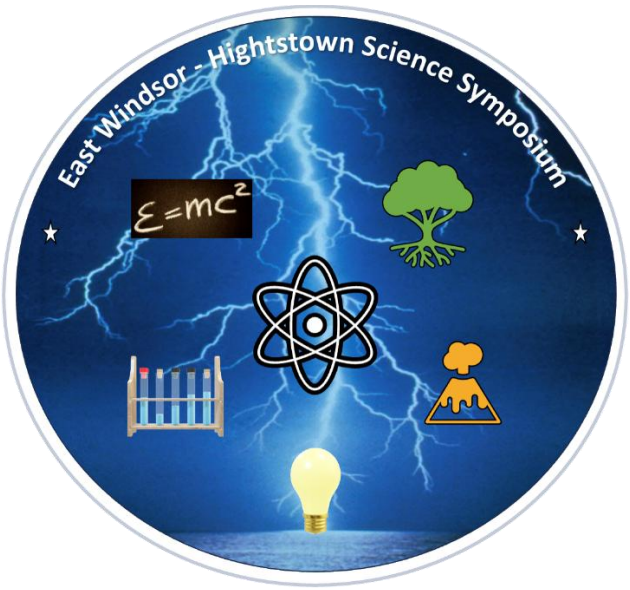
East Windsor - Hightstown Science Symposium

March 29, 2025



Let's discover the world of STEM together by showcasing your talent and creativity through your innovations.

ABSTRACT BOOK
2025

Presented by: South Asian Cultural Society of East Windsor (SACS)
in Association with
East Windsor Regional School District (EWRSD)

Join our First Lego League, WRO & Vex Teams!!!

steamworksstudio.com/monroe

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South Jersey Regional Winners First Lego League, 2025

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Monroe Sport Center
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Mission Statement

Our mission is to create an inclusive platform where students are encouraged to explore, experiment and push their boundaries to showcase their love for science and contribute to the advancement of human knowledge.

Email: ewhsciencesymposium@gmail.com

Website:
https://ewhssciencesymposium.org

Agenda

Grades 3-8

08:00 am - 08:45 am: Team registration/check-in and setup project exhibits
08:45 am - 09:00 am: Introduction to judges and explanation for rubric
09:00 am - 12:30 pm: Teams present their project to the judges (max 15 mins per team)
12:30 pm - 01:30 pm: Sponsor recognitions, results, awards and closing comments.

Grades K-2

10:00 am – 10:30 am: Team registration/check-in and setup project exhibits
11:00 am – 12:30 pm: Teams present their project to the judges (max 15 mins per team)
12:30 pm - 01:30 pm: Sponsor recognitions, results, awards and closing comments.

Sponsors

1. STEAM Works Studio Monroe Township
2. East Windsor Dental Arts
3. Patidar
4. EW Resident – Mrs. Arpita Patel

Special Thanks to Gangadhara Rao Vakkalagadda (North Brunswick Township Science Symposium) for providing guidance and assistance in organizing the event!

Judges

1. Alexis O'Rane
2. Christine Holcombe
3. Jessica Mendoza
4. Jessica Sudah
5. Naresh Chennamsetty
6. Randi Tompkins-Byock

Message from Mr. Mark Daniels, EWRSD Superintendent

Dear EWRSD Community:

It is with great excitement that I welcome you to the second annual East Windsor-Hightstown Science Symposium, a showcase of talent, creativity, and innovation among our elementary and middle school students! Today represents a significant milestone in our journey to inspire and cultivate the next generation of scientists, engineers, and innovators. At this symposium, you will witness firsthand the impressive projects, experiments, and discoveries developed by our curious creators. Each exhibit reflects the ingenuity and passion of our students.

As Superintendent of Schools, I am deeply proud of the dedication and hard work demonstrated by our students. This symposium is a testament to our commitment to fostering a culture of exploration, collaboration, and excellence in STEM education.

To our students: seize this opportunity to showcase your talents and share your curiosity for science and technology. Your creativity and innovation have the ability to shape the future and positively impact our world.

To our parents, educators, and organizing team: thank you for your continued support and guidance in nurturing the potential of our students. Your dedication is instrumental in shaping the next generation of STEM leaders.

I encourage everyone to engage, explore, and celebrate the remarkable achievements of our aspiring innovators. Together, let us inspire curiosity, ignite passion, and unlock the boundless potential that exists within each of our talented students.

Sincerely,

Mark Daniels
Superintendent of Schools

Organizing Team

Jagruti Patel
Chairperson

Rupangi Vyas
Treasurer

Kinjal Patel
Event Coordinator

Dhaval Vyas
IT Coordinator

Sarvanababu Murugesan
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Patidar of East Windsor

Elementary School Grades Abstract (K-2 Grades)

Title: Electric Play Dough Project
Team Name: Science Experts (Kindergarten)
Submitted By: Aakanksha Pratapa, Julia Platt

Objective & Goals
This project explores the principles of electricity using play dough as a conductor and modeling clay as an insulator. The goal is to create a simple electrical circuit that lights up LED bulbs and produces sound using a battery box with a clip cord.

