket Racer Car

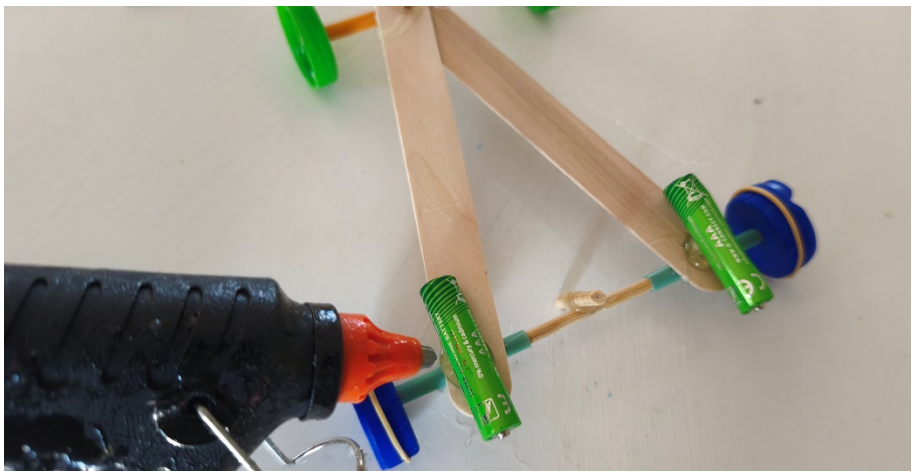


Step 10 – **Add Rubber Bands for Grip**

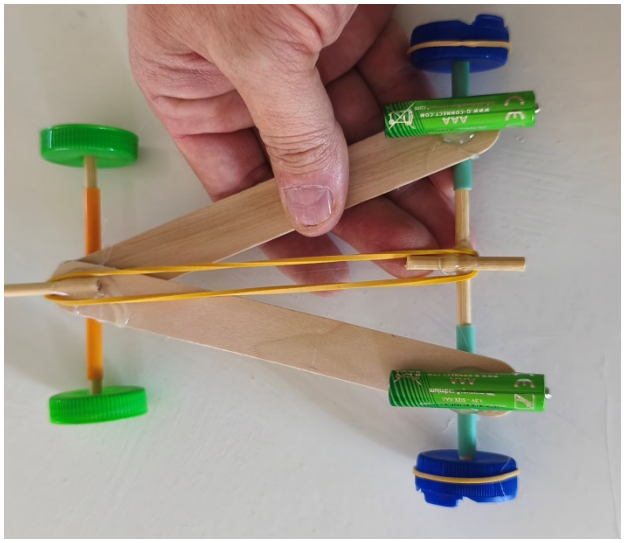
Wrap small rubber bands around the bottle-cap wheels to increase friction and help the car move smoothly.

Step 11 – **Add Weight for Balance**

Glue one battery on each side of the back frame to help your car stay stable during motion.



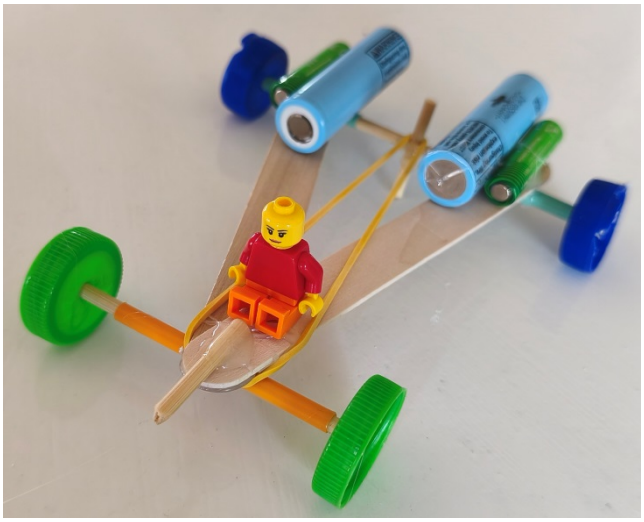
Activity 4 – The Rocket Racer Car



Step 12 – Add the Rubber Band Engine
Hook a rubber band from the front tip of the frame to the middle cross-stick (rear axle).
This rubber band stores energy — it's your *rocket power*!

Step 13 – Get Ready to Launch!
Wind the rubber band around the rear axle several times.
Place your racer on the floor, let go, and watch it zoom forward!

(Optional) Add Your Driver
Add a small LEGO figure on top to make your racer look like a real space pilot.



Extension Challenge

- *Can you make your racer go faster or farther by changing the number of rubber bands?*
- *Try different straw lengths or battery placements — how does it affect speed and balance?*
- *What if you design a bigger frame with three sticks?*
- *Can you make a "dual-engine" version using two rubber bands?*

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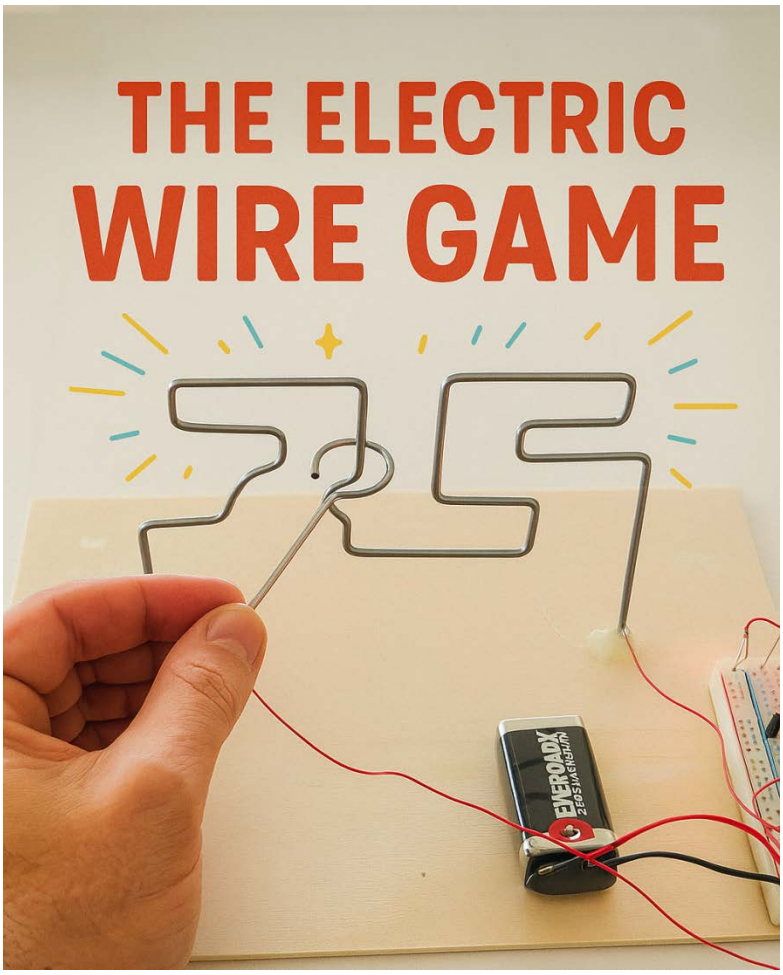
Activity 5 – The Wire Buzzer Game



Theme: Electricity & Circuits

Duration: 60–90 minutes

Difficulty: Medium Fun

Materials Cost: Very low – most items from home or a makerspace!