Methods & Materials
Materials used in this experiment include conductive play dough, insulating modeling clay, LED lights, a battery box with a clip cord. The experiment involves inserting LED lights into the play dough and connecting them to a battery pack. The modeling clay is used to prevent short circuits and control the flow of electricity.

Results
During the experiment, when the battery pack was connected to the conductive play dough, the LEDs lit up. This confirmed that the play dough conducted electricity effectively. When modeling clay was placed between the circuits, the LED lights did not turn on, demonstrating that the clay acted as an insulator. Students observed that electricity needs a complete path to flow and that different materials impact circuit function.

Conclusion
This experiment showed that play dough can carry electricity because it has salt and water, while modeling clay cannot because it does not have these things. When we connected the battery to the play dough, the lights turned on, but when we used the modeling clay, the lights stayed off. This means play dough is a conductor, and modeling clay is an insulator, just like we thought!
Sometimes, the lights were not as bright as other times. This could be because some play dough was thicker or drier than other pieces. If we do this experiment again, we could try using different kinds of play dough or adding more salt to see what happens. We could also try different batteries to see if the lights get brighter or dimmer. This experiment helped us learn how electricity moves and how we can use different materials to make fun, working circuits!

Summary
This project attempts to explain kids what insulator and conductor is and how electricity flows.

Title: Lego City & Water Pump
Team Name: Lego Boys (Grade 1)
Submitted By: Dhruva Divili, Viswa Muntha, Lord Mars, Kiran Nallapati

Objective /Goals
This study is aimed to determine if we can make a Lego City with an operating water pump.

Materials
Legos (including pieces to build the pump and motor housing)
- Remote control
- Batteries
- Receiver
- Water container

- Tubing or pipes (to guide water flow)

Method:
The ability to design and build a working water pump in the middle of the lego "city" using Legos, by attaching a lego motor and connecting it to the receiver. Installing batteries and testing the remote control to ensure it operates the motor. A connection of plastic tubing and pipes will allow water to flow through and enter a container (water tank).
By testing the water pump this way the researchers will determine that the pump is working by observing the water moving through the tubing while activating the remote control.

Hypothesis:
The researchers believe that they can make a Lego city with a functional Water Pump using Lego's thats battery operated

Expected Results:
Researchers should observe the water being distributed from the water pump to the container and the lego water pump and battery source can be used functionally
Conclusion and Discussion:
Based on the schematic of the water pump it should be functional and working, but the material of lego's are not the preferred medium to make this type of project.
Summary:
This project aims to determine if you can build a lego city and have an operating water pump made with the medium of Legos.

Title: Blaze Busters
Team Name: Super Angels (Grade 2)
Submitted By: Aadhira Vijaykumar, Samantha Grace Kelly

Objective / Goal (What are we doing and why?)

- We are building a model of how to extinguish forest fires because of the bad things that happen with fires. We want to help Mother Nature.
- We are going to use sensors and a water sprinkler system. The plan is for the sensors to feel the flames and put water on them. When there's no more flame, the pump will stop spreading water. We don't want to waste water.

Materials & Methods (What stuff are we using?)

- We built a mountain using a Styrofoam mold. We covered it first in aluminum foil. We covered that with paper mâché. We will paint it and add decorations.

Results / Expected Results (What do we think will happen?)

- We will start the fire on a candle or something like that. We will start it carefully near the top of the mountain, with aluminum foil underneath.
- We expect that when the fire starts, the sensor will sense it. Then the sprinkler will spray the water to put out the fire. We might try to catch the water to send it back to the sprinkler, through tubes.

Conclusion / Discussion (What do we hope to learn from this?)

- Our conclusion should show us how to end a fire, like the fires that happen in nature. It might show a faster way to stop fires.

Title: Cycle of Water
Team Name: The STEM Stars Grade 2
Submitted By: Arnav Saravanababu, Mithra Govindaraju, Ella Roy

Objective/Goal: To demonstrate water cycle and its importance

Methods/Materials: The materials we will use to demonstrate are a transparent snow globe, water, humidifier. We used a humidifier inside the globe to show how evaporation and condensation works.

Results: We are able to demonstrate the process of evaporation and condensation and hence the cycle of water.

Conclusions/Discussion:
Water is the most abundant and unique molecule in our planet earth which is the key to all life forms. Water cycles through multiple stages such as evaporation, condensation, and precipitation. Evaporation is when water in oceans, lakes, rivers, and ponds gets hot and rises up in the air and turns into water vapor. The higher in the atmosphere the colder it gets. Condensation is when the cold water vapor turns into clouds. Precipitation is when the clouds are full of tiny water droplets that the cloud gets so heavy that it either snows or rains. This keeps on going over and over again to keep our planet lush and habitable for all life forms.

Title: Water Filtration System
Team Name: Science Bros (Grade 2)
Submitted by: Brandon Platt and Nolan Black

Objectives/Goals
This project explores the ways of purifying water by reducing/removing water contaminants by means of moving through a filtered system using common materials as a physical barrier to trap and remove pollutants. The goal is to make the water suitable for drinking purposes.