Mission: Steady Hands Challenge!

Are you ready to test your *focus and precision* like a true engineer?
Your mission is to build a **Wire Buzzer Game** – a fun test of skill where players must carefully move a metal loop along a wavy wire path **without touching it**.
If you do… the **buzzer beeps** and the **LEDs flash red!**

Can you finish the path without setting off the alarm? Let's find out!

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Activity 5 – The Wire Buzzer Game

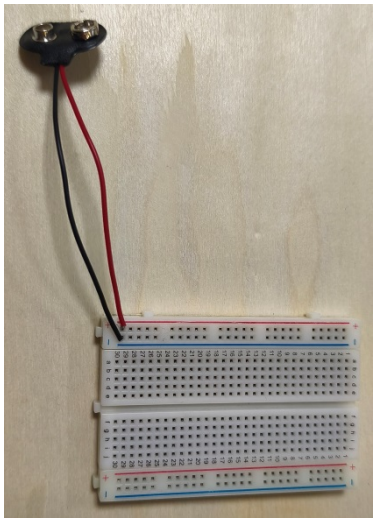
Let's Build Step by Step!

Step 1 – Prepare your lab!

Lay out all your materials neatly on your table — just like a real inventor getting ready for an experiment!

What You'll Need

- 1 × Breadboard
- 1 × 9V battery + snap connector
- 1 × Buzzer
- 2 × Red LEDs
- 1 × 330 Ω resistor
- Jumper wires (red, black, and white)
- A piece of metal wire (for the game path)
- A wooden board (as base)
- A hot glue gun
- Optional: Pliers to bend the wire



Step 2 – Power connection.

Plug the red and black wires of your 9V battery connector into the breadboard's power rails (+ and –).

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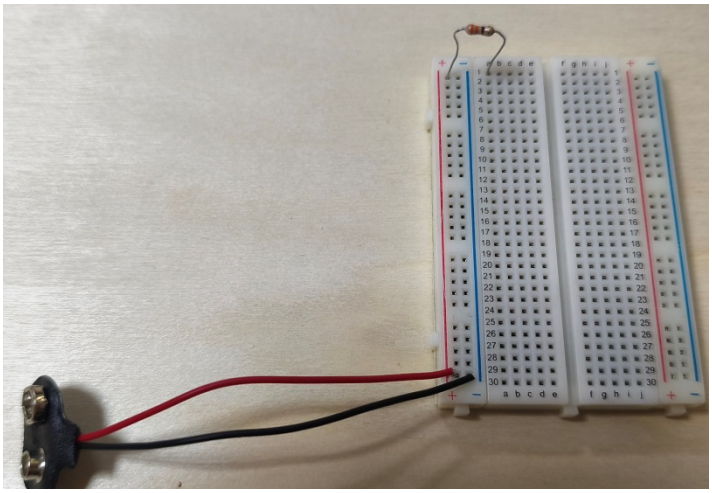
Activity 5 – The Wire Buzzer Game



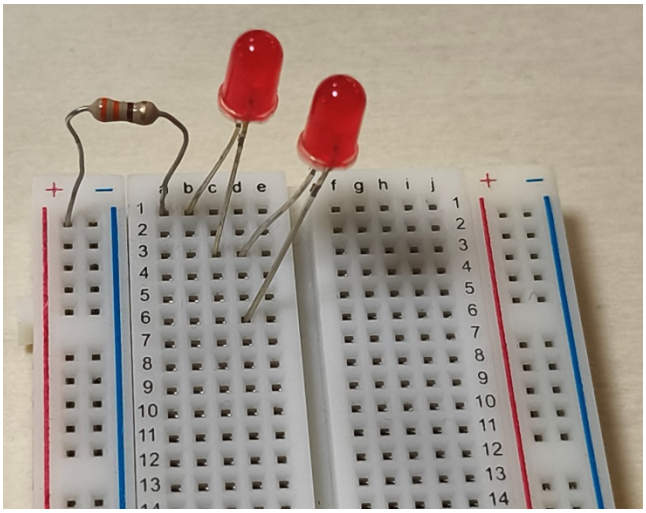
Step 3 – Add the resistor.

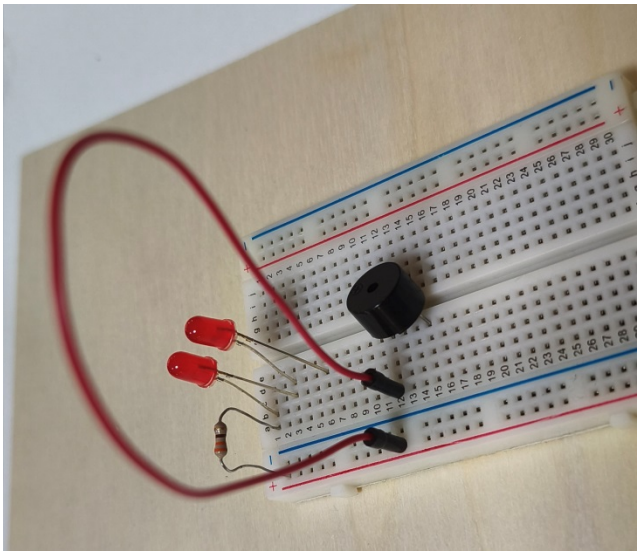
Place your 330 Ω resistor between the positive line and a row on the breadboard. This will protect the LEDs from too much current.

Think like an engineer: Resistors act like traffic lights for electricity — they control how much current can “drive” through!

Step 4 – Add the LEDs.

Insert two red LEDs with their long legs (anodes) connected to the resistor line and short legs (cathodes) to the ground (–).





Step 5 – Connect the buzzer.

Place the buzzer on the breadboard — connect its positive leg to the same line as the LEDs’ anodes, and its negative leg to the ground.