Methods/Materials
Materials used in this project include: a plastic bottle cut in half, layering different materials like cotton balls, activated charcoal, sand, larger rocks and gravel inside, with the larger particles (like gravel and large rocks) at the top and finer materials (like sand) at the bottom, allowing water to slowly drip through the layers, filtering out impurities. The last layer added to the filtration system is a coffee filter. The method of adding a filter is the process of removing suspended solids/pollutants from water by passing the water through permeable fabric and porous materials.

Results
During the experiment, we note that as the particles move through the many layers of the filtration system, it allows for different sized particles to be removed depending on which layer the water passes through. The water moves through the first layer of larger rocks and gravel. This process helps filter medium sized particles which are visible to the human eye such as dirt. As the water moves its way through the charcoal and sand, it removes microscopic particles to assist in filtering out any bacteria/germs we may not be able to see with the human eye. Activated charcoal, also known as active carbon, allows for chemicals in the water to cling to the surface of the carbon and is removed from the water. This process is also known as absorption. The last layer the water will run through is the coffee filter. Water will filter through the tiny holes within the coffee filter and trap particles like oil. As a result, we have clean water in the glass after it moves through the filtration system.

Conclusion/Discussion

Utilizing a water filtration system allows access to clean drinking water by effectively removing a wide range of contaminants, including dissolved/ undissolved solids, chemicals, bacteria and heavy metals. The filtered water allows for improved taste, reduced health risks, and a more environmentally friendly alternative to bottled water. It is important to note that boiling water after the filtration process is important to ensure that any remaining bacteria is effectively removed.

Summary
This project demonstrated that the use of a filtration system is necessary to produce clean and safe drinking water.

Elementary School Grades Abstract (Grades 3-5)

Title: "Innovative Green Energy Generation and Smart Distribution Strategy for Efficient Power Supply"

Team Name: Third Grade Thunders (Grade 3)
Submitted by: Sahasra Prabakaran, Rushitha Varma Kalidindi, Shivaan Desai

Objective/Goals:
Our objective is to use green energy like, water, solar and wind to generate a power and innovative strategy for distribution of generated power. In spring we can use water , in summer solar energy and all year around wind to generate a power. We are planning to combine all these power generation unit near by to have a power distribution system in place and use the generate power effectively and efficiently.

Methods/Materials:
Ruler, Scissors, Craft Knife, Duct Tape, Cutter, Plastic Bottle, Plastic Bottle Caps, Wooden Skewers, Rotor, Paper Clips, Bendable Wire, Motor, Water, Paper/Any Kind Box, Aluminum Foil, Plastic Wrap, Solar Panels, Sunlight, Light Weight Wind Blades, Rotating Hub, Mount, Wind Blower/Fan Generator/Device to Demonstrate Electricity, Wires, Paper Board, Poster, Straw, Small Light Bulbs, etc.
Hydro power generation: Water Flow from water stored in water bottle into the caps mounted on wooden skewers/another bigger cap which is attached to the rod on rotor. Flow of water spins the caps faster which spins the generator that is attached to small light bulbs. The faster moving caps generate electricity and lights up the bulbs.
Solar power generation: When sun shines on solar panels, energy from the sunlight is absorbed by the PV Cells in the panel that generates electricity. The generator is attached to solar panels and light bulb which lights up due to electricity generated by PV cells.
Wind power generation: Wind turbines use wind to rotate the turbines faster that is attached to the generator which is attached to the light bulbs. The electricity generated through the wind power lights up the bulb.
All sources are build in one area and attached to the same generator so any of the energy source can be used to generate electricity based on the season and conditions.

Results:
Daytime generates electricity through solar power. Night time generates electricity through hydro power and by which we can save hydro power for future. In dry days we can generate electricity using solar power as there wont be water available at all times and by doing so we can have continuous power. By keeping hydropower and solar power at the same place we can use the same power lines and substation to supply power. By making solar panels float on the ocean or sea we can save space and water.

Conclusion/Discussion:
Electricity can be generated by any of the three energy sources. By setting all three energy sources near each other and connected to the same power generator and power lines can be interchangeably used to produce electricity that will provide continuous electricity while saving water and space.

Summary:
All available power sources, if properly planned to build can be efficiently used that wil be give continuous power supply and save resources.

Title: Crazy Volcanos
Team Name: Mini Einsteins (Grade 3)
Submitted by: Lucy Loonan and Parker Negron

Objectives/Goals:
We were trying to figure out what would happen if we exploded volcanos with different openings.

Methods/Materials:

We used a seltzer bottle, a bowl, and a cup. The liquid was made of baking soda, vinegar, and food coloring.

Results:
The bottle was the most violent reaction, then the cup, then the bowl.
Bottle: 1/3 c still bubbling
Bowl: 1/2 c stops bubblige
Cup: 1/2 c bubbled more than bowl less than bottle.

Conclusion/Discussion:
The bigger openings-have less violent reactions, the smaller openings have more violent reactions. The shape affected the reactions.

Project Title: Magnetic Lab
Team Name: MagnetoMinds (Grade 3)
Submitted by: Arshini Bavisetti, Kavya Vyas, Reeva Mehta, Vajra Sai Vedururu, Pahal Sheth

Objective
The goal of this experiment is to show how electricity and magnets work together to create movement. We will build a small electric train using simple materials to demonstrate this concept.