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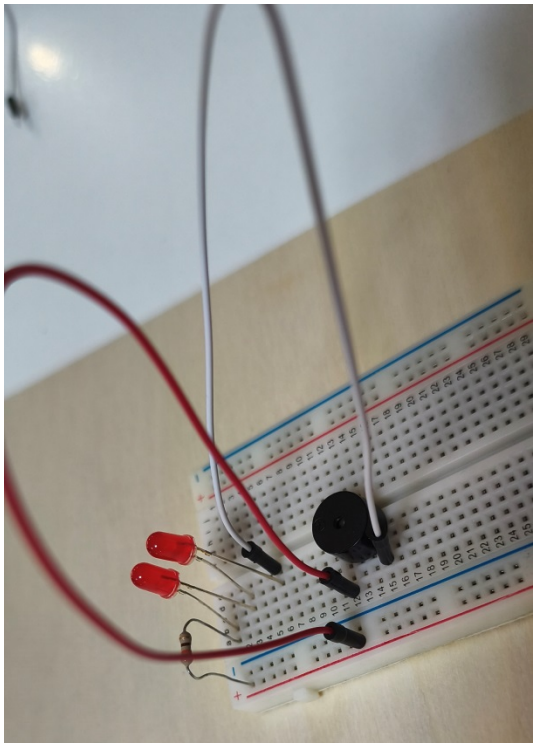
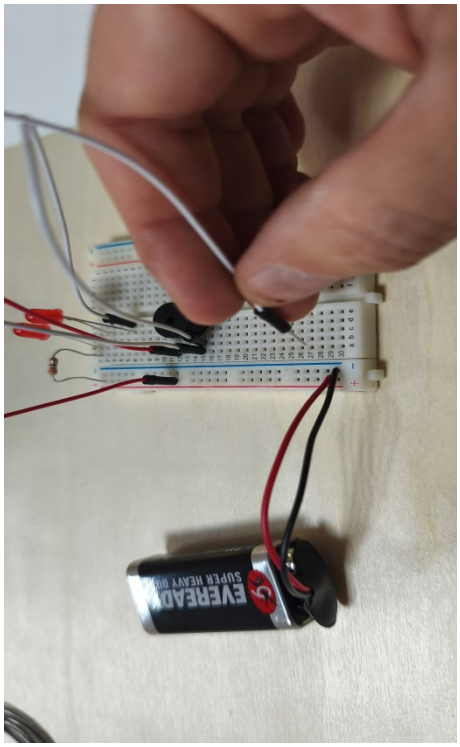
Activity 5 – The Wire Buzzer Game

Step 6 – Add control wires.

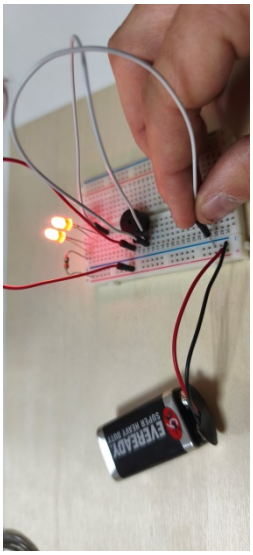
Use jumper wires to connect the output points (from the LEDs and buzzer) that will later go to your metal wire maze.





Step 7 – Test your circuit!

Touch the jumper wires together — if the LEDs light up and the buzzer sounds, everything works!



Did you know? Buzzers use a thin vibrating plate that moves back and forth rapidly to create sound waves. Electricity literally makes it buzz!

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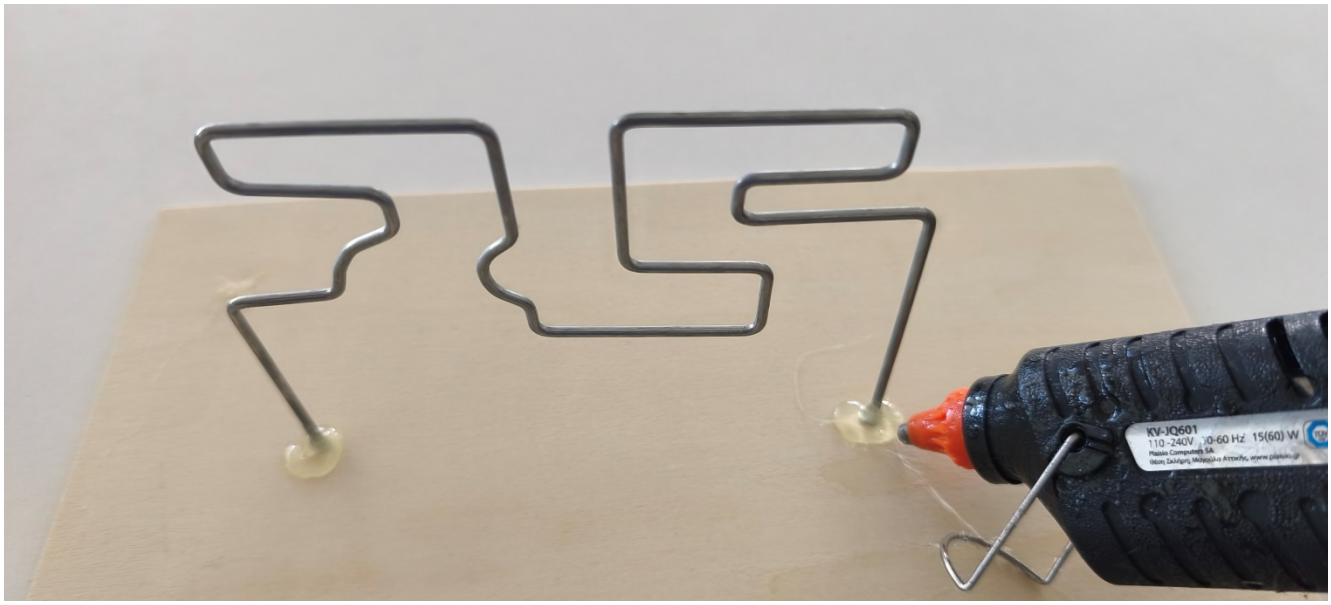
Activity 5 – The Wire Buzzer Game

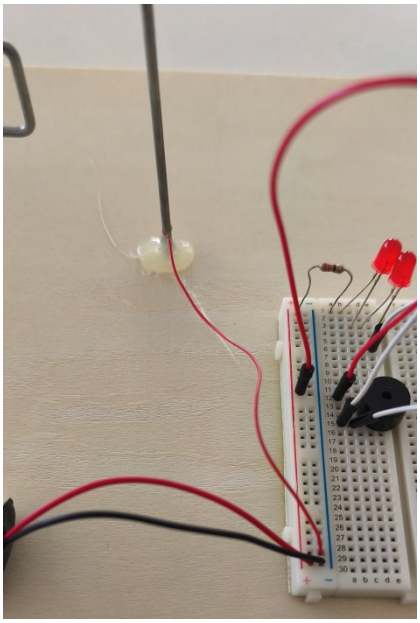
Step 8 – Create your metal maze.

Take your metal wire and bend it into a fun, twisty path. You can make it easy or super challenging! Glue the two ends of your metal wire onto the wooden board with the hot glue gun. Let it cool and harden.



Step 9 – Connect one wire to the maze.

Attach one of your red jumper wires to one end of the maze wire using glue or tape — this connects it to your breadboard circuit.



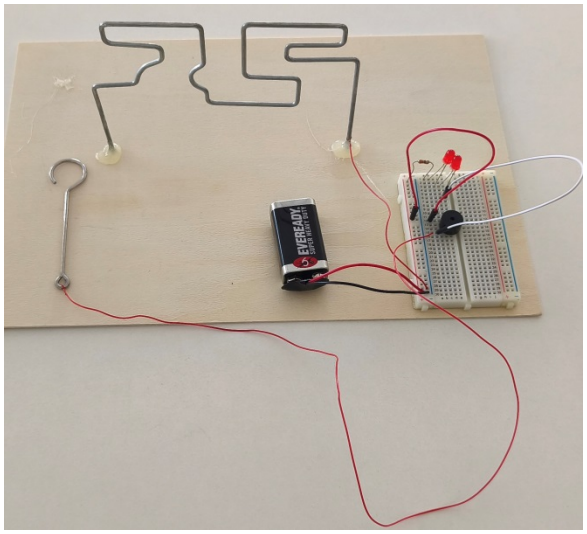
Activity 5 – The Wire Buzzer Game

Step 10 – Make the loop wand!

Use another piece of metal wire to create a loop at one end (this will move along the maze). Attach a jumper wire to its other end.

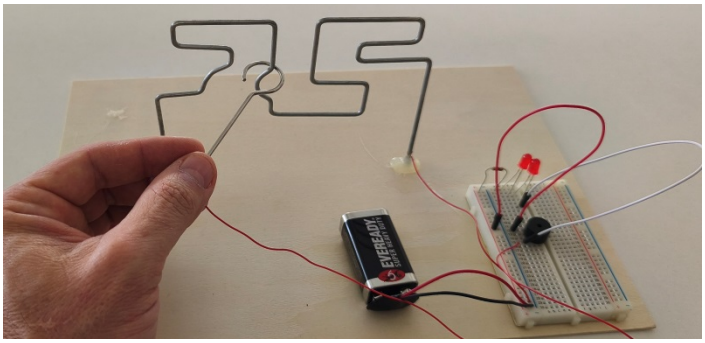
Step 11 – Final assembly.

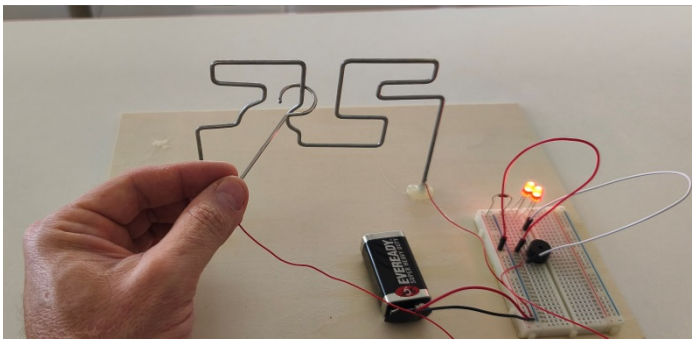
Connect your loop wand wire and the maze wire both into your breadboard — one to the positive path, one to the signal line.



Step 12 – The moment of truth!

Hold the loop and carefully move it through the maze. If it touches the metal wire — BUZZ! LEDs flash and the buzzer screams!





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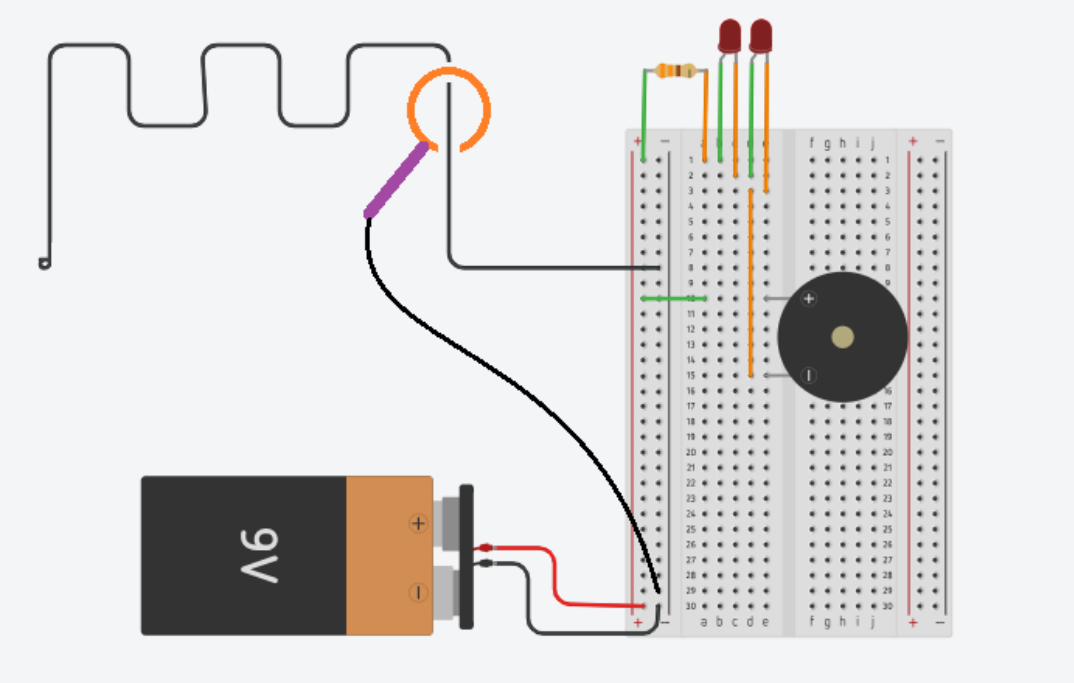
Activity 5 – The Wire Buzzer Game

The electric wiring!

Here's how the circuit connects the buzzer, LEDs, and maze wire together!



Learning Outcomes

- Learn how electric circuits work
- Understand conductivity and current flow
- Practice problem solving and fine motor control
- Build an interactive STEM challenge game

Challenge Time!

Try timing how fast you can complete the maze without a buzz! Compete with your friends and record the fastest score. Can you redesign the maze to make it even harder?

Extension Challenge

- Add a score counter using a microcontroller (Arduino or Micro:bit)!
- Decorate your base like a spaceship or obstacle course!
- Replace the buzzer with a melody module for fun sound effects!

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Activity 6 – The Mini Catapult Engineers

Activity 6 – The Mini Catapult Engineers

Theme: Physics & Engineering
Duration: 45–60 minutes
Difficulty: Easy Fun
Materials Cost: Very low – all from home or school!

Mission: Launch Like an Engineer!

Hey curious inventor!
Today you're going to build your own mini catapult — just like the ones used in ancient times for castle battles … but this time, we'll use it to launch soft beads or paper balls in your room (no dragons harmed!).