Materials Used
- A small battery (AA or AAA)
- Strong magnets (Neodymium)
- Copper wire (shaped into a coil)

Results
When the battery is placed inside the copper coil with magnets on both ends, an exciting reaction occurs! The battery sends electricity through the wire, generating an invisible magnetic force. This force pushes the train forward through the coil. The train continues moving until the battery runs out or is removed.

Conclusions/Discussion
This experiment shows how electricity and magnets work together to create movement. It explains how electricity and magnetism interact to push objects. The force involved is the one that acts on a charged particle moving through a magnetic field. Real high-speed maglev trains use this same principle in a more advanced way, allowing them to float above the tracks and travel quickly without friction.

Summary
This simple battery-powered train is a fun way to learn about electricity and magnets. It shows how energy from the battery turns into movement, just like how real electric trains work. Even though this tiny train can't carry people, it helps us understand how big trains and machines use the same ideas to move smoothly and quickly. The experiment also shows how magnets can reduce friction, making trains travel faster and

more efficiently. This basic science is used in many technologies, like high-speed trains, to improve energy use and transportation systems.

Title: The plant vascular system - The function of the xylem.
Team Name: Sciencemallows (Grade 3)
Submitted By: Heer Patel, Mahi Patel, Meera Sriram, Niralya Tamilarasan

Objectives: To prove how the xylem takes the water and minerals up to the leaves and petals of vascular plants.

Materials & Methods: The materials used for this experiment are White carnations, Celery sticks, Lettuce leaves, Cabbage leaves, Water, Glass Jar and Food colors. The experiment involves leaving different plant materials such as leaves and flowers in colored water for 24 hours to see which leaf/flower takes up water/color better.

Results: The carnation and the cabbage absorbed the colored water faster than the celery and the lettuce because the former has more xylem cells.

Summary: This experiment mainly focuses on the function of the xylem which is a part of the plant's extensive vascular system. It would be impossible for the plant to survive without this function. The function of the xylem can be applied to the farming industry to grow crops in areas with rain & drought. Florists also use this process to color different flowers to make beautiful arrangements.

Title: This Battery is a Lemon!
Team Name: Laughing Gases (Grade 3)
Submitted by : Jiyaan and Inigo

Materials :
- A lemon
- A penny
- Galvanized nail
- Alligator clips
- Copper wire
- A flashlight bulb

Steps :
1. Roll the lemon on a table with some gentle pressure to mash up the inside of the lemon without breaking the peel.
2. Stick the penny and the nail into the lemon, making sure that they do not touch.
3. With alligator clips attach a piece of copper wire to the penny and another piece of copper wire to the nail.
4. Carefully touch both wires to a small flashlight bulb.
5.

Why We Choose This Project:
We chose this project because having a lemon as a battery is **FASCINATING!** It also shows how a lemon can act like a battery.

Expected Results :
The flashlight bulb should light up when the copper wire touches it.

Observed Results:
The result was that the bulb did not light up! When we checked the lemon with the multimeter it showed us 0.8volts for one lemon. Then we thought we needed two lemons so we tried that and that did not work!! When we checked the lemons with the multimeter it showed us 1.33volts for two lemons. Then we thought we needed three lemons so we tried that and that did not work!!! When we checked the lemons with the

multimeter it showed us 2.03volts for three lemons. Then we thought we needed four lemons so we tried that and that did not work!!!! When we checked the lemons with the multimeter it showed us 2.57volts for four lemons.

Conclusion:
So we think we need more lemon batteries or a smaller LED for the project to work.

Title: Suspension Bridge
Team Date: Golden Gate Musketeers (Grade 4)
Submitted by: Akshar Pratapa, Aayush & Aarush Penugonda, Jiyaan Patel

Introduction:
Hi! We are the Golden Gate Musketeers! In this essay we have how we did to make a design of the Golden Gate Bridge and how we plan to do it.

Goal:
Our goal in this science project is to build a suspension bridge that has magnet roads that can let cars move by itself. We are trying to make the bridge look as much as the Golden Gate Bridge as possible. The dimensions are 4 feet long for the base and 1 foot wide and 1 inch tall. The bridge is 1 foot tall, and the road is 4 inches tall. We made a clay ocean and islands. This is our plan.

Method:
We first got a rectangular base that we found, and we wrote where everything's going to be and the dimensions and measurements. We also got corner braces to hold the wood pillars, so they stay sturdy. We got 10 ft of chain for the main suspension cables and 40 feet of smaller chains for the vertical suspenders. Our idea is to do the foundations first,so the bridge can stay on the base. Then we do the main suspenders and vertical suspenders, then we would put the LED lights and the extra decors. This is how we did the bridge, and we had to do lots of planning.

Materials:
Wood , steel chains , Screws, play doh, clay , red paint.

Results and Concluson:
The results we got at the end was a bridge that is a type of red like the Golden Gate Bridge, islands at each end of the bridge made out of clay, a magnetic road to make cars move, and an ocean made out of clay, so it can be more flexible. We will have LED lights to light up the bridge to make it vibrant.