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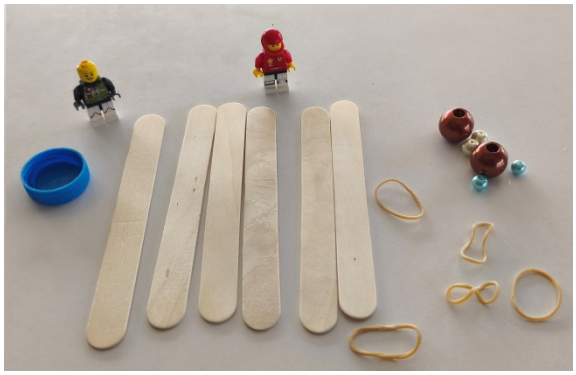
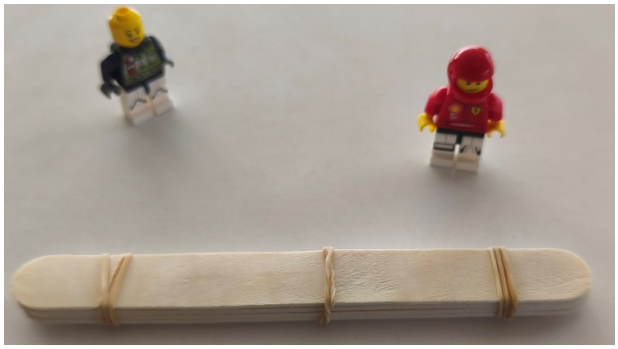
Activity 6 – The Mini Catapult Engineers

Your mission is to design a catapult that can launch a bead the farthest distance possible — using only simple craft materials and your amazing engineering mind!

What You'll Need



- 6 wooden craft sticks
- 3–4 rubber bands
- 1 plastic bottle cap
- Small beads or paper balls (for launching)
- Tape or glue
- (Optional) 2 LEGO minifigures to be your safety engineers



Let's Build Step by Step!

Step 1 – Stack the Base

Stack 5 craft sticks on top of each other and secure both ends tightly with rubber bands. This will be your catapult's strong base.

Think like an engineer! The tighter the bands, the more stable your base becomes.

Step 2 – Make the Lever

Take **2 craft sticks** and tie them together at **one end** using **rubber bands**.
Leave the **other end free to open** — this way, you'll create your **lever arm**!

Think like an engineer! A lever helps you lift or launch things with less effort — just like in real machines!

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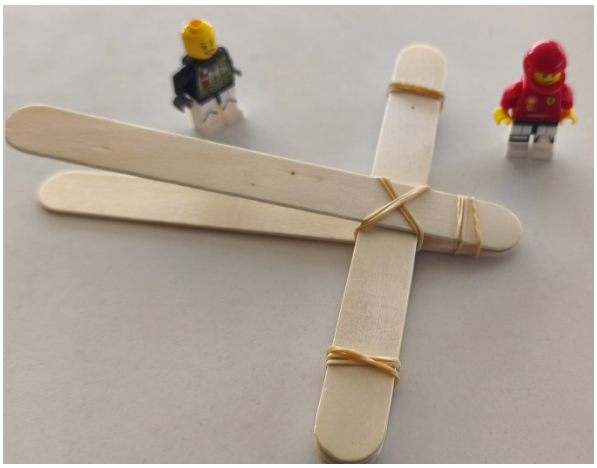
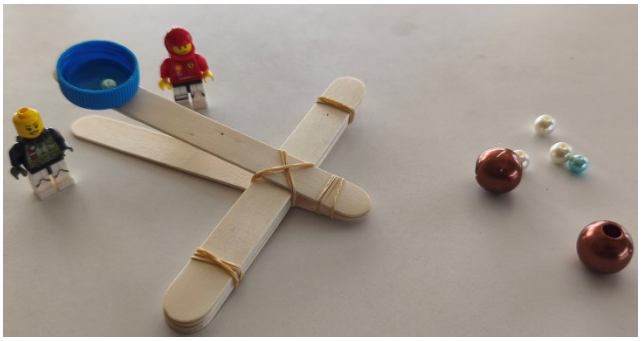
Activity 6 – The Mini Catapult Engineers



Step 3 – Secure the Cross Point
Use another rubber band to tie the two parts together where they cross, forming the pivot point. Now it can flex like a spring!
Did you know? This point is called the fulcrum — every lever (like a seesaw or your arm) has one!

Step 4 – Add the Launcher Cup
Attach the bottle cap on the upper end of the lever stick using glue or tape. This is where you'll place your projectile (the bead or paper ball).



Step 5 – Load and Launch!
Place a bead inside the cap, hold down the base with one hand, and press down the lever… then release!
Watch your mini catapult launch objects through the air — experiment with different angles and band tensions!

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Activity 6 – The Mini Catapult Engineers

Test & Tweak

Try changing:

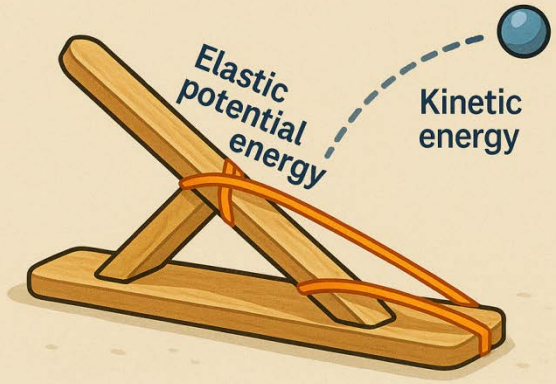
- How tightly you wrap the bands
- How far you press before release
- The weight of your projectile

Each small change affects distance — that's how real engineers test prototypes!

Science Behind It

When you press the stick down, elastic potential energy is stored in the stretched rubber bands.

When you release it, that energy is quickly transformed into kinetic energy, launching your bead into the air!



This is the same principle used in slingshots, bows, and even modern aircraft launch systems on aircraft carriers!

Extension Challenge

- *Can you make your catapult launch even farther by adjusting the lever arm?*
- *Try hitting a small target from different distances.*
- *Build a mini wall from paper cups — can your catapult knock it down?*
- *Add decorations and name your invention — maybe "The Rainbow Launcher" or "The Marble Blaster!"*

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Activity 7 – The Rubber-Powered Jet Racer

✈ Activity 7 – The Rubber-Powered Jet Racer!

Theme: Physics & Engineering
Duration: 60–90 minutes
Difficulty: Medium Fun
Materials Cost: Very low – all from home or recycled materials!

🌍 Mission: Build Your Own Jet Racer!

Get ready to build your own rubber-powered jet racer! Using recycled bottles, caps, and rubber bands, you'll design a small propeller-powered vehicle that moves forward just like a real mini airplane!

Your mission is to discover how stored energy in a stretched rubber band can make your jet move. Are you ready, engineer?

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Activity 7 – The Rubber-Powered Jet Racer

What You'll Need

- 2 small plastic bottles
- 4 plastic bottle caps (for wheels)
- 1 wooden skewer stick
- A bunch of rubber bands
- Glue gun (with adult supervision!)
- Cutter or scissors
- Soldering iron or hot nail (for small holes)
- (Optional) 1 small toy pilot

Let's Build Step by Step!

Step 1 – Cut the Bottle

Use a cutter or scissors to carefully cut one of the bottles about one-third from the top. This part will become your propeller base.

Think like an engineer! Always plan where to cut before you start. Precision is the secret to a smooth flight!

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Activity 7 – The Rubber-Powered Jet Racer

Step 2 – Create Propeller Blades
Make 4–5 vertical cuts around the neck of the bottle and gently fold each strip outward to form blades.

💡 Did you know? Propeller blades push air backward — and that air pushes the vehicle forward! 🚀

Step 3 – Make a Hole for the Shaft
With adult help, use a hot nail or soldering iron to make a small hole in the bottle cap's center.

Step 4 – Attach the Propeller
Insert the wooden skewer through the hole and glue it in place using the glue gun. This will be the main rotating axis for your propeller.

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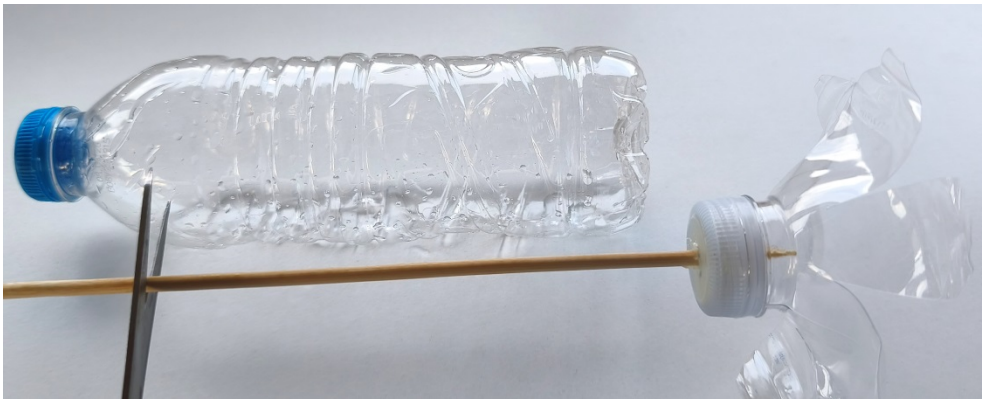
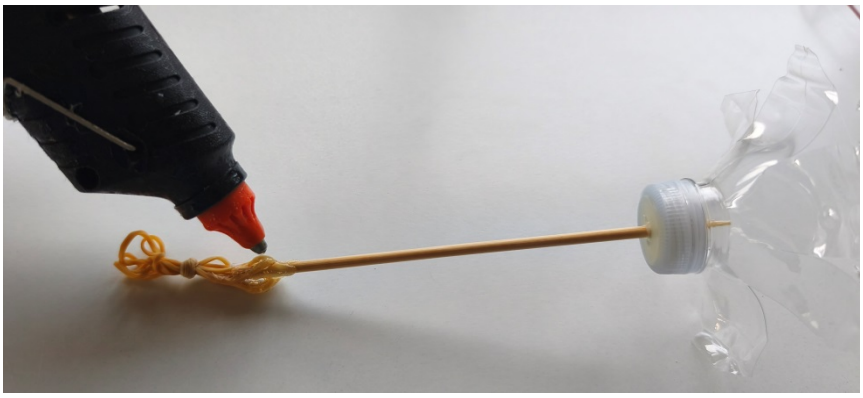
Activity 7 – The Rubber-Powered Jet Racer

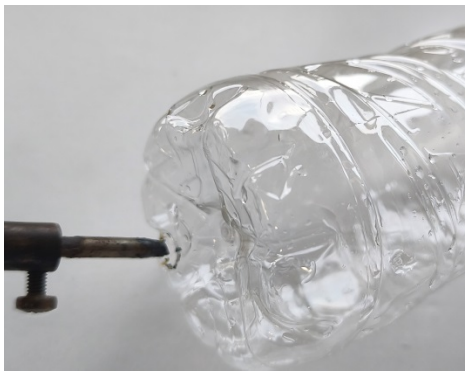
Step 5 – Prepare the Second Bottle (Body)
Take the second bottle — this will be your jet's main body. Use scissors to cut off the excess stick if needed.



Step 6 – Add the Rubber Band Engine
Tie several rubber bands together and attach them to the back end of the skewer. Secure with glue for extra strength. The rubber bands will store potential energy when twisted — ready to release it in motion!



Step 7 – Make a Rear Hole
Carefully make a small hole in the back of the main bottle to pass the other end of the rubber band through.



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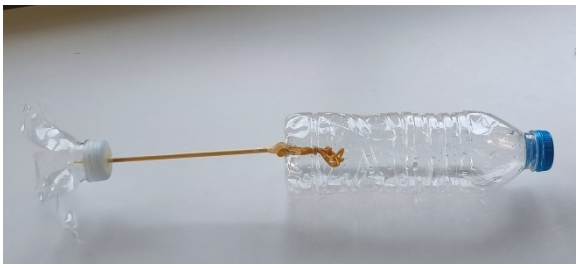
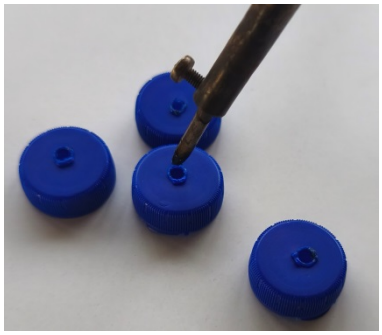
Activity 7 – The Rubber-Powered Jet Racer

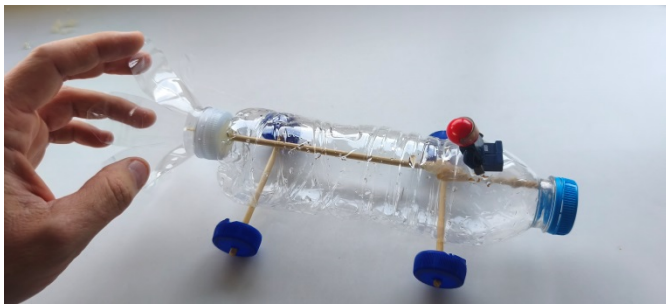
Step 8 – Connect the Bottles
Slide the skewer through the first (propeller) bottle and into the second one. Cut off the excess stick if needed. Screw the cap onto the bottle, making sure to catch the rubber bands securely.