Title: Toothpaste Dispenser
Submitted by: Vedant Juthani, Rian Patel, and Devaansh Patel (Grade 4)

Objectives/Goals:
Enrich the kid's daily teeth cleansing routine by minimizing effort to get toothpaste out of the tube on their own when it is at less than 20% capacity and making it a playful experience.
Our goal is to efficiently dispense the most toothpaste out of a tube so people don't spend minutes getting it out and can do the same task in a few seconds.

Methods/Materials:
Our method is to first insert rear end of the tube into the dispenser wall opening. The materials used were different types of scrap Legos and wheels. Our dispenser prototype is a Lego wall connected to a set of wheels. That is where you insert the rear end of the toothpaste tube and push the Lego dispenser up the

tube so that the toothpaste comes out. You can also add blocks to minimize how much toothpaste you need.

Expected Results:
We anticipate that the total dispense of the toothpaste will be 95% of the 20% left in the tube.

After Results:
We managed to get a lot of toothpaste easily. When we tested how much toothpaste we got out on every dispense, we got 2-3 grams each time. We achieved 90% of our goal.

Title: "The Base of Tooth vs. Acid: the pH Battle"
Team: "The pHantastic Duo" (Grade 4)
Submitted by: Harrison Kelly & Lydon Giske

Introduction & Hypotheses
We are testing how different liquids with different pH levels affect teeth. We want to see which ones might weaken tooth enamel.
We are also testing how these liquids change our saliva. This helps us understand indirect effects on our teeth.

- **Direct Effects:** We think the pH of the liquids will change over time because of calcium and phosphate leaking from the teeth. Some liquids will damage enamel faster. We predict that:

1. If a liquid is too acidic, the enamel will break down.
2. If a liquid is too basic, the teeth might get calcium build-up.

- **Indirect Effects:** We think these liquids will change our saliva's pH immediately, but our body will try to bring it back to normal over time.

Materials & Methods
We are using cow teeth because they are like human teeth. We will measure pH with litmus strips.
We will test these liquids:

- Baking Soda solution
- Coffee
- Soda (Coke)
- Electrolytes (Propel) in water
- Fruit Juice
- Salt
- Seltzer
- Tea
- Water Flavoring (Mio)
- Vinegar

We will check the pH of the liquids and the teeth:

1. Before testing
2. After 1 hour
3. After 24 hours
4. After 7 days
5. After 14 days

We will also test our saliva after drinking select beverages right away, after 5 minutes, and after 10 minutes.

Results
We will record pH levels and take pictures of the teeth.

Conclusion & Discussion
We hope to learn which drinks help keep teeth healthy and which ones can cause damage.

Title: How can we tell the food is spoiled?
Team Name : Food Guardians (Grade 5)
Submitted by: Aishani, Sara, Soundarya & Vibha

Abstract:
Our project is about making a smell sensor system using an Arduino UNO board to find out if food is spoiled without using our senses. We use gas sensors to detect gases that show if food is going bad. The Arduino reads the sensor data and turns on lights to show if the food is fresh or spoiled.
Objective: To create an easy-to-use system that finds out if food, like bread, is spoiled before we can see mold.
Materials Used:
- **Gas Sensors:** Finds different gases in the air.
- **Arduino UNO:** Reads sensor data and has analog and digital outputs.
- **Breadboard:** Helps connect the Arduino to the sensors.
- **Jumper Wires:** Connects pins on the Arduino and sensors.
- **Power Cable/USB Cable:** Connects the Arduino to a computer to upload code.
- **Other Items:** Mask, gloves, and different types of bread.

Results:
1. **Sensing Gases:** The sensors can find gases like carbon dioxide, oxygen, nitrogen, hydrogen, and methane.
2. **Pin Connections:** The wires need to be in the right spots for the sensors to work correctly.

Expected Results:
1. **Finding Spoiled Food:** The Arduino will tell if the food is fresh or spoiled.
2. **Indicator Lights:** Green light means fresh food, red light means spoiled food.

Conclusion:
The question we aimed to answer is: **How Can We Tell If Food Is Spoiled?** The answer is by using the Arduino UNO board. The board has lights that show if the food is fresh or spoiled. This system needs to be set up and coded correctly to work. This project shows how we can use an Arduino to find bad gases and tell if food is spoiled, making food safer for everyone.

Title: G^3: Glam + Germs = Gross
Team Name: Glam Squad (Grade 5)
Submitted by: Amayah Baysah, Jocelyn Stiles, Margaret Fenlon, Reya Vyas

Objective: The objective is to show bacterial growth on the makeup/applicators and to provide information on how to clean makeup/applicators.

Materials and Methods: We swabbed the makeup products and prepared petri dishes which were stored in a controlled heated environment.
We also went to different makeup stores and spoke to the makeup artists about how to clean, when to get rid of, and in-house storage of makeup products.
Additionally, we performed online research using reliable sources.

Results: A week later, we observed bacterial growth on petri dishes.
During our interaction with makeup artists, we learnt that all makeup has an expiration date. If makeup has a different color and odor, it does not blend well, seems chunky then should be thrown away immediately.
Additionally, at home, rubbing alcohol and Dawn dish soap can be used to clean the makeup products. Makeup should also be stored in dry conditions.
While doing our research, we learnt that the most common ways that bacteria gets on makeup is by sharing products and spreading germs from yourself onto the makeup.