Step 9 – Build the Wheel System
Use the blue bottle caps as wheels. Make small holes in their centers, then attach them using short skewer pieces as axles. Fix the cups to the skewers with glue. Then open holes to the body of the airplane to attach the wheels.



Step 10 – Attach the wheels to the main body of the airplane.



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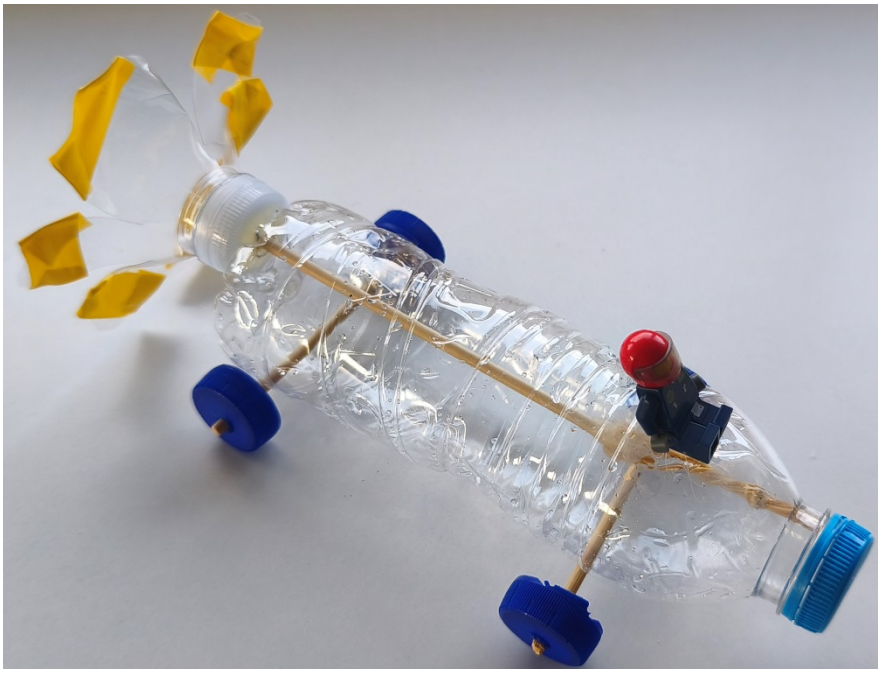
Activity 7 – The Rubber-Powered Jet Racer

Step 11 – Add Your Pilot and Decorate!
Place your mini pilot on top, decorate the propeller blades with colored tape for visibility, and your jet racer is ready for takeoff!



Engineer's tip: Bright colors make your creation look awesome and easier to track in motion!

Challenge

Wind up the propeller by twisting it backward about 20–30 turns, place your racer on a flat surface, and release!
How far can your jet go?
Try changing the number of rubber bands or blade shapes to see how it affects speed and distance!

Extension Challenge

- Experiment with different propeller sizes or shapes.

- Add cardboard wings or a tail fin for more "airplane" style.

- Measure how far your jet travels and create a data chart of distance vs. number of twists.

- Can you design a version that runs only using recycled parts?

Science Behind It

When you twist the rubber band, it stores elastic potential energy. When you release it, that energy turns into kinetic energy, spinning the propeller and pushing air backward — which propels your racer forward!

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Activity 8 – The Tiny Magnetic Motor!

Theme: Engineering & Motion

Theme: Electricity & Magnetism
Duration: 45–60 minutes
Difficulty: Easy & Fun
Materials Cost: Very Low

Mission: Become a Real Electromagnetism Engineer!!

Close your eyes and imagine…

You step inside a secret high-tech laboratory where only true inventors, scientists, and explorers are allowed.
The doors open slowly and a deep electronic voice announces:

“Welcome, young engineer. Today you will repeat one of the greatest discoveries in science.”

Your mission?
To build a **real working electric motor**, just like the ones inside:

Activity 8 – The Tiny Magnetic Motor!

⚡ electric cars
🛰️ space robots
🌀 washing machines

🎮 and many toys you use every day!

And just like the legendary scientist **Michael Faraday**, you will do it using only three simple things:

→ a battery
→ a magnet
→ and a copper wire

Almost 200 years ago, Faraday discovered that electricity and magnetism can *push objects into motion*.
Today, **YOU** will recreate his first motor — the baby version of every modern machine.

Suit up, young inventor.
Today, you are not "playing".
Today… **you become a real scientist!** ⚙️
Let the adventure begin! 🚀✨

🧰 Let's Build Step by Step!

Step 1 – Lay all your materials on the table neatly.
Your Minion and LEGO worker stand ready like tiny inspectors watching your engineering skills. 👀

What You'll Need

You will need:

- 1 AA battery
- 1 strong neodymium donut magnet (neodymium ring magnet)
- 1 neodymium rod magnet (for the stand)
- 1 piece of **bare copper wire** (20–25 cm)
- Two little toy "engineers" who supervise the project! 👷‍♂️😄

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Activity 8 – The Tiny Magnetic Motor!

Step 2 – Test the Battery & Magnet

Place the magnet near the positive side of the battery.

Feel how strongly they attract each other.

Explain to your young scientist:

"Magnets create invisible fields. We'll use this field to make motion!"

This is your motor's **magnetic engine**.

Step 3 – Attach the Magnet on Top

Gently place the magnet ON the positive terminal of the battery.

Press softly until it sits flat like a helmet.

If you have more ring magnets, stack them!

More magnets = stronger spin.

Step 4 – Shape the Copper Wire

Now turn your copper coil into a very special shape.

1. Straighten the wire carefully.
2. Form a tall rectangle or "gate" shape that fits around the battery.
3. Make a rounded **loop** at the bottom — this must sit on the magnet.
4. Add a tiny **bend/bump** near the top so the wire touches the positive terminal only at one point.

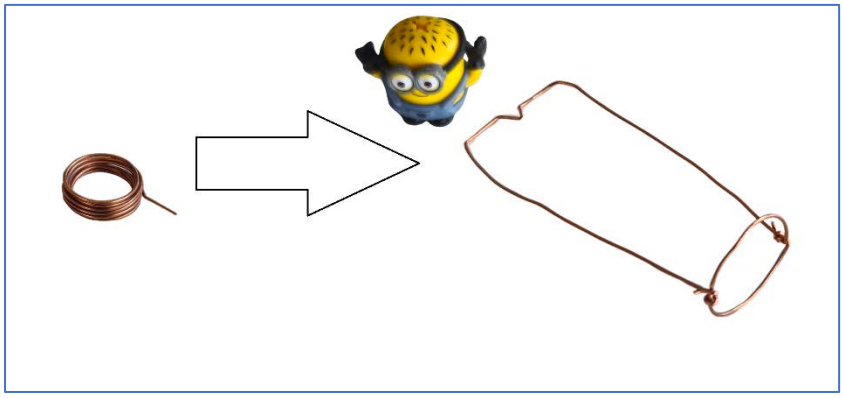
This ensures the wire is free to spin and does not slide off.

Engineer Tip:

If the wire is too tight → it won't spin.

If it's too loose → it falls off.

Find the "sweet spot"!



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Activity 8 – The Tiny Magnetic Motor!

Step 5 – Wrap the Battery

Place the battery horizontally and wrap your shaped wire around it like a belt.

Check that:

- The bottom loop can touch the magnet.
- The top bump can touch the positive terminal.

This creates the path for electricity.

Step 6 – Build Your Stand

Stand the magnet rod upright.

Stand the *rod magnet* upright and place the flat (negative) side of the battery on top of it

Now the battery is a "tower", the wire is the "spinning arms", and the magnets are the "engine room".

You now have a complete electric circuit:

Positive → Wire → Magnet → Metal Rod → Battery Negative

Electricity is ready to flow!

Step 7 – Assemble the Complete Motor

Carefully place the shaped wire around the battery again.

Make sure:

- The top end lightly touches the positive terminal
- The bottom loop rests gently on the magnet
- The wire is perfectly balanced

Your little LEGO engineer and Minion look impressed.

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Step 8 – Activate Your Motor!

Give the wire a *tiny* push.

Just a gentle tap.

If everything is correct…

THE WIRE STARTS SPINNING BY ITSELF!

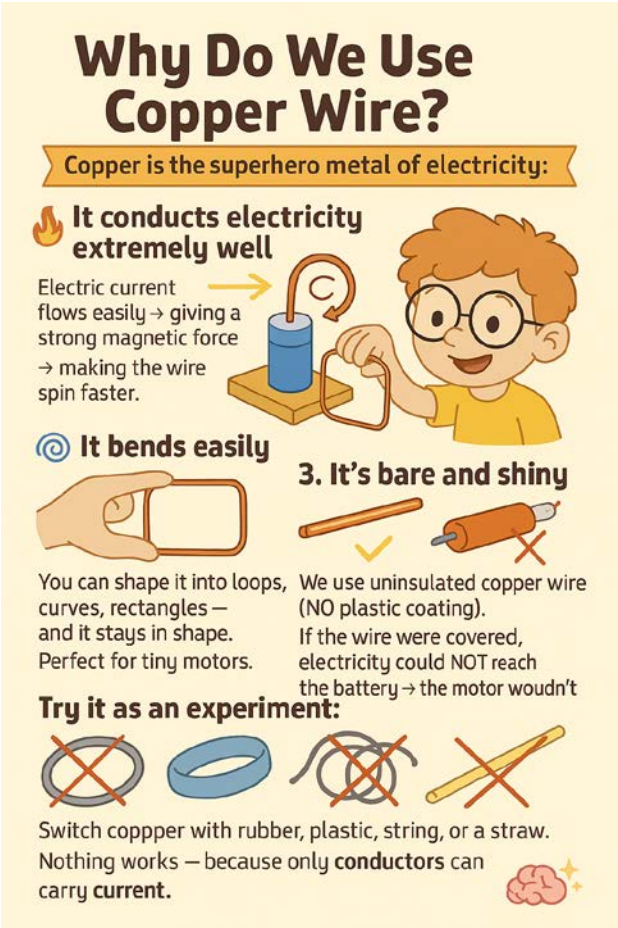
You've just built a real **homopolar motor** using pure science.

Electricity + magnetism = motion!

Bravo, young engineer!

Safety Note

- The wire may get warm — don't leave it running for more than 10–20 seconds at a time.
- Disconnect the wire when you finish.
- Keep magnets away from small children and electronics.
- Never leave the motor connected unattended.



Why Do We Use Copper Wire?

Copper is the **superhero metal** of electricity:

1. It conducts electricity extremely well

Electric current flows easily → giving a strong magnetic force → making the wire spin faster.

2. It bends easily

You can shape it into loops, curves, rectangles — and it stays in shape.

Perfect for tiny motors.

3. It's bare and shiny

We use **uninsulated** copper wire (NO plastic coating).

If the wire were covered, electricity could NOT reach the battery → the motor wouldn't work.

Try it as an experiment:

Switch copper with rubber, plastic, string, or a straw.

Nothing works — because **only conductors can carry current**.

Congratulations! You've just learned the difference between conductors and insulators.

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🚀 Activity 8 – The Tiny Magnetic Motor!

Did You Know?

This type of motor was invented by **Michael Faraday in 1821**, and it was the **first electric motor in history**.

Every motor today — from scooters to drones — is its great-great-great-grandchild!

You just recreated real scientific history. 📜🔬

🛠 Think Like an Engineer!

If your motor doesn't spin:

✓ Does the wire touch BOTH the top and bottom?

✓ Is the wire balanced or leaning?

✓ Is the magnet clean?

✓ Is the wire shape symmetrical?

✓ Try adjusting the bump at the top!

Fail, fix, try again — that's how real engineers work.

Challenge

Try to discover:

- Which wire shape spins fastest?
- Does the motor change speed if you make the wire shorter?
- Can you make it spin in the OPPOSITE direction?
- Can you make a "dancing shape" motor? ☆♡⚡

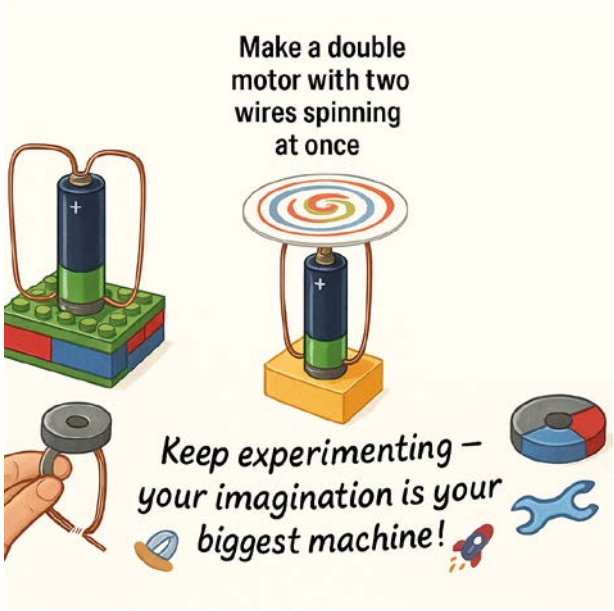
Record your results in a small "Engineer's Journal"! 📓

🏁 Extension Challenge

Ready for advanced engineering?

- Build a **LEGO base** to hold your battery tower securely
- Make a **double motor** with two wires spinning at once
- Add a paper disc on top → create your own spinning ART
- Try different magnet strengths and compare the results
- Explain the Lorentz Force to a friend — like a real scientist

Keep experimenting — your imagination is your biggest



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Activity 8 – The Tiny Magnetic Motor!

machine!

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