Conclusion: This project shows that bacteria can grow on makeup and makeup applicators. It also provides the correct way to clean makeup.

Title: Rainwater harvesting working model
Team: Rain water Harvesters (Grade 5)
Submitted by: Naomi Jajal & Padmaja Phadtare

Objective: This study aimed to capture and store rainwater to meet water needs, reduce flooding, and improve water quality.

Methods/Materials: A rainwater harvesting system typically includes materials like a catchment area (usually a roof), gutters, downspouts, filters (including first-flush diverters), storage tanks, and a distribution system, with the methodology being to collect rainwater from the roof directly or through gutters , filter it to remove debris, store it in a tank, and then distribute it as needed for irrigation or other uses.

Result: Rainwater harvesting results in a significant reduction in water usage from municipal sources, lowering water bills. It contributes to groundwater recharge and alleviates pressure on existing water systems, especially in drought-prone areas. It's considered an environmentally friendly and cost-effective way to manage water resources by utilizing naturally available rainwater for non-potable uses like irrigation and toilet flushing.

Conclusion: Rainwater harvesting is a valuable practice that can help meet future water needs. It can help reduce the effects of climate change and groundwater depletion. Rainwater harvesting can be cost-effective and easy to implement. It can be used for irrigation and other commercial purposes. It is a good source of water for bathing, washing, and other domestic purposes, especially in areas where access to public water supply is difficult. Studies have shown that using rainwater has improved the lives of the people living in drought-prone areas greatly.

Summary: The project attempts to capture and store rainwater as a valuable practice that can help meet future water needs which is easy to implement and cost effective to improve the quality of lives of people.

Title:Wind Turbines
Team: Tech Titans (Grade 5)
Submitted by: Karter Beck, Liam Carrion, Derek Vista

Goals
Our goal was to make a model of a wind turbine that would lift a cup full of paper clips. We also wanted to simulate how a wind turbine functions. We achieved these goals using materials shown in the next section.

Methods/Materials
A wind turbine needs a sturdy base to keep the blades steady, so we used a wooden board (approx. 12” by 9”) and drilled a hole in it (with adult supervision, of course). We then glued a PVC pipe (16”) onto the board. Next, we drilled a hole into the pipe (again, with adult supervision) and stuck a skewer in a straw in the small hole. We then carefully measured each propeller (1” bottom, 7” height, 2” top) and glued them onto a plastic disk and drilled a hole in the middle of the plastic disk. We took the disk with propellers attached and put it on the skewer. We then blew the wind at an angle so that the wind turbine could lift the cup.

Results
Our first prototype “Aaron” had a weak base and worked about 50% of the time. The blades spun, though the string sometimes dropped the cup. However, attempt #2 “Bobby” was much better. It had a stable base, faster blades, and the string never dropped the cup. However, both prototypes only worked when constant wind was blown at an angle.

Summary
In summary, we reached our goals and learned how wind turbines worked. Using wind to generate kinetic energy, the turbine turned the skewer, lifting the cup. We learned how a wind turbine gains energy from wind, and how wind can be a natural source of energy.

Middle School Grades Abstract (Grades 6-8)

Title: Windmill Irrigation System
Team Name: The Kids Who Harnessed the Wind (Grade 6)
Submitted by: Nathan Shamy, Nathan LemMon, Rachel Ng, Defne Dağcı

Objectives/Goals
In the book “The Boy Who Harnessed the Wind,” by William Kamkwamba, William’s community suffered from a drought. He researched in a library and built a windmill that could pump water to irrigate the crops. Inspired by William, we designed and modeled a sustainable irrigation system.

Materials
K’nexTM, transfer pump, tubing, wind, water, plants, soil, and pots.
Methods
We built a windmill out of K’nexTM that is composed of a tailpiece, crown, fan, fan blades, and central tower. We also have a rain barrel to collect rainwater. The crank built out of K’nexTM is powered by the windmill. This pushes and pulls the transfer pump up and down and pumps the water from the rain barrel into a drip irrigation system. We will test the windmill by spinning the blades.

Expected Results
We expect the windmill and transfer pump to be effective in reducing fossil fuels for the pumps and water treatment.
Application
We can incorporate this into our lives to reduce our dependence on fossil fuels. People can collect rainwater from their gutters, build a small windmill, and attach a transfer pump to irrigate a small garden. This can reduce runoff, dependence on municipal water, which uses fossil fuels to clean and treat, and water loss due to evaporation.

Conclusion/Discussion
In conclusion, we learned that by harnessing the wind we can move water. We modeled one example of how to accomplish this. We were inspired by William’s design and perseverance, which helped our team get through challenges in the process. We hope to inspire others to explore ways to reduce their use of fossil fuels.

Title: Which Homemade Fertilizer Works Best On Fenugreek?
Team Name: Nature’s Nook (Grade 6)
Submitted by: Janvi Patel. Aarna Soma, Anika Soma, Anwita Kalakata

Objective/Goal

This study is to determine the most useful homemade fertilizer for fenugreek.

Methods/Materials
In this experiment, we will be testing which homemade fertilizer works on the fenugreek plant. We will have the same plant, same container, soil watering times, everything except the fertilizer. We will provide pictures every week and data on the plants everyday such as the height, weight, etc. We water our plants every Wednesday and Saturday, along with placing twenty seeds for each plant. We will put the fertilizers on the second week. The fertilizers used wll ne banana
peels. Coffee grounds, eggshells, and we will grow a plant with no fertilizer. Fertilizers help plant growth because they help provide the nutrients needed to survive. Coffee grounds contain several key nutrients needed by plants, including nitrogen, potassium, magnesium, calcium, and other trace materials.Egg shells contain calcium, potassium, and magnesium, all of which is healthy for plant growth!Banana peels are full of potassium and make the perfect slow-release fertilizer! We will also grow a plant without any fertilizer to see the differences between the nutrients given.

Results/Expected Results
We believe that if we use coffee grounds as fertilizer for our fenugreek plant, then it will provide the best nutrients and health to our beloved plant. If we use eggshells as fertilizers for our fenugreek plant, then it will provide enough nutrients for it to be healthy, but those plants won't have as good growth as the coffee ground plant. If we use banana peels as fertilizers for the plant, then it may not provide the expectations of nutrients for the plant in order for it to
thrive and live healthy. It still will make the plant healthy but it won't have the same effects as the coffee grounds.

Conclusion/Discussion
Based on our hypothesis, coffee grounds worked best because they had the key nutrients and helped improve the plant the most than the other fertilizers. This may do well for farmers, ecosystems, the planet, and future generations to come.

Title: Designing and Building the all new Fire-Fighting Robot, Super Nova Fire Pro

Team Name: The 7th Grade Inventors (Grade 7)
Submitted by: Saumya H. & Mukund P.

Objective/Goal:
The goal of our fire fighting robot is to reduce or put away accidental fires at home, or outside, to prevent anything severe from happening without the firefighters here. In a fire, the SuperNova FirePro robot quickly detects and extinguishes small flames with a press of a button. If the fire is large, it notifies firefighters with your location and lets you communicate via a two-way sound system, and can withstand temperatures up to 1500°F. Afterward, it returns to its station to charge wirelessly, making it a game-changer in fire safety.

Materials and Methods:
Materials: Arduino Uno, plastic base, solderless breadboard, capacitor, L298N motor driver, 1K ohm resistor, karaoke motherboard, 2 microphones, 5-6V water pump, 1N4148 diode, TIP122 transistors, 9V rechargeable batteries, 9V battery-to-Arduino connector, jumper wires, wireless power modules, fire/flame sensor, B-O gear motors. **Methods:** We glued the Arduino Uno, L298N motor driver, and breadboard onto the plastic base. Then, we connected wires to three flame sensors and soldered the B-O

motors in pairs. After that, we plugged the motors into the L298N motor driver and connected the driver to the Arduino Uno. We added the diode, capacitor, and resistor to the motor driver and breadboard, then powered the Arduino and karaoke motherboard. The robot is fully assembled and ready to function.

Results:
There is less fire disasters at home, because the robot completely puts away simple fires, calling for **help** while still trying to put it away

Conclusion:
With SuperNova FirePro, you can prevent accidental fires without the need for you to call the fire department when it automatically sends a notification including the house location, the fire, and the carbon dioxide status.

Title: Arduino Planetary Lander
Team Name: Legends (Grade 7)
Submitted By: Aadhav Saravanababu, Kavish Vyas, Kush Patel, Vihaan Sriram

Objective: To safely land a planetary lander using an Arduino microcontroller and an ultrasonic distance sensor.

Methods/Materials: The materials we used to build the lander were foam, cardboard, and aluminum foil. To construct the parachute we used string and nylon. In the actual circuit, we used an Arduino microcontroller, servo motors, and an ultrasonic distance sensor. To power the circuit, we used a nine-volt battery. The foam is a shock-absorbing material, while the cardboard was used to build the overall structure of our lander. The Arduino is the brain of our lander. The ultrasonic distance sensor measures distance by using ultrasonic waves. At a predetermined distance which is 3 feet, the distance sensor sends signals to the microcontroller to activate the servo motors to deploy the parachute.

Results: When we lowered our prototype to 3 feet, it deployed the parachute, safely landing our prototype.

Conclusion: In the end, we can see that an Arduino microcontroller, servo motors, and an ultrasonic distance sensor can work well together to land a planetary lander safely. It can not work without a parachute and impact-absorbing materials. The servo motors receive a signal which causes physical movement, deploying a parachute. This is the reason it safely lands, as well as the foam (impact absorbing material) which helps protect the payload.
We can also see from research that thrusters are the best way to land it. They are accurate and can land it the most safely. The reason why planetary landers are very important to humanity is because they can help us learn more about the universe. It allows scientists and astronomers to learn about other celestial bodies and to search for life. This can help humankind in the future.

Summary: This project tries to land a planetary lander with an Arduino and a distance sensor.

Title: Spot the Difference
Team Name: The Machine Minds (Grade 7)
Submitted By: Kasyap Darbha, Abhiram Chakravarthula, Dhanush

Objective The main goal of this project is to showcase the significant progress in artificial intelligence (AI) and its increasing influence over time. We aim to highlight how the advanced capabilities of AI can easily trick the human brain. Through data collection via research and surveys, we will share our results with the judges, focusing on the potential risks linked to AI.

Materials and Methods: In this project, we used printouts that display a mix of AI-generated images and authentic photographs. These visuals will be central to our presentation. To clearly communicate our findings, we incorporated graphical representations of the survey data we gathered.

Expected Results: We expect the survey results to clearly reveal the strengths and weaknesses of AI techniques. Many respondents are likely to have difficulty differentiating between AI-generated images and real photographs. The hyper-realistic features of AI are anticipated to influence perceptions, causing individuals to erroneously perceive AI images as genuine because of their realistic appearance in comparison to actual photos.

Conclusion: In conclusion, our project highlights the growing capabilities of AI, especially in the realm of image generation. By comparing real images with those created by AI, we can recognize both the impressive potential and the associated risks. Although AI's capacity to generate hyper-realistic images can be utilized for beneficial purposes, it also brings forth issues related to misinformation, a decline in trust, and the danger of artificial images eclipsing authentic ones.

Title: Glowing Pathways Using Bioluminescent Bacteria

Team Name: Unsupervised Scientists (Grade 8)
Submitted by: Sonia Patel, Meghana Chinthapatla, Isabella Gonzalez, Cindy Esquite-Aroche

Objective / Goal: The goal of this project is to create a sustainable, electricity-free glowing pathway using phosphorescent (glow-in-the-dark) powder to represent bioluminescent bacteria. By absorbing sunlight during the day and emitting light at night, this innovative solution can enhance visibility and safety in outdoor spaces while reducing energy consumption.

Materials: Glow-in-the-dark phosphorescent powder (strontium aluminate-based), clear waterproof resin or paint, concrete pathway stones or tiles, brushes, and UV/sunlight exposure.

Methods: Mix the phosphorescent powder with a clear outdoor resin or paint. Evenly coat concrete pathway stones or tiles with the mixture. Allow them to dry and cure properly for durability. Place the treated pathway stones in an outdoor area with adequate sunlight exposure. Observe and measure the glow duration and intensity at night.

Results / Expected Results: The treated pathway stones should absorb sunlight during the day and emit a soft glow at night, creating a visually appealing and functional illuminated path. The glow intensity may vary based on exposure to sunlight and the amount of phosphorescent powder used. The effect should last for several hours after sunset, providing an eco-friendly alternative to artificial lighting.

Conclusion / Discussion: This project demonstrates how phosphorescent materials can be used to enhance outdoor lighting without electricity. The solution is cost-effective, easy to implement, and environmentally friendly. Future improvements may involve testing different powder concentrations, coatings for increased longevity, and applications in urban infrastructure for sustainable lighting solutions

Title: A Dynamite Explosion- Rube Goldberg

Team name: Dynamites (Grade 8)
Submitted by: Hansika Tamilarasan, Nora Rodrigues, Uma Nallapati

Objective:The primary objective of a Rube Goldberg machine is to perform a simple task in an overly complicated and indirect way, often relying on a chain reaction of events to achieve the desired outcome, emphasizing creativity and problem-solving.

Methods/Materials: During our project, we used a variety of materials. For our base, we employed cardboard, aluminum foil, needles, and tape. To construct our different simple machines, we used cups along with additional tape and cardboard. To create our volcano, we utilized paints, clay, and flasks. We also included a chemical known as hydrogen peroxide, which was responsible for our explosive reaction, referred to as "elephant toothpaste." This will serve the course of our project, we utilized a diverse array of materials. For the foundational structure, we employed cardboard, aluminum foil, needles, and tape.The volcano model was created using paints, clay, and flasks. A particular chemical, hydrogen peroxide, was used to facilitate the explosive reaction known as "elephant toothpaste," which is intended to serve as the concluding element of the Rube Goldberg machine. To conclude this project typically demonstrates a success rate of approximately 50%.

Results:The Rube Goldberg worked smoothly 9 out of 10 times it was tested, leading to the volcano's chemical reaction.

Summary: Our primary goal in creating this experiment was to demonstrate how simple machines can interact and work together to accomplish a straightforward task. This concept aligns with the innovative spirit of Rube Lucious Goldberg, who is famous for his intricate contraptions. In our experiment, we incorporated a fun and vibrant demonstration known as "elephant toothpaste." This chemical reaction, which produces a large foam explosion resembling toothpaste for an elephant, served as an engaging example of how different elements can combine in a simple machine setup. We used various simple machines, such as levers and pulleys, to initiate the reaction that eventually led to the impressive foam eruption. Through this hands-on activity, we aimed to illustrate not only the principles of mechanics and engineering but also the importance of creativity and problem-solving when things don't go as planned. Even if a Rube Goldberg machine may not function perfectly every time, it offers a valuable opportunity to learn and experiment with the concepts of force, motion, and chemical reactions.

